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# Jacobs

# Belmont Permanent Desalination Plant – Modification 1: Construction Noise Assessment

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#### **Executive summary**

#### Overview

The Belmont Drought Response Desalination Plant was approved as SSI-8896 by the then New South Wales (NSW) Minister for Planning and Public Spaces on the 23 July 2021. The approved Project involves the construction and operation of a drought response desalination plant producing up to 30 megalitres per day (ML/day) including seawater intake infrastructure; desalination units; brine discharge via existing ocean outfall; electricity/water supply; and ancillary works. The approved Project is being developed on land (Part Lot 1 DP 433549) at 12a Ocean Park Road, Belmont South ('the Project area') that comprises a portion of the Belmont South Wastewater Treatment Works (WWTW) which is located to the southeast of the town of Belmont, NSW within the Lake Macquarie Council local government area (LGA).

An Environmental Impact Statement (EIS) and Response to Submissions and Amendment Report (Amendment Report) were submitted to the Department of Planning and Environment (DPE) in November 2019 and August 2020 respectfully, for the State Significant Infrastructure (SSI) project. Hunter Water proposes modifying the approved Project, from a drought response desalination plant with a 30 ML/day capacity (the approved Project) to a desalination plant that is permanently available for operation with the same capacity. Some other changes to the design and construction have also been identified by Hunter Water during design refinement which also require assessment as part of this modification and which together will be referred to as the 'Proposed Modification'.

Changes associated with the Proposed Modification that will modify construction noise include some out of hours work (OOHW) construction associated with the following activities:

- Dewatering of the soil surrounding the brine discharge pipeline (from the desalination plant to the WWTW outfall) and other deeper excavations on the site (in addition to the 24 hours 7 days per week (24/7) inlet works dewatering that was assessed in the EIS/ Amendment Report and included in the project approval)
- Intake pipeline installation (via pipe jacking/ micro tunnelling using a micro-tunnel boring machine (micro-TBM)). These activities were included in the Amendment Report Noise Assessment (Section 5.1.2.2) but were not assessed as a 24/7 activity. In addition, the contractor has supplied a revised plant list that also addresses the future proofing of the intake system (generally larger cranes, pumps and generators) and includes a water separation plant
- Use of a helicopter to transport construction personnel and materials between Lake Macquarie Airport and the offshore jack-up barge to construct intake structure of the direct ocean intake (DOI) system and generally there will not be more than 24 flights per day and around 3,000 flights in total over an 8 month period
- Small amount of OOHW light and heavy vehicle construction traffic
- Some crane lifts in the early morning to avoid windy weather periods; and some cut-over and commissioning activities (the latter only addressed qualitatively).

Proposed changes in construction methodology, plant and equipment during standard hours construction activities including:

- Longer and larger bulk earthworks phase associated with the requirement to raise the site 1.5-2.5 metres underneath the building and infrastructure area footprint
- Potential changes in noise associated with the offshore jack-up barge with a larger crane required for the construction of the DOI structure that would be located slightly closer to shore but further to the north
- Significant increase in both light vehicle and heavy vehicle construction traffic.

The purpose of this Construction Noise Assessment is to assess the changes in noise impacts associated with the construction phase of the Proposed Modification. Revised Secretary's Environmental Assessment Requirements (SEARs) issued on the 24 January 2018 for the EIS and the Amendment Report completed for the Project required an assessment of the likely noise impacts of the proposed development in accordance with the *Interim Construction Noise Guideline* (Department of Environment and Climate Change (DECC), 2009). No additional SEARs have been issued by the Department of Planning and Environment (DPE) in response to the Scoping Request Letter (dated 8 November 2023) for this EIS Modification, noting that the Scoping Request Letter discusses the need to address construction noise associated with the Proposed Modification.

#### Results of the updated assessment

#### Site construction noise impacts

Sound power levels (SWL) associated with the construction stages were adjusted based on the revised construction noise and equipment proposed for the relevant construction scenarios. Generally, onshore stages have been predicted to increase in noise by up to 3 dB(A) (A-weighted decibels) during standard construction hours (day works), while others are predicted to decrease in noise by up to 2 dB(A). Offshore stages, on the other hand may increase in noise by 9 dB(A) to 17 dB(A) depending on the stage in question.

It has been assumed as a result of the changes required for the Proposed Modification, that the only acoustic change during construction of the project was associated with the SWL of the construction stages as the locations of the works (with the exception of the relocated DOI), topography, receiver locations etc have not changed. Due to this, the predicted noise at the nearby receivers can be linearly adjusted in line with the proposed SWL change to determine the predicted noise level change as a result of the proposed modification. The assessment predicted that no stages would produce noise greater than the already defined standard hours and out of hours works noise management levels (NML) at nearby receivers during on site construction stages.

#### **Construction traffic noise impacts**

Due to construction traffic associated with the modification, the worst-affected receivers whose building facades are closest to the road along the Pacific Highway, Beach Street, Hudson Street, Ocean Park Road will experience traffic noise greater than the applicable traffic noise assessment level.

It is noted that due to the significant existing traffic on the Pacific Highway, the addition of the construction traffic would not increase the overall traffic noise level by more than 2 dB(A) and hence any actual change in traffic noise would be limited along this road.

#### **Construction helicopter noise impacts**

Noise from helicopter movements at Lake Macquarie Airport to the jack-up barge would be undertaken in terms of the airport's existing approval and Environmental Protection Licence. As a result, noise impacts associated with take-off and landing at the Lake Macquarie Airport and the proposed flight paths to the jack-up barge have not been assessed.

Helicopter  $L_{Aeq}$  and  $L_{Amax}$  noise levels from the jack-up barge landings and take offs have been predicted to remain well below the respective noise performance benchmarks at all nearby suburbs.

While the night L<sub>Aeq</sub> noise levels remain below the noise performance benchmark, the ENCM from which the benchmarks are derived makes it clear that helicopter flights between 10PM and 7AM should be avoided where possible due to the additional noise sensitivity of residential receivers during these times. As such, extra care and consideration should be undertaken when planning helicopter flights during the night period.

#### **Mitigation measures**

No site construction stages have been predicted to produce a construction noise impact above the applicable day or night time NMLs and therefore no additional activity related mitigation measure have been proposed. The noise management and mitigation measures described in *Belmont Drought Response Desalination Plant Environmental Impact Statement Appendix P: Noise and Vibration Impact Assessment* (GHD, 2019) (EIS NVIA) have been deemed to still be applicable and suitable for the project.

However, one additional mitigation is required to control noise when construction stages overlap. Due to the fact that works may not be undertaken in distinct stages, there is a risk that the noise from two stages may take place at once and lead to more noise than predicted reaching nearby receivers. As such, the construction contractor should take care to manage the total noise from construction of the project, especially if there are overlapping noisy activities in order to keep noise levels below the NMLs.

Without implementation of noise mitigation or management measures, construction traffic noise impacts at some receivers along Beach Street, Hudson Street and Ocean Park Road would likely be greater than the relevant noise assessment thresholds, therefore appropriate construction traffic noise management measures have been recommended, including:

- Schedule construction traffic movements, especially heavy vehicles, to minimise night periods
- Ensuring vehicles are adequately silenced before leaving or accessing the Project area and heavy vehicles to avoid use of compression brakes
- Reduce the speed of construction related traffic along site access roads.

