Lower Hunter Water Plan: Temporary Desalination Project

Preliminary Environmental Assessment

Prepared for

Hunter Water

36 Honeysuckle Drive
Newcastle NSW 2300

May 2017

Preliminary Environmental Assessment

Lower Hunter Water Plan: Temporary Desalination Project

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Abbreviations

Abbreviation	Description
ADWG	Australian Drinking Water Guidelines
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
BIA	Biodiversity Impact Assessment
Brine	The hypersaline by-product of desalination
CL Act	Crown Lands Act 1989 (NSW)
CSMP	Contaminated Soils Management Plan
DCP 2014	Lake Macquarie Development Control Plan 2014
DP&E	NSW Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPL	Environment Protection Licence under the *Protection of the Environment Operations Act 1997* (NSW)
FTE	Full time equivalent
GHG	Greenhouse gas
Hunter Water	Hunter Water Corporation
LEP	Local Environmental Plan
LGA	Local Government Area
LHWP	Lower Hunter Water Plan
mbgs	Metres below ground surface
ML	Megalitres (one megalitre equals one million litres)
ML/d	Megalitres per day
NES	National Environmental Significance
NHMRC	National Health and Medical Research Council
NP&W Act	*National Parks and Wildlife Act 1974* (NSW)
PEA	Preliminary Environmental Assessment
PFD	Process Flow Diagram
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
RO	Reverse Osmosis
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SRD	State and Regional Development
SSI	State Significant Infrastructure
SWIA	Surface Water Impact Assessment

Abbreviation	Description
The Project Area	The project area refers to the Hunter Water land holding at the Belmont WWTW which also includes 'the Site'.
The Site	The land area proposed for the desalination plant and intake infrastructure, adjacent to, and located on the same parcel of land as the Belmont Wastewater Treatment Works. References to 'the site' does not include the area potentially covered by upgrades to power and water supply connections.
The Plan	*Hunter Regional Plan 2036*
TIA	Traffic Impact Assessment
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
UV	Ultra-filtration
WWTW	Wastewater Treatment Works

Executive Summary

Introduction

This Preliminary Environmental Assessment (PEA) is prepared on behalf of Hunter Water Corporation (Hunter Water) in support of an application for the potential construction and operation of a temporary desalination plant, if it is required in the future to respond to an extreme (rare) drought. The site is located at Belmont South, off Ocean Park Road, within the Lake Macquarie Local Government Area in New South Wales. The site is on Hunter Water owned property adjoining the existing Belmont Wastewater treatment works (WWTW).

In 2014, the NSW Government released the *Lower Hunter Water Plan* (LHWP) (Metropolitan Water Directorate, 2014) detailing how a secure supply of water will be delivered to the residents and business of the Lower Hunter Region, including under potential drought conditions. The LHWP recognises and provides a balance between the need to supply a growing region, and to protect the health and amenity of the environment.

The LHWP identified that the region's existing water supply sources are secure and reliable during normal weather conditions, but are very susceptible to rapid depletion during a prolonged or extreme drought. To guard against potential future droughts, the LHWP outlines a series of water supply, management and efficiency measures to be implemented in stages, if required to slow the depletion of storages. One of these measures is the potential implementation of temporary desalination capacity if an extreme drought scenario eventuates in the future. To ensure that an appropriate temporary desalination option is ready for rapid implementation in response to an extreme drought, Hunter Water is completing design of the temporary desalination plant and securing necessary environmental and planning approvals in advance.

Temporary desalination is intended to be used in conjunction with other staged drought response measures that would already be in place for an extreme drought including water transfers from the Central Coast, developing new groundwater resources, demand management programs (including Water Wise rules) and water/stormwater re-use schemes.

The temporary desalination project would involve the construction and operation of a temporary reverse osmosis desalination plant with the capacity to produce approximately 15 megalitres per day (ML/d) of potable water. The project would also involve ancillary works including upgrades to power and water supply connections. Seawater intake for the desalination plant would be via subsurface horizontal beach wells and brine discharge would be to the ocean via the existing WWTW outfall pipe at the site which discharges approximately 1.5km from the shoreline.

This report provides the Preliminary Environmental Assessment (PEA) for the project for the purpose of identifying Secretary's Environmental Assessment Requirements (SEARs) for an Environmental Impact Statement (EIS) under, Part 5.1 of the *Environmental Planning and Assessment Act* 1979 (EP&A Act).

The Project

The temporary desalination project would involve the potential construction and operation of a temporary desalination plant if it is required in response to a future extreme drought. The project would employ reverse osmosis and would consist of the following key elements:

- Seawater intake infrastructure consisting of subsurface beach wells;
- Desalination process units capable of producing a total of 15ML/day of potable water;
- Using the existing Belmont WWTW outfall for the discharge of brine;
- Construction of an electricity supply connection from the existing electricity supply network to the desalination plant;
- Construction of a potable water supply connection to supply potable water from the desalination plant into the existing Hunter Water potable water supply network; and
- Other ancillary construction works.

Statutory Context

The project is permissible without development consent under *State Environmental Planning Policy (Infrastructure) 2007*, being development for the purpose of a water treatment facility to be carried out by a public authority in a prescribed zone. The temporary desalination plant site is zoned SP2 Infrastructure under the *Lake Macquarie Local Environmental Plan 2014*, which is a prescribed zone for the purpose of water treatment facilities.

The project is also declared to be State Significant Infrastructure under Part 5.1 of the EP&A Act because it meets the requirements for such a declaration under *State Environmental Planning Policy (State and Regional Development) 2011*. In particular, the project involves development for the purpose of desalination plant by or on behalf of a public authority that has a capital investment value of more than $10 million. The Minister for Planning is therefore the approval authority for the project and an EIS must be prepared.

Key Environmental Issues

An environmental risk screening has been undertaken for the project, including potential impacts on the surrounding natural and built environment and the potential concerns of the local community and stakeholders. The key environmental assessment issues identified for the project which would be assessed in more detail during the preparation of the EIS are:

- Hydrology and water quality, with a focus on the discharge of brine;
- Coastal processes and the potential future climate change implications for sea level rise and inundation, particularly the potential impact of coastal processes on desalination plant infrastructure;
- Biodiversity, with a focus on potential impacts to aquatic/marine ecology and nearby wetlands; and
- Greenhouse gas impacts, associated with the indirect generation of emissions associated with generation of electricity to supply the project during operation.

Other factors that will also be considered in the EIS are:

- Geology, soils and contamination; in relation to potential historical contamination as well as sediment and erosion control during construction;
- Heritage impacts, both in relation to Aboriginal and non-Aboriginal heritage;
- Noise and vibration impacts, principally during construction and also in relation to the operation of the facility;
- Traffic and transport impacts during construction;
- Waste management, during construction and operation;
- Landscape character and visual amenity impacts;
- Air quality impacts, generated through construction-related dust emissions; and
- Social and economic impacts and the potential benefits of improved water security for the local community and economy.

As part of the preparation of the EIS, further assessments would be carried out to define the potential environmental impacts of the project and to identify mitigation and management measures to minimise impacts on the environment during construction and operation of the project.

1.0 Introduction and Background

1.1 Introduction

Temporary desalination is included in the Lower Hunter Water Plan (LHWP) as one of a number of future response measures to an extreme (rare) drought to slow the depletion of water storages by supplementing supply with desalinated water. It is a short-term contingency measure for an extreme drought. Consistent with the recommendations of the LHWP, Hunter Water is seeking approval under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), to potentially construct and operate a temporary desalination plant at Belmont Wastewater Treatment Works (WWTW) (the site), if it is needed in response to an extreme drought.

The site is located at Belmont South, off Ocean Park Road, within the Lake Macquarie Local Government Area. The site is adjacent to, and located on the same parcel of land as, the existing Belmont WWTW. The treatment works is located in the coastal dunes behind Nine Mile Beach, between the beach and Belmont Lagoon. Belmont WWTW is a conventional activated sludge plant servicing the urban development on the eastern side of Lake Macquarie. The regional context of the site is shown in Figure 1, while the local context and site surrounds is shown in Figure 2.

The project would involve the construction and operation of a temporary seawater reverse osmosis desalination plant with the capacity to produce approximately 15 megalitres per day (ML/d) of potable water to the local Hunter Water potable water supply network if extreme drought conditions eventuate in the future. The project would also involve ancillary works including upgrades to power and water supply connections. Seawater intake for the desalination plant would be via subsurface horizontal beach wells and brine discharge would be to the ocean via the existing WWTW outfall pipe at the site that discharges approximately 1.5km from the shoreline.

This report provides the Preliminary Environmental Assessment (PEA) for the project for the purpose of identifying Secretary's Environmental Assessment Requirements (SEARs) for an Environmental Impact Statement (EIS) under, Part 5.1 of the EP&A Act.

1.2 The Proponent

Hunter Water Corporation (Hunter Water) is a State-owned corporation responsible for providing drinking water, wastewater, recycled water and some stormwater services to a population approaching 600,000 people in homes and businesses across the Lower Hunter.

Hunter Water employs over 450 employees who work closely with contractors, stakeholders and the community to manage an asset base of more than $2.5 billion worth of water, wastewater and recycled water infrastructure, ensuring a sustainable water future for the Lower Hunter.

Hunter Water's services, projects and activities cover 6,671 square kilometres in the areas of Cessnock, Lake Macquarie, Maitland, Newcastle, Port Stephens, Dungog and small parts of Singleton. Hunter Water delivers an average of 188 ML of water per day. Major water sources for Hunter Water include: Grahamstown Dam (182,305 ML), Chichester Dam (18,356 ML), Tomago Sandbeds (60,000 ML) and Anna Bay Sandbeds (16,024 ML).

Hunter Water also maintains an extensive system to transport wastewater (sewage), which includes approximately 4,995 km of sewer mains, 434 wastewater pumping stations and 19 wastewater treatment works, treating almost 70,000 ML of wastewater annually.

1.3 Background

1.3.1 The Lower Hunter Water Plan

The Metropolitan Water Directorate, then in the NSW Department of Finances and Services, led the development of the *Lower Hunter Water Plan* (LHWP) in consultation with Hunter Water, Government agencies, the community and stakeholders.

In 2014, the NSW Government released the LHWP (Metropolitan Water Directorate, 2014) detailing how a secure supply of water will be delivered to the residents and business of the Lower Hunter Region, including under potential drought conditions. The LHWP recognises and provides a balance between the need to supply a growing region, and to protect the health and amenity of the environment.

The LHWP identified that the region's existing water supply sources are secure and reliable during normal weather conditions, but are very susceptible to rapid depletion, for example high rates of dam evaporation, during a prolonged or extreme drought. To guard against potential future droughts, the LHWP outlines a series of water supply, management and efficiency measures to be implemented in stages, if required to slow the depletion of storages. These measures are summarised in Table 1.

Table 1 Lower Hunter Water Plan drought response measures

Measure	Drought response
Surface water	Water transfers between the lower Hunter and Central Coast systems during droughts in either region will make better use of existing storages and improve drought resilience in both regions.
Groundwater	The amount of water supplied from groundwater sources generally increases in a drought.
Water efficiency	Additional water efficiency programs for both households and businesses will be activated in drought to help reduce demand as water storages fall. Hunter Water will also invest more in active leak detection and pressure management programs to reduce losses from the water supply system.
Demand management	Water restrictions will be applied as storage levels fall to reduce both household and business demand and keep as much water in the storages as possible. Restrictions are a quick and effective response to drought. When in place, restrictions will be actively supported by education and awareness campaigns, and enforced through compliance activities.
Recycled water	In a drought, additional recycling opportunities may become more viable for customers seeking an alternate supply that does not depend on rainfall.
Rainwater and stormwater use	There may be more interest in opportunities for stormwater harvesting for industrial uses or watering of sporting fields in a drought, although their dependence on rainfall makes them less reliable in a drought.
Temporary desalination	Temporary desalination plants provide an emergency drought response for a very extreme drought. By planning in advance, the units can be built quickly if and when needed, and they would be removed when no longer required.

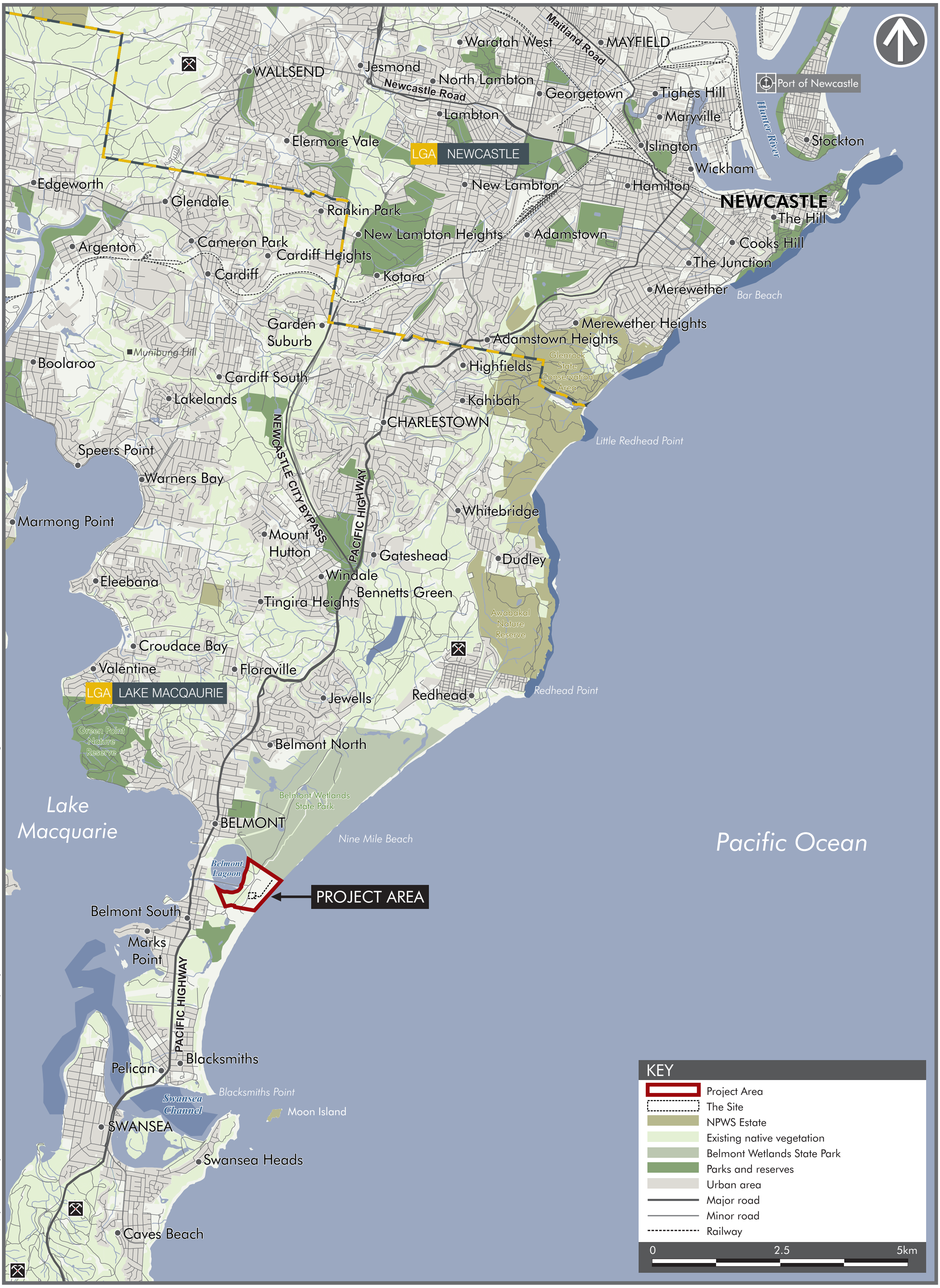
As identified in Table 1, one of these measures is the potential implementation of temporary desalination capacity if an extreme drought scenario eventuates in the future. Small scale temporary desalination was preferred to a permanent large scale plant and subsequently included in the LHWP due to its lower lead in time, rainfall independence, and the ability to either rent or sell/re-use the desalination plants when they are no longer required.

