

Appendix R – Landscape Character and Visual Impact Assessment

The cover features a photograph of a sandy beach with waves breaking in the distance under a clear blue sky. A large, semi-transparent green shape is overlaid on the left side of the image, extending from the top left towards the center. The text is placed within this green area and on a white background at the bottom.

GHDWOODHEAD

Hunter Water Corporation

Belmont Drought Response Desalination Plant

Amendment Report

Landscape Character and Visual Impact Assessment

Architecture
Interior Design
Planning
Urban Design
Landscape Architecture

June 2020

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Appendix A Landscape Character Methodology

Appendix B Visual Impact Assessment Methodology

1 Introduction

1.1 Background

Hunter Water Corporation (Hunter Water) is seeking approval to construct and operate a drought response desalination plant (the 'Project'), adjacent to the Belmont Wastewater Treatment Works (WWTW) in Belmont South, a suburb of Lake Macquarie Local Government Area (LGA) of New South Wales (NSW) (the 'Project area'); (see Figure 2-1).

Like much of NSW, the Lower Hunter region continues to experience ongoing drought conditions. In response to the drought, Hunter Water is rolling out a program of drought response measures as outlined in the 2014 Lower Hunter Water Plan (LHWP). Measures include the staged introduction of water restrictions, implementation of a broad range of water conservation and water loss initiatives as well as various operational measures. The 2014 LHWP identified the implementation of emergency desalination as a measure of last resort in response to a severe drought, and would only be implemented if water storage levels reached a critical point and all other measures have been implemented.

GHD Pty Ltd (GHD) were engaged by Hunter Water to prepare an Environmental Impact Statement (EIS) (GHD, 2019a) to support a development application for the Project as State Significant Infrastructure (SSI) under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The EIS was prepared in accordance with the provisions of the EP&A Act and the EP&A Regulation and addresses the Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning, Industry and Environment (DPIE) for the Project on 12 December 2017 and revised on 24 January 2018. The EIS was publicly exhibited by DPIE for 28 days from 21 November 2019 to 19 December 2019.

The Project described in the EIS included the construction and operation of a desalination plant, designed to produce up to 15 megalitres per day (ML/day) of potable water, with two sub-surface intake structures.

Since commencing this Project, Hunter Water has begun a major review of the 2014 LHWP, now referred to as the Lower Hunter Water Security Plan (LHWSP). The LHWSP seeks to determine the preferred portfolio of supply and demand side options to ensure a sustainable and resilient supply for the region, over the long term as well as during drought. This work indicates that a drought response portfolio including a desalination plant at Belmont with a nominal production capacity of up to 30 ML/day would provide the best balance of meeting the community's needs should a severe drought occur, while still providing value for money.

In addition to the proposed increase in plant capacity, further design development and assessment following completion of the EIS has identified that a direct ocean intake would perform considerably better than a sub-surface option across key criteria including, reliability, efficiency and scalability.

1.2 Purpose and scope of this report

This report has been prepared to support the Amendment Report and address the requirements for the SEARs in considering the revised impacts of the amended Project.

This report provides a brief overview of the amended Project. This assessment considers the impacts associated with the proposed amendments to the Project. Therefore, this report should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, November 2019) and *Belmont Drought Response Desalination Plant – Noise and Vibration Assessment* (GHD, November 2019).

1.3 Consideration of design changes

The SEARs relevant to the Project are summarised in Table 1-1 below, including identification of where in this report this requirement has been addressed in consideration to the Project, as amended (see Section 2).

Table 1-1 SEARs (SSI 8896)

Requirements	Relevant Section
An impact assessment at representative private receptors and public vantage points	4 and 5

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 Project changes

2.1 Overview

In addition to the proposed increase in plant capacity, the amended Project includes the following design changes:

- **Seawater intake:** Further design development and liaison with Hunter Water's construction partners following completion of the EIS identified reliability and construction risks with the proposed horizontal sub-surface intake system as described in the EIS. An assessment of the horizontal sub-surface intake system was undertaken against alternative intake options. This assessment found that a direct ocean intake would perform considerably better than a sub-surface option across key criteria including reliability, efficiency and scalability (see Section 2.3).
- **Power supply:** The EIS proposed to meet power requirements for the Project via a minor upgrade to the existing 11 kV power supply network in the vicinity of Hudson and Marriot Street. The amendment to the capacity of the water treatment process plant means this is now unfeasible, due to inability to meet energy requirements. Instead, the Project will connect to Ausgrid's 33 kV network in the vicinity of the Project (see Figure 2-2).

2.2 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.

2.3 Project description

2.3.1 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.

2.3.2 Key features of the amended Project

The amended Project for the construction and operation of a drought response desalination plant, designed to produce up to 30 ML/day of potable water, includes the following key components:

Direct ocean intake – To ensure provision of sufficient quantities of raw feed water for the water treatment process plant, a direct ocean intake is proposed as part of the amended Project, as follows:

- *Sea Water Pump Station (On-shore)*, including a central well, screening and pump housing, proposed to be a concrete structure (referred to as a wet well) of approximately nine to 11 m diameter, installed to a depth up to 20 m below existing surface levels.
- *Intake pipeline*, the indicative pipeline alignment is approximately 1000 m in length, extending outwards from the central housing to the off-shore intake structure. Construction of the intake pipeline would be determined during detailed design; however, the following construction methodologies/considered and assessed included Construction method 1 (CM1) Horizontal directional drilling (HDD) and (CM2) Pipejacking/micro-tunnelling.
- *Intake structure (Off-shore)*, the intake structure would be in the form of a horizontal intake with a velocity cap structure and low through-screen velocity to minimise impacts on marine species and habitat. The intake structure would be 5 m in diameter, have a minimum of 5 m clearance from the seabed and a depth of approximately 18 m of water.

Water treatment process plant – The water treatment process plant would not significantly change from that described in the EIS. The inclusion of buildings to house equipment rather than the installation of containerised equipment is the primary change. The buildings would be placed above ground level and located to allow incremental installation, if required. 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 raw feed water.
- *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.

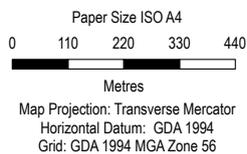
Brine disposal system – The desalination process would produce up to 56 ML/d of wastewater, comprising predominantly brine, as well as a small amount of pre-treatment and RO membrane cleaning waste. The waste brine from the desalination process would be transferred via a pipeline to a brine pump station at the Belmont WWTW for disposal via the existing ocean outfall pipe.

Power supply – Power requirements of the amended water treatment process plant would require connection to Ausgrid's 33 kV line to the north-west of the water treatment process plant site, with new private power line connecting to a substation within the plant site.

Ancillary facilities – including a tank farm, equipment housing buildings, chemical storage and dosing, hardstand areas, stormwater and cross drainage, access roads, parking areas, and fencing, signage and lighting.

Each of these elements are described further in Appendix C of the Amendment Report.

The desalination plant would be connected to Hunter Water's potable water network via a potable water pipeline proposed to be constructed to augment the existing water network. The pipeline does not form part of the Project and would be part of a separate design and approvals process.