Noise management measures relating to the use of a helicopter have been provided to minimise the noise impacts, including:

- Operate all helicopters associated with the project in line with the noise management requirements of the Lake Macquarie Airport General Conditions of Use and the general 'Fly Neighbourly' Principles.
- Schedule helicopter movements to avoid night periods to the greatest extent possible

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## **Terms and abbreviations**

Term/ Abbreviation	Definition			
AHD	Australian Height Datum			
Ambient Noise Level	The prevailing noise level at a location due to all noise sources but excluding the noise from the specific noise source under consideration. Generally measured as a dB(A) noise level.			
Background Noise Level	The lower ambient noise level, usually defined as the value of the time varying ambient noise level exceeded for 90% of the measurement time. Usually defined in the dB(A) scale – LA90.			
CMNE	Construction ad Maintenance Noi	se Estimator		
dB	Sound pressure levels are expressed in decibels as a ratio between the measured sound pressure squared and the reference pressure squared. Some typical noise levels are presented below:			
	Sound Pressure Level, dB(A) Example			
	130	Threshold of pain		
	120	Jet aircraft take-off at 100 m		
	110	Power tool at 1 m		
	100	Nightclub		
	90	Heavy trucks at 5 m		
	80	Kerbside of busy street		
	70	Loud radio (in typical domestic room)		
	60	Office		
	50	Domestic fan heater at 1m		
	40	Living room		

Term/ Abbreviation	Definition			
	30	Theatre		
	20	Rural environment on still night		
	10	Sound insulated test chamber		
	0	Threshold of hearing		
dB(A)	The A-weighted sound pressure level in decibels, denoted dB(A) is the unit generally used for the measurement of environmental, transportation or industrial noise. The A-weighting scale approximates the sensitivity of the human ear when it is exposed to normal levels and correlates well with subjective perception over a number of different types of sounds. An increase or decrease in sound level of approximately 10 dB(A) corresponds to a subjective doubling or halving in loudness. A change in environmental noise level of 2 dB(A) is considered to be just noticeable.			
DECC	Department of Environment and C	limate Change		
DOI	Direct Ocean Intake			
DPE	Department of Planning and Envir	onment		
EPA	Environment Protection Authority			
EIS	Environmental Impact Statement			
EPL	Environmental Protection License			
EP&A Act	Environmental Planning and Assessment Act 1979			
ESD	Ecologically Sustainable Development			
FTE	Full Time Equivalent			
ICNG	Interim Construction Noise Guideline			
kV	Kilovolt			
LA90	The A weighted sound pressure level that is exceeded for 90% of the measurement period. Usually used to represent the background noise level.			
Laeq	The A weighted equivalent continuous sound level is denoted Laeq.			
Leq	The equivalent continuous sound level. The steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating levels can be described in terms of a single figure level.			
LGA	Local Government Area			
Lmax and LAMax	The maximum measured sound pressure level, Lmax. The A-weighted variation, Lamax is also used in various guidelines and standards			
Micro-TBM	Micro Tunnel Boring Machine			
ML/day	Megalitres per day			
Noise Sensitive Area	That part of the land within the apparent boundaries of any piece of land which is within a distance of 10 m outside the external walls of any of the following buildings; dwelling and residential building OR			

Term/ Abbreviation	Definition
	That part of the land within the apparent boundaries of any piece of land on which is situated any of the following buildings which is within a distance of 10m outside the external walls of any dormitory, ward or bedroom of such buildings.
NML	Noise Management Level
NSW	New South Whales
Noise emission	Received noise at a receiver (either internally within a building or external at an outdoor receiver)
NPI	NSW Environmental Protection Authority's Noise Policy for Industry (2017).
Out of Hours Works (OOHW)	All periods of time outside of Standard Hours.
POEO Act	Protection of the Environment Operations Act 1997
RBL	Rating background levels
SEPP SRD	State Environmental Planning Policy (State and Regional Development) 2011
Sound Level Meter	An instrument consisting of a microphone, amplifier and data analysis package for measuring and quantifying noise.
SPL	Sound Pressure Level (dB), the measure of noise, expressed in decibels, as a ratio between the measured sound pressure level and the reference pressure. Typically provided with a reference distance from the source.
SEARS	Revised Secretary's Environmental Assessment Requirements
SSI	State Significant Infrastructure
Standard Hours	The periods of Monday to Friday 7:00AM to 6:00PM and Saturday 8:00AM to 1:00PM.
SWL	Sound Power Level (dB), the measure of the total acoustic power radiated by a source. It is a characteristic of the sound source which is not affected by the environment within which the source is located.
Suitably qualified acoustic consultant	An acoustic consultant who is a full member of the Australian Acoustical Society (or equivalent)
t	Tonne
24/7	24 hours 7 days per week
WWTW	Waste Water Treatment Works

# 1. Introduction

#### 1.1 Background

The Belmont Drought Response Desalination Plant was approved as SSI-8896 by the then New South Wales (NSW) Minister for Planning and Public Spaces on the 23 July 2021. The approved Project (refer to **Figure 1-1**) involves the construction and operation of a drought response desalination plant producing up to 30 megalitres per day (ML/day) including seawater intake infrastructure; desalination units; brine discharge via existing ocean outfall; electricity/water supply; and ancillary works.

An Environmental Impact Statement (EIS) and Response to Submissions and Amendment Report (Amendment Report) were submitted to the Department of Planning and Environment (DPE) in November 2019 and August 2020, for the State Significant Infrastructure (SSI) project. Hunter Water proposes modifying the approved Project, from a drought response desalination plant with a 30 ML/day capacity (the approved Project) to a desalination plant that is permanently available for operation with the same capacity. Some other changes to the design and construction have also been identified by Hunter Water during design refinement which also require assessment as part of this modification and which together will be referred to as the 'Proposed Modification'. Further description of the Proposed Modification is included in **Chapter 2**.

#### 1.2 Location

The approved Project is being developed on land (Part Lot 1 DP 433549) at 12a Ocean Park Road, Belmont South ('the Project area) that comprises a portion of the Belmont South Wastewater Treatment Works (WWTW) which is located to the southeast of the town of Belmont, NSW within the Lake Macquarie Council local government area (LGA), refer to **Figure 1-2**.

#### 1.3 Purpose of this report

The purpose of this Construction Noise Assessment is to assess the changes in noise impacts associated with the construction phase of the Proposed Modification. Revised Secretary's Environmental Assessment Requirements (SEARs) issued on the 24 January 2018 by the Secretary of the then NSW Department of Planning Industry and Environment, now the DPE. The SEARs were assessed as part of the EIS and the Submissions and Amendment Report (completed for the Project approval). The SEARs relevant to this assessment of the Proposed Modification are presented in **Table 1-1**.

Table 1-1 Secretary's environmental assessment requirements -noise

SEARs	
Noise	An assessment of the likely noise impacts of the proposed development in accordance with the <i>Interim Construction Noise Guideline</i> (Department of Environment and Climate Change (DECC), 2009).

No additional SEARs have been issued by the DPE in response to the Scoping Request Letter (dated 8 November 2023) for this EIS Modification, noting that the Scoping Request Letter discusses the need to address construction noise associated with the Proposed Modification.



Figure 1-1 The approved Project (from GHD, 2020)



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# 2. Description of the Proposed Modification

#### 2.1 The Proposed Modification

Key elements of the Proposed Modification are shown in **Figure 2-1** and include the following (noting some further refinements may occur during compilation of the Modification):

- A 30 ML/day desalination plant that is permanently available for operation
- Infilling to raise the area underneath the building and infrastructure footprint between 1.5 2.5 metres to a height of around 3.8 – 4.3 metres Australian Height Datum (AHD), to cater for the 1 in 100 year flood event under predicted climate change conditions
- Increase in building area footprint (but all new area located within the approved Project footprint) associated with:
  - The inclusion of additional infrastructure such as a fire water system, process tankage, administration building, workshop building, switch rooms and other ancillary buildings
  - Sizing of building footprints for all key Project elements including the direct ocean intake (DOI) system, the water treatment process plant, the brine disposal system, the power supply and ancillary facilities area
- Increase in height of the lime tower up to 15 metres above the infilled ground level
- Relocation of the DOI system, further to the north, resulting in a decrease in the length of the ocean intake pipeline to around 850 metres
- Increase in the diameter of the DOI structure to up to 14 metres to allow for future proofing of the system
- Increase in the size of DOI elements including the on-shore seawater pump station structure, ocean intake
  pipeline and riser which connects the ocean intake pipeline to the above seafloor intake structure to allow
  for future proofing of the system
- Option of an underground brine pipeline (between the desalination plant and the Belmont WWTW) in addition to the approved Project above ground option
- Power connection changed to a dual 11 kilovolt (kV) system that will tie into the existing network located to the south of the Project area. This will require the upgrade of around 0.2 kilometre long underground/overhead power supply along Ocean Park Road at the southwest end of the approved Project footprint and the removal of the connection to the west of the Project for the previous 33 kV connection (refer to Figure 1-1). There will be a new 11kV power connection from the sub-station at Pelican to the Hunter Water gate however this would be assessed separately by AusGrid
- Change in the approved Project footprint associated with the realigned marine elements and the change in power supply connection described above
- Change in stormwater management
- Some aspects of the construction methodology have changed and include:
  - Small changes in the dredging impact area at the proposed ocean intake site and inclusion of an additional option to dispose of dredged material in Coastal Waters at an approved marine reception area
  - Inclusion of a larger crane (up to 700 tonne (t)) that will be up to 60 metres above sea level on the
    offshore jack-up barge during construction of the DOI system. The offshore jack-up barge will also
    include onsite accommodation for construction staff working shifts
  - A helicopter will be used to transfer construction personnel and materials to and from the offshore jack-up barge to construct intake structure of the DOI system and generally there will not be more than 24 flights per day and around 3,000 flights in total over an 8 month period