To ensure that an appropriate temporary desalination option is ready for rapid implementation in response to an extreme drought, Hunter Water is completing design of the temporary desalination plant and securing necessary environmental and planning approvals in advance.

Temporary desalination is intended to be used in conjunction with other staged drought response measures (outlined in Table 1) that would already be in place for an extreme drought including water transfers from the Central Coast, developing new groundwater resources, demand management programs (including Water Wise rules) and water/stormwater re-use schemes.

1.3.2 Previous Investigations

The selection of the Belmont WWTW site as the preferred site for a temporary desalination plant was achieved through a robust site selection process which considered a range of alternative sites. The site selection process is summarised in Section 2.4.1.



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REGIONAL CONTEXT

Preliminary Environmental Assessment
Lower Hunter Water Plan: Temporary Desalination Readiness Activities

FIGURE 1

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LOCAL CONTEXT
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Lower Hunter Water Plan: Temporary Desalination Readiness Activities

FIGURE 2

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2.0 The Project

2.1 Site Description

The site is located at Belmont South, off Ocean Park Road, within the Lake Macquarie Local Government Area in New South Wales as shown in Figure 2. The site is on the same parcel of land as the existing Belmont WWTW. The treatment works is located in the coastal dunes behind Nine Mile Beach, between the beach and Belmont Lagoon. Belmont WWTW is a conventional activated sludge plant servicing the urban development on the eastern side of Lake Macquarie. The site is on land described as Lot 1 DP 433549 which is approximately 11.8 hectares and is owned by Hunter Water.

The indicative location for the temporary desalination plant is to the south of the fenced compound area for the existing Belmont WWTW, with power connections to the west, water connections to the south-west and north, and water intake infrastructure to the east. The temporary desalination plant would likely occupy approximately two hectares of the Hunter Water land parcel with additional area required within and outside of this land parcel for water supply and power connection corridors and water intake and discharge infrastructure. The power and water connection routes included in this PEA are indicative and will be confirmed during the design development. Vegetation at the site has largely been cleared for WWTW operations. An indicative layout for the temporary desalination plant is provided in Figure 3**.**

The area immediately surrounding the site consists of coastal bushland and wetland environments immediately to the west, including Belmont Lagoon to the north-west, and Belmont Wetlands State Park to the north. Land to the east includes the coastal environment of Nine Mile Beach, consisting of coastal sand dunes and the South Pacific Ocean located 40 metres from the desalination plant site.

A low density residential area as part of the suburb of Belmont South is located on either side of the Pacific Highway, approximately 800 metres to the south west of the site. Belmont Cemetery is located 700 metres to the south west while Belmont Golf Club is located 600 metres to the south. Belmont Bay, within Lake Macquarie, is located 1.2 kilometres to the west of the site.

As described in Section 2.2 the project would involve ancillary works including upgrades to power and water supply connections. For the purposes of this PEA, references to ‘the site’ do not include the area potentially covered by upgrades to power and water supply connections, however potential impacts to these areas are identified within this PEA.

2.2 Project Description

Consistent with the recommendations of the LHWP, in the event of an extreme drought, Hunter Water is seeking approval to construct and operate a temporary seawater reverse osmosis desalination plant located at the Belmont WWTW site. The temporary desalination plant would have the capacity to produce approximately 15 megalitres per day (ML/d) of drinking water to the local network during extreme drought conditions. The project would also involve ancillary works including upgrades to power and water supply connections.

A general overview of the desalination process is provided below, while a detailed description of the infrastructure associated with the proposed temporary desalination plant is provided in Section 2.2.1 to 2.2.9. The project description is based on the concept design developed for the site. The indicative conceptual site layout is shown in Figure 3.

Desalination

Desalination removes salt and other impurities from salty water to produce fresh water that can be used for drinking water supplies, or for industrial processes that need high quality water.

The two most widely used and commercially proven technologies for desalination are reverse osmosis and thermal distillation. Most desalination plants built recently in Australia use reverse osmosis, which uses less energy than thermal distillation. The project would use the reverse osmosis method.

For the project, seawater would be pumped into the desalination plant from the ocean through the seabed via subsurface intakes (see Section 2.2.1 and pass through two levels of initial filtration to remove most of the large and small particles and impurities. The filtered seawater would then enter a reverse osmosis plant where it would pass through special membranes that act like microscopic strainers. The pores in the membranes are so tiny that only fresh water would flow through leaving behind bacteria, viruses, other impurities and salt. Around 40 per cent of the water that goes through the desalination plant comes out as desalinated water. The remainder (referred to as brine) would be pumped back into the ocean via the existing Belmont WWTW outfall (see Section 2.2.3).

Following desalination, water would be further tested and treated as necessary to meet quality requirements of the Australian Drinking Water Guidelines (ADWG) as published by the Commonwealth Government’s National Health and Medical Research Council (NHMRC).

2.2.1 Intake

Seawater intake infrastructure would most likely consist of horizontal subsurface beach wells. Subsurface beach wells are generally acknowledged as producing better raw water quality than open seawater intakes and reducing pre-treatment requirements for the desalination plant.

Horizontal wells would be positioned in front of the temporary desalination plant site and directed out to the ocean approximately 50m from the shoreline under the sea floor avoiding third party properties and low salinity aquifers as shown in Figure 3.

The conceptual horizontal intake well arrangement for Belmont has been developed based on the following horizontal well design:

- Indicatively three metre diameter vertical shaft of approximately 20m depth;
- Each shafts would likely contain three 50m length, 400 mm diameter horizontal intake pipes emanating out from the base of the shaft under the seabed; and
- Subsurface intakes would be placed on the end of each horizontal well designed to draw in seawater through the seabed providing pre-filtration.

This conceptual intake arrangement, including numbers and depth of shafts and wells, would be refined during the development of the concept design and described in detail in the EIS.

2.2.2 Process Units

Process units for the temporary desalination plant would consist of two containerised package treatment plants capable of producing a total of approximately 15ML/day of potable water. Indicative sizes and layouts of process units are shown in the general site layout in Figure 3.

A conceptual process flow diagram (PFD) has been developed for the project and is shown in Figure 5.

The desalination process would consist of:

1. Seawater intake;
2. Pre-screening and pre-filtration (with a pre-treatment reject stream);
3. Ultrafiltration;
4. Reverse osmosis (with a reverse osmosis reject (brine) stream);
5. Chlorinated disinfection; and
6. Storage / supply to network.

The water supplied to the local network would meet the Australian Drinking Water Quality Guidelines set by the NHMRC.

2.2.3 Outfall

Brine would be discharged to the ocean utilising the existing Belmont WWTW outfall pipe (blending WWTW effluent with brine water from the desalination plant). An underground connection to the existing treatment plant outfall would be required and would be constructed parallel to Nine Mile Beach between the temporary desalination plant and the existing outfall as shown on Figure 3**.**

Upgrade works to the existing treatment plant outfall were completed in 2008. The outfall pipe discharges approximately 1.5km offshore through 168 diffusers and includes pumps installed to increase maximum capacity during high flow periods to 4,500 L/s.

2.2.4 Civil Works

There is sufficient land available at the site to construct the desalination plant with ample room for construction laydown and truck turnaround areas. An indicative construction laydown area is identified in Figure 3.

2.2.5 Power Supply

A new underground connection to an existing feeder or substation would be required for the power supply to the temporary desalination plant. Two options are currently being investigated for the power supply connection:

1. Connect to existing Feeder 33597 at Ellen Street (distance from feeder to desalination plant to feeder would be approximately 1.5 kilometres); or
2. New Feeder 33602R for interconnection with Pelican Zone Substation (distance from feeder to desalination plant to feeder would be approximately 3.5 kilometres).

Reference is made to Figure 4 showing the indicative power network connections.

2.2.6 Potable Water Connection

Two connections have been identified to allow desalinated water to be delivered into the potable water network. The local water network supply zone would not have the available capacity to receive and distribute 15ML/day under level 4 water restrictions (which would be in place in the event of an extreme drought). A second connection point into an adjacent supply zone is therefore required. The two identified connection points are into the:

- 375mm diameter main at the corner of Beach Street and Hudson Street, Belmont South (Beach Street connection); and
- 375mm diameter main on Pacific Highway opposite Dalrymple Street, Belmont North (Dalrymple Street connection).

Beach Street connection

The Beach Street connection would supply potable water into the Mount Hutton water network zone and would extend approximately 1.2 kilometres along the existing treatment plant access road. Based on preliminary designs, the connection would be laid parallel to the existing water reticulation main.

Dalrymple Street connection

The Dalrymple Street connection would supply potable water into the Lookout (New Lambton Heights 2) water network zone.

The distance from the temporary desalination plant to the Dalrymple Street connection point would be approximately six kilometres. The connection would utilise an existing easement for the rising main that ultimately connects Bennetts Green 2 (formerly Windale 3) Wastewater pump station. An intermediate pump station would be required for water to reach the Lookout zone. This connection would run parallel with the rising main and pass through the suburb of Jewels in order to connect to the Pacific Highway. Reference is made to Figure 4 showing the indicative route for water network connections.

2.2.7 Roads and Access

The existing access road to the Belmont WWTW via Ocean Park Road would be utilised for light and heavy vehicles movements associated with the construction and operation of the project.

2.2.8 Workforce

It is anticipated that a work force of approximately 20 full time equivalent (FTE) employees would be required during the construction phase of the project.

Once fully operational it is anticipated that four FTE full-time employees would be required to manage the onsite operations.

2.2.9 Operating Hours

In the event of an extreme drought the project would be operational 24 hours per day, seven days per week for the temporary period it is required to supplement potable water supply, in accordance with the LHWP.

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INDICATIVE SITE LAYOUT
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FIGURE 3

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INDICATIVE POWER AND POTABLE WATER CONNECTION

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Lower Hunter Water Plan: Temporary Desalination Readiness Activities

FIGURE 4

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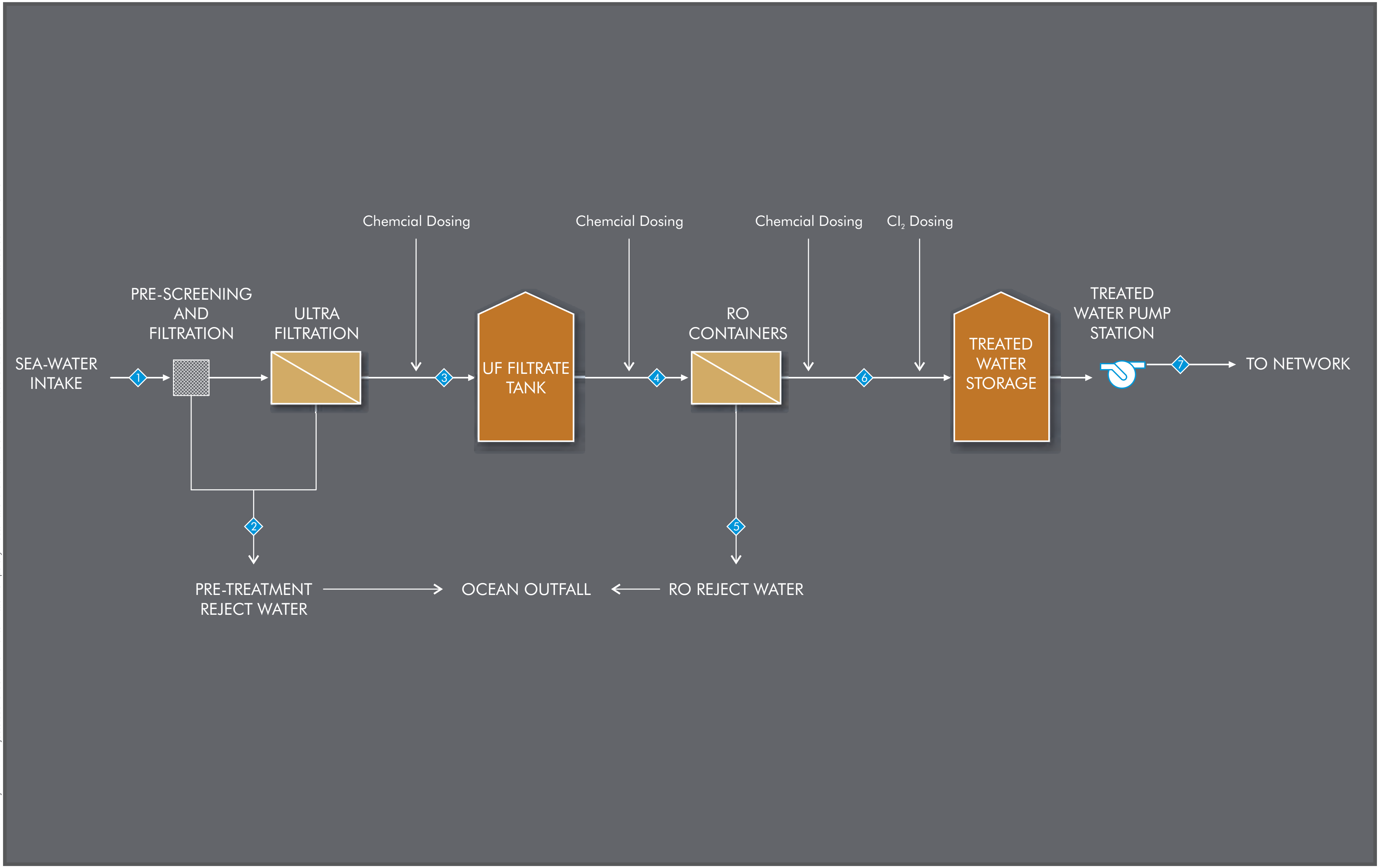

G:\IENV\GIS\Projects\605 Projects\60515293 Lower Hunter Water Temporary Desalination\Belmont\FIGURES\PEA\60515293 F5 Process Flow Chart 30 06 2017 TO Rev B

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PROCESS FLOW CHART

Preliminary Environmental Assessment
Lower Hunter Water Plan: Temporary Desalination Readiness Activities

FIGURE 5

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2.3 Project Timing

The project would be constructed and operated in an extreme drought event, in accordance with specific water storage (%) trigger levels as defined in the LHWP. The trigger levels are outlined below:

- Prior to reaching 65%temporary desalination readiness activities would be completed including Concept Design, planning and seeking environmental approvals;
- When storage levels drop to around 65%, work on Detailed Design, would be triggered;
- If storage levels drop to around 35%, construction of the temporary desalination plant would commence;
- If storage levels continue to drop below 30%, the temporary desalination plant would commence operation at or below 30 per cent (but no later than 15%) depending on construction timing and the rate of storage depletion;
- When storage levels recover, operation would cease at around 35% where storage levels are increasing; and
- The temporary desalination process units would remain on-site until the risk of continued drought was past, with decommissioning and site rehabilitation at 50% or higher.

These trigger points may be amended subject to consideration of other external factors as required to meet Hunter Water's security of supply requirements.

An indicative program has been developed for the project and is summarised in Table 2. The program would be subject to the water storage trigger levels outlined above.

Table 2 Temporary Desalination Plant Design and Construction Program

Phase	Year 1	Year 2	Year 3	Year 4	Year 5
Concept design and planning approval					
Detailed design					
Construction					
Commissioning and Commencement of Operations					

2.4 Alternatives

This section provides an overview of the available alternatives to the project. Alternatives are generally defined as being:

- The 'do nothing' alternative;
- Utilising alternative locations; or
- Utilising alternative desalination plant designs or arrangements.

Each of the alternatives is briefly explained below. A full analysis of the alternatives would be provided in the EIS for the project.

2.4.1 Do Nothing

The 'do nothing' option would involve Hunter Water not constructing and operating a temporary desalination plant in the event of an extreme drought. While temporary desalination is considered alongside a number of drought response measures in the LHWP, for this option potential water security would be compromised because Hunter Water would not be able to slow the depletion of water storages by supplementing supply with desalinated water in the event of an extreme drought. The project would involve the supply of an additional 15 ML/day of water to the water supply network which could be significant in delaying the depletion of water storages for a severe drought.