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Date 29/06/2020

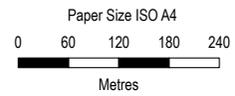
Project Location

Figure 2-1



Legend

- Onshore project area
- Indicative offshore project area
- No-go area
- Drought response desalination plant indicative layout
- Brine pump station
- Indicative construction compound and laydown area
- Seawater pump station
- Stormwater basin
- Indicative intake structure location
- Power connection
- Indicative intake pipeline
- Existing WWTW ocean outfall



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



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The Amended Project

Figure 2-2

To highlight the changes made to the project between the EIS and the amended Project, Figure 2-3 presents a 3D representation of the Project prior to changes while Figure 2-4 depicts the amended Project, including changes to the water treatment process plant and the sea water pump station.

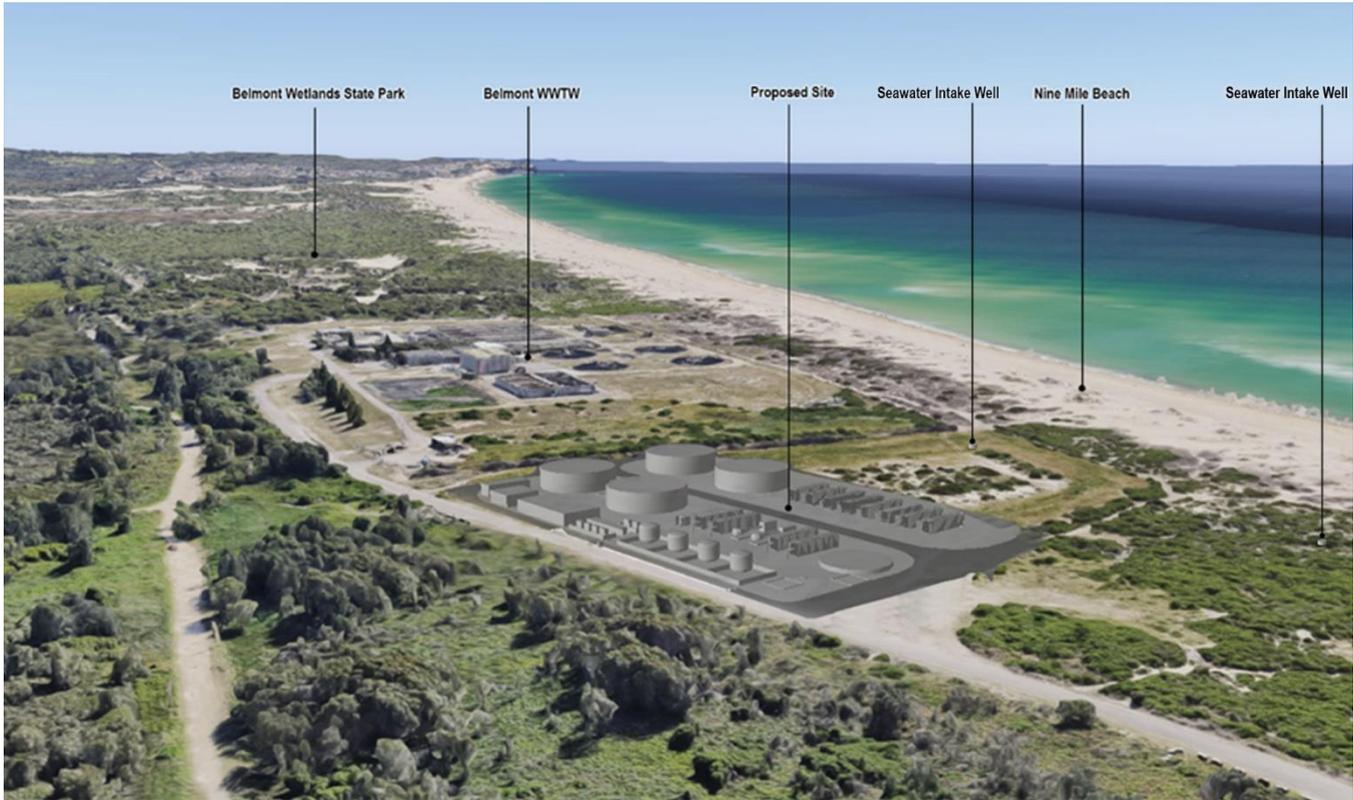


Figure 2-3 3D Representation of the EIS Design



Figure 2-4 3D Representation of the Conceptual Design of the Amended Project

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 has been consistent between the EIS and the Amendment assessment (this report), and 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 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.

The EIS has previously addressed the following items in detail:

- Regional and Local Strategic Context
- Land use zones
- Land use and built form
- Topography
- Vegetation

Please refer to the EIS document for further information on these areas.

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 below. Consistent methodology to assess the landscape character zones has been employed through the EIS and the Amendment assessment.

Here, both construction and operational impacts are being assessed. There are two construction methodologies that are being assessed:

1. Horizontal Directional Drilling (HDD)
2. Micro Tunnelling/Pipe Jacking

Both construction methodologies require the use of an offshore construction barge. Each construction methodology will present minor differences on how this impacts the beach scape during construction.

In relation to the technicalities of each method, it is important to note that portions of these are “unseen” and therefore will not be subject to this assessment. The key components for the landscape character assessment will be the requirements of the barge and the on-shore construction zone.

Please refer to Appendix A for Landscape Character Assessment Methodology. A key aspect of this assessment is that the introduction of these construction methods is temporary. Whilst objectively the introduction of construction equipment and infrastructure to a zone is significant, when assessed through this method in consideration of duration to the sensitivity and magnitude, the impact will differ from what may be initially perceived.