- Change of the construction ancillary facilities location from the southern end of the Project area to the northern end of the Project area
- A requirement for out of hours work (OOHW) during construction including 24 hours 7 days per week (24/7) over a 9-12 month period associated with the micro Tunnel Boring Machine (micro-TBM) activities for the DOI pipeline
- Some short duration OOHW associated with some crane lifts to avoid windy weather periods in the early morning; a small amount of light and heavy vehicle movements, and some cut-over and commissioning activities
- Some changes to the plant and equipment required to construct the Project
- Increase in project construction duration to 36 months
- Increase in construction workforce numbers peaking at around 215 Full Time Equivalent (FTE) construction personnel
- Increase in heavy vehicle movements (two way) to about 10,000 vehicle movements over the three year duration of construction (peaking at around 180 200 heavy vehicle movements per day equating to around 10 inbound and 10 outbound per hour) to cater for the increased volume of fill required, transport of pipe segments and other construction material
- Increase in light vehicle movements to around 72,000 over the three year duration of construction (peaking at around 430 light vehicles movements a day) to cater for the increase in construction workforce required on site. Generally, around 80% of the staff (i.e. 172 of the 215 FTE peak) would arrive before the start of the day shift which is scheduled to start at 7AM and around 80% (i.e. 172 of the 215 FTE peak) would depart after the end of the day shift which is scheduled for 6PM.

This Modification Application also seeks to modify some of the consent conditions associated with construction hours and OOHW and these are described further in **Section 7.2** 



Figure 2-1 Key elements of the Proposed Modification

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# 3. Existing noise environment

The existing site conditions have been defined in the *Belmont Drought Response Desalination Plant Environmental Impact Statement Appendix P: Noise and Vibration Impact Assessment* (GHD, 2019) (EIS NVIA). As per the EIS Report, there are sensitive receivers near the Project area which may be impacted by noise from the construction stages and operation of the proposed plant. The nearby sensitive receivers identified in the report are categorised as:

- Residential (the nearest being approximately 800 metres away)
- Commercial/Retail (around 1 kilometres away along Pacific Highway)
- Hotel/Motel (Belmont Executive Apartments (1.2 kilometres away), Lakeview Motor Inn (1.1 kilometres away), Squid's Ink Motel (1.2 kilometres away), Gunyah Hotel (1.3 kilometres away))
- Active recreation (Belmont Golf Club (850 metres away at nearest point), Nine Mile Beach (approx. 200 metres to nearest point), Belmont South Playground (1.2 kilometres away))
- Passive recreation (Belmont Cemetery (700 metres away))
- Education (St Francis Xavier's Primary School (1.5 kilometres away), Creative Kids Preschool (1 kilometres away), Belmont TAFE (1.4 kilometres away))

Also described in the report was the results of existing baseline noise monitoring undertaken at 24 Beach Street, South Belmont between the dates of the 23 September and 30 September 2019. The rating background levels (RBL), displayed in **Table 3-1** were then used to determine the NML for the assessment of construction noise.

Location	LA90 RBL noise levels dB(A)			L <sub>Aeq</sub> ambient noise levels dB(A)		
	Day	Evening	Night	Day	Evening	Night
24 Beach St, Belmont	38	37	33	55	50	47

Table 3-1 Measured existing baseline noise levels

# 4. Legislation and relevant policy requirements

#### 4.1 NSW Legislation

#### 4.1.1 Environmental Planning and Assessment Act 1979

#### 4.1.1.1 Project approval

The Belmont Drought Response Desalination Plant was approved as SSI-8896 by the then New South Wales (NSW) Minister for Planning and Public Spaces under Division 5.2 of Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on the 23 July 2021 following submission of an EIS and Amendment Report to DPE in November 2019 and August 2020 respectively. The Project is identified as a State Significant Infrastructure (SSI) project as it satisfies Clause 4(1) of the then State Environmental Planning Policy (State and Regional Development) 2011 (SEPP SRD), being development for the purpose of desalination plants by or on behalf of a public authority that has a capital investment value of more than \$10 million.

#### 4.1.1.2 Proposed Modification

Under Section 5.25 of the EP&A Act, a proponent may request the Minister to modify the approval for State Significant Infrastructure. Such approval is required if the infrastructure as modified is not consistent with the existing approval issued under Section 5.13 of the Act.

After consultation with the DPE, Hunter Water considers that the Project as modified is not consistent with the Minister's approval under Section 5.13 of the EP&A Act. Therefore, a Modification Report has been prepared to support a request by Hunter Water for the Minister to modify the approval to allow the changes discussed in **Section 2** of this Report. An updated Construction Noise Assessment (this report) has been completed to assess the construction noise impacts of the Proposed Modification as part of the Modification Report.

The Minister may modify the approval with or without changes to the (existing) conditions of approval.

#### 4.1.2 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is the primary piece of legislation regulating pollution control and waste disposal in NSW and is administered by the NSW Environment Protection Authority (EPA). It provides an integrated system of licences to set out protection of the environment policies and to adopt more innovative approaches to reduce pollution in the environment, having regard to the need to maintain ecologically sustainable development (ESD).

Where an activity is deemed a scheduled activity under Schedule 1 of the POEO Act an Environmental Protection License (EPL) is required. Schedule 1 Part 20 of the POEO Act applies to helicopter-related activity, meaning the landing, taking off or parking of helicopters being an activity a) that has an intended use of more than 30 flight movements per week (where take-off and landing are separate flight movements), <u>and</u> b) that is conducted within 1 kilometre of a dwelling not associated with the landing, take-off or parking of helicopters. Since the helipad on the jack-up barge is greater than 1 kilometre from a dwelling the Proposed Modification would not require an EPL.

The proposed helicopter-related activity at Lake Macquarie Airport is located within one kilometre of a dwelling. However, Lake Macquarie Airport has confirmed that the take-off and landing of the helicopter from this location would operate under the airport's licencing conditions, including EPL number 21349 under the POEO Act which allows for up to 5,000 helicopter flight movements per year. Note that this excludes the Westpac Rescue helicopter service movements associated with the airport.

### 4.2 NSW guidelines

#### 4.2.1 Interim Construction Noise Guideline

The *Interim Construction Noise Guideline* (ICNG) (Department of Environment and Climate Change [DECC], 2009) provides guidance for assessing noise from construction activities in NSW. It establishes NMLs for recommended standard construction hours and for hours outside of the recommended standard hours.

Construction is considered to have the potential to cause a noise impact if the predicted noise exceeds the applicable NML. **Table 4-1** lists ICNG guidance for establishing construction NMLs at residential receivers.

Time of Day	NML LAeq (15 min)	How to apply
Recommended standard hours (SH): Monday to Friday 7:00AM to 6:00PM Saturday 8:00AM to 1:00PM No work on Sundays or public holidays	Noise affected: Rating Background Level (RBL) + 10 dB(A)	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured LAeq(15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of work to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected: 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: times identified by the community when they are less sensitive to noise (such as before and after school for work near schools, or mid-morning or mid-afternoon for work near residences if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours (OOH) – All other times including public holidays	Noise affected: RBL + 5 dB(A)	A strong justification would typically be required for work outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see Section 7.2.2 of the ICNG.