The ‘do nothing’ option was considered to be inadequate as it would not increase water security for the lower Hunter in the event of an extreme drought.

2.4.2 Alternative Locations

The selection of the Belmont WWTW site as the preferred site for a temporary desalination plant was achieved through a robust site selection process which considered a range of alternative sites. An overview of the site selection process is provided below.

Temporary Desalination Preliminary Feasibility Assessment and Site Confirmation Report

A Temporary Desalination Preliminary Feasibility Assessment was completed by Hunter Water in 2013 and investigated potential temporary desalination site locations. Twenty one potential sites were reviewed at a preliminary level. A list of nine sites was then produced through a screening process. The nine sites considered for further assessment included:

Primary sites:

- Stockton former WWTW;
- Belmont WWTW; and
- Burwood WWTW.

Secondary sites:

- Belmont Airport; and
- Eraring Power Station;

Unlikely sites:

- Hexham, near Pacific Highway;
- Tomago, School Drive;
- Advanced Water Treatment site, Steel River; and
- Former BHP site, Mayfield North.

In 2015, Hunter Water completed a Site Confirmation Report which aimed to identify the best suited of the nine sites for temporary desalination and where concept design would be undertaken in the next phase of the project. The sites were divided into ‘primary’, ‘secondary’ and ‘unlikely’ sites. The sites considered unlikely were considered feasible if a sustainable method for brine disposal could be identified, such as disposal to sewer.

As part of the Site Confirmation Report a hydro-economic model, similar to that used in the preparation of the LHWP, was run to assess and optimise supply and demand based on a range of plant capacities (9ML/day, 15 ML/day & 30 ML/day). It was found that a temporary desalination plant supplying 15 ML/day would provide increased water security for a relatively marginal increase in cost compared to a single large or multiple small plants producing 9 ML/day.

Using the required 15ML/day of potable water production as a base, the assessment also took into consideration nine elements at each site including: connection to Hunter Water’s potable network, brine disposal, raw intake method, raw water quality risks, site environmental constraints, energy supply, land ownership, footprint and cost.

The Site Confirmation Report recommended that concept design and environmental investigations be undertaken at Belmont WWTW and the former Stockton WWTW. It also recommended that the Eraring Power Station site be investigated provided that an agreement could be reached with Origin Energy to potentially house a temporary desalination plant on their site.

Lower Hunter Water Plan – Mine Water Option

In additional to the above listed sites the LHWP also identified the potential to access and utilise mine water held in underground coal mines in western Lake Macquarie as a potential source of raw water. High-level investigations lead by the Department of Primary Industries (DPI) Water section indicated that Newstan Colliery, operated by Centennial Coal, was a potential source of raw water for a desalination plant.

Centennial Coal currently operates an 11 ML/d water treatment plant as part of its Environment Protection Licence to discharge mine water to the environment from the Newstan site. It was therefore agreed that the feasibility of this site would be investigated further as a part of the Temporary Desalination Readiness site selection process.

Temporary Desalination Readiness

For the Temporary Desalination Readiness Project, Hunter proceeded with investigations to develop a short-list of suitable sites for desalination being:

- Belmont WWTW;
- Stockton WWTW;
- Eraring Power Station; and
- Newstan Colliery (Fassifern).

In order to inform a site selection workshop for the project, investigations were undertaken to provide Hunter Water with the ability to confidently compare each site against consistent criteria to determine the lowest risk and therefore most appropriate site with consideration of technical, environmental, social, commercial and financial risks.

Investigations undertaken to inform the Desalination Readiness Project included:

- Site assessment including:
  - Field investigations;
  - Assessment of commercial and social risks;
  - Power supply requirements;
  - Site contamination reviews; and
  - Assessment of environmental risks and impacts.
- Concept development including:
  - Concept design;
  - Cost estimates; and
  - Programs.

The aim of these assessments was to inform the site selection workshop to identify a preferred site.

A decision making framework was developed to confidently compare each site against consistent criteria to determine the lowest risk and therefore most appropriate site. The framework was developed with reference to *Guideline – Capital Projects Economic Appraisal Guideline* (HWC, 2011), which establishes a robust and consistent framework within which to develop business cases for the investment of capital in projects.

Site Selection Workshop

A site selection workshop was undertaken to compare each site against consistent criteria in accordance with the decision making framework developed for the project to determine the lowest risk and therefore most appropriate site. The Site Selection Workshop was attended by representatives of AECOM, Hunter Water and the Department of Primary Industries (DPI) Office of Water – Metropolitan Water Directorate.

<u>Chosen site – Belmont WWTW</u>

Based on the outcomes of the site selection workshop it was considered that the Belmont WWTW site presented the lowest risk option based on the available information. It was therefore recommended that the Belmont WWTW site be progressed.

2.4.3 Alternative Temporary Desalination Plant Design and Arrangement

During the site selection process and concept development for the project, a number of alternative temporary desalination plant designs and arrangements were considered. The consideration of these alternatives is outlined below.

Multiple Desalination Plant Sites

The option of constructing and operating multiple smaller capacity desalination plants at different sites was considered. This option was not preferred due to the need to obtain planning approvals for multiple sites and the potential inability to reach desalination water supply requirements in the event of a drought where not all desalination plant sites were approved.

Alternative Intake Design

The option of using vertical groundwater intake wells was considered for the project. The development of the concept design indicated that horizontal seawater intake wells were preferred due to their higher intake volumes and smaller footprint requirements relative to vertical groundwater wells that would require a larger number of wells spread across approximately 1km to achieve the required raw water intake quantity. Horizontal wells could be directed out to sea from a smaller landside footprint avoiding third party properties and low salinity aquifers and could be maintained within the Belmont WWTW site boundary. Vertical wells were not able to achieve the same outcomes.

Alternative Process Units

Package treatment plants from at least two vendors were considered for the project during development of a high level concept to inform the site selection process. The cost difference between each system quoted by the vendors was comparable.

2.5 Project Benefits

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 primary benefit of the project is to provide a drought contingency measure that is not dependant on rainfall. A temporary desalination plant would help the make the water supply system more resilient to climate variability. The ability for Hunter Water to provide a safe secure potable water supply is of significant benefit for the community, public health and economic stability.

The project offers a flexible contingency measure at a relatively low upfront cost compared with other measures as it would only be installed in a very rare drought and as late as possible. This would allow cost to be delayed until such time as the temporary desalination measure is required.

While temporary desalination is considered alongside a number of drought response measures in the LHWP, without the project, water security would be compromised because Hunter Water would not be able to slow the depletion of water storages by supplementing supply with desalinated water in the event of a severe drought. Other drought response measures identified in the LHWP would be progressively enacted prior to temporary desalination to alleviate supply issues.

The project represents a benefit in utilising an existing developed site at the Belmont WWTW. The site has sufficient cleared land to occupy the desalination plant and existing infrastructure including an access road and the WWTW ocean outfall. This infrastructure would be utilised for the project, presenting a cost saving measure for the development. This would also have environmental benefits by reducing overall construction and operational impacts that would otherwise result from the installation of new infrastructure.

As outlined in Section 2.4, a range of alternative locations and alternative desalination plant designs and arrangements have been considered for the project. The project location and design as provided in this PEA is indicative of the lowest risk option that is able to provide a supply of an additional 15 ML/day of water to the water supply network in the event of a severe drought, with impacts to the environment anticipated to be manageable.

3.0 Environmental Planning Considerations

3.1 Permissibility

Clause 125(3) of the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) provides that development for the purpose of a water treatment facility (such as a desalination plant or a recycled or reclaimed water plant) may be carried out by or on behalf of a public authority without consent on land in any of the following land use zones:

a. RU1 Primary Production;

b. RU2 Rural Landscape;

c. RU4 Primary Production Small Lots;

d. IN1 General Industrial;

e. IN3 Heavy Industrial;

f. SP1 Special Activities; and

g. SP2 Infrastructure.

The temporary desalination plant is for the purpose of a water treatment facility and is to be carried out by Hunter Water (a public authority). The site is zoned SP2 Infrastructure under the *Lake Macquarie Local Environmental Plan 2014*. As such, the temporary desalination plant is permissible without development consent under the *Environmental Planning and Assessment Act 1979* (EP&A Act).

3.2 State Significant Infrastructure

Clause 14(1) of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) declares development to be State Significant Infrastructure (SSI) if the development is permissible without consent under the EP&A Act and is a type of development specified in Schedule 3 of that SEPP. Schedule 3 of the SRD SEPP includes development for the purpose of desalination plants by or on behalf of a public authority that has a capital investment value of $10 million. The temporary desalination plant would exceed this capital investment threshold and is therefore declared to be State Significant Infrastructure under Part 5.1 of the EP&A Act. The Minister for Planning is the approval authority for the project, and an Environmental Impact Statement (EIS) must be prepared.

3.3 Environmental Planning Instruments

The following environmental planning instruments include provisions relating to issues that would or may be relevant to the environmental impact assessment of the project and relevant provisions would be considered in the EIS:

3.3.1 State Environmental Planning Policy No 14 – Coastal Wetlands (SEPP 14)

SEPP 14 aims to protect and preserve NSW coastal wetlands. The wetlands adjacent to Belmont Lagoon are listed as SEPP14 Wetlands. The indicative distances to the SEPP 14 wetlands from temporary desalination plant infrastructure at the site is listed below:

- Immediately adjacent for power connection corridor;
- Sections of the water connection corridor would be immediately adjacent; and
- 10 metres west of temporary desalination plant.

The actual extent of SEPP14 wetlands would be defined by a qualified ecologist to verify the accuracy of available wetland mapping and confirm the proximity of the project disturbance area, particularly water and power connection corridors, to the SEPP 14 wetlands. This will in turn allow potential impact to the wetlands to be defined. Notwithstanding, under section 115ZF of the EP&A Act, SEPP 14 does not apply to development that is State Significant Infrastructure. Regardless, consideration of potential impacts to coastal wetlands would be undertaken as part of the environmental assessment of a proposed desalination plant. It is likely that SEPP14 would be superseded in the next 12 months by the *Coastal Management State Environmental Planning Policy* which is currently in draft (refer Section 3.3.4).

3.3.2 State Environmental Planning Policy No 71 – Coastal Protection (SEPP 71)

The site is located within the coastal zone and the provisions of SEPP 71 therefore will be considered for application to the proposed works. SEPP 71 aims to protect and manage the natural, cultural, recreational and economic attributes of the NSW coast. SEPP 71 includes a number of aims and development control considerations and the proposed desalination plant would be required to be consistent with these considerations or provide sufficient justification for any inconsistencies.

The application of SEPP 71 would include consideration of how the desalination plant would impact upon natural, cultural and recreational uses of the coastal area, potential impact to public access and related environmental impacts.

Under section 115ZF of the EP&A Act, SEPP 71 does not apply to development that is State Significant Infrastructure, however consistent with good environmental practice consideration of potential impacts to the coastal zone would be undertaken for an environmental assessment of the proposed desalination plant and ancillary infrastructure. It is likely that SEPP 71 would be superseded in the next 12 months by the *Coastal Management State Environmental Planning Policy* which is currently in draft (refer Section 3.3.4).

3.3.3 State Environmental Planning Policy No 55 – Remediation of Land (SEPP 55)

SEPP 55 provides a state-wide planning approach for the remediation of contaminated land. Clause 7 of SEPP 55 requires a consent authority to consider whether the land is contaminated and whether it is suitable (or can be made suitable) for the purpose of proposed developments.

The site has potential historic contamination issues that would need to be adequately assessed. The known contamination issues as a result of historical land uses are detailed in Section 7.1. It would need to be demonstrated the land (including any residual contamination) is not inconsistent with the proposed use for the establishment of desalination infrastructure.

3.3.4 Draft Coastal Protection State Environmental Planning Policy

The *Coastal Management Act 2016* will replace the current *Coastal Protection Act 1979* (Coastal Protection Act) once public consultation on the draft Coastal Management State Environmental Planning Policy (Coastal Management SEPP) has been completed. It is anticipated that the Draft Coastal Protection SEPP will come into force during preparation of the project EIS and therefore will be the relevant planning policy to which the project should be assessed.

The *Coastal Management Act 2016* will establish the requirements for the preparation of coastal management programs which would replace existing coastal zone management plans over time.

The *Coastal Management Act 2016* will be associated with the draft Coastal Management SEPP, which would integrate current coastal related SEPPs. The new Coastal Management Act will divide the coastal zone into four coastal management areas:

- Coastal wetlands and littoral rainforests area;
- Coastal vulnerability area;
- Coastal environment area; and
- Coastal use area.

It is likely that the site would be located in proximity to or within these four coastal management areas. Potentially relevant management objectives for the coastal management areas would include but not be limited to:

- Protecting and enhancing the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons;
- Maintaining the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system;
- Having the appropriate type, bulk, size and scale of development for the coast; and
- Maintaining essential infrastructure.

Potentially relevant development controls for the coastal management areas would include but not be limited to the requirement for consent authorities to review a number of criteria that ensure proposals:

- Protect the environment, including marine estate and sensitive coastal lakes;
- Protect water quality;
- Protect fauna and their habitats;
- Protect Aboriginal cultural heritage and places;
- Incorporate water sensitive design; and
- Protect the surf zone.

While consideration of the Coastal Management SEPP would not be required under section 115ZF of the EP&A Act for a State Significant Infrastructure project, it would be considered for an environmental assessment of the temporary desalination plant and ancillary infrastructure consistent with good environmental practice.

3.3.5 Lake Macquarie Local Environmental Plan 2014 (LEP 2014)

The project would be located within the Lake Macquarie local government area which is subject to the *Lake Macquarie Local Environmental Plan 2014* (LEP 2014). Development consent from Lake Macquarie City Council would not be required as the SRD SEPP would prevail over local planning controls for a temporary desalination plant.

The temporary desalination plant footprint would be located on land zoned SP2 – Infrastructure (Sewage Treatment Plant).

Water and power supply connections would potentially be constructed in the following land use zones at Belmont:

- E2 – Environmental Conservation;
- E3 – Environmental Management;
- SP2 – Infrastructure (Sewage Treatment Plant);
- R2 – Low Density Residential;
- RE1 – Public Recreation; and
- RE2 – Private Recreation.

Water intake and discharge infrastructure would potentially be constructed in the following land use zones at Belmont:

- E2 – Environmental Conservation; and
- SP2 – Infrastructure (Sewage Treatment Plant).

The project would be consistent with the aims and objectives of the SP2 zone. The project would be permissible with consent in all zones with the exception of the E2 and E3 zones. However, as noted in Section 3.1, permissibility would be established through the provisions of the SRD SEPP.

Environmental provisions of the LEP 2014 of potential relevance to a temporary desalination plant at the site are provided in Table 3. The project would be designed to be consistent with these objectives where practicable.

Table 3 Environmental Provisions of LEP 2014

Section	Objectives
7.1 Acid sulfate soils	*Ensure that development does not disturb, expose or drain acid sulfate soils and cause environmental damage.*
7.2 Earthworks	*Ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land.*
7.4 Coastal risk planning	*(a) to avoid significant adverse impacts from coastal hazards,* *(b) to ensure uses of land identified as coastal risk are compatible with the risks presented by coastal hazards,* *(c) to enable the evacuation of land identified as coastal risk in an emergency,* *(d) to avoid development that increases the severity of coastal hazards,* *(e) to maintain existing coastal processes,* *(f) to avoid adverse impacts on the environment.*
7.5 Terrestrial biodiversity	*Maintain terrestrial biodiversity by:* *(a) protecting native fauna and flora, and* *(b) protecting the ecological processes necessary for their continued existence, and* *(c) encouraging the conservation and recovery of native fauna and flora and their habitats.*
7.6 Limited development on foreshore area	*Ensure that development in the foreshore area will not impact on natural foreshore processes or affect the significance and amenity of the area.*
7.7 Development on sensitive Aboriginal landscape areas	*Recognise and conserve sensitive Aboriginal landscape areas*

Lake Macquarie Development Control Plan 2014 (DCP 2014)

The provisions of DCP 2014 would not apply to the project.