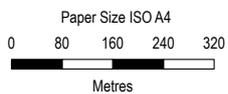
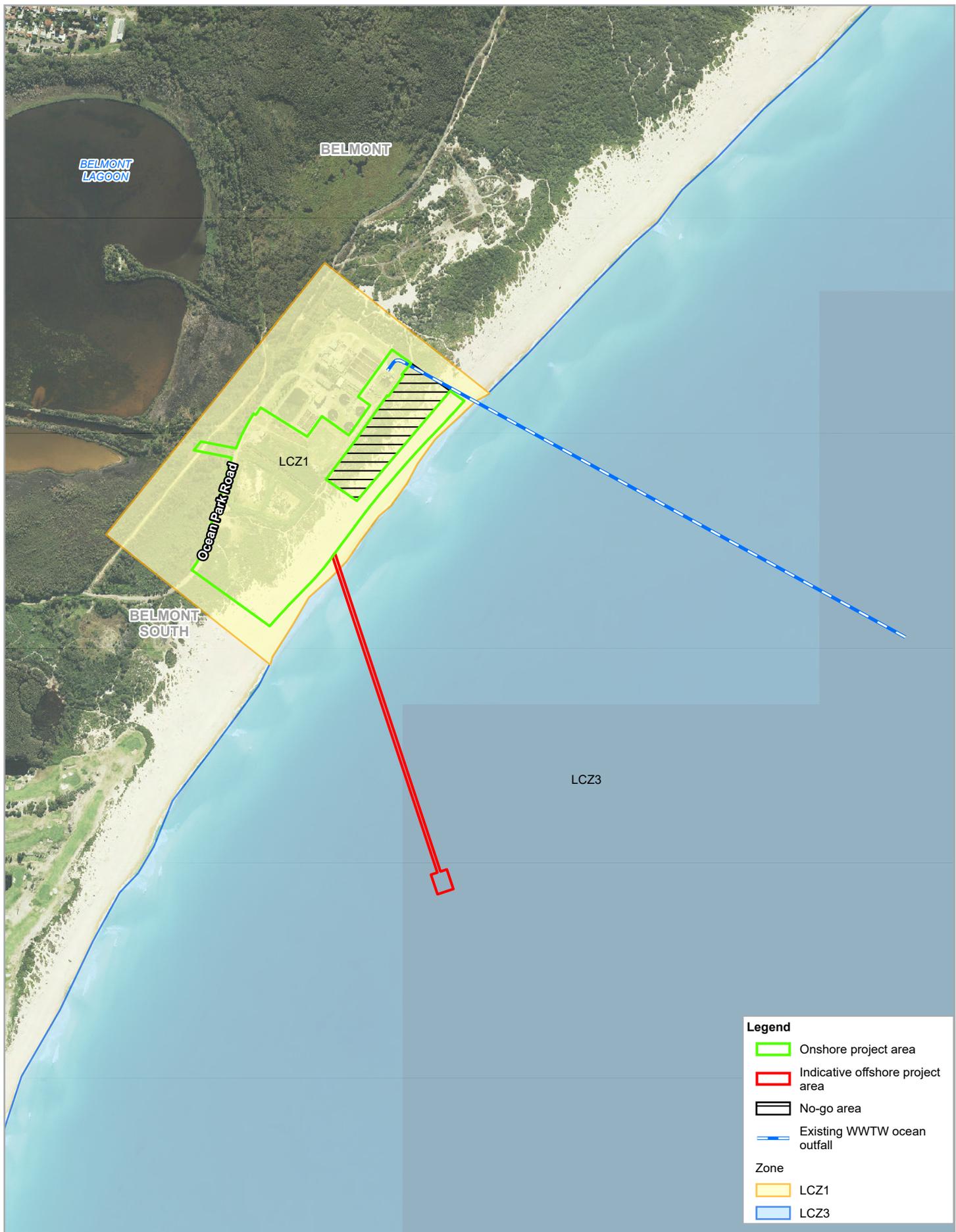
The study area was broken down into two landscape character zones (LCZ) of broadly homogenous characteristics or strongly defined spatial qualities (refer to Figure 4-1).

It should be noted that LCZ 2 – South Belmont Residential is no longer included. As the capacity of the Project has increased from 15 ML/day to 30 ML/day, the Project will be connected into an alternate 33 kV system as opposed to the 11 kV system located within LCZ 2 due to the increase in power requirements. Additionally, both the onshore and offshore Project areas have changed since the EIS. As a result, the Landscape Character Zones relevant to the Amended Project are:

- LCZ 1 – Coastal Dunes and Beach Scape
- LCZ 3 – Ocean – Sea Scape

The change in the water treatment process plant and the sea water pump station of the Project will not impact the landscape character of each zone and as such is consistent with the EIS.

Please refer to Appendix A of the report for a description of how the sensitivity, magnitude and impact of landscape character zones are measured.



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



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Landscape Character Zones

Figure 4-1

4.2 LCZ 1 Impact Assessment – Coastal Dunes and Beach Scape

Existing environment

The existing landscape character of LCZ1 is described in Table 4-1, with photographs provided in Figure 4-2 and Figure 4-3 below.

The changes to the Project capacity in relation to the water treatment process plant and the sea water pump station is not significant enough to cause any change to the landscape character of the Coastal Dunes and Beach Scape zone, and as such the assessment for the amended Project is consistent with the EIS.



Figure 4-2 View West Towards Existing WWTW



Figure 4-3 View South along Nine Mile Beach adjacent to Project Site

Table 4-1 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

4.2.1 LCZ 1 - Coastal Dunes and Beach Scape – Operational

Impact

The sensitivity, magnitude and overall impact prediction for LCZ1 is provided in Table 4-2. As outlined, changes to the Project’s water treatment process plant and sea water pump station do not cause implications to the impact of the Project on the Coastal Dunes and Beach Scape landscape character zone.

Table 4-2 LCZ1 Impact Assessment - Operational

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 1 - Coastal Dunes and Beach Scape – Construction Methodology 1

This assessment is for impacts to this landscape character for construction phase only. For impacts during operation, refer to section 4.2.1.

Construction methodology 1 refers to Horizontal Directional Drilling (HDD) which involves installing a pilot drill hole out to a barge/anchored vessel. From the barge, the pilot hole is then back reamed to the outer diameter of the pipeline and with the allowance for any grouting required to stabilise the reamed void. The pipeline is then pulled back to shore and construction is completed.

Impact

The sensitivity, magnitude and overall impact prediction for LCZ1 is provided in Table 4-3. As outlined, changes to the Project's water treatment process plant and sea water pump station do not cause implications to the impact of the Project on the Coastal Dunes and Beach Scape landscape character zone during construction stage of methodology 1.

Table 4-3 LCZ1 Impact Assessment - Construction - Methodology 1

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. As such, the Project is not anticipated to result in a notable alteration to the landscape character of this LCZ.</p>

4.2.3 LCZ 1 - Coastal Dunes and Beach Scape – Construction – Methodology 2

This assessment is for impacts to this landscape character for construction phase only. For impacts during operation, refer to section 4.2.1.

Construction methodology 2 refers to the Micro Tunnelling/Pipe Jacking method. This method is a remotely controlled construction process that creates a bored hole using a micro-tunnelling-boring-machine from a launch shaft along a predetermined alignment to a receiving shaft.

Impact

The sensitivity, magnitude and overall impact prediction for LCZ1 is provided in Table 4-4. As outlined, changes to the Project’s water treatment process plant and sea water pump station do not cause implications to the impact of the Project on the Coastal Dunes and Beach Scape landscape character zone during construction stage of methodology 2.

Table 4-4 LCZ1 Impact Assessment - Construction - Methodology 2

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>

4.3 LCZ 3 Impact Assessment – Ocean/Sea Scape

This landscape character zone will only be effected during construction phase. During operation, there will be no impact.

Existing environment

The existing landscape character of LCZ 3 is described in Table 4-5, with a photograph of the ocean as seen from the beach located in Figure 4-4 and Figure 4-5. This zone has been included as a result of the barge that will be required to be located in the ocean during the construction phase of the intake structure. Whilst the Project has been amended, this landscape character zone will not be impacted and as such the assessment will be consistent with the EIS.

It is important to note that LCZ 3 differs from the other Land Character Zones as it is a dynamic landscape. This means that an array of unpredictable conditions are able to present themselves within the landscape, and as such it is not possible to identify and outline each possible condition. The following table references this range of possible conditions.