Table 4-1 ICNG guidance for establishing construction NMLs at residential receivers

Background noise monitoring to identify the Project's applicable NMLs was previously undertaken and reported in the EIS NVIA (2019). The NMLs presented in the EIS NVIA (2019) were derived in accordance with legislation, policies and guidelines that are still currently applicable at the time of preparing the Modification Report. Additionally, a desktop study of the project area found that no significant changes to land use or the

acoustic environment have occurred since the noise monitoring performed in 2019 to determine rating background levels. Consequently, the EIS NVIA (2019) NMLs are still appropriate and have been adopted as the NMLs in this modification assessment. These have been replicated in **Table 4-2** below.

Table 4-2 Construction NMLs (residential and non-residential receivers)

Receiver type	NML LAeq (15min) dB(A)					
	Highly affected During standard construction hours		Outside standard construction hours (day <sup>1</sup> )	Outside standard construction hours (night <sup>2</sup> )		
Residential	75 dB(A)	48 dB(A)	43 dB(A)	38 dB(A) <sup>3</sup>		
School	-	45 dB(A) Internal	-	-		
Retail outlets	-	70 dB(A) External	70 dB(A) External	70 dB(A) External		
Active recreation area	-	65 dB(A) External	65 dB(A) External	65 dB(A) External		

<sup>1</sup>Outside standard construction hours (day) is defined as 7:00AM to 8:00AM and 1:00PM to 6:00PM on Saturdays, 8:00AM to 6:00PM Sundays and public holidays.

<sup>2</sup>Outside standard construction hours (night) is defined as 6:00PM to 7:00AM Monday to Friday and 6:00PM to 8:00AM on Saturdays, Sundays and public holidays.

<sup>3</sup>Criteria based on night time RBL. NML derivation adopted from the NSW EPA Noise Policy for Industry minimum assumed RBLs (Table 2.1 of NPI).

#### 4.2.2 NSW road noise policy

Road traffic noise impacts due to the construction (and operation) of the Project were assessed against the following guidance from the application notes of the NSW *Road Noise Policy* (Department of Environment, Climate Change and Water, 2011) (RNP):

'...for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.'

In reference to the day or night assessment criterion above, the assessment refers to the criterion provided in the RNP, displayed in **Table 4-3** below.

Road Category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7AM – 10PM)	Night (10PM – 7AM)
Freeway/arterial/ sub-arterial roads	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	L <sub>Aeq,</sub> (15 hour) 60 dB(A)	L <sub>Aeq, (9 hour)</sub> 55 dB(A)
Local roads	Existing residences affected by additional traffic on existing local roads generated by land use developments	L <sub>Aeq, (1 hour)</sub> 55 dB(A)	L <sub>Aeq, (1 hour)</sub> 50 dB(A)

Table 4-3 Relevant road noise policy assessment criteria

#### 4.2.3 Helicopter noise

There is no applicable NSW environmental noise assessment guidance methodology for helicopter noise. For the purpose of assessing noise from helicopter landings and take-off from the Jack-Up Barge associated with the Proposed Modification, an indicative noise performance benchmark has been selected based on Section 165 of the NSW *Environmental Noise Control Manual* (NSW EPA, 1994) (ENCM). It is noted that the ENCM is now superseded/ withdrawn and there is no stipulated legislative requirement for the criteria in the ENCM to be met by the Project. The ENCM noise level guidelines have only been considered as a nominal benchmark for the project's helicopter noise to be compared against.

The relevant sections of the ENCM, which have been adopted as the noise performance benchmark for the project's helicopter noise, are as follows:

- 1. The measured L<sub>Aeq,T</sub> (assessed over the entire daily operating time of the helipad (assumed for this assessment to be 7AM 10PM for day and 10PM 7AM for night)) should not exceed 55 dB(A) for a residence or 65 dB(A) for a commercial property
- 2. The measured maximum noise level L<sub>Amax</sub> should not exceed 82 dB(A) at the nearest residential premises or 85 dB(A) at the nearest commercial building
- 3. Operation outside the hours of 7AM to 10PM should be avoided where possible except for emergency flights.

# 5. Assessment methodology

#### 5.1 Background

A SoundPLAN model was developed for the proposal as part of the EIS based on site layout, plant and equipment sound power levels (SWL), and topography. The model included scenarios associated with specific construction stages for the EIS and Amendment Report stages including:

- Planning mobilisation and preparation
- Desalination plant earthworks and hardstand
- Desalination plant pipeline connections
- Caisson installation
- DOI installation
- Commissioning
- Tank installation
- Containerised equipment
- Compounds.

Results of the noise assessments completed for the EIS and Amendment Report found that:

- All stages associated with the construction of the desalination plant are not expected to exceed the NMLs
- Additional construction related traffic is predicted to have a noticeable but acceptable impact relative to current traffic noise

The noise results displayed in the EIS/Amendment reports relevant to this modification have been displayed in **Table 5-1** and **Table 5-2** below.

Table 5-1 Noise im	pacts at nearest receiv	er in EIS/amendn	nent report - S	Standard Hours
	ipacts at nearest receiv	ci ili El3/ ullicitati	icherepore .	Standard Hours

Construction Stage	Receiver	EIS/Amendment Report Predicted noise level LAeq(15min) dB(A)	Construction NML LAeq(15min) dB(A)	Predicted noise impact above NML?
Desalination plant	Nine Mile Beach	57	65	No
earthworks and hardstand	33 Williams Street, Belmont	39	48	No
Wet well/sea water pump station construction	Nine Mile Beach	58	65	No
	33 Williams Street, Belmont	36	48	No
Pipe jacking/micro-	Nine Mile Beach	54	65	No
tunnelling	33 Williams Street, Belmont	40	48	No
Intake dewatering	Nine Mile Beach	43	65	No
	33 Williams Street, Belmont	22	48	No
	Nine Mile Beach	52	65	No

Construction Stage	Receiver	EIS/Amendment Report Predicted noise level L <sub>Aeq(15min)</sub> dB(A)	Construction NML LAeq(15min) dB(A)	Predicted noise impact above NML?
Compound (peak of works)	33 Williams Street, Belmont	36	48	No
Intake structure connection	Nine Mile Beach	31	65	No
	33 Williams Street, Belmont	23	48	No
Intake structure connection - piling	Nine Mile Beach	31	65	No
	33 Williams Street, Belmont	23	48	No

Table 5-2 Noise impacts at nearest receiver in EIS/amendment report - Outside of Standard Hours

Stage	Receiver	Predicted noise level – L <sub>Aeq,15min</sub> dB(A) in EIS/Amendment Report	NMLs — L <sub>Aeq,15min</sub> dB(A)	Predicted noise impact above NML
Intake dewatering	Nine Mile Beach	43	65	No
	33 Williams Street, Belmont	22	38	No
Compound (night activities)	Nine Mile Beach	52	65	No
	33 Williams Street, Belmont	36	38	No

#### 5.2 Changes associated with the Proposed Modification

An updated Construction Noise Assessment has been prepared to assess changes associated with the Proposed Modification that will modify construction noise. The changes include:

- Dewatering of the soil during construction of the brine discharge pipeline (from the desalination plant to the WWTW outfall) and other deeper excavations on the site (in addition to the 24/7 DOI works dewatering that was assessed in the EIS/ Amendment Report and included in the project approval)
- Intake pipeline installation (via pipe jacking/ micro-tunnelling). These activities were included in the Amendment Report Noise Assessment (Section 5.1.2.2) but were not assessed as a 24/7 activity. In addition, the contractor has supplied a revised plant list that also addresses the future proofing of the intake system (generally larger cranes, pumps and generators) and includes a water separation plant
- Use of a helicopter to transport crew and materials between Lake Macquarie Airport and the offshore jack-up barge (which is required to construct the DOI)
- Small amount of OOHW light and heavy vehicle construction traffic
- Some crane lifts in the early morning OOHW to avoid windy weather periods; and
- Some OOHW cut-over and commissioning activities.