3.4 Licencing and Other Environmental Approvals

Under sections 115ZG and 115ZH of the EP&A Act, other NSW environmental approvals:

- Would not be required for the project (section 115ZG); or
- Would be required to be issued consistent with the development consent for the project (section 115ZH).

Environmental approvals that do not apply to or in respect of State Significant Infrastructure but which have been considered in the preparation of this PEA are in Table 4.

Table 4 Relevant Approvals not required under section 115ZG

Approval	Comment
Concurrence under Part 3 of the Coastal Protection Act 1979	The project is located within the coastal zone. Potential impacts to coastal processes would be assessed in the EIS for the project.
A permit under section 201 of the *Fisheries Management Act 1994*	The Project may involve dredging or reclamation works. This would be defined during design development and assessed in the EIS accordingly.
A permit under section 205 of the *Fisheries Management Act 1994*	Potential impacts to marine vegetation would be assessed in the EIS for the project.

Approval	Comment
A permit under section 219 of the *Fisheries Management Act 1994*	The Project is unlikely to result in the blockage of fish passage.
An approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977*	The Project is unlikely to impact non-Aboriginal heritage items.
An Aboriginal heritage impact permit under section 90 of the *National Parks and Wildlife Act 1974*	A search of the OEH AHIMS register has identified a number of registered Aboriginal heritage sites in proximity to the proposed plant but none within the desalination plant or connecting power and water infrastructure footprints. Refer Section 7.2 Despite this there is the potential for previously unidentified Aboriginal artefacts to occur within the project disturbance area. Potential impacts to Aboriginal heritage would be assessed in the EIS for the project.
An authorisation referred to in section 12 of the *Native Vegetation Act 2003* (or under any Act repealed by that Act) to clear native vegetation or State protected land	The project would potentially require minor clearing of native vegetation for the establishment of temporary desalination plant and ancillary infrastructure. Potential impacts to native vegetation would be assessed in the EIS.
A bushfire safety authority under section 100B of the *Rural Fires Act 1997*	Bushfire prone land would not require subdivision to accommodate the project.
A water use approval (section 89), a water management work approval (section 90) or an activity approval (other than an aquifer interference approval) (section 91) of the *Water Management Act 2000*	The project may involve the taking of groundwater during construction works (aquifer interference). During the assessment it will be confirmed if an aquifer interference approval is required depending on the quantity of groundwater that may be extracted noting that the horizontal well will be designed to target seawater, not groundwater. An assessment of potential impacts to surface and groundwater would be undertaken in the EIS for the project.

Table 5 discusses each of the approvals required under Section 115ZH of the EP&A Act and its applicability to the project.

Table 5 Relevant Approvals required under section 115ZH

Approval	Comment
An aquaculture permit under section 144 of the *Fisheries Management Act 1994*	The project would not involve aquaculture therefore no aquaculture permit would be required.
An approval under section 15 of the *Mine Subsidence Compensation Act 1961*	The desalination plant is not located within a mine subsidence district. Sections of the indicative potable water main may be located within the Lake Macquarie Mines Subsidence District.
A mining lease under the *Mining Act 1992*	The project does not involve a mining lease.
A production lease under the *Petroleum (Onshore) Act 1991*	The project would not involve petroleum production.
An EPL under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in	Belmont WWTW has an existing environment protection licence. Depending on the final layout and classification of the plant and the discharge of brine and pre-treatment waste, new or amended licences may be required. Even if the desalination plant itself does

Approval	Comment
section 43 of that Act)	not trigger any scheduled activity under Schedule 1 of the POEO Act, Hunter Water may seek a licence for a non-scheduled activity as a protection against prosecution under section 120 of the POEO Act for the pollution of waters.
Consent under section 138 of the *Roads Act 1993*	The project would potentially require works to be undertaken within the road corridor of a classified road in particular the Pacific Highway near Belmont / Jewels for connecting power and water infrastructure.
A licence under the *Pipelines Act 1967*	The project would not involve the operation of a pipeline that would require a licence under the *Pipelines Act 1967.*

3.4.1 Crown Lands Act 1989 (CL Act)

The CL Act provides for the administration and management of Crown Land in NSW. A licence from the Department of Primary Industries – Lands under section 45 of the CL Act would be required for the siting and operation of infrastructure on Crown Land. A licence would be required for the siting and operation of sea water infrastructure constructed and operated below the mean high water mark, which is likely to be required for the project. The potable water main connection to the north of the site would traverse the Belmont Wetlands State Park via an easement though Crown Land managed by a trust. Consultation would be undertaken with the Department Primary Industries – Land regarding required licences or approvals if this connection is proposed.

An approval under the CL Act would also be required for any modifications required within a Crown road easement which is located near the WWTW site.

3.5 Strategic Planning

3.5.1 Lower Hunter Water Plan (LHWP)

The LHWP identified that the region's existing water supply sources are secure and reliable during normal weather conditions, but are very susceptible to rapid depletion during a prolonged or extreme drought. To guard against potential future droughts, the LHWP outlines a series of water supply, management and efficiency measures to be implemented in stages, if required to slow the depletion of storages.

As part of investigations for the LHWP, baseload desalination (capable of supplying baseload water demand i.e. a supply that can satisfy a large percentage of Hunter Water's daily potable water network demands) was investigated as an option for emergency drought response. The investigation concluded that lead in times (time required to plan, design seek approvals and construct) for baseload desalination were too long to be considered since water storage levels for the lower Hunter can deplete rapidly in the event of an extreme drought. Small scale temporary desalination was preferred and subsequently included in the LHWP due to its lower lead in time and the ability to either rent or sell/re-use the desalination plants when they are no longer required.

Temporary desalination is intended to be used in conjunction with other staged drought response measures (outlined in Table 1) that would already be in place for an extreme drought including water transfers from the Central Coast, developing new groundwater resources, demand management programs (including Water Wise rules) and water/stormwater re-use schemes.

The LHWP also considers the investigation of potential sources of groundwater which may be suitable to access in a drought. A specific example in the LHWP is to explore the potential to treat and use groundwater pumped out of underground coal mines on the western side of Lake Macquarie. This option was considered in site selection investigations for the Newstan alternative site option as described in Section 2.4.

3.5.2 Hunter Regional Plan 2036

The site is situated in an area subject to *Hunter Regional Plan 2036* (the Plan). The Plan was prepared by the NSW Department of Planning and Environment (DP&E) in 2012 to guide land use planning priorities and decisions toward 2036. The Plan includes 27 strategic directions and associated actions to guide land use. Relevant directions include:

- Direction 15: Sustain water quality and security. Direction 15 includes the action to plan for the security of the region's town water supply; and
- Direction 16: Increase resilience to hazards and climate change. Direction 16 identifies that climate change is likely to result in varying rainfall, higher temperatures and prolonged dry periods and drought and includes the action to manage the risk associated with climate change.

The project would directly respond to these two actions from the Plan by increasing resilience to drought and plan for the future security of the region's water supply by providing a drought contingency measure that is not dependant on rainfall. The provision of a secure water supply is also closely linked to the ability of the plan to meet the needs of projected population and jobs growth within the Hunter region.

3.5.3 City of Lake Macquarie Environmental Sustainability Action Plan 2014-2023

The *City of Lake Macquarie Environmental Sustainability Action Plan 2014-2023,* prepared by Lake Macquarie City Council, identifies the need to adapt to climate change and ensure preparedness against natural hazards and disasters. The project would address these needs in providing a contingency measure for drought, with the frequency and duration of drought potentially increasing under climate change conditions.

3.6 Commonwealth Environmental Approvals

3.6.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires the approval of the Commonwealth Minister for the Environment and Energy for actions that may have a significant impact on matters of National Environmental Significance (NES). Approval from the Commonwealth Minister is in addition to any approvals under NSW legislation.

The EPBC Act provides for the identification, conservation and protection of places of national heritage significance and provides for the management of Commonwealth heritage places. The EPBC Act lists nine matters of NES that must be addressed when assessing the environmental impacts of a proposal. These matters are:

- World heritage properties;
- National heritage places;
- Ramsar wetlands of international significance;
- Threatened species and ecological communities;
- Migratory species;
- Nuclear actions (including uranium mining);
- Commonwealth marine areas;
- Great Barrier Reef Marine Park; and
- A water resource, in relation to coal seam gas development and large coal mining development.

Other matters protected under the EPBC Act include the protection of the environment where proposed activities are located on Commonwealth land. It is considered unlikely the proposed works would represent a Controlled Action under the EPBC Act. Specified studies may however indicate that referral to the Commonwealth Department of Environment and Energy is required, for example if an EPBC Listed species is located in close proximity to the site and ancillary infrastructure as part of ecological site assessment. This would be assessed when detailed investigations are undertaken.

The results of a Protected Matters search for matters of NES within 10 kilometres of the site are provided in Table 6.

Table 6 Matters of NES within 10 kilometres of Belmont WWTW Site

NES Matter	Matters of NES within 10 kilometres of the site
World Heritage Properties	None
National Heritage Properties	None
Wetlands of International Importance	None
Great Barrier Reef Marine Park	None
Commonwealth Marine Area	None
Listed Threatened Ecological Communities	None
Listed Threatened Species	24
Listed Migratory Species	16

4.0 Consultation

Hunter Water is committed to embedding stakeholder engagement within its culture and core functions, and to integrating stakeholder engagement into organisational governance, strategy planning and operational management. This approach would be reflected in the stakeholder engagement and consultation undertaken as part of the temporary desalination project.

4.1 Consultation Objectives

In order to undertake a comprehensive environmental impact assessment of the project, clear and effective consultation with the community and Government agencies is required. The objective of consultation and stakeholder engagement for Hunter Water is to attain improved outcomes through collaboration, outcomes Hunter Water could not achieve in isolation.

Hunter Water is committed to engaging with all relevant stakeholders to ensure that the potential impacts identified for the project are understood and documented and where possible avoided or minimised. To achieve this objective, Hunter Water would undertake all stakeholder consultation with the aim of providing stakeholders with an opportunity to express their views and concerns, provide feedback and be involved in the EIS process.

The key objectives of consultation would be to:

- Initiate and maintain open communication;
- Provide an understanding of the regulatory approval process to stakeholders;
- Seek local information and input into the project by providing a range of opportunities for stakeholders to identify key issues for consideration; and
- Proactively work with stakeholders to propose strategies to maximise benefits and minimise any negative impacts of the project.

4.2 Stakeholder Consultation

4.2.1 Previous Consultation Undertaken for the LHWP

The Metropolitan Water Directorate led a whole-of government process to develop the Lower Hunter Water Plan. This collaborative approach has ensured consistency between the plan and other policies, including the Hunter Regional Plan 2036 developed by the DP&E. This approach has also ensured the needs of the environment have been considered along with the needs of water users in the region, through environmental regulations and the water sharing plans for the region’s rivers.

Along with the Metropolitan Water Directorate, the government organisations involved in developing the plan were:

- Hunter Water Corporation;
- Department of Premier and Cabinet;
- NSW Treasury;
- NSW Office of Water;
- Office of Environment and Heritage;
- Environment Protection Authority;
- Department of Primary Industries;
- Department of Planning and Environment;
- NSW Health;
- NSW Public Works; and
- Local governments.

Planners also worked in close consultation with the community and other stakeholders to develop the plan, so their values, priorities and preferences could be incorporated into decision-making. Community members and representatives from a range of stakeholder groups were involved in four sets of workshops from December 2012 to September 2013.

4.2.2 Future Consultation for the Development of the Project

Hunter Water would use a variety of communication tools and activities to inform and receive feedback from stakeholders including meetings, presentations, community information sessions, development of project newsletters/information sheets, a project website and provision of contact details for any enquiries. Hunter Water would also ensure that all the issues identified and the resultant outcomes from consultation are recorded and fed back into the EIS process.

In addition, stakeholder engagement for the project would reference and build upon the engagement process used for the preparation of the LHWP.

Project consultation would be initiated following the submission of this PEA to DP&E, throughout the EIS phase of the project, and during the construction and operation of the project (where approval is gained). The key objectives of the project consultation would include the following:

- To identify key stakeholder groups and communities relevant to or likely to be affected by the project;
- To manage and facilitate the engagement of identified stakeholders;
- To identify the nature and extent of stakeholder issues and concerns, as well as relevant strategies to proactively manage these issues and concerns;
- To outline procedures for communication with identified stakeholders;
- To define the key messages, and communication tools and techniques to be used by Hunter Water during the EIS phase of the project and related exhibition phases to disseminate information and provide opportunity for feedback;
- To identify the policies and procedures to be used by Hunter Water to record and respond to enquiries, complaints, issues, incidents and other feedback received from identified stakeholders;
- To monitor and report on community initiated enquiries; and
- To identify and allocate communication roles within Hunter Water and the responsibilities of these roles.

4.3 Government Agencies and Non-Government Stakeholders

Consultation with relevant government agencies and non-government stakeholders would be undertaken, and would continue during preparation of the EIS and for the duration of the project. Some of the key government agencies and non-government stakeholders could include:

- Department of Planning and Environment;
- Department of Industry, Skills and Regional Development;
- Department of Primary Industries - Fisheries;
- Department of Primary Industries - Water;
- Office of Environment and Heritage;
- NSW Environment Protection Authority;
- Roads and Maritime Service;
- Lake Macquarie City Council;
- Department of Industry – Lands;
- Belmont Wetlands State Park Trust;
- Mine Subsidence Advisory NSW; and
- SafeWork NSW.

5.0 Identification of Key Assessment Issues

Environmental protection is a fundamental priority for the management of the services undertaken by Hunter Water. Hunter Water aims to provide services that meet the needs of our customers in an efficient, reliable and environmentally sustainable manner. It is also a fundamental goal to conduct all operations in accordance with the principles of ecologically sustainable development which includes the integration of ecological, economic and social objectives into the management of operations and resources.

5.1 Approach to Identification of Key Environmental Issues

An initial screening of potential issues for consideration in the EIS has been undertaken, with the aim of determining the likely level of assessment required to adequately and appropriately address each issue. In undertaking the initial screening, consideration has been given to the significance of each potential environmental impact (through a preliminary environmental risk screening) and also to the likely level of stakeholder interest in each issue. The inclusion of stakeholder perceptions of potential environmental impacts is considered an important part of determining the level of assessment that should be applied, given that key stakeholder concerns may not necessarily align with a purely technical analysis of environmental risks.

By combining the likely significance of each identified environmental issue with the expected level of stakeholder interest, an assessment has been made as to whether each issue is integral to the assessment of the project, and whether a detailed specialist investigation or desktop analysis would be appropriate. Where a high level of stakeholder interest is expected, a potential environmental impact has been determined to be a key issue, requiring a detailed assessment irrespective of the outcomes of environmental risk screening.

5.1.1 Environmental Risk Screening

The environmental risk screening has been prepared in reference to:

- The outcomes of the relevant assessments that comprise the Hunter Water Corporation Temporary Desalination Project Readiness Activities Stage 1 project;
- A review of the potential applicable environmental constraints and opportunities at the Belmont WWTW site and indicative water main and power alignments; and
- Key risks identified in a review of other desalination approvals projects including identifying areas of primary community interest associated with these projects.

The preliminary environmental risk screening for the project has taken into consideration the likelihood of an environmental impact occurring and the consequence of that impact should it not be mitigated. The likelihood and consequence of each impact have been combined through the significance screening matrix (Table 7) to establish the likely significance of the issue for the environmental assessment of the project.

Table 7 Significance Screening Matrix

Likelihood of Effect	Consequence of Unmitigated Effect		
	Minor	Moderate	Major
Improbable	Very Low	Low	Medium
Possible	Low	Medium	High
Probable	Medium	High	Very High

The allocation of risk is based upon the following considerations:

Likelihood of effect:

1. Improbable: imperceptible or short term cumulative impacts;
2. Possible: modest or medium term cumulative impacts; and
3. Probable: serious or long term cumulative impacts.