Figure 4-4 Ocean as seen from Belmont Golf Course - Construction - Methodology 1 and Methodology 2



Figure 4-5 Offshore Construction Barge Location - Construction - Methodology 1 and Methodology 2

Table 4-5 LCZ 3 Landscape Character

Summary	<ul style="list-style-type: none"> • A barge exists at a point in the ocean to support the construction phase of the intake structure
Landform	<ul style="list-style-type: none"> • N/A - Body of Water
Vegetation	<ul style="list-style-type: none"> • N/A
Landscape Features	<ul style="list-style-type: none"> • Vast body of water, dynamic conditions that change dramatically
Infrastructure	<ul style="list-style-type: none"> • N/A
Land Use/Built Environment	<ul style="list-style-type: none"> • N/A
Spatial Quality/amenity	<ul style="list-style-type: none"> • Scale – Vast • Enclosure – Exposed • Diversity – Complex • Texture – Smooth • Form – Undulating to Horizontal • Colour – Muted • Balance – Harmonious to Chaotic • Movement – Still to Busy • Pattern – Random

4.3.1 LCZ 3 - Ocean/Sea Scape – Construction – Methodology 1

Construction methodology 1 refers to Horizontal Directional Drilling (HDD) which involves installing a pilot drill hole out to a barge/anchored vessel. From the barge, the pilot hole is then back reamed to the outer diameter of the pipeline and with the allowance for any grouting required to stabilise the reamed void. The pipeline is then pulled back to shore and construction is completed.

Impact

The sensitivity, magnitude and overall impact prediction for LCZ3 is provided in Table 4-6. As outlined, changes to the Project’s water treatment process plant and sea water pump station do not cause implications to the impact of the Project on the Ocean/Sea Scape landscape character zone during construction stage of methodology 1.

Table 4-6 LCZ 3 Impact Assessment - Construction - Methodology 1

Sensitivity	Moderate
Magnitude	Low
Impact	Moderate - Low
Comments	<p>The existing character of the ocean is an extensive body of water that can range in conditions from extremely calm waters to rough seas with large waves.</p> <p>The impact of the Project on character of this landscape has been identified as moderate - low, as the barge within the ocean would only be present for a short time during the construction phase of the intake structure.</p> <p>The offshore construction zone (the barge) will emit artificial light as a safety precaution. Minimal lighting is required for safety and navigational purposes. This lighting will not cause significant impact visually as a result of these minimum requirements.</p> <p>The introduction of the intake structure from the EIS design does not cause any adverse implications to this landscape character zone as a result of the vast and dynamic nature of the ocean.</p>

4.3.2 LCZ 3 – Ocean/Sea Scape – Construction – Methodology 2

This landscape character zone will only be effected during construction phase. During operation, there will be no impact.

Construction methodology 2 refers to the Micro Tunnelling/Pipe Jacking method. This method is a remotely controlled construction process that creates a bored hole using a micro-tunnelling-boring-machine from a launch shaft along a predetermined alignment to a receiving shaft.

Impact

The sensitivity, magnitude and overall impact prediction for LCZ3 is provided in Table 4-7. As outlined, changes to the Project’s water treatment process plant and sea water pump station do not cause implications to the impact of the Project on the Ocean/Sea Scape landscape character zone during construction stage of methodology 2.

Table 4-7 LCZ 3 Impact Assessment – Construction – Methodology 2

Sensitivity	Moderate
Magnitude	Low
Impact	Moderate - Low
Comments	<p>The existing character of the ocean is an extensive body of water that can range in conditions from extremely calm waters to rough seas with large waves.</p> <p>The offshore construction zone (the barge) will emit artificial light as a safety precaution. Minimal lighting is required for safety and navigational purposes. This lighting will not cause significant impact visually as a result of these minimum requirements.</p> <p>The impact of the Project on character of this landscape has been identified as moderate-low, as the barge within the ocean would only be present for a short time during the construction phase of the intake structure.</p> <p>The introduction of the intake structure from the EIS design does not cause any adverse implications to this landscape character zone as a result of the vast and dynamic nature of the ocean.</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 Project
- Viewpoint 2 – Nine Mile Beach – Offshore Construction Zone
- Viewpoint 3 – Belmont Golf Course
- Viewpoint 4 – Andersons Point – Elevated Residential
- Viewpoint 5 – Belmont North – Elevated Residential
- Viewpoint 6 – 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.

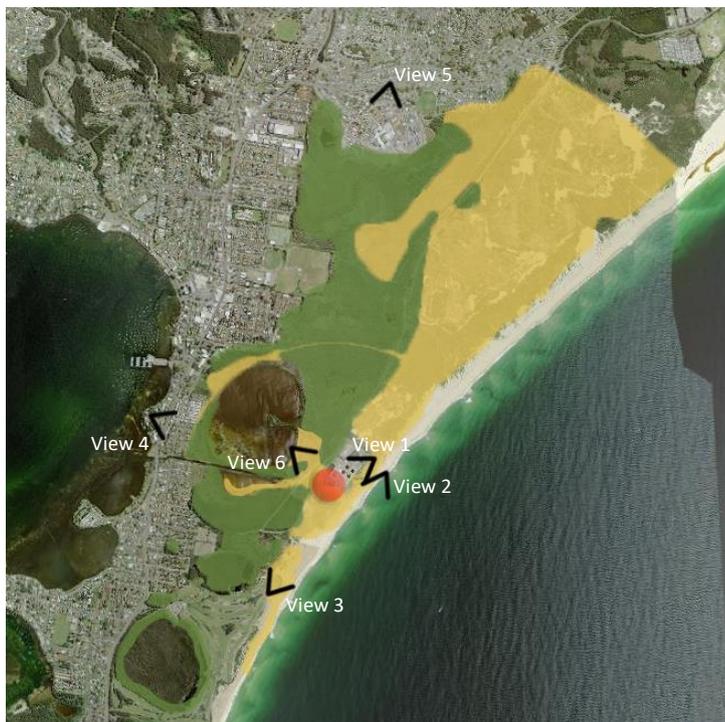


Figure 5-1 Key Viewpoints

The same methodology has been used in both the EIS and the Amendment assessment. Please refer to Appendix B of the report for a description of how the sensitivity, magnitude and impact of the assessed viewpoints are measured.

This visual impact assessment for the following viewpoints highlights the Amended Project from the EIS, in regards to changes to the water treatment process plant and the sea-water pump station. Whilst the plant has increased in size, this does not incur additional impacted viewpoints. In relevant viewpoints these items are specifically identified, along with clarifications about consistency with the EIS.

Within this visual impact analysis, as with the landscape character assessment:

- Construction methodology 1 refers to Horizontal Directional Drilling (HDD) which involves installing a pilot drill hole out to a barge/anchored vessel. From the barge, the pilot hole is then back reamed to the outer diameter of the pipeline and with the allowance for any grouting required to stabilise the reamed void. The pipeline is then pulled back to shore and construction is completed.
- Construction methodology 2 refers to the Micro Tunnelling/Pipe Jacking method. This method is a remotely controlled construction process that creates a bored hole using a micro-tunnelling-boring-machine from a launch shaft along a predetermined alignment to a receiving shaft.