- Proposed changes in construction methodology, plant and equipment during standard construction hours, including:
  - Longer and larger bulk earthworks phase associated with the requirement to raise the entire site 1.5 2.5 metres
  - Potential changes in noise associated with the offshore jack-up barge with a larger crane required for the construction of the DOI structure that would be located slightly closer to shore but further to the north
  - Significant increase in both light vehicle and heavy vehicle construction traffic.

#### 5.3 Proposed methodology

The updated assessment has been completed in consideration of the revised Project SEARs identified in **Table 1-1**. This includes consideration of the relevant policy and guidelines, including the NSW DECC ICNG listed in **Section 4.2.1**.

#### 5.3.1 Site construction noise

As the SoundPLAN modelling associated with the EIS and Amendment Report Noise Assessments is robust, and only minor changes are proposed as part of the Modification, it is proposed that the previous total sound power level for each stage is compared with the Proposed Modification total sound power level for that stage rather than undertaking further SoundPLAN modelling.

The updated site construction noise assessment:

- Adopts the background noise levels and derived Construction NMLs from the original EIS and Amendment Report Noise and Vibration Assessments
- Adopts the construction equipment locations and Sound Power Levels from the original EIS and Amendment Report assessments (with the exception of the relocated DOI for the offshore component), and
- Accepts the original SoundPLAN predictions.

The proposed methodology involves the undertaking the following stages:

- Revise sound power levels:
  - Identify which construction noise stage in the EIS and Amendment Noise and Vibration Assessments will be modified based on the activities listed in **Section 5.2**
  - Modify/add equipment to the construction noise stage based on client input and the activities listed in **Section 5.2**
  - Revise overall construction sound power levels of the revised construction noise stage (where revised for this modification report) to the EIS/Amendment Report SWLs to determine whether the predicted noise impacts would be lower/greater than they were previously.
- Revise noise impacts at receivers:
  - Based on the assumptions noted at the top of this section, it has been assumed that the only acoustic change during the construction of the Project for the Proposed Modification was associated with the SWL of the construction stages (i.e. the locations of the stages (with the exception of the relocated DOI), topography, receiver locations etc have not changed). As such, any changes to the SWL of the construction noise scenario would have an approximately equal change to the sound pressure level (SPL) at the receiver in question (e.g. a SWL change of +5 dB(A) would result in a change in the SPL at a receiver of approximately +5 dB(A) as well). Based on this:

- For the construction noise stages revised as part of the modification, SPLs at sensitive receivers will be modified linearly to the SWLs determined for the construction noise stage in question
- The revised SPLs will be compared to the applicable NML to determine the construction noise impact
- The revised impacts will be compared to the mitigation measures identified in the Amendment Report and Project Conditions of Approval to identify if additional/ modification of measures / conditions are required to mitigate and/or manage any identified adverse impacts resulting from the revised construction noise stages.

#### 5.3.2 Construction traffic

The revised construction traffic including additional truck movements to and from site have been assessed using the construction traffic noise assessment spreadsheet within the EMF-NV-TT-0067 Construction and Maintenance Noise Estimator (CMNE) Tool (Transport for New South Wales, 2022). The updated construction traffic volumes are displayed in **Table 5-3** for daily traffic along the Pacific Highway, and **Table 5-4** for AM and PM hourly peak traffic along the local roads.

Revised construction traffic noise levels have been compared against the relevant noise assessment thresholds in **Section 6.2**.

Road	Timing	Direction	Traffic	Construct	ion traffic
			Speed	Light vehicles	Heavy vehicles
Pacific Highway	Jhway Day (7AM – 10PM)	Northbound	60	408.5	125
Night (10PM – 7AM)		Southbound		408.5	125
	Night (10PM –	Northbound	60	21.5	75
	7AM)	Southbound		21.5	75

Table 5-3 Construction traffic inventory (daily traffic)

 Table 5-4 Construction traffic inventory (hourly peak traffic)

Road	Timing	Direction	Traffic	Construction traffic		
			Speed	Light vehicles	Heavy vehicles	
Beach Street	AM Peak (1hr)	Eastbound	50	43	10	
		Westbound		0	10	
	PM Peak (1hr)	Eastbound	50	0	10	
		Westbound		43	10	
Hudson Street	AM Peak (1hr)	M Peak (1hr) Eastbound		43	10	
		Westbound		0	10	
	PM Peak (1hr)	Eastbound	50	0	10	
		Westbound		43	10	
Ocean Park	AM Peak (1hr)	Eastbound	50	43	10	
Road		Westbound		0	10	

Road	Timing	Direction Traffic		Construct	ion traffic
			Speed	Light vehicles	Heavy vehicles
	PM Peak (1hr)	Eastbound	50	0	10
		Westbound		43	10

#### 5.3.3 Helicopter noise

The noise impacts associated with the take-off and landing of helicopters from the Jack-Up Barge was assessed using the SoundPLAN 9.0 acoustic modelling software.

Within the noise modelling software, noise was predicted using the CONCAWE noise propagation algorithm. This algorithm was selected based on Jacobs' understanding of the different prediction methods being more suited to calculation of noise propagation of moving noise sources.

A number of inputs and assumptions have been adopted in order to model helicopter noise. These are provided in **Table 5-5** and **Table 5-6**. Outcomes of the noise modelling were then compared to the helicopter noise performance benchmarks detailed in **Section 4.2.3**.

Model input	Details
Topography	Terrain data were derived from a combination of the NSW Land Property Information 10m resolution bare earth Digital Elevation Model
Receivers	Receiver points were placed around the residential areas of Belmont and Belmont South, at a height of 1.5m.
Ground Absorption	Water: (Absorption coefficient = 0.00)
	Vegetation and suburban: (Absorption coefficient = 0.50)
Noise Sources	Derived from the noise measurements contained within <i>Dyke Point Helipad Development Application Statement of Environmental Effects</i> (ADW Johnson, 2021).
	Helicopter movements detailed in <b>Table 5-5</b> .
	Helicopters are modelled as a moving point source, travelling from the starting helipad at surface level up to a cruising height of 152 m.
	Take-off:
	L <sub>Aeq</sub> : 85.7 dB(A) (assuming helicopter speed of 120 km/h), L <sub>AMax</sub> : 136.5 dB(A)
	Landing:
	L <sub>Aeq</sub> : 84.2 dB(A) (assuming helicopter speed of 120 km/h), L <sub>AMax</sub> : 135.0 dB(A)
Meteorological	Construction and Operational Noise
Conditions	'Neutral' Meteorological conditions, as defined by the <i>Noise Policy for Industry</i> (EPA, 2017):
	Air temperature: 10°C
	Humidity: 70%
	Air pressure: 1013.3 mbar
	Wind speed: 0 m/s
	Wind direction: N/A
	Pasquill stability class: D

Table 5-5 Noise model inputs and assumptions

<u> </u>			
Hour	Airport to Jack-up Barge	Jack-up Barge to Airport	Total
5:00 - 6:00	2	2	4
6:00 - 7:00	1	1	2
7:00 - 8:00	2	2	4
8:00 - 9:00	1	1	2
18:00 - 19:00	2	2	4
19:00 - 20:00	2	2	4
20:00 - 21:00	2	2	4
TOTAL	12 Inbound	12 Outbound	24 Movements

#### Table 5-6 Timing of daily helicopter movements

# 6. Assessment of impacts

#### 6.1 Site construction noise

#### 6.1.1 Sound power levels

As noted in **Section 5.3.1**, the first action to assess the noise predicted as a result of the proposed modification was to re-evaluate the SWLs associated with each modified construction noise stage resulting from the changes to construction equipment. The results of the re-evaluated noise levels are displayed in **Table 6-1** for the onshore stages, and in **Table 6-2** for the offshore stages. The modified or additional plant and equipment required for the Proposed Modification is included in red text.