Consequences of unmitigated effect:

1. Minor: minor environmental change;
2. Moderate: moderate adverse environmental change; and
3. Major: important adverse environmental change.

The ranking of issues aims to prioritise the issues for assessment and does not consider the application of mitigation measures to manage the environmental effects. Appropriate and proven mitigation measures would be used to minimise potential impacts, and would be detailed in the EIS.

5.1.2 Review of Expected Stakeholder Interest

The expected level of stakeholder interest in each potential environmental issue identified has been considered, based on stakeholder consultation to date and a broad review of key issues raised in submissions in relation to other projects of this nature.

Potential environmental impacts have been assigned an expected level of stakeholder interest based on the definitions presented in Table 8.

Table 8 Screening Levels – Expected Stakeholder Interest

Level of Interest	Definition
High level of interest	Issue raised in feedback from most stakeholders or in most submissions made on the development.
Medium level of interest	Issue raised in feedback from some stakeholders or in some submissions made on the development.
Low level of interest	Issue not raised, or rarely raised in feedback from stakeholders or in submissions made on the development.

5.2 Screening of Environmental Assessment Significance

The outcomes of the preliminary screening process to determine likely key issues of environmental assessment significance are presented in Table 9. This screening aims to allow for general prioritisation of environmental assessment issues based on potential significance and does not take into account the application of mitigation measures to minimise and manage potential impacts. In all cases, reasonable and feasible mitigation measures would be applied to the project to minimise potential impacts. Mitigation measures would be developed during the assessment process and presented in detail in the EIS.

Table 9 Outcomes of Screening of Environmental Assessment Significance

Issue	Unmitigated Environmental Risk Screening			Stakeholder Level of Interest	Environmental Assessment Significance
	Likelihood	Consequence	Significance		
Energy and Greenhouse Gas					
Greenhouse Gas emissions	Probable	Moderate	High	High	High
Energy requirements	Probable	Moderate	High	High	High
Ecology					
Impacts to aquatic ecology	Probable	Moderate	High	High	High
Impacts to terrestrial ecology	Probable	Moderate	High	High	High
Groundwater Dependent Ecosystems	Possible	Moderate	Medium	Medium	Medium
Hydrology and Water Quality					
Impacts from brine disposal	Probable	Moderate	High	High	High
Intake water quality	Probable	Moderate	High	High	High
Construction impacts to surface water quality	Possible	Moderate	Medium	Medium	Medium
Groundwater impacts from raw water extraction	Possible	Moderate	Medium	Medium	Medium
Site flooding risk	Improbable	Moderate	Low	Low	Low
Coastal Processes and climate change					
Beach erosion and coastal inundation impacts during construction and operation	Possible	Major	High	Medium	High
Dune stability impacts during construction and operations	Possible	Moderate	High	Medium	High
Contamination					
Soil contamination impacts	Possible	Moderate	Medium	Medium	Medium
Groundwater contamination impacts	Possible	Moderate	Medium	Medium	Medium
Geology, soils and contamination					
Increased sedimentation and erosion	Possible	Moderate	Medium	Low	Medium
Potential to encounter contaminated soils	Possible	Minor	Low	Low	Low

Issue	Unmitigated Environmental Risk Screening			Stakeholder Level of Interest	Environmental Assessment Significance
	Likelihood	Consequence	Significance		
Potential to encounter Acid Sulphate Soils	Possible	Minor	Low	Low	Low
Heritage					
Impacts to Aboriginal heritage	Possible	Moderate	Medium	Medium	Medium
Impacts to non-Aboriginal heritage	Possible	Minor	Low	Low	Low
Noise and Vibration					
Construction noise and vibration impact	Possible	Minor	Low	Low	Low
Operational noise and vibration impact	Possible	Minor	Low	Medium	Medium
Traffic, Transport and Access					
Site access and road network impacts	Low	Minor	Very low	Low	Low
Beach access	Possible	Minor	Low	Medium	Medium
Waste					
Operational waste[1]	Probable	Minor	Medium	Low	Medium
Landscape Character and Visual Amenity					
Impacts to coastal character and view catchment	Possible	Moderate	Medium	Medium	Medium
Air Quality					
Air quality impacts from construction activities	Possible	Minor	Low	Low	Low
Social and Economic					
Creation of employment opportunities	Probable	Minor	Medium	Low	Medium
Increased financial costs to community	Probable	Minor	Medium	Medium	Medium
Security of water supply – supply of potable water	Possible	Moderate	Medium	Medium	Medium

1 – Brine disposal is considered under hydrology and water quality.

5.3 Identification of Key Environmental Assessment Issues

Based on the risk screening presented in Table 9, key issues of consideration in the EIS for the project have been identified and are summarised in Table 10. These issues are discussed in further detail in Section 6.0 and Section 7.0.

For each of the issues considered in Table 10, an assessment of significance was made based on the dominant significance ranking. For example, in the case of ecology, the majority of environmental significance rankings for potential impacts were rated as high in the absence of mitigation measures. As a consequence, these issues will be carried forward as key issues for the environmental impact assessment of the project. A similar approach was taken to identify groundwater, surface water, traffic, air quality, noise, visual amenity and, waste, to be of medium significance to the environmental planning process. This risk screening assessment was based on the information currently available and the desktop investigations undertaken to date. These environmental assessment significance rankings would be reviewed and updated where relevant as more detailed environmental investigations are undertaken to inform the preparation of the EIS for the project.

Table 10 Identification of Key and Other Assessment Issues

Issue	Environmental Assessment Significance	Key Issues/ Other Issue
Hydrology and water quality	High	· Impact of brine on receiving water quality. · Potential impact to groundwater. · Potential impact of flooding or water supply and power connection corridors. · Brine disposal.
Coastal processes and climate change	High	· Potential impacts to desalination plant from severe erosion events or storm surges.
Ecology	High	· Proximity of Belmont Lagoon and SEPP14 Wetlands. · Potential impacts to terrestrial ecology during construction. · Potential impacts to aquatic ecology during construction and operation, including for the discharge of brine. · Potential risk of water high in chlorine (hyperchlorinated) release to the environment e.g. during commissioning, or other unwanted release.
Energy and greenhouse gas	High	· Energy usage and greenhouse gas emissions associated with the desalination process.
Geology, soils and contamination	Medium	· Historic site contamination issues associated with the operation of the Belmont WWTW.
Heritage (Aboriginal and non-Aboriginal)	Medium	· Based on the extent of known Aboriginal artefacts within the vicinity (Refer Section 7.2) there is potential for previously unidentified artefacts to be impacted by the project. · Potential for Aboriginal artefacts to occur on sandy margins to the north east and south of the site. · The nearest non-Aboriginal heritage item is located over one kilometres from the site.
Noise and Vibration	Medium	· Site is close to popular recreational areas including Nine Mile Beach and Belmont Lagoon. · Potential impacts associated with construction of water supply and power connections in residential areas. · Potential operational noise impacts to recreation users of the Belmont Waters State Park.

Issue	Environmental Assessment Significance	Key Issues/ Other Issue
Transport and access	Medium	· Potential impacts to the local road network as a result of construction and operational traffic. · Potential impacts to access to Nine Mile Beach. · Potential impacts to the Fernleigh Track as a result of constructing connecting main.
Waste	Medium	· Operation of desalination plant would involve the transportation, delivery and storage of chemicals and chemical waste.
Landscape character and visual amenity	Medium	· Site is close to popular recreational areas including Nine Mile Beach and Belmont Lagoon.
Air quality	Low	· Construction air quality impacts
Social and Economic	Medium	· Creation of employment opportunities. · Security of critical water supply to residents and business. · Increased financial costs to community.

6.0 Key Environmental Issues

This section considers the key environmental assessment issues for the project. In considering each of these issues, both through this PEA and through the future EIS for the project, the key focus would be to avoid or minimise adverse impacts, with residual implications for the environment and local community mitigated and managed to ensure minimisation of impacts wherever reasonable and feasible.

6.1 Hydrology and Water Quality

6.1.1 Existing Environment

Surface Water

The site is located within a coastal dune environment which due to elevation and soil (sand) transmissivity lacks significant surface water features. Surface waterbodies and watercourses in close proximity to the project site are shown in Figure 6 and consist of:

- Belmont Lagoon located 30 metres to the north-west. This is a shallow coastal saltwater lagoon which connects to Lake Macquarie in Belmont Bay via Cold Tea Creek. The lagoon is adjacent to protected (SEPP 14) wetlands;
- The South Pacific Ocean located 40 metres to the east. This area of coastline between Redhead Headland to the north and Swansea Channel to the south contains three beaches. From north to south these beaches are known as Redhead Beach, Nine Mile Beach (adjacent to the site) and Blacksmiths Beach. With the exception of the Belmont WWTW and the Belmont Golf Course to the south, Nine Mile Beach and its dune system are relatively undeveloped and therefore have minimal surface impact from human activities. Due to the transmissivity of the sandy soils there is no significant standing water in the beach or dune environments close to the WWTW;
- Belmont Bay located 1.2 kilometres to the west of the site. Belmont Bay forms part of Lake Macquarie which is a large (approx. $110km^2$), relatively shallow (average depth approx. 8m) coastal saltwater lake which drains to the Pacific Ocean through the Swansea Channel approximately 5km to the south of the Belmont WWTW site;
- Sludge / effluent lagoons within the Belmont WWTW. A lined lagoon within the boundaries of the Belmont WWTW for the storage of sludge materials following waste water processing. The WWTW also includes a number of aboveground concrete storage tanks such as clarifier tanks and aerobic digester tanks; and
- The power and potable water connection infrastructure would, in addition to passing adjacent to the Belmont Wetland, traverse areas that include a number of formalised street drains and ephemeral first order streams, particularly the Dalrymple Street potable water connection to the north.

Runoff from the west of the site access road generally drains to Belmont Lagoon, while runoff from the east of the site access road is directed to the lowest point at the site at the base of the existing sand dunes along Nine Mile Beach where it infiltrates into the sandy soils.

Under existing operations, the Belmont WWTW effluent discharges secondary treated effluent into the South Pacific Ocean via an outfall pipe approximately 1.5km offshore.

The site not is not located within 1% Annual Exceedance Probability (AEP) flood extent for the existing, 2050 or 2100 scenarios (GHD, 2007). Flooding issues have not previously been recorded at the site.

Groundwater

A Conceptual Hydrogeological Model (AECOM 2016a) has been developed for the site which has informed the information outlined in this section. This conceptual model included a database and desktop review of available information to gain an understanding of the subsurface and groundwater conditions likely to be present in the vicinity of the project site.

The principal aquifer in the region is that which comprises various unconsolidated sand units along the coast. The bedrock units underlying the sands do not appear to be a viable aquifer unit in a regional context.

The hydro-stratigraphy for the site can be described as:

- Quaternary aged dune sands (Hunter Coastal Sands); and
- Permian aged sandstone bedrock at varying depths.

The site falls into the Hawkesbury to Hunter Coastal Sands water asset area which is covered by the *Water Sharing Plan for the North Coast Coastal Sands Groundwater* Sources (DPI, 2016b). This plan governs the groundwater extraction licences and limits. At the commencement of the plan the long-term average annual groundwater extraction limit for the Hawkesbury to Hunter Coastal Sands was 20,445 ML/yr.

The site is known to have had four groundwater monitoring bores installed, however, only three were able to be located (August 2016 - MW1, MW2 and MW4) as part of investigations for the Temporary Desalination Project pre PEA investigations.

Depth to water was found to be between 3.80 and 4.37 metres below ground surface (mbgs), within the range of historic depths taken in 2002 (4.3 - 5.9 mbgs) and 2011 (1.03 – 2.68 mbgs). Field parameters taken in 2011 and 2016 reported slightly acid to neutral pH (6.0-6.8) and low salinity (620-940 µS/cm), inferring minimal sea water influence in these monitoring wells.

Taking into consideration an estimated average thickness of 40 metres across the sand layer an inferred saturated thickness of the sand aquifer is therefore approximately 30 metres (AECOM 2016a).

<u>Hydrogeological Parameters</u>

The total thickness of the Hawkesbury to Hunter Coastal Sands is estimated to be between 15 and 40m, with an assumed average saturated thickness of 30 m across the site (AECOM 2016a).

6.1.2 Issues for Consideration

Surface Water

The key issue for consideration in relation to surface water relates to potential impacts on water quality as a result of the discharge of brine to seawater. The utilisation of the existing operational Belmont WWTW outfall provides the opportunity for a combined brine/effluent discharge which would dilute the salinity of the brine. For comparison, the EPL for the existing Belmont WWTW is for a facility with the capacity to discharge up to 30,000ML per year, or approximately 83ML per day. Whilst daily discharge from the WWTW would typically be much less, particularly during drought conditions, the proposed desalination plant producing 15 – 20ML/day of brine represents approximately <25% of this flow.

Dilution of the brine by treated effluent from the WWTW would potentially reduce total salinity at the point of discharge compared to the discharge of undiluted brine. Investigations as part of the EIS would quantify the dilution effect. Dispersion modelling would be undertaken to determine the nature of water quality impacts associated with the increased outfall discharge stream. It is noted that Hunter Water already undertakes a program of surveying water quality, marine sediments and benthic and marine fauna to monitor potential impacts resulting from the existing outfall. These monitoring results would be used as a baseline for further assessment of the project.

The potential for the project to impact upon other surface waters would need to consider potential impact to the Belmont Lagoon and Lake Macquarie. Whilst no direct impacts would be anticipated during operation, there is potential for the project to result in construction impacts such as erosion and sedimentation due to ground disturbance. These impacts would be managed to avoid impacts to the nearby Belmont Lagoon and SEPP14 Wetlands. In particular, the potential impacts associated with the construction of power and potable water connections, including trenching work adjacent to the Belmont Wetlands. Further consideration of potential ecological impacts to SEPP 14 wetlands is provided in Section 6.3.

Aside from the Belmont Wetlands the power and potable water connection traverse a number of constructed street drains and ephemeral first order streams. The EIS would identify potential interaction with these drainage lines, determine if potential impacts would occur and identify appropriate measures to manage any associated impacts.

During operation the desalination plant would require differing amounts of chemicals for use pre and post treatment of water, and to maintain the working order of the desalination plant. In addition the storage of diesel fuel for standby generators may also be required as part of the project. Whilst there is the possibility of spills, which may lead to receiving water impacts, the implementation of standard storage, handling and bunding measures means there would be a limited potential of spills to occur in surface waters.

Groundwater

Construction of the desalination plant itself would only require shallow footing requirements. As detailed in Section 6.1.1 groundwater depths vary across the site, however are generally found to be below this level. Therefore, potential groundwater impacts as a result of the construction of the desalination plant elements, is likely to be minimal.

Connections of potable water and power infrastructure and the pipe connecting to the existing outfall are likely to be within two metres of the existing ground level. Utility connections would traverse areas near wetlands and these excavations may have the potential for groundwater infiltration. The EIS would assess the potential for this groundwater infiltration and make recommendations regarding management measures they may be required to manage groundwater if encountered.

Construction of the proposed intake infrastructure would require excavation at much greater depths than the remainder of the project. Current estimates indicated that a vertical shaft of 20m depth would be required subject to further design. It would likely result in the works moving through the groundwater aquifer.

The typical construction methodology for such a shaft is through the use of a caisson which provides a water tight chamber in which the excavation works can progress down to the desired depth. This in effect would seal off the groundwater from the works meaning there would be minimal impacts to groundwater. There is potential for minor leaks and seepage, however this is not expected to be of significant volume.

In regards to the intake of water for the desalination plant, horizontal bores would be pushed out from the base of the vertical shaft under the seabed. The distance and depth at which these shafts would be placed would be determined such that they avoid interacting with groundwater aquifers and so the intakes only target seawater. Further detailed investigations to determine seabed bathymetry and to characterise the aquifers would be required to feed into the intake design.