5.2 Viewpoint 1 – Nine Mile Beach – Adjacent to Project Site

Viewpoint 1 represents the line of sight from a receptor adjacent to the Project site. The existing site is shown in Figure 5-2.



Figure 5-2 View 1 Existing

Changes to the water treatment process plant and the sea water pump station have implications for this viewpoint. The EIS design is shown in Figure 5-3, whilst the Amended Project is shown in Figure 5-4.



Figure 5-3 View 1 with EIS design



Figure 5-4 View 1 with the Amended Project design

Figure 5-5 relates to the onshore construction zone location relevant for construction methodologies 1 and 2.



Figure 5-5 View 1 Onshore Construction Zone Location

5.2.1 Viewpoint 1 – Operational Assessment

The changes to the water treatment plant and the sea water pump station from the EIS design to the amended Project will be assessed separately. Table 5-1 and Table 5-2, and Table 5-3 and Table 5-4 provide the water treatment process plant and sea water pump station’s sensitivity and impact respectively.

Table 5-1 Viewpoint 1 – Amended Project – Water Treatment Process Plant - 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 5-2 Viewpoint 1 – Amended Project – Water Treatment Process Plant - 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> <p>Whilst the changes made from the EIS design to the Amended Project make the presence of the sea water pump station more significant, its impact within the context of the Nine Mile Beach landscape environment is still considered moderate – low.</p>

Table 5-3 Viewpoint 1 – Amended Project – Sea Water Pump Station - 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 5-4 Viewpoint 1 – Amended Project –Sea Water Pump Station - 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> <p>Whilst the changes made from the EIS design to the Amended Project make the presence of the sea water pump station more significant, its impact within the context of the Nine Mile Beach landscape environment is still considered moderate – low.</p>

5.2.2 Viewpoint 1 – Construction – Methodology 1 Assessment

A representation of viewpoint 1 with the onshore construction zone located is provided in Figure 5-5.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 1 during the construction phase of the Project, and as such the visual impact assessment for viewpoint 1 is consistent with the EIS.

The viewpoint sensitivity and impact ratings are provided in Table 5-5 and Table 5-6.

Table 5-5 Viewpoint 1 – Construction Methodology 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 – Construction Methodology 1 - Impact

Sensitivity	Low
Magnitude	Moderate
Impact	Moderate - Low
Comments	Changes between the EIS design and the Amended Project design will not have any implications for the impact of the duration of construction methodology 1 on this viewpoint. Due to the existing presence of the WWTW, the limited duration of 3-4 months of the construction phase, and the location of the construction zone located within the Project site, this phase will have a moderate – low impact on this viewpoint as there will be no additional obstruction to the landscape.

5.2.3 Viewpoint 1 – Construction – Methodology 2 Assessment

A representation of viewpoint 1 with the onshore construction zone located is provided in Figure 5-5.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 1 during the construction phase of the Project, and as such the visual impact assessment for viewpoint 1 is consistent with the EIS.

The viewpoint sensitivity and impact ratings are provided in Table 5-7 and Table 5-8.

Table 5-7 Viewpoint 1 – Construction Methodology 2 - 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 5-8 Viewpoint 1 – Construction Methodology 2 - Impact

Sensitivity	Low
Magnitude	Moderate
Impact	Moderate - Low
Comments	Changes between the EIS design and the Amended Project design will not have any implications for the impact of the duration of construction methodology 2 on this viewpoint. Due to the existing presence of the WWTW, the limited duration of 3-4 months of the construction phase, and the location of the construction zone located within the Project site, this phase will have a moderate – low impact on this viewpoint as there will be no additional obstruction to the landscape.

5.3 Viewpoint 2 – Nine Mile Beach - Offshore Construction Zone

Viewpoint 2 will only be impacted during the construction stage of the Project and as such there is no operational assessment.

A representation of viewpoint 2 with the offshore construction zone (the barge) for construction methodologies 1 and 2 is provided in Figure 5-6.



Figure 5-6 View 2 With Offshore Construction Zone Barge

5.3.1 Viewpoint 2 – Construction – Methodology 1 Assessment

A representation of viewpoint 2 with the offshore construction zone (the barge) is provided in Figure 5-6.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 2 during the construction phase of the Project, as the offshore construction zone is consistent with the EIS.

Table 5-9 Viewpoint 2 Sensitivity

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

Table 5-10 Viewpoint 2 Impact

Sensitivity	Low
Magnitude	Moderate
Impact	Moderate - Low
Comments	<p>Due to the nature of the landscape that this viewpoint is capturing, it is important to note it's dynamic nature and the range of conditions that may vary due to the presence of vessels within the ocean.</p> <p>The offshore construction zone (the barge) will emit artificial light as a safety precaution. Minimal lighting is required for safety and navigational purposes. This lighting will not cause significant impact visually as a result of these minimum requirements.</p> <p>The introduction of the intake structure from the EIS design does not cause any adverse implications to this viewpoint as a result of the vast and dynamic nature of the ocean.</p> <p>The impact of construction methodology 1 on viewport 2 is therefore classified as Moderate – Low as it will make little difference to the vastness of the ocean.</p>

5.3.2 Viewpoint 2 – Construction – Methodology 2 Assessment

A representation of viewpoint 2 to the offshore construction zone (the barge) is provided in Figure 5-6.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 2 during the construction phase of the Project, as the offshore construction zone is consistent with the EIS.

Table 5-11 Viewpoint 2 Sensitivity

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

Table 5-12 Viewpoint 2 Impact

Sensitivity	Low
Magnitude	Moderate
Impact	Moderate - Low
Comments	<p>Due to the nature of the landscape that this viewpoint is capturing, it is important to note it's dynamic nature and the range of conditions that may vary due to the presence of vessels within the ocean.</p> <p>The offshore construction zone (the barge) will emit artificial light as a safety precaution. Minimal lighting is required for safety and navigational purposes. This lighting will not cause significant impact visually as a result of these minimum requirements.</p> <p>The introduction of the intake structure from the EIS design does not cause any adverse implications to this viewpoint as a result of the vast and dynamic nature of the ocean. The impact of construction methodology 2 on viewport 2 is therefore classified as Moderate – Low as it will make little difference to the vastness of the ocean.</p>

5.4 Viewpoint 3 – Belmont Gold Course

A representation of viewpoint 3 with the Project in place is provided in Figure 5-7. Viewpoint 3 represents the line of sight from a receptor at Belmont Golf Course to the Project site.



Figure 5-7 View 3 from 11th hole at Belmont Golf Course

Figure 5-8 represents the onshore construction zone with the offshore barge, relevant for construction methodologies 1 and 2.



Figure 5-8 View 3 from 11th hole at Belmont Golf Course with Onshore Construction Zone and Barge

5.4.1 Viewpoint 3 – Operational Assessment

A representation of viewpoint 3 with the Project in place is provided in Figure 5-7.

Whilst the view to the Project site includes the Amended Project, the changes to the water treatment process plant and the sea water pump station are not visible.

As a result, the visual impact assessment is consistent with the EIS. The changes to the water treatment process plant and the sea water pump station from the EIS design to the Amended Project will be assessed separately. Table 5-13 and Table 5-14, Table 5-15 and Table 5-16 provide the water treatment plant and the sea water pump station’s sensitivity and impact respectively.