As expected, the expanded earthworks stages and additional traffic movements to and from site have had an impact on a number of the onshore stages. In particular, the earthworks and hardstand construction noise stages have been predicted to increase in noise by 3 dB(A) to 120 dB(A), with the peak of construction compound stage also predicted to increase by 3 dB(A) to 115 dB(A). The Intake Dewatering stage is the only out of hours work stage where noise has been predicted to increase, increasing by 5 dB(A) to 106 dB(A). It should be noted that this noise level is still relatively low and isn't anticipated to cause issues with keeping noise levels below with the out of hours work NML. While a number of new noise sources were introduced to the Pipe Jacking/Micro- Tunnelling scenario, the movement of certain of the micro-tunnel boring equipment to the base of the caisson/ within the intake tunnel has resulted in the scenario reducing in overall noise by 1 dB(A) to 119 dB(A) during the Standard Hours. The contractor has indicated that they will not be removing material from the TMB spoil stockpile outside of Standard Hours, so omitting the excavator and heavy vehicles (trucks) as well as not using the 250 tonne crane reduces the overall noise by 2 dB(A) to 118dB(A) for the OOHW construction noise stage.

Offshore noise levels have been predicted to increase by more significant numbers. The offshore intake structure construction noise levels have been predicted to be 10 dB(A) greater than the intake structure construction scenario in the Amendment Report, while the piling associated with the offshore intake structure construction may be 17 dB greater than the scenario in the Amendment Report, at 126 dB(A) (noting that the SWL of the piling equipment includes a +5 dB(A) penalty for noise character).

It is important to note that while the construction stages were delineated with their own noise levels in the EIS and Amendment reports, it is likely that some stages may overlap to some extent, resulting in increased noise levels compared to those displayed. As such, the contractor should take care to manage the total noise from construction of the project especially if there are noisy activities within overlapping construction phases to keep noise levels below the NMLs.

Construction noise stage	Equivalent construction noise scenario in EIS/ Amendment Report	Equipment	Quantity of equipment	Quantity of equipment in EIS/ Amendment Report	Equipment noise source level – SWL <sub>Aeq,15min</sub>	Utilisation of equipment of busiest 15 minutes of construction	Overall construction stage noise source level – SWL <sub>Aeq,15min</sub>	Overall construction stage noise source level in EIS/ Amendment Report – SWL <sub>Aeq,15min</sub>	Change in overall construction stage noise source level – SWL <sub>Aeq,15min</sub>
Desalination plant	Desalination plant	Dozer	1	1	107	100%	120	117	+3
earthworks and hardstand	earthworks and hardstand (FIS	15t Excavator	2	1	107	100%			
hardstand	Report)	45t Excavator	1	-	112	100%			
		Compressor	1	1	101	100%			
		Generator	1	1	99	100%			
		Concrete pump	1	1	108	50%			
		14t Vibratory roller	2	1	109	100%			
		Grader	1	1	110	100%			
		Water cart	1	1	101	100%			
		Concrete truck	1	1	109	50%			
		Plate Compactor	2	-	108	100%			
		Articulated Dump Truck	2	-	100	100%			
		Heavy vehicles	10	2	107	50%			
		Light vehicles	2	2	78	100%			
Out of Hours Crane	None (New stage)	15t Excavator	1	N/A	107	100%	111	N/A	N/A
Operations for Main Plant Works		Generator	1	N/A	99	100%			
		Franna Crane	1	N/A	104	100%			
		Hand tools	2	N/A	102	50%			
		Welding equipment	1	N/A	105	100%			
Wet well/sea water	Wet well/sea water	Pump	1	1	97	100%	118	118	0
pump station construction	pump station construction	Generator	1	1	90	100%			
		Welding equipment	1	1	101	100%			

Table 6-1 Modified noise source levels - onshore stages

Construction noise stage	Equivalent construction noise scenario in EIS/ Amendment Report	Equipment	Quantity of equipment	Quantity of equipment in EIS/ Amendment Report	Equipment noise source level – SWL <sub>Aeq,15min</sub>	Utilisation of equipment of busiest 15 minutes of construction	Overall construction stage noise source level – SWL <sub>Aeq,15min</sub>	Overall construction stage noise source level in EIS/ Amendment Report – SWL <sub>Aeq,15min</sub>	Change in overall construction stage noise source level – SWL <sub>Aeq,15min</sub>
	(Amendment	15t Excavator	1	1	99	100%			
	Report)	30t Crane	-	1	98	-			
		100t Crane	1	-	104	100%			
		Concrete saw	1	1	117	100%			
		Heavy vehicles	4	2	108	100%			
Pipe Jacking/Micro-	Pipe Jacking/Micro-	Auger Drill Rig <sup>3</sup>	1	1	<b>116</b> <sup>5</sup>	100%	119	120	-1
Tunnelling (Standard	Tunnelling (Amendment Report)	Boring Jack Power Unit <sup>4</sup>	1	1	112	100%			
Tiousy		Drill Rig Truck <sup>4</sup>	1	1	<b>115⁵</b>	100%			
		15t Excavator	1	1	99	100%			
		Heavy vehicles	2	2	108	100%			
		30t Crane	-	1	98	-			
		250t Crane	1	-	108	100%			
		100t Crane	1	-	104	100%			
		1500 kVA Generator	2	1	107	100%			
		Sump pumps	-	1	97	-			
		Slurry pumps	1	-	103	100%			
		Surface water supply pump	1	-	108	100%			
		Water Separator	1 <sup>2</sup>	-	110	100%			
Pipe Jacking/Micro-	Pipe Jacking/Micro-	Auger Drill Rig <sup>3</sup>	1	1	<b>116</b> <sup>5</sup>	100%	118	120	-2
Tunnelling (OOHW)	Tunnelling (Amendment	Boring Jack Power Unit <sup>4</sup>	1	1	112	100%			
	Report)	Drill Rig Truck <sup>4</sup>	1	1	<b>115⁵</b>	100%			
		15t Excavator	0	1	99	-	]		
		Heavy vehicles	0	2	108	-			

Construction noise stage	Equivalent construction noise scenario in EIS/ Amendment Report	Equipment	Quantity of equipment	Quantity of equipment in EIS/ Amendment Report	Equipment noise source level – SWL <sub>Aeq,15min</sub>	Utilisation of equipment of busiest 15 minutes of construction	Overall construction stage noise source level – SWL <sub>Aeq,15min</sub>	Overall construction stage noise source level in EIS/ Amendment Report – SWL <sub>Aeq,15min</sub>	Change in overall construction stage noise source level – SWL <sub>Aeq,15min</sub>
		30t Crane	-	1	98	-			
		100t Crane	1	-	104	100%			
		1500 kVA Generator	2	1	107	100%			
		Sump pumps	-	1	97	-			
		Slurry pumps	1	-	103	100%			
		Surface water supply pump	1	-	108	100%			
		Water Separator	1 <sup>2</sup>	-	110	100%			
Intake Dewatering	Intake Dewatering	Generator	3	1	97	100%	106	101	+5
	(EIS Assessment)	Pump	3	1	99	100%			
Compound (Peak of	Compound (EIS	Excavator	2	1	107	100%	115	112	+3
Construction)	Assessment)	Delivery trucks	5	2	107	100%			
		Light vehicles	20	2	78	100%			
Compound (Night	Compound (EIS	Excavator	-	1	107	-	110	112	-2
activities)	Assessment)	Delivery trucks	1	2	107	100%			
		Light vehicles	5	2	78	100%			

Note<sup>1</sup> – Construction stage no longer being undertaken

 $Note^2$  – Noise level is the combination of a number of sources that make up the water separator

Note<sup>3</sup> – Noise sources assumed to be equivalent to hydraulic pipe jacking

Note<sup>4</sup> – Noise sources assumed to be equivalent to micro-tunnel boring

Note<sup>5</sup> – Noise source located within intake tunnel in the modification scenario – equivalent to a noise reduction at the surface of -5dB