Similar to potential impacts to surface water, chemical spills have the potential to result in contamination of groundwater (for example, the accidental release of hydraulic fluids during construction work, both at ground level and within excavations). Again with appropriate measures in place potential for this to occur would be minimal.

6.1.3 Method of Assessment

Surface Water

A surface water impact assessment (SWIA) would be undertaken for inclusion in the EIS to ensure that a full assessment of potential impacts to surface water is undertaken for both the construction period and during operation of the temporary desalination plant. Potential construction impacts are considered to be manageable with standard management measures such as for sediment and erosion.

A key component for assessing potential operational surface water impacts would be the undertaking of dispersion modelling to determine potential impact of brine dispersal on the marine environment. Dispersion modelling would focus on the salinity impacts but also need to assess the impacts of varying brine levels based on high and low dilution scenarios when considered with the operation of the existing WWTW outfall.

Dispersion modelling would also provide feedback to the design process. Firstly it would allow the outfall end-of-pipe diffusers to be designed, or modified, to maximise diffusion and therefore minimise potential impacts. Secondly the dispersion modelling would need to demonstrate that outfall water would be appropriately dispersed such that it does not adversely interact with the chosen intake location, and therefore intake water quality. As part of the assessment recommendations would be made for any mitigation measures to address any potential impacts to surface water.

Investigations required to assess potential impacts of the project in regards to aquatic and marine ecology are discussed in Section 6.3. The use of benthic fauna surveys would likely form an ongoing monitoring component of the operation of the project to assess the extent of any impacts.

Groundwater

Groundwater investigations would be undertaken to define groundwater and aquifer characteristics including depth and extent, potential interaction with adjoining aquifers or surface water bodies (Lake Macquarie, Belmont Lagoon and nearby wetlands) and determine groundwater quality parameters. These investigations would occur in tandem with bathymetric surveys to inform the design development for the intake infrastructure as the intake will be the point at which the project has the most potential to impact on groundwater.

In order to inform the assessment monitoring well/s would be installed and data collected. This would also occur over a period that allows seasonal variability to be understood. Use of this data would also allow monitoring and analysis to be undertaken during operations to determine if any impacts to groundwater are occurring.

Bathymetric surveys would be undertaken off the shore and seabed areas as inputs in the design process. This information would be coupled with groundwater investigations as inputs into the intake designs to allow the design to achieve seawater intake without drawing down on groundwater interactions.

Potential impacts to Groundwater Dependant Ecosystems, would be assessed as part of the ecological investigations as discussed in Section 6.3.

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ENVIRONMENTAL CONSTRAINTS
Preliminary Environmental Assessment
Lower Hunter Water Plan: Temporary Desalination Readiness Activities

FIGURE 6

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6.2 Coastal Processes and Climate Change

6.2.1 Existing Environment

The site is located in the coastal dunes behind Nine Mile Beach, located within 40 metres of the Nine Mile Beach fore dune and within 170 metres of the shoreline. Nine Mile beach extends from immediately north of the northern breakwater of Swansea Channel to Redhead headland in the north. Nine Mile Beach is characterised by a low sandy beach in the south, extending to wide dunes of heights up to 15 metres north between Swansea Channel and Redhead.

Existing coastal hazards at the site have been identified in the *Lake Macquarie Coastal Zone Hazards and Risk Assessment* (BMT, 2015), which modelled beach erosion, beach recession and storm surge extent for a number of likelihood scenarios for the existing (2015), 2050 and 2100 scenarios, as well as reviewed historical information such as survey and aerial photographs. The following issues have been identified as potentially impacting the coastline in the vicinity of the site:

- Beach erosion and recession;
- Storm surges; and
- Sea level rise.

Photogrammetric review of historical information indicated that while the Nine Mile Beach area has been subject to some erosion and recession over the life of the available photographic record, it has generally demonstrated recovery from erosion events such that there is no significant trend of recession over the assessed timeframes.

Storm surges have been shown to have the potential to breach the beach fore dune in places where it sits at lower elevations. Whilst breach potential near the site is considered to be limited, significant storm surge has the potential for surge waters to break through sections of the fore dune and lead to inundation of a larger rear dune area. Investigations indicated that inundation of the site would have a low potential and if did occur would not be at significant depths.

Sea level rise was not shown to have had an appreciable impact on the existing coastline and coastal processes. BMT (2015) also noted that a key factor for consideration as part of any infrastructure or development should be the potential impact to existing sea level conditions under both calm (normal) and sea surge scenarios.

6.2.2 Issues for Consideration

The location of the site within the coastal environment of Nine Mile Beach means that it is potentially susceptible to hazards related to coastal processes and climate change. Considering the coastal location of the site, potential hazards related to climate change include sea level rise and storm surges.

General issues for consideration include the potential for the project to contribute to localised beach erosion around desalination plant infrastructure during construction and operation and potential impacts related to construction within sandy soils and active sand dunes.

Specific issues for consideration are listed below and, as above, are primarily informed by the *Lake Macquarie Coastal Zone Hazards and Risk Assessment* undertaken (BMT, 2015). The following issues have been identified as potential constraints for the site and therefore key items for consideration that would need to be addressed in the EIS:

- The potential placement of water intake infrastructure for the project being located within beach erosion and recession hazard areas. While much of the infrastructure would be constructed at depth, surface infrastructure will need to consider erosion potential;
- The underground connection to the existing treatment plant outfall would potentially be located within beach erosion and recession hazard areas for the worst case (‘rare’) existing (BMT, 2015) scenario, and within the hazard areas for the ‘rare’ and ‘unlikely’ modelled 2050 and 2100 scenarios (BMT, 2015);
- A 1 in 100 year storm surge for the existing (2015) scenario would involve potential wave overtopping to the south of the site (BMT, 2015);

- A 1 in 100 year storm surge for the modelled 2050 and 2100 scenarios would involve potential wave overtopping and inundation of the area between the existing Belmont WWTW and Belmont Golf Corse, including the site (BMT, 2015); and
- The potential impact on sea level rise as a result of climate change has the potential to lead to more extreme storm and flood events which will need to be factored in to the projects ultimate design.

The following have been identified for the proposed site location:

- The site and indicative water supply and power connection corridors are not located within beach erosion and shoreline recession hazard areas for the existing or modelled 2050 or 2100 scenarios, even for a worst case ('rare') scenario (BMT, 2015). The coastline in this location has shown relatively stability since European settlement;
- The site is not within the inundation level for sea level rise of 0.9m AHD (2100); and
- The site and project indicative water supply and power connection corridors are not located within 'almost certain' coastal inundation hazard areas for the existing (2015), 2050 or 2100 scenarios (BMT, 2015).

6.2.3 Method of Assessment

A coastal processes and hazards assessment would be undertaken for inclusion in the EIS to ensure that a full assessment of costal hazards is undertaken for both the construction period and during operation of the temporary desalination plant. The coastal process assessment would assess:

- Potential impacts during the construction of the project including undertaking construction activities on sandy soils and sand dunes;
- Potential impacts during the operation of the project, including potential impacts to infrastructure from storm surges and erosion events; and
- An assessment of the potential impacts of coastal hazards on the project factoring in the potential amplification of impacts as a result of sea level rise associated with climate change. Design levels for hazard analysis would utilise the applicable still water design levels as detailed in the NSW Governments *Coastal Risk Management Guide Incorporating Sea Level Rise Benchmarks In Coastal Risk Assessment* (OEH, 2010)

The assessment of coastal hazards and processes would build upon available information such as that prepared by BMT (2015) to determine potentially hazardous events. As part of the assessment recommendations would be made, including design requirements, for mitigation measures to address any potential impacts to coastal processes or to manage potential impacts of coastal hazards on the project.

6.3 Ecology

6.3.1 Existing Environment

The existing Belmont WWTW site comprises of highly disturbed terrain. The only vegetation on the WWTW site comprises a mixture of a regularly mown lawn that is separated from the surrounding dune vegetation, and some sand area with a groundcover of Bitou Bush.

Vegetation surrounding to the south and east of the site consists of Pigface (*Carpobrotus glaucescens*), Spinifex (*Spinifex sericeus*) and the introduced Bitou Bush (*Chrysanthemoides monilifera*). Bitou Bush is the dominant species in this area, with no vegetative strata supported above this layer. The Nine Mile Beach active wave zone does not support any vegetation.

The areas to the west and north of the site are more densely vegetated and include the SEPP14 wetland environment adjoining Belmont Lagoon. SEPP 14 wetlands are located as close as 10 metres to the west of the temporary desalination plant site, and are also mapped as being immediately adjacent to the proposed water connection corridor to the north, and the power connection corridor.

Aquatic and terrestrial species recorded around the Belmont WWTW, but not within the boundary, as part of previous investigations include:

- Swamp Sclerophyll Forest on Coastal Floodplains Endangered Ecological Community (EEC), Swamp Oak Floodplain Forest EEC, Sydney Freshwater Wetlands EEC and Bangalay Sand Forest EEC, which have been identified to the west and north of the temporary desalination plant site and water and power connection corridors (Hunter Water, 2015);
- Grey Headed Flying Fox (*Pteropus poliocephalus*), White-bellied Sea-Eagle (*Haliaeetus leucogaster*) and Eastern Osprey (*Pandion cristatus*) (listed under the TSC Ac and EPBC Act) which have been recorded adjacent to the temporary desalination plant site (Hunter Water, 2015);
- Potential habitat for the Wallum Froglet (*Crinia tinnula*) and other threatened flora and fauna species in proximity to the temporary desalination plant site (Hunter Water, 2015);
- Recorded sightings of migratory marine species within five kilometres of the site (whales, turtles, dugong) (GHD, 2007); and
- Other threatened and non-threatened marine species are known to exist around the existing Belmont WWTW outfall, including fish, large invertebrates, reptiles, and marine mammals (Advisian, 2016). The area around the outfall is known to be naturally devoid of marine vegetation (Patterson Britton & Partners, 2003). There is potential for fauna species to be impacted for the construction of the seawater intake infrastructure.

A review of the Atlas of Groundwater Dependent Ecosystems (BOM, 2017) indicated that land adjoining the Hunter Water site has the potential to contain groundwater dependant ecosystems. Previous assessments have recorded groundwater dependant ecosystems associated with the nearby SEPP 14 wetlands.

6.3.2 Issues for Consideration

Construction

A search of the OEH threatened species database and site inspection identified EECs and threatened species are unlikely to be located within the desalination plant site due to its disturbed nature. Identified EECs and threatened species may be located within indicative water supply and power connection corridors. Potential impacts to nearby environments including the SEPP14 Wetlands could occur as a result of sedimentation and erosion during construction. The construction of the subsurface beach wells would be associated with potential impacts to marine ecosystems.

Potential impacts to SEPP14 wetlands, marine ecosystems and other sensitive ecological environments would need to be assessed for the construction of the power supply and potable water connections.

Operation

The primary matter for interest in relation to the operation of the project on biodiversity is the discharge of brine via the existing Belmont WWTW outfall. The outfall is located approximately 1,500 metres offshore and would therefore potentially impact marine ecology. Organisms that would potentially be impacted include those that live in the water column (e.g. fish, marine mammals) and those that live in the surface layers of ocean sediments (e.g. invertebrates). The area around the outfall is known to be naturally devoid of marine vegetation (Patterson Britton & Partners, 2003).

As outlined in Section 2.2.1, seawater intake infrastructure would consist of horizontal subsurface beach wells. This intake design would draw seawater through the sea bed and therefore minimise impacts to marine ecology through entrainment that would otherwise be associated with open seawater intakes.

6.3.3 Method of Assessment

A Biodiversity Impact Assessment (BIA) would be undertaken for inclusion in the EIS to ensure that a full assessment of potential impacts to ecology is undertaken for both the construction period and during operation of the temporary desalination plant. The BIA would assess:

- The condition of the existing environment and species habitat including the extent and condition of nearby mapped SEPP14 Wetlands;
- Potential impacts to terrestrial and aquatic ecology during the construction of the project;
- Potential impacts to terrestrial and aquatic ecology during the operation of the project, including a focus on the potential impact of marine environments from the discharge of brine. The potential impact of the project on marine ecology would also utilise analysis undertaken as part of the surface water assessment in regards to outfall water quality and brine dispersion modelling to determine potential ecological impacts;
- Intake potential for interaction with marine ecology including marine fauna; and
- Potential impacts to groundwater dependant ecosystems.

As part of the assessment mitigation measures would be identified to address any potential impacts to biodiversity.

6.5 Energy and Greenhouse Gas

6.5.1 Existing Environment

The proposed temporary desalination plant would be located on land currently owner by Hunter Water on a larger parcel of land that currently houses the existing Belmont WWTW. Currently the site indirectly produces greenhouse gases through the consumption of power (electricity) which is required to run the WWTW pumps and wastewater treatment equipment. As this power would be predominately sourced from coal powered generators this represents an indirect source of carbon dioxide emissions.

In addition the WWTW also has the potential to result in the release of fugitive emissions of other greenhouse gases such as methane that are produced as by-products of anaerobic sludge digestions processes within the WWTW.

The area where the desalination plant is proposed to be located is currently a mixture of hardstand, open sand and bitou bush groundcover. This area would have a negligible impact on energy use or greenhouse gas generation.

6.5.2 Issues for Consideration

Greenhouse gas (GHG) emission sources listed in the Australian Government reporting legislation include:

- Carbon dioxide (CO_2);
- Sulfur hexafluoride (SF_6);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Hydrofluorocarbons (HFCs); and
- Perfluorocarbons (PFCs).

Emissions of these GHGs are categorised into three different scopes (1, 2 or 3) in accordance with the World Business Council for Sustainable Development and World Resources Institute Greenhouse Gas Protocol (2004), and the Australian Government GHG accounting and reporting systems. The definitions of each of these scopes are as follows:

- Scope 1 emissions: also referred to as “direct emissions”, are emissions which are generated directly by the proposed development, e.g. emissions generated by the use of diesel fuel by construction plant/equipment;

- Scope 2 emissions: also referred to as “indirect emissions”, are emissions which are generated outside of the project’s boundaries to provide energy to the project, e.g. the use of purchased electricity from the grid; and
- Scope 3 emissions: also referred to as “indirect upstream emissions”, due to third party supply chains that are in direct relation to the project (e.g. extraction, production and transport of purchased materials and waste disposal offsite).

Due to the high pressure operating requirements of reverse osmosis desalination, it is an energy intensive process involving the consumption of a relatively large amount of electricity. The primary potential GHG impact associated with the project would be indirect, through the consumption of electricity. The generation of this electricity at the power station source would result in the emission of GHG emissions.

Other likely GHG emission sources would include (but not be limited to):

- During construction:
  - Fuel use for construction vehicles, plant and equipment; and
  - Embodied energy of construction materials;
- During operation:
  - Emissions from site vehicles and vehicles for delivery and dispatch of materials.

These emission sources are not anticipated to produce large quantities of GHG.

6.5.3 Method of Assessment

A GHG assessment undertaken as part of the EIS would involve:

- Identification of potential emissions sources for the project construction and operation;
- A quantitative assessment of the potential scope 1, 2 and 3 GHG emissions of the project;
- A qualitative assessment of the potential impacts of these emissions on the environment; and
- An assessment of all measures to minimise the GHG emissions of the project and ensure energy efficiency during construction and operation.

The methodology for the GHG assessment would be aligned with NSW, Australian and international standards including the following, as applicable to the project:

- The *Greenhouse Gas Protocol* (World Resources Institute and World Business Council for Sustainable Development);
- *National Greenhouse Accounts Factors* (Commonwealth Department of the Environment and Energy);
- *National Carbon Accounting Toolbox*; and
- *National Greenhouse and Energy Reporting System: Technical Guidelines* (Commonwealth Department of the Environment and Energy).