Table 5-13 Viewpoint 3 – Amended Project – Water Treatment Process Plant - 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 5-14 Viewpoint 3 - Amended Impact – Water Treatment Process Plant – 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 (and thus the water treatment process plant) however, is screened by vegetation from this viewpoint.

Table 5-15 Viewpoint 3 - Amended Project – Sea Water Pump Station – 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 5-16 Viewpoint 3 - Amended Project – Sea Water Pump Station - 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 (and thus the sea water pump station) however, is screened by vegetation from this viewpoint.

5.4.2 Viewpoint 3 – Construction – Methodology 1 Assessment

A representation of viewpoint 3 with the onshore and offshore construction zone locations provided in Figure 5-8.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 3 during the construction phase of the Project, as such the onshore and offshore construction zones are consistent with the EIS.

Table 5-17 Viewpoint 3 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 5-18 Viewpoint 3 Impact

Sensitivity	Low
Magnitude	Low
Impact	Low
Comments	<p>Construction methodology 1 involves the presence of both onshore and offshore construction zones. Viewpoint 2 captures both of these.</p> <p>The offshore construction zone (the barge) will emit artificial light as a safety precaution. Minimal lighting is required for safety and navigational purposes. This lighting will not cause significant impact visually as a result of these minimum requirements.</p> <p>The impact on this viewpoint is classified as low as the WWTW is already present from this view. Most of the onshore construction works will be screened by vegetation, and the offshore barge will have minor interference with the landscape due to the dynamic nature of the ocean and the existing presence of vessels.</p> <p>The introduction of the intake structure from the amended design does not cause any adverse implications to this viewpoint as a result of the vast and dynamic nature of the ocean.</p>

5.4.3 Viewpoint 3 – Construction – Methodology 2 Assessment

A representation of viewpoint 3 with the onshore and offshore construction zone locations provided in Figure 5-8.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 3 during the construction phase of the Project, as such the onshore and offshore construction zones are consistent with the EIS.

Table 5-19 Viewpoint 3 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 5-20 Viewpoint 3 Impact

Sensitivity	Low
Magnitude	Low
Impact	Low
Comments	<p>Construction methodology 2 involves the presence of both onshore and offshore construction zones. Viewpoint 2 captures both of these.</p> <p>The offshore construction zone (the barge) will emit artificial light as a safety precaution. Minimal lighting is required for safety and navigational purposes. This lighting will not cause significant impact visually as a result of these minimum requirements.</p> <p>The impact on this viewpoint is classified as low as the WWTW is already present from this view. Most of the onshore construction works will be screened by vegetation, and the offshore barge will have minor interference with the landscape due to the dynamic nature of the ocean and the existing presence of vessels.</p> <p>The introduction of the intake structure from the amended design does not cause any adverse implications to this viewpoint as a result of the vast and dynamic nature of the ocean.</p>

5.5 Viewpoint 4 – Andersons Point – Elevated Residential

A representation of viewpoint 4 with the Project in place is provided in Figure 5-9. Viewpoint 4 represents the line of sight from a receptor at Andersons Point to the Project site.



Figure 5-9 View 4 from Andersons Point Residential

Figure 5-10 represents the onshore construction zone with the offshore barge, relevant for construction methodologies 1 and 2.



Figure 5-10 View 4 from Andersons Point Residential Construction Zone Locations

5.5.1 Viewpoint 4 – Operational Assessment

A representation of viewpoint 4 with the Project in place is provided in Figure 5-9.

Whilst the view to the Project site includes the Amended Project, the changes to the water treatment process plant and the sea water pump station are not visible.

As a result, the visual impact assessment is consistent with the EIS. The changes to the water treatment process plant and the sea water pump station from the EIS Project design to the Amended Project will be assessed separately.

Table 5-21 Viewpoint 4 – Amended Project – Water Treatment Process Plant - 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 5-22 Viewpoint 4 – Amended Project – Water Treatment Process Plant - Impact

Sensitivity	Moderate
Magnitude	Negligible
Impact	Negligible
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 (and thus the water treatment process plant) would be negligible.

Table 5-23 Viewpoint 4 - Amended Project – Sea Water Pump Station - 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 5-24 Viewpoint 4 - Amended Project – Sea Water Pump Station - Impact

Sensitivity	Moderate
Magnitude	Negligible
Impact	Negligible
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 (and thus the sea water pump station) would be negligible.

5.5.2 Viewpoint 4 – Construction – Methodology 1 Assessment

A representation of viewpoint 4 with the onshore and offshore construction zone locations is provided in Figure 5-10.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 4 during the construction phase of the Project, as such the onshore and offshore construction zones are consistent with the EIS.

Table 5-25 Viewpoint 4 Sensitivity

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

Table 5-26 Viewpoint 4 Impact

Sensitivity	Moderate
Magnitude	Negligible
Impact	Negligible
Comments	<p>Construction Methodology 1 includes both onshore and offshore construction zones.</p> <p>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 onshore and offshore construction zones, the vegetation screening between them and the construction works is such that any sighting would be very limited. The Project is over 1 km away therefore the magnitude of the construction works would be negligible.</p> <p>The minimal lighting required during construction on the barge would not impact this view point due to the distance from the receptor.</p>

5.5.3 Viewpoint 4 – Construction – Methodology 2 Assessment

A representation of viewpoint 4 with the onshore and offshore construction zone locations is provided in Figure 5-10.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 4 during the construction phase of the Project, and as such the onshore and offshore construction zones are consistent with the EIS.

Table 5-27 Viewpoint 4 Sensitivity

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

Table 5-28 Viewpoint 4 Impact

Sensitivity	Moderate
Magnitude	Negligible
Impact	Negligible
Comments	<p>Construction Methodology 2 includes both onshore and offshore construction zones.</p> <p>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 onshore and offshore construction zones, the vegetation screening between them and the construction works is such that any sighting would be very limited. The Project is over 1 km away therefore the magnitude of the construction works would be negligible.</p> <p>The minimal lighting required during construction on the barge would not impact this view point due to the distance from the receptor.</p>

5.6 Viewpoint 5 – Belmont North – Elevated Residential

A representation of viewpoint 5 with the Project in place is provided in Figure 5-11. Viewpoint 5 represents the line of sight from a receptor at Belmont North to the Project site.



Figure 5-11 View 5 from North Belmont Elevated Residential

Figure 5-12 represents the onshore construction zone with the offshore barge, relevant for construction methodologies 1 and 2.



Figure 5-12 View 5 from North Belmont Elevated Residential Construction Zone Locations

5.6.1 Viewpoint 5 – Operational Assessment

A representation of viewpoint 5 with the Project in place is provided in Figure 5-11. Whilst the view to the Project site includes the Amended Project, the changes to the water treatment process plant and the sea water pump station are not visible.

As a result, the visual impact assessment is consistent with the EIS. The changes to the water treatment plant and the sea water pump station from the EIS Project design to the Amended Project will be assessed separately.