Construction noise scenario	Equivalent construction noise scenario in EIS/ Amendment Report	Equipment	Quantity of equipment	Quantity of equipment in EIS/ Amendment Report	Equipment noise source level – SWL <sub>Aeq,15min</sub>	Utilisation of equipment of busiest 15 minutes of construction	Overall construction noise scenario noise source level – SW	Overall construction noise scenario noise source level in EIS/ Amend't Report – SWL <sub>Aeq(15min)</sub>	Change in overall construction noise scenario noise source level – SWL <sub>Aeq(15min)</sub>
Intake structure	Intake structure	15t Excavator	-	1	99	-	119	109	+9
construction	construction (Amendment Report)	700t Crane	1	-	113	75%			
	()	250t Crane	1	-	108	75%			
		30t Crane	-	1	98	-			
		Tug Boat	1	-	108	100%			
		Compressor	1	-	101	100%			
		Generator	1	-	99	100%			
		Ocean Barges	2	2	0	100%			
		Jack-Up Barges	1	-	108	100%			
		Suction Dredge Pump	1	-	116	100%			
		Concrete Batching	1	1	105	50%			
		Clamshell Excavator	1	1	105	50%			
Intake structure	Intake structure	15t Excavator	-	1	99	-	126	109	+17
construction - Piling	construction (Amendment Report)	30t Crane	-	1	98	-			
	(Amenamene Report)	Ocean Barges	-	2	0	-			
		Concrete Batching	-	1	105	-			
		Clamshell Excavator	-	1	105	-			
		Vibratory Piling Rig	1	-	126 <sup>1</sup>	100%			

#### Table 6-2 Modified noise source levels – offshore stages

Note<sup>1</sup> – Noise source is  $121 \, dB(A)$  with a +5dB penalty

#### 6.1.2 Noise levels at receivers

As stated in **Section 5.3.1**, it has been assumed as a result of the proposed changes, that the only acoustic change to the construction of the project was associated with the SWL of the construction equipment (i.e. the locations of the stages (with the exception of the relocated DOI), topography, receiver locations etc. have not changed). Due to this, the predicted noise at the nearby receivers can be linearly adjusted in line with the proposed SWL change to determine the predicted noise level change as a result of the proposed modification. **Table 6-3** and **Table 6-4** display the predicted noise levels at each receiver, in comparison to the associated noise levels in the EIS/Amendment reports, in addition to the relevant criteria. As shown in **Table 6-3**, during Standard Hours no new noise impacts have been predicted. This is in part to due to the relatively minor increase in noise during the onshore stages, while the large distance between the offshore stages and the sensitive receivers means the predicted large increase in noise does not result in noise increasing to above the NML.

For outside of Standard Hours, due to the reduction of noise during the compound stage and the minor increase in noise from dewatering, neither of these stages have been predicted to result in construction noise levels by greater than the NML. For the Pipe Jacking/Micro-tunnelling stage, noise have been predicted to be at but not above the Outside of Standard Hours NML at the nearest residential receiver.

Cutover and pre-commissioning activities were also indicated as being undertaken as OOHW, however at the time of the assessment the equipment and details were not developed, and therefore only a qualitative assessment was possible. It is not anticipated that these stages would produce noise greater than the NMLs, however the contractor should carefully manage noise during these stages to ensure that noise is not become greater than the NMLs.

Stage	Receiver Predicted noise lo dB(/		evel – L <sub>Aeq,15min</sub> A)	NMLs — LAeq, 15min	Predicted noise impact
		EIS/Amendment Report	Modification	dB(A)	above NML?
Desalination plant	Nine Mile Beach	57	60	65	No
earthworks and hardstand	33 Williams Street, Belmont	39	42	48	No
Wet well/sea	Nine Mile Beach	58	58	65	No
water pump station construction	33 Williams Street, Belmont	36	36	48	No
Pipe	Nine Mile Beach	54	53	65	No
Jacking/Micro- Tunnelling (Standard Hours)	33 Williams Street, Belmont	40	39	48	No
Intake Dewatering	Nine Mile Beach	43	48	65	No
	33 Williams Street, Belmont	22	27	48	No
Compound (Peak	Nine Mile Beach	52	55	65	No
of Construction)	33 Williams Street, Belmont	36	39	48	No

#### Table 6-3 Predicted noise impacts at nearest receiver - Standard Hours

Stage	Receiver	Predicted noise level – L <sub>Aeq,15min</sub> dB(A)		NMLs – L <sub>Aeq,15min</sub>	Predicted noise impact
		EIS/Amendment Report	Modification	dB(A)	above NML?
Intake structure	Nine Mile Beach	31	41	65	No
connection	33 Williams Street, Belmont	23	33	48	No
Intake structure connection - Piling	Nine Mile Beach	31	48	65	No
	33 Williams Street, Belmont	23	40	48	No

 Table 6-4 Predicted noise impacts at nearest receiver - Outside of Standard Hours

Stage	Receiver	Predicted noise l dB(/	evel – L <sub>Aeq,15min</sub> A)	NMLs – L <sub>Aeq,15min</sub>	Predicted noise impact
		EIS/Amendment Report	Modification	dB(A)	above NML
Pipe	Nine Mile Beach	54	52	65	No
Jacking/Micro- Tunnelling (OOHW)	33 Williams Street, Belmont	40	38	38	No
Intake Dewatering	Nine Mile Beach	43	46	65	No
	33 Williams Street, Belmont	22	25	38	No
Compound (Night	Nine Mile Beach	52	50	65	No
activities)	33 Williams Street, Belmont	36	34	38	No
Crane Operations for Main Plant Works	Nine Mile Beach	-	45 <sup>1</sup>	65	No
	33 Williams Street, Belmont	-	31 <sup>1</sup>	38	No

Note 1 – As this is a new construction noise stage, no EIS/ Amendment Report noise levels at receivers are available. Instead, noise levels were adjusted from the Pipe Jacking/Micro- Tunnelling (OOHW) stage, as the closest analogue for this stage.

## 6.2 Construction traffic noise

Construction traffic noise from the Project was assessed through the Roads and Maritime Services' *Construction and Maintenance Noise Estimator Tool.* Road traffic noise predictions were made at the nearest noise sensitive receivers to each of the roads in the primary route (refer to **Section 5.3.2**).

As shown in **Table 6-5**, due to construction traffic associated with the modification, the worst-affected receivers whose building facades are closest to the road along the Pacific Highway, Beach Street, Hudson Street, Ocean Park Road will experience traffic noise greater than the applicable traffic noise assessment level.

It is noted that due to the significant existing traffic on the Pacific Highway, the addition of the construction traffic would not increase the overall traffic noise level by more than 2 dB(A) and hence any actual change in traffic noise would be limited along this road.

Road	Time	Construction traffic noise level (dB(A))	Traffic noise mitigation level (dB(A))	Construction traffic noise greater than traffic noise mitigation level?
Pacific	Day (7AM – 10PM)	64.5	60	Yes
Highway	Night (10PM – 7AM)	65.0	55	Yes
Beach Street	AM Peak (6AM – 7AM)	64.8	50	Yes
	PM Peak (6PM – 7PM)	68.0	55	Yes
Hudson	AM Peak (6AM – 7AM)	62.7	50	Yes
Street	PM Peak (6PM – 7PM)	64.5	55	Yes
Ocean Park	AM Peak (6AM – 7AM)	61.4	50	Yes
Road	PM Peak (6PM – 7PM)	63.4	55	Yes

Table 6-5 Predicted construction traffic noise level at nearest noise sensitive receivers

#### 6.3 Helicopter noise

Modelling for helicopter noise has been developed in line with the methodology described in **Section 5.3.3** and was compared to the noise performance benchmarks detailed in **Section 4.2.3**. Noise was predicted at the properties nearest to the jack-up barge within the suburbs of Belmont and Belmont South. Predicted helicopter noise levels are shown in **Table 6-6**.

L<sub>Aeq</sub> and L<sub>Amax</sub> noise levels have been predicted to remain well below the respective noise performance benchmarks. While the night L<sub>Aeq</sub> noise levels remain below the noise performance benchmark, the ENCM from which the benchmarks are derived makes it clear that helicopter flights between 10PM and 7AM should be avoided where possible due to the additional noise sensitivity of residential receivers during these times. As such, extra care and consideration should be undertaken when planning helicopter flights during the night period.