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7.0 Other Environmental Issues

This section considers the other environmental assessment issues for the project. In considering each of these issues, both through this PEA and through the future EIS for the project, the key focus would be to avoid impacts if possible. It is acknowledged that not all of these impacts would be avoidable, for example some of the following may occur:

- Soils – potential impacts would occur as a result of excavations of footings and installation of utility connections;
- Noise and vibration – construction and operational activities would generate noise and vibration;
- Traffic – construction and operational activities would generate traffic movements;
- Waste – construction and operational activities would generate waste products;
- Landscape and visual – the construction of new plant may impact on the visual landscape;
- Air quality – potential impacts such as dust generated during construction; and
- Social and economic – impacts to the community and ecology, including positive impacts associated with security of water supply.

The EIS will focus on potential impacts to identify where impacts may occur and recommend appropriate management measures to reduce these impacts such that the residual implications for the environment and local community are minimised.

7.1 Geology, Soils and Contamination

7.1.1 Existing Environment

Geology and Soils

A review of the geology and soils at the site and surrounding areas using the NSW Department of Industry (2016): 1:100,000 and 1:25,000 - Newcastle-Hunter Area Coastal Quaternary Geology and NSW Department of Industry (2016): 1:100,000 Geology - Gosford Lake Macquarie Special maps indicated the geological conditions beneath the Site are:

- Quaternary beach sands and shallow marine sediments, comprising coastal sand deposits (medium to fine grained marine sands with podsols and beach sands with coarse grained quartz sand, shell fragments and gravel); and
- Bedrock comprising Permian age Boolaroo and Adamstown Sub Groups of the Newcastle Coal Measures, comprising various proportions of conglomerate, sandstone, coal, siltstone, tuff and shale of Permian age. The surrounding area is likely to have been extensively undermined for coal.

The Swansea Acid Sulphate Soil Risk Map (Office of Environment and Heritage, 1998) indicates a high probability of acid sulphate soil materials in the vicinity of the Belmont WWTW. However, results of acid sulphate soil testing on three samples of sands from the site have indicated that the samples were not potential acid sulphate soil (Robert Carr and Associates, 2002). Further investigations would be required for the power and water connections to identify the likely presence of acid sulphate soil.

The local area consists of an approximately 1 km wide belt of Quaternary dune sand. Soils at the adjacent Belmont Wetlands State Park have been described as siliceous sands up to 50 m in depth (DPI, 2016 and 2016b).

Sand and coal mining operations on the site and within the adjacent wetlands have altered the soils. During mining operations overburden spoil and coal chitter were used as fill. A number of abandoned quarry pits and sealed shafts are located in the adjacent wetlands and one at Belmont Lagoon, immediately west of the site (Jeffrey & Katauskas, 1994).

The Belmont WWTW has been modified substantially during operations, primarily as a result of shallow cut and fill earthworks for surface infrastructure and more intrusive excavations for the installation of infrastructure at depth, for example outfall or utility connections. Previous sub-surface investigations reported fill containing household, building and demolition waste up to 2 mbgs (SKM, 2012).

Available subsurface data indicates that, with the exception of some variability in the depth of fill, the subsurface conditions in the vicinity of the existing Belmont WWTW are relatively uniform and generally comprise:

- 2m of fill, generally comprising sand, with a trace to some gravel, to varying depths, overlying;
- 30m of unconsolidated sands, generally fine to medium grained; and
- Bedrock.

The exact depth of bedrock is undefined at the site as no bedrock was encountered during previous site investigations. However the maximum depth of boreholes drilled was less than 10m from surface which is well above anticipated bedrock depths of 30-40m below surface.

Contamination

The neighbouring operational Belmont WWTW has previously reported concentrations of nutrients and heavy metals above adopted groundwater criteria and concentrations of microbiological analysis above the levels of reporting which may present potential contamination links to the site (SKM, 2012).

Filling and waste material stockpiles as well as redundant evaporation pond infrastructure are located within the temporary desalination plant site footprint and may present potential sources of contamination.

It is likely that there are potential asbestos/contaminated materials associated with possible remaining subsurface pipework, relating to the former evaporation ponds immediately adjacent to the site to the west and the south.

The potential for contamination within the indicative project water supply and power connection corridors is unknown, however contamination is considered to be unlikely considering the proximity of the corridors to natural wetland areas. Contamination issues are more likely to be encountered within these corridors where they are located in proximity to the WWTW.

7.1.2 Issues for Consideration

The local geology of the site including the areas for the construction of the desalination plant and connecting infrastructure (power and water), need to be defined through further design work. Importantly the design of the proposed seawater intake will need to consider key geological parameters including confirmation of underlying strata material and type, as well as depth to bedrock.

A Phase 1 Site Contamination Review (AECOM, 2016b) for the site identified that there is a moderate risk of potential contamination associated with the site that may present an unacceptable risk to human health and/or the environment. The Phase 1 assessment recommended that an intrusive investigation (bores or test pits) would be undertaken as part of the EIS with the main objective of assessing the potential contamination status of soil and groundwater at the site.

The key environmental concerns associated with soils and contamination is primarily relevant to the construction phase. The disturbance of soil, including potentially contaminated soils onsite has the potential to result in impacts such as:

- Erosion and sedimentation of nearby watercourses;
- Accidental spillages of chemicals/fuel by construction plant and equipment which may be washed into the local drainage system;
- The potential for aeolian (wind) erosion to occur from unsecured stockpiles or soil mounds created during construction; and
- Disturbance of contaminated soils onsite, if present.

However, it is anticipated that these impacts would be appropriately managed and mitigated in accordance with general construction management measures. The potential presence of additional contaminated soils onsite would be investigated as part of the EIS and appropriate management measures recommended where required.

7.1.3 Method of Assessment

An intrusive investigation (bore or test pits) would be undertaken to inform the EIS with the main objective of assessing the potential contamination status of soil and groundwater and identifying the need for remediation or management measures to mitigate unacceptable contamination risks to make the site suitable for the proposed construction and use of the temporary desalination plant.

It is considered likely that these issues can be suitably managed through the preparation of a Contaminated Soils Management Plan (CSMP) which would guide how construction works are to be carried out across the site.

7.2 Heritage

7.2.1 Existing Environment

Historic (non-Aboriginal) Heritage

Searches of relevant heritage inventories were undertaken on 10 December 2016 to identify heritage items within five kilometres of the project site.

World Heritage List

There are no listed World Heritage items located within five kilometres of the site or the indicative project water supply and power connection corridors.

National Heritage List

There are no listed National Heritage items located within five kilometres of the site or the indicative project water supply and power connection corridors.

Commonwealth Heritage List

There are no listed Commonwealth Heritage items located within five kilometres of the site or the indicative project water supply and power connection corridors.

NSW State Heritage Register

No item listed on the NSW State Heritage Register is likely to be impacted by the project or the indicative project water supply and power connections.

Lake Macquarie Local Environmental Plan 2014

There are a number of local heritage items listed in Schedule 5 of the LEP 2014 in the suburbs of Jewels, Belmont North, Belmont, Belmont South and Marks Point, including the heritage items listed in Table 11 within proximity to both the site and proposed water and power connections.

Table 11 Heritage Items

Item	Proximity to Project
Item 11, House 'Yarragee', Lot 1, DP 881605.	Approximately 350m from the nearest part of the project electrical connection and 1200m from the proposed desalination plant.
Item 13 'Captain Bain's house' Lot 2 DP 13715.	Approximately 970m from the nearest part of the project potable water connection and 1200m from the proposed desalination plant.
Item 14, House 'The Bennals', Lot D, DP 402085 Item 237, Tank Traps, Lot 7024 DP1057186.	Approximately 700m from the nearest part of the project electrical connection and 1400m from the proposed desalination plant.
Item 15, Adamstown to Belmont, the New Redhead Estate and Coal Company Railway, various lots.	Immediately adjacent to the proposed northern potable water connection alignment.

Item	Proximity to Project
Item 16, Branch lines from the Belmont Railway, various lots.	Connects to Item 15 at a discreet location adjacent to the proposed northern potable water connection alignment.
Item 17 Former John Darling Colliery. Lot 100, DP 1136505; Lots 1–3, DP 814551.	Approximately 500m from the nearest part of the project potable water connection and 2200m from the proposed desalination plant.
Item 18 Former staff houses, colliery row. Lots 12, 14 and 15, DP 848941; Lot 120, DP 853391; Lot 8, DP 883150	Approximately 500m from the nearest part of the project potable water connection and 2200m from the proposed desalination plant.
Item 123, 'Cabbage Trees' Lots 102 and 103, DP 755233; Lot 135, DP 1151226.	Approximately 470m from the nearest part of the project electrical connection and 2100m from the proposed desalination plant.
Item 229, House, Lot 1 DP124241.	Approximately 470m from the nearest part of the project electrical connection and 2100m from the proposed desalination plant.
Item 237 'Tank Traps' Lot 7024 DP 105186	Approximately 450m from the nearest part of the project electrical connection and 2500m from the proposed desalination plant.
A10 Nature reserve and being Permian fossil insect horizon.	Approximately 500m from the nearest part of the project potable water connection and 2200m from the proposed desalination plant.
A13 Former John Darling Colliery.	Approximately 500m from the nearest part of the project potable water connection and 2200m from the proposed desalination plant.

The closest listed heritage items are Item 15 and Item 16 which make up the former Adamstown to Belmont, the New Redhead Estate and Coal Company Railway and, Branch lines from the Belmont Railway. The potable water connection to Dalrymple Street would potentially cross under Item 15 requiring the potential impact of this to be assessed in the EIS. Considering the buffer distance between other listed heritage items and the site it is unlikely that any of the heritage items would be directly impacted by the construction or operation of the desalination plant.

Aboriginal Heritage

The Aboriginal Heritage Information Management System (AHIMS), administered by the NSW Office of Environment and Heritage (OEH), contains records of all Aboriginal objects reported to the Chief Executive of the OEH in accordance with section 89A of the NP&W Act. It also contains information about Aboriginal places which have been declared by the Minister to have special significance with respect to Aboriginal culture. Previously recorded Aboriginal objects and declared Aboriginal places are known as 'Aboriginal sites'. A search of the AHIMS databased was undertaken for the suburbs of Jewels, Belmont North, Belmont, Belmont South and Marks Point. The results of the search identified the Aboriginal heritage items listed in Table 12**.**

Table 12 Aboriginal Heritage Information Management System Sites

AHIMS Site Number, Type and Name	Proximity to Project, Site and Utility Connections
45-7-0046 Open artefact site Dudley-Jewells Swamp Area, Redhead South.	300m from potable water connection. 4400m from desalination site.
45-7-0047 Open artefact site Dudley-Jewells Swamp, Redhead South.	200m from potable water connection. 4200m from the desalination site.
45-7-0048 Open artefact site Dudley-Jewells Swamp Area; Site 2.	Immediately adjacent to the potable water connection and 3600m from the desalination site.
45-7-0049 Open artefact site Dudley-Jewells Swamp Area.	Immediately adjacent to the potable water connection and 3600m from the desalination site.

AHIMS Site Number, Type and Name	Proximity to Project, Site and Utility Connections
45-7-0204 Open artefact site BSAS-2.	100m to the potable water connection and 3500m from the desalination site.
45-7-0051 Shell Artefact – Midden. Jewells swamp area Swansea.	470m from the potable water connection. 3500m from the desalination site.
45-7-0130 Open artefact site. Belmont STW Camp Site.	400m from the potable water connection. 1000m from the desalination site.
45-7-0042 Open artefact site. Nine Mile Beach	200m from the electricity and potable water connections and 200m from the desalination site.
45-7-0041 Open artefact site. Mark's Point Nine Mile Beach.	200m from the electricity and potable water connections and 200m from the desalination site.
45-7-0284 Midden. Anderson Parade.	600m from the electricity and potable water connections. 1200m from the desalination site.
45-7-0030 Midden. Belmont.	700m from the electricity and potable water connections. 1300m from the desalination site.
45-7-0364, Bahtabah Mission Site PAD. Belmont.	900m from the electricity and potable water connections. 1400m from the desalination site.
45-7-0348, BHW04. Open artefact site.	950m from the potable water connection. 1200m from the desalination site.
45-7-0347 BHW03. Open artefact site.	950m from the potable water connection and 1400m from the desalination site.
45-7-0229 Pelican Point Open artefact site	850m from the potable water connection and 3000m from the desalination site.

As detailed in Table 12 there are a number of previously identified Aboriginal Heritage items in close proximity to the project, including to the desalination plant and the potable water and electricity connections. Based on this review of known Aboriginal heritage artefacts there are also likely to be previously unidentified artefacts in close proximity to the project.

7.2.2 Issues for Consideration

Historic (non-Aboriginal) Heritage

Searches of heritage databases have identified that there are no non-Aboriginal heritage items in the vicinity of the site and indicative project water supply and power connection corridors, except for the Belmont Railway line. While it is not anticipated that there will be any direct impacts to these items, consideration will be required regarding indirect impacts such as visual and landscape.

Aboriginal Heritage

There is the potential for Aboriginal artefacts to occur on dune areas to the north east and south of the site outside the fenced Belmont WWTW compound area, as well as in close proximity to the proposed power and potable water connection corridors. Consideration will be required in relation to the previously identified artefact locations, as well as the potential for unknown or previously unidentified items to be present.

7.2.3 Method of Assessment

Historic (non-Aboriginal) Heritage

A desktop historic (non-Aboriginal) heritage impact assessment will be undertaken for the project in accordance with relevant statutory guidelines.

Aboriginal Heritage

An Aboriginal cultural heritage due diligence assessment will be undertaken for the project in accordance with relevant statutory guidelines, notably the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (DECC, 2010). Key tasks will include:

- A review of the landscape (i.e. environmental) context of the project;
- A review of relevant archaeological and ethno-historic information for the local landscape and environs, including a search of the AHIMS database; and
- A field investigation to confirm the presence of known Aboriginal sites and identify the presence of any unknown Aboriginal sites and potential for subsurface objects to occur.

If the due diligence assessment indicates the potential presence of Aboriginal objects which cannot be avoided, a detailed assessment of the significance of impact or potential impacts on Aboriginal heritage will be undertaken in consultation with Aboriginal community representatives who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects in the area. Subsequent management actions would then be developed in further consultation with Aboriginal community representatives and a management plan prepared.

7.3 Noise and Vibration

7.3.1 Existing Environment

The primary activities dominating the local noise environment for the site include:

- Vehicles travelling along Ocean Park Road and the Pacific Highway;
- Natural ocean processes (wave motion);
- Recreational vehicle noise (e.g. motorbikes and four wheel drives) from recreational users of Nine Mile Beach and the Belmont Wetlands State Park; and
- Operations at the Belmont WWTW.

Nearby noise sensitive receivers include a low density residential area as part of the suburb of Belmont South located on either side of the Pacific Highway, approximately 800 metres to the south west of the site.

7.3.2 Issues for Consideration

Construction

Given the 800 metre distance between nearby residential receivers, noise impacts associated with the construction of the temporary desalination plant are anticipated to be low and would be temporary for the duration of the works. Construction works for power and water supply upgrades would potentially be required to be constructed in closer proximity to residential receivers, however these works would be short-term and temporary. Noise would also be generated from the transportation of materials and equipment associated with the proposed construction activities. Construction noise also has the potential to have similar impacts upon recreational users of Nine Mile Beach and the Belmont Wetlands State Park.

Operation

Whilst the proposed desalination plant may be temporary in nature, in the event of an extreme drought the project would be operational 24 hours per day, seven days per week for the temporary period it is required to supplement potable water supply, in accordance with the LHWP. The primary noise sources from the operating plant would be the various pumps required by the project. This includes seawater intake, brine discharge, reverse osmosis and potable water pumps. In addition connection to the potable water network at Dalrymple Street would require a water pump station (WPS) at an appropriate location along the proposed alignment to achieve the required water pressures. Whilst this location has not yet been confirmed, the EIS will assess potential noise impacts from the WPS based on its preferred location and proximity to sensitive receivers.