Table 5-29 Viewpoint 5 - Amended Project - Water Treatment Process Plant - 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 5-30 Viewpoint 5 – Amended Project – Water Treatment Process Plant - 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 (and thus the water treatment process plant) would be negligible.

Table 5-31 Viewpoint 5 - Amended Project – Sea Water Pump Station - 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 5-32 Viewpoint 5 - Amended Project – Sea Water Pump Station - 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 (and thus the sea water pump station) would be negligible.

5.6.2 Viewpoint 5 – Construction – Methodology 1 Assessment

A representation of viewpoint 5 with the onshore and offshore construction zone locations is provided in Figure 5-12.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 5 during the construction phase of the Project, and as such the onshore and offshore construction zones are consistent with the EIS.

Table 5-33 Viewpoint 5 Sensitivity

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

Table 5-34 Viewpoint 5 Impact

Sensitivity	Moderate
Magnitude	Negligible
Impact	Negligible
Comments	<p>Construction methodology 1 involved both onshore and offshore construction zones.</p> <p>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.</p> <p>The minimal lighting required during construction on the barge would not impact this view point due to the distance from the receptor.</p>

5.6.3 Viewpoint 5 – Construction – Methodology 2 Assessment

A representation of viewpoint 5 with the onshore and offshore construction zone locations is provided in Figure 5-12.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 4 during the construction phase of the Project, and as such the onshore and offshore construction zones are consistent with the EIS.

Table 5-35 Viewpoint 5 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 5-36 Viewpoint 5 Impact

Sensitivity	Moderate
Magnitude	Negligible
Impact	Negligible
Comments	<p>Construction methodology 2 involved both onshore and offshore construction zones.</p> <p>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.</p> <p>The minimal lighting required during construction on the barge would not impact this view point due to the distance from the receptor.</p>

5.7 Viewpoint 6 – Belmont Wetlands State Park – Kalaroo Fire Trail

Current views of the Project site from viewpoint 6 are shown in Figure 5-13. This is also relevant for construction methodologies 1 and 2 as these are not visible from this viewpoint.



Figure 5-13 Existing View 6 from Kalaroo Fire Trail

Viewpoint 6 represents the line of sight from a receptor within Belmont Wetlands State Park, on the Kalaroo Fire Trail to the Project site. The Amended Project is shown in Figure 5-14. Figure 5-15 locates the onshore construction zone that is screened by vegetation for construction methodologies 1 and 2.

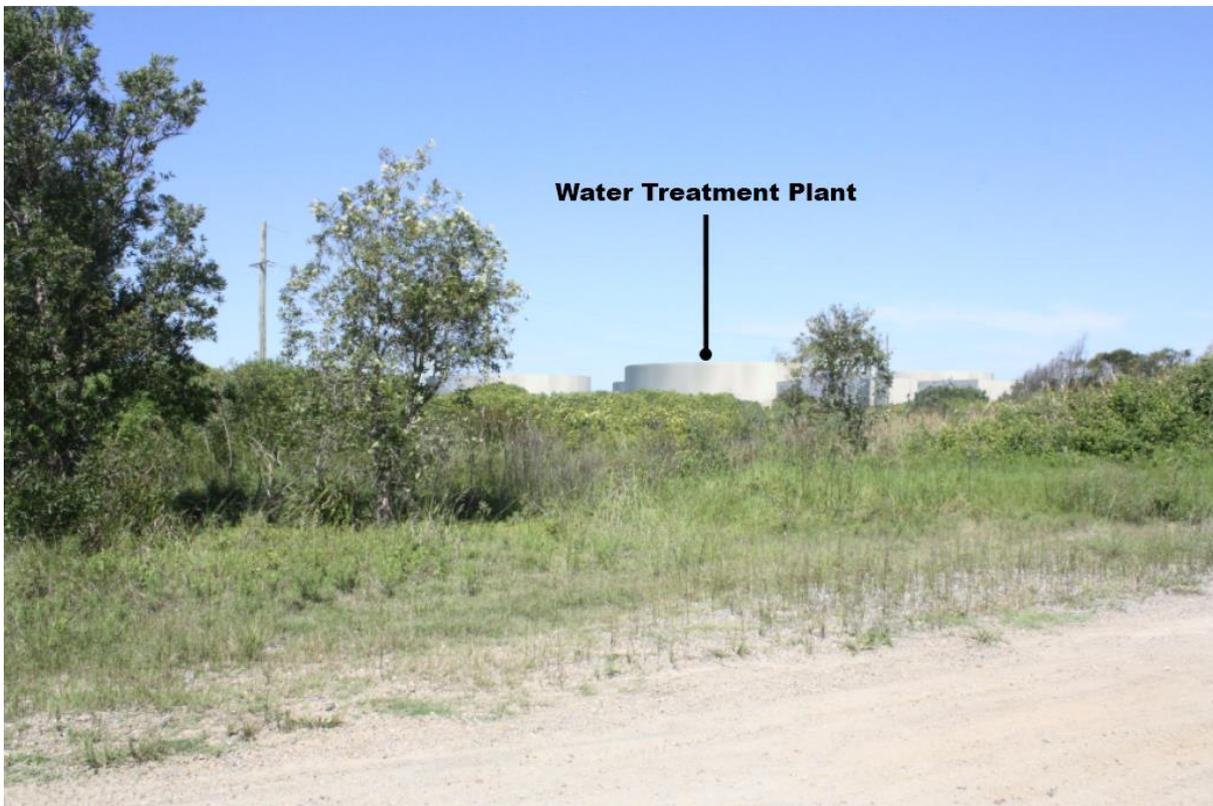


Figure 5-14 View 6 with the Amended Project design



Figure 5-15 View 6 from Kalaroo Fire Trail – Onshore Construction Zone

5.7.1 Viewpoint 6 - Operational Assessment

Current views of the Project site from viewpoint 6 are shown in Figure 5-13.

Viewpoint 6 represents the line of sight from a receptor within Belmont Wetlands State Park, on the Kalaroo Fire Trail to the Project site. The Amended Project is shown in Figure 5-14.

Whilst the Project is visible for this viewpoint, the changes in the water treatment process plant and the sea water pump station are not visible and as such the visual impact assessment for this viewpoint will be consistent with the EIS. The visual impacts of the water treatment process plant and the sea water pump station will be assessed separately.

Table 5-37 Viewpoint 6 – Amended Project – Water Treatment Process Plant - 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 5-38 Viewpoint 6 - Amended Project – Water Treatment Process Plant - Impact

Sensitivity	Low
Magnitude	Negligible
Impact	Negligible
Comments	Whilst the Project is visible from viewpoint 6, the changes to the water treatment process plant in the Amended Project are not visible. As such the impact of the water treatment process plant to viewpoint 6 is negligible.

Table 5-39 Viewpoint 6 – Amended Project – Sea Water Pump Station - 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 5-40 Viewpoint 6 – Amended Project - Sea Water Pump Station – Sensitivity

Sensitivity	Low
Magnitude	Negligible
Impact	Negligible
Comments	Whilst the Project is visible from viewpoint 6, the changes to the sea water pump station in the Amended Project are not visible. As such the impact of the water treatment process plant to viewpoint 6 is negligible.

5.7.2 Viewpoint 6 – Construction – Methodology 1 Assessment

A representation of viewpoint 6 with the onshore construction zone location is provided in Figure 5-15. The offshore construction zone is not visible from this view point.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 6 during the construction phase of the Project, and as such the construction zones are consistent with the EIS.

Table 5-41 Viewpoint 6 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 5-42 Viewpoint 6 Impact

Sensitivity	Low
Magnitude	Moderate
Impact	Moderate - Low
Comments	Due to the presence of much dense, and reasonably high vegetation surrounding the project site as viewed from the Kalaroo Fire Trail, the onshore construction zone would only be visible where dense, high forest vegetation between receptors and the onshore project zone is at a minimum.

5.7.3 Viewpoint 6 – Construction – Methodology 2 Assessment

A representation of viewpoint 6 with the onshore construction zone location is provided in Figure 5-15. The offshore construction zone is not visible from this view point.

Changes to the water treatment process plant and the sea water pump station do not impact viewpoint 6 during the construction phase of the Project, and as such the construction zones are consistent with the EIS.

Table 5-43 Viewpoint 6 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 5-44 Viewpoint 6 Impact

Sensitivity	Low
Magnitude	Moderate
Impact	Moderate - Low
Comments	Due to the presence of much dense, and reasonably high vegetation surrounding the project site as viewed from the Kalaroo Fire Trail, the onshore construction zone would only be visible where dense, high forest vegetation between receptors and the onshore project zone is at a minimum.

6 Conclusion and mitigation measures

6.1 Summary

The following tables provide a comparative summary of the landscape character and visual impact assessments for the EIS Project and the Amended Project.

Table 6-1 Landscape Character Impact Assessment - EIS and Amended Project Comparison

Landscape Character Zone	Landscape Character Impact Assessment	
	EIS Project	Amended Project
LCZ 1	Moderate - Low	Moderate – Low
LCZ 3	No Impact	Negligible

Table 6-2 Visual Impact Assessment - EIS and Amended Project Comparison

Key Viewpoint	Visual Impact Assessment	
	EIS Project	Amended Project
Viewpoint 1	Moderate - Low	Moderate - Low
Viewpoint 2	No Impact	Moderate - Low
Viewpoint 3	No Impact	Negligible
Viewpoint 4	Negligible	Negligible
Viewpoint 5	Negligible	Negligible
Viewpoint 6	Moderate - Low	Moderate - Low

As demonstrated through this comparative assessment, there is a minor increase in the impact to landscape character or the visual impact of the Amended Project.

Whilst the doubling of the Project’s capacity from 15 ML/day to 30 ML/day has affected the water treatment process plant and sea water pump station’s significance within the Project, when considered against the Project’s wider context these changes do not have significant enough implications to alter the EIS landscape character and visual impact assessments. As such, the impact assessments are consistent with the EIS.

The introduction of the intake structure from the amended design does not cause any adverse implications to the associated landscape character zones and viewpoints as a result of the vast and dynamic nature of the ocean.

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

6.2 Mitigation

Mitigation measures suggested within the EIS are still relevant for the Amended Project. These mitigation measures include:

- Existing large trees and vegetation would be maintained and protected wherever possible.
- A muted colour palette should be utilised for the proposed desalination plant structures to reduce contrast with the surrounding vegetation.
- The works area would be kept tidy during construction minimising visual impact on the adjoining dwellings.
- 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. Lighting of the temporary barge for intake pipeline and intake structure construction methods will be required as per NSW Roads and Maritime Night Safety guidelines. This is required as to mitigate issues out at sea, ensuring that other vessels/water activity are able to clearly identify the equipment's location.
- During operation, lighting would be provided at the 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 1 km from the desalination plant

7 References

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Appendix A

Landscape Character Methodology

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 the tables below.

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/derelect. Widespread erosion or loss. No sense of remoteness.

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
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

Landscape character attributes

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

Landscape Character 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

Evaluating impact

The combination of sensitivity and magnitude provides the rating of the landscape character impact for individual landscape character zones. 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.

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

Appendix B

Visual Impact Assessment Methodology

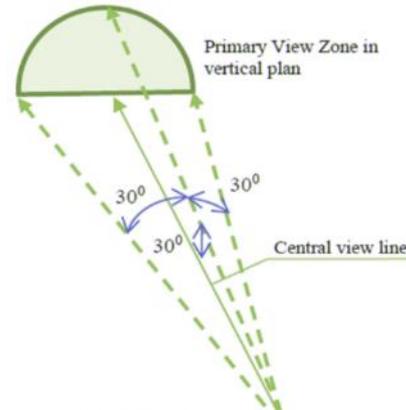
Viewpoint sensitivity and magnitude of change

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. 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.

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



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 the following tables.

Viewpoint Sensitivity

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

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.
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.

Evaluating impact

The combination of sensitivity and magnitude provides the rating of the visual impact for individual viewpoints. 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.

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

Impact assessment

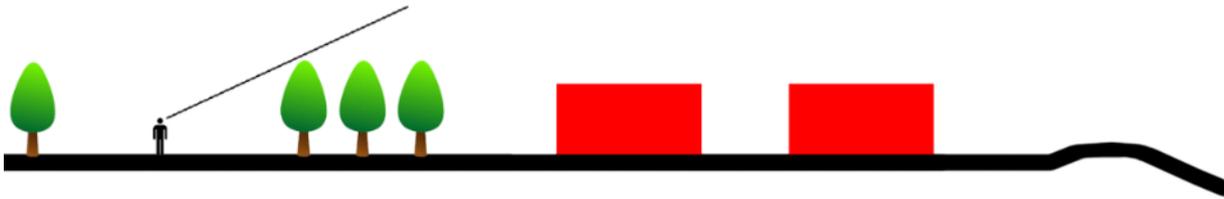
The key visual elements of the Project are the four storage tanks, each with an approximate height of 5 m. The majority of vegetation surrounding the Project to the west contains dense forest with a height above 5 m. The Project is therefore entirely screened from possible receptors within the low lying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

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 desalination plant.

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.

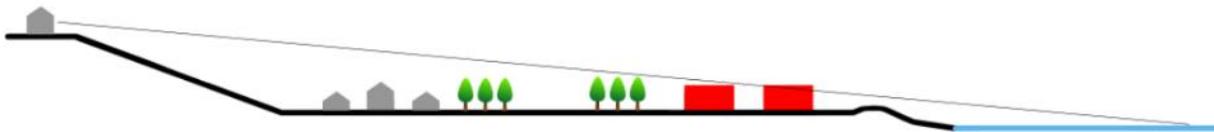
Importantly those specific areas where the Project is visible, are areas where the number of receptors is low, limited to recreational activities. This in turn reduces the sensitivity of the view, but could increase negative responses.



Short Level View Potential Screening



Short Level View Potential Obscuring



Distant Elevated View Potential

GHD

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https://projects.ghd.com/oc/newcastle1/cs0865hwctemporaryde/Delivery/Documents/2219573_Belmont Visual Assessment_AR.docx

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