Given the 800 metre buffer distance between nearby residential receivers and the existing noise environment, it is considered that noise levels could be managed to meet the relevant criteria. As such, the project is not expected to generate significant noise impacts at surrounding residential receiver locations during operation. Notwithstanding, a noise impact assessment would be undertaken to inform the EIS, in accordance with the requirements of the *NSW Industrial Noise Policy* (EPA, 2000).

Vibration

Vibration is not expected to be an issue during construction or operation. In the case of construction works in particular, the project would be planned to ensure that vibration-generating activities are located at sufficient distances from sensitive receivers and structures would be designed and managed to meet acceptable human response and structural integrity outcomes. The potential for structural damage or human discomfort would be considered as part of the EIS for the project.

7.3.3 Method of Assessment

An assessment of noise and vibration for project construction and operation would be undertaken as part of the EIS. The methodology proposed for this assessment would include:

- Determination of existing background noise levels;
- Determination of sound power levels of all acoustically significant plant and equipment to be operated during construction and operation;
- Analysis of noise data with reference to local weather conditions, local screening effects, ground topography and cumulative impacts;
- Impact assessment (prediction of noise levels including modelling) of construction and operational noise, including consideration of cumulative impacts, sleep disturbance impacts and traffic noise at identified nearest sensitive receivers, for day, evening and night time periods under calm and prevailing meteorological conditions;
- Calculation of vibration impacts;
- Identification of noise and vibration management strategies and mitigation measures, as required; and
- Identification of any residual environmental risk.

Results of construction noise associated with the project would be compared against noise management levels derived in accordance with the *Interim Construction Noise Guideline* (DECC, 2009). All reasonable and feasible noise mitigation measures would be applied to construction works. In the event that noise management levels are exceeded, even with the application of mitigation measures, alternative noise management measures would be identified and implemented where appropriate.

The outcomes of the predicted noise levels for the operation of the project, including the desalination plant and the water pumping station, would be compared with noise limits derived in accordance with the *NSW Industrial Noise Policy* (EPA, 2000). Based upon the outcomes of operational noise assessment, noise attenuation and mitigation measures may be required.

7.4 Traffic, Transport and Access

7.4.1 Existing Environment

Access to the Belmont WWTW site is from Ocean Park Road, Belmont South. The eastern portion of this road lies within the WWTW site. Ocean Park Road runs in a generally east-west direction outside of the WWTW boundary, and in an approximately north-south direction inside the WWTW site. Ocean Park Road forms an extension of Beach Street, which intersects with the Pacific Highway. The majority of traffic entering and leaving the WWTW site would travel to the Pacific Highway via Ocean Park Road/ Beach Street. Ocean Park Road also provides access to Nile Mile Beach and the Belmont Wetlands State Park for recreational users. This includes vehicles, cyclists and pedestrians.

Currently there are three permanent employees and three maintenance staff at the WWTW. The majority of employee vehicle movements occur at the change of shift (12 vehicle movements at the change of shift).

One biosolids truck pickup occurs each day at the WWTW and screenings / grit is picked up once a week in a compactor truck. In the worst case, this equates to four truck movements per day. In addition, a storage area is maintained by Hunter Water at the Belmont WWTW to provide for the repairs of water and sewer mains. The number of truck movements varies depending on the maintenance and operational works program. On average, there is about 10 to 15 truck movements in a week associated with the storage area.

7.4.2 Issues for Consideration

Construction

Additional traffic movements would be required during the project construction period for the delivery of construction materials, plant and equipment. These movements are likely to comprise heavy vehicles, such as B doubles and semi-trailers, which would access the site via the existing Belmont WWTW access from Ocean Park Road. However, as part of the assessment of traffic impacts undertaken for the EIS, recommendations would be made for mitigation measures to address any potential impacts on local road users during construction.

Construction of the project would potentially temporarily restrict access to some sections of Nine Mile Beach and the Belmont Wetlands State Park in the vicinity of the site. The extent to which this may occur would be described and assessed.

Construction of the power and potable water connections may have some impacts upon access to public areas where construction activities are taking place such as footpaths. Such impacts are likely to be temporary. Construction of the northern water connection may also impact access to the Fernleigh track subject to final design and location of the pipeline.

Operation

During operation, it is anticipated that the project may generate approximately of 20 heavy vehicle movements per day and 40 light vehicles movement per day during the height of construction activities.

An assessment of the impacts of the project on local traffic would be undertaken to inform the EIS and mitigation and management measures would be recommended to ensure that local roads are able to accommodate the proposed increase in traffic volumes, while maintaining the safety and convenience of existing road users.

Consultation would be undertaken with Lake Macquarie City Council and the Roads and Maritime Service during the design phase to ensure that the road network is sufficient to accommodate traffic likely to be generated by the project.

Operation of the project is unlikely to result in impacts to access to Nine Mile Beach or the Belmont Wetlands State Park for recreational users. Regardless, an assessment of potential access impacts to these users during operation of the project would be undertaken.

7.4.3 Method of Assessment

A Traffic Impact Assessment (TIA) would be undertaken for inclusion in the EIS to ensure that a full assessment of potential traffic impacts is undertaken for both the construction period and during operation of the project. The TIA would assess:

- The capacity of the local and regional road network to accommodate the level of additional traffic generated;
- The capacity of local intersections to accommodate the level of additional traffic generated;
- The arrangements for internal traffic movement within the site including the provision of adequate turning bays and car parking;

- Potential cumulative traffic impacts assessment with existing Belmont WWTW operations; and
- Assess the potential traffic and access impacts to users of Nine Mile Beach and the Belmont Wetland State Park as a result of construction and operational activities.

As part of the assessment recommendations would be made for any mitigation measures to address any potential traffic impacts. In preparing this assessment relevant guideline documents from Lake Macquarie City Council and the Roads and Maritime, including the *Guide to Traffic Generating Development* (RTA, 2002), would be reviewed and consultation would be undertaken with these agencies as appropriate.

7.5 Waste

7.5.1 Existing Environment

There are solid and liquid waste streams associated with the existing Belmont WWTW, including the discharge of effluent via the existing treatment plant outfall.

7.5.2 Issues for Consideration

Construction

During construction of the project, the primary waste streams would be associated with:

- Steel scraps/ offcuts;
- Excess concrete;
- Potential excess spoil;
- Putrescible waste (from site offices and crib rooms);
- Blackwater (sewage) from staff amenities; and
- Green waste from surface clearing/works.

Consideration of quantities of waste generated, storage, transportation and disposal at licenced facilities would be undertaken. The implementation of the waste hierarchy would also be included with the aim of maximising waste avoidance, reduction, reuse and recycling.

Operation

During the operation of the project, the primary waste solid streams would be associated with:

- General waste refuse;
- Empty chemical drums; and
- Reverse osmosis cartridge filters.

During the operation of the project, the primary waste liquid streams would be associated with:

- Brine;
- Reverse osmosis cleaning and sanitising chemicals; and
- Other liquid wastes generated during plant commissioning and maintenance.

Potential impacts associated with the disposal of brine are discussed in Section 6.1. Opportunities would be investigated to dispose of other liquid wastes with brine through the existing WWTW outfall during operation.

7.5.3 Method of Assessment

Assessment of the waste impacts of the project would include the identification and quantification of expected waste streams that would result from both the construction and operational phases of the project. Categories would be determined based on the *Waste Classification Guidelines* (EPA, 2014), Following this the waste hierarchy would be applied to examine what wastes could be avoided, reduced, reused, recycled or require disposal in that order of preference. Once the type, amount and preferred management options have been identified for the expected waste streams, the management options would be verified to ensure they can be practically implemented. Licensed facilities would be identified with the ability and capacity to accept the identified waste streams and referenced for inclusion into future construction and operational environmental management plans.

Specific consideration would be given to the likelihood, quantities and types of wastes which may be generated. Identification of appropriate means of storage, handling and disposal will also need to be identified.

Details of proposed waste management measures would be detailed in a project specific Waste Management Plan, which would be developed prior to the commencement of construction activities.

7.6 Landscape Character and Visual Amenity

7.6.1 Existing Environment

The landscape character of the local area is primarily defined by three distinct land use types:

- Land within and directly surrounding the site to the north comprises the Belmont WWTW. This area is flat and characterised by cleared areas consisting of site buildings and operational infrastructure associated with the Belmont WWTW and storage of materials for maintenance of the water and sewer reticulation systems;
- Land to the south and east of the site consists of the coastal environment of Nine Mile Beach, consisting of the varied topography of coastal sand dunes, low-lying coastal vegetation and the South Pacific Ocean located 40 metres from the desalination plant site. The topography between the beach and the site is steep providing limited views of the existing WWTW for recreational users of Nine Mile Beach; and
- The area immediately surrounding the site to the north and west consists of low lying bushland and wetland environments, including Belmont Lagoon to the north-west and Belmont Wetlands State Park to the north.

The nearest residential receivers from the site are located approximately 800 metres to the south west and do not have an existing view to the site.

Project water supply and power connections would be undertaken primarily in visual settings associated with the coastal environment, low density urban areas, local roads and some arterial roads (the Pacific Highway).

7.6.2 Issues for Consideration

Construction

The presence of construction vehicles, plant and equipment and construction activities undertaken onsite may impact on local visual amenity. However, construction activities would be largely undertaken within the footprint of the existing WWTW site with some construction activities for project water supply and power connections undertaken in residential areas. Visual impacts would also be associated with the presence of construction activities and vehicles on the Pacific Highway and Ocean Park Road for the duration of the construction period.

Operation

Considering the existing visual impact of the Belmont WWTW and the limited views to the site, the operation of the proposed development would only result in minimal changes to the appearance of the site when viewed from the nearest public place (Nine Mile Beach). The project water supply and power connections would be installed underground subject to final design. Components of the water pumping station may be required to be above aground. The potential visual impact of any aboveground components will be assessed as part of the EIS.

Additional external lighting required for security purposes and for 24 hour operation of the site may create artificial light glow which would be visible within the landscape. All external lighting installed onsite would therefore be in accordance with the requirements of Australian Standard 4282- 1997 – *Control of the obtrusive effects of outdoor lighting*, and would be designed to minimise visual intrusion and light spill.

7.6.3 Method of Assessment

Although potential visual impacts of the proposal are anticipated to be low, a detailed visual impact assessment would be undertaken to address community concern.

An assessment of landscape character and visual amenity impacts would be prepared for inclusion in the EIS, including identification of sensitive landscapes and receivers, preparation of visualisations to demonstrate the impacts of the project and consideration of potential mitigation measures.

The EIS would recommend mitigation strategies to address any residual visual impacts including site landscaping, use of suitable colours/finishes to buildings and structures and control of outdoor lighting, as appropriate.

7.7 Air Quality

7.7.1 Existing Environment

The existing air quality environment in the vicinity of the site is primarily influenced by the operation of the nearby Belmont WWTW. Wastewater treatment facilities can potentially generate nuisance odours usually associated by the presence of anaerobic conditions in treatment processes. Process units that are generally associated with high odour production are flow reception facilities and preliminary treatment areas.

7.7.2 Issues for Consideration

Construction

Airborne dust and fumes are the most likely potential impacts on air quality arising from the construction of project. Dust emissions from wind erosion may be caused by construction activities, including:

- Excavation;
- Stockpiling; and
- Vehicle movements.

Fumes from plant and machinery used during construction works have the potential to impact upon air quality.

As the construction works for the desalination plant would be undertaken over 800 metres from the nearest residential receivers, air quality impacts are anticipated to be minor for this component of the project. There may be some dust generation for works occurring in residential areas for the construction of the water and power connections. Mitigation measures would need to be implemented to minimise dust and odour emissions during construction works.

Operation

The operation of the project would not be associated with notable air quality impacts.

7.7.3 Method of Assessment

A qualitative air quality impact assessment would address potential air quality impacts during both the construction and operation of the project taking into account both prevailing and worst case atmospheric conditions and the location of sensitive receptors in the areas surrounding the site and power and water main connections. The assessment would identify both design and management measures to mitigate any potential impacts.

7.8 Social and Economic

7.8.1 Existing Environment

The project is located within the Lake Macquarie LGA. The site is located in the suburb of Belmont South, with the nearest residential development approximately 800 metres to the south west of the site. The project would service the lower Hunter region which is the second largest urban centre in NSW behind Sydney. Its population has grown by 22,500 in the period 2009-2014. Population growth has been closely associated with the coastal areas of the Region, particularly Newcastle, Lake Macquarie and Port Stephens.

Economically the Lower Hunter has a strong mining and industrial manufacturing heritage upon which it is building an increasingly diverse economic base, skilled workforce and nationally significant economic infrastructure, including the world's largest coal exporting port.

The LGA boasts a variety of community services and social infrastructure such as child care centres, schools, hospital and health services and retirement villages. None of these sensitive receivers are located within proximity to the site. Sensitive receivers in close proximity of the water and power connections would be identified in the EIS.

7.8.2 Issues for Consideration

It is considered unlikely that the project would generate significant socio-economic impacts during the construction phase. The primary potential negative social and economic impacts from the construction and operation from the project would be amenity impacts previous discussed in this assessment including:

- Noise (Section 7.3);
- Traffic, transport and access (Section 7.4); and
- Landscape character and visual amenity (Section 7.6).

The primary potential positive social and economic impacts from the operation from the project would include:

- Increased water security in the event of a severe drought and associated benefits including:
  - Minimisation of the duration and severity of drought restriction measures;
  - Minimisation of economic damage associated with a lack of potable water; and
  - Minimisation of damage to recreational and public facilities associated with reduced water supply.
- At least 5 full time jobs would be created for the operation of the project.

The treated water to be supplied to the network will meet the requirements of the ADWG.

Overall, the project would provide benefits to the community and the lower Hunter region, most notably in terms of providing a drought response measure to increase water security.

7.8.3 Method of Assessment

As part of the preparation of the EIS a socio-economic assessment of the project would be conducted. The assessment would identify the relevant socio-economic profile relating to the project and would outline the social and economic features of the area including population demographics, workforce, industry, tourism base and cultural infrastructure.

In addition, the assessment would include further analysis of the scale, timing and distribution of the construction and operational workforce and related social and economic impacts, both positive and negative in nature. Where the potential for impacts that would be detrimental to the local community is identified, mitigation and management measures would be investigated and presented in the EIS.

8.0 Conclusion

Temporary desalination is included in the LHWP as one of a number of future response measures to an extreme (rare) drought to slow the depletion of water storages by supplementing potable water supply with desalinated water. It is a short-term contingency measure for an extreme drought. Consistent with the recommendations of the LHWP, Hunter Water is seeking approval under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), to construct and operate a temporary desalination plant, if it is needed in response to an extreme drought.

This PEA provides a preliminary assessment of the environmental and planning considerations to guide the preparation of SEARs for the SSI application in respect of the proposed temporary desalination plant. The key areas that have been identified for further detailed assessment during the preparation of the EIS are:

- Hydrology and water quality, with a focus on the discharge of brine;
- Coastal processes and climate change, particularly the potential impact of coastal processes on potential desalination plant infrastructure;
- Biodiversity, with a focus on potential impacts to aquatic ecology and nearby wetlands; and
- Greenhouse gas impacts, associated with the indirect generation of emissions during operation.

Other factors that will also be considered in the EIS are:

- Geology, soils and contamination; in relation to historical contamination as well as sediment and erosion control during construction;
- Heritage impacts, both in relation to Aboriginal and non-Aboriginal heritage;
- Noise and vibration impacts, principally during construction and also in relation to the operation of the facility;
- Traffic and transport impacts;
- Waste management, during construction and operation;
- Landscape character and visual amenity impacts;
- Air quality impacts, generated through construction-related dust emissions; and
- Social and economic impacts, and the potential benefits relating to water security for the local community and economy.

In assessing the project, the key focus would be avoidance and minimisation of impacts on the environment and local communities, where practical and feasible, when taking into consideration engineering constraints and cost implications. The assessment would also identify mitigation and management measures to minimise impacts on the environment during construction and operation of the project. Consultation with affected property owners, stakeholders and the local community will continue throughout the project assessment, design and construction phases.

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