As mentioned previously, no assessment of the noise impacts associated with flight paths to and from the jack-up barge or associated with taking-off or landing at Lake Macquarie Airport has been undertaken. These movements would be undertaken under the airport's approvals and Environmental Protection Licence 21349. The EPL for Lake Macquarie Airport allows for up to 5,000 helicopter movements annually. The proposed modification would entail around 3,000 flight movements over eight months. Additionally, the airport already hosts regular plane departures and arrivals that would be ongoing and part of the existing environment including the Westpac Rescue Helicopters undertake numerous movements 24/7 from the airport. As such, residents near the airport would already have familiarity with aircraft noise including 24/7 emergency helicopter movements. The noise associated with the helicopter movements required for the Proposed Modification would not be a new noise and is not anticipated to be particularly intrusive to nearby receivers.

Predictive noise maps of the helicopter take-offs and landings are displayed in **Figure 6-1**, **Figure 6-2** and **Figure 6-3**.

Suburb	Most affected area	Noise parameter	Predicted noise level – dB(A)	Noise performance benchmark – dB(A)	Noise is above benchmark?
Belmont	Eastern extent of suburb, between Glover Street in	LAeq (Day) (7AM – 10PM)	29	55	No
	the north to Capri Close in the south.	LAeq (Night) (10PM – 7AM)	27	55	No
		LAMax	59	82	No
Belmont South	Green Street	LAeq (Day) (7AM – 10PM)	30	55	No
		LAeq (Night) (10PM – 7AM)	28	55	No
		LAMax	60	82	No

Table 6-6 Predicted helicopter noise impacts at the most affected area within the three adjacent suburbs



Figure 6-1 Helicopter noise predictive modelling results for the jack-up barge helicopter landing and takeoff activities - Day L<sub>Aeq</sub> noise levels



Figure 6-2 Helicopter noise predictive modelling results for the jack-up barge helicopter landing and takeoff activities - Night L<sub>Aeq</sub> noise levels



Figure 6-3 Helicopter noise predictive modelling results for the jack-up barge helicopter landing and takeoff activities - L<sub>AMax</sub> noise levels

# 7. Review of mitigation measures

#### 7.1 Review of mitigation measures

#### 7.1.1 Site construction noise

Based on the outcomes of the construction noise assessment in **Section 6.1**, no site construction noise stages have been predicted to result in noise greater than the applicable NML. This is predominantly the result of the increases in noise from the proposed modifications being either generally minimal (such as the onshore stages) or occurring a far enough distance away that larger increases in noise do not lead to the overall noise impacts being greater than the NMLs (as was the case for the offshore stages).

Due to the absence of any new construction noise impacts being identified, the noise management and mitigation measures described in the EIS NVIA (2019) have been deemed to still be applicable and suitable for the project.

Due to the fact that works may not be undertaken in distinct construction noise stages, there remains a risk that the noise from two stages may take place at once and lead to more noise than predicted reaching nearby receivers. As such, an additional mitigation is described in **Table 7-1** in order to keep noise levels below the NMLs.

Control measure	Details
Active management of overlapping noise stages	The contactor should manage the total noise from construction of the project especially when undertaking noisy activities to minimise the risk that the combined noise will lead to higher than predicted noise at nearby receivers.

Table 7-1 Site construction noise management measure

#### 7.1.2 Construction traffic

Due to the increase in construction traffic as part of the modification, receivers along Beach Street, Hudson Street, Ocean Park Road and potentially the Pacific Highway will experience noise greater than the applicable traffic noise mitigation level. As such, mitigation measures should be applied to address noise at receivers adjacent to the relevant roads. Measures to address traffic noise impacts have been provided in **Table 7-1**.

Control measure	Details
Scheduling	Schedule construction traffic movements, especially heavy vehicles, to minimise night periods
Speed reduction	Reduce the speed of construction related traffic to 40 km/hour along Beach Street and Ocean Park Road and to 20 km/hour within the Project area.
Community consultation	Organise consultations and messaging (letterbox drops, phone calls, etc) to alert and inform residents along the affected construction traffic routes. Consultation should include, as a minimum, the predicted noise levels along the construction traffic routes and the timings of traffic movements.

Table 7-2 Construction traffic noise management measures

#### 7.1.3 Helicopter noise

It has been identified that the predicted L<sub>Aeq</sub> and L<sub>AMax</sub> helicopter noise levels will be lower than the noise performance benchmark at all suburbs. Regardless, measures to reduce noise from the helicopters for consideration have been detailed in **Table 7-3**, should the management of helicopter noise be seen as a focus.

Control measure	Details
Scheduling	Schedule helicopter movements so that they occur within 5.30AM and 8.30PM and to avoid night periods to the greatest extent possible, unless required for emergencies
Fly Neighbourly	Operate all helicopters associated with the Proposed Modification in line with the noise management requirements of the Lake Macquarie Airport General Conditions of Use and the general 'Fly Neighbourly' Principles.

Table 7-3 Helicopter noise management measures

#### 7.2 Conditions of approval

Hunter Water have reviewed the conditions of approval and would like DPE to consider including the following conditions of approval to manage construction noise impacts including OOHW work. These would follow on after existing condition D7 and are detailed in **Table 7-4**.

Table 7-4 Conditions of approval	pertaining to	construction noi	ise
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Proposed additional Conditions of Approval		
D8	Variation to work hours	
	Notwithstanding Conditions D3, D4 and D5, work may also be undertaken outside the hours specified in the following circumstances	
	a. By Approval, including:	
	i. Where different construction hours are permitted or required under an EPL in force in respect of the SSI; or	
	ii. Works which are not subject to an EPL that are approved under an Out-of-Hours Work Protocol as required by Condition D9; or	
	iii. Negotiated agreements with directly affected residents and sensitive land use(s).	
	b. Prescribed Activity, including:	
	<ul> <li>Tunnelling and ancillary support activities including delivery of materials to directly support tunnelling which are permitted 24 hours a day, seven (7) days a week) in accordance with the documents in A2</li> </ul>	
	Definitions	
	Low risk noise or vibration activities	
	i. Construction that causes LAeq(15 minute) noise levels:	
	<ul> <li>No more than 5 dB(A) above the rating background level at any residence in accordance with the ICNG, and</li> </ul>	
	<ul> <li>No more than the 'Noise affected' NMLs specified in Table 3 of the ICNG at other sensitive land use(s); or</li> </ul>	
	ii. Construction that causes:	
	<ul> <li>Continuous or impulsive vibration values, measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), or</li> </ul>	

Proposed additional Conditions of Approval		
	<ul> <li>Intermittent vibration values measured at the most affected residence are no more than the preferred values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006).</li> </ul>	
D9	Out-Of-Hours Work Protocol – Works Not Subject to an EPL	
	An Out-of-Hours Work Protocol must be prepared to identify a process for the consideration, management and approval of work which is outside the hours defined in Conditions D3, and that are not subject to an EPL and do not satisfy any other condition of the approval. The Protocol must be approved by the Planning Secretary before commencement of the Out-of-Hours Work. The Protocol must be prepared in consultation with the ER and EPA. The Protocol must include:	
	<ul> <li>Identification of low and high-risk activities and an approval process that considers the risk of activities, proposed mitigation, management, and coordination, including where:</li> </ul>	
	<ul><li>i. The ER has reviewed all proposed out-of-hours activities and confirmed their risk levels,</li><li>ii. Low risk activities can be approved by the ER, and</li></ul>	
	iii. High risk activities are approved by the Planning Secretary;	
	<ul> <li>b. A process for the consideration of out-of-hours work against the relevant NML and vibration criteria;</li> <li>c. A process for selecting and implementing mitigation measures for residual impacts in consultation with the community at each affected location, including respite periods consistent with the requirements of Condition D10. The measures must take into account the predicted noise levels and the likely frequency and duration of the out-of-hours works that sensitive land use(s) would be exposed to, including the number of noise awakening events;</li> </ul>	
	d. Procedures to facilitate the coordination of out-of-hours work including those approved by an EPL or undertaken by a third party, to ensure appropriate respite is provided; and	
	Notification arrangements for affected receivers for approved out-of-hours work and notification to the Planning Secretary of approved low risk out-of-hours works. This condition does not apply if the requirements of Condition D4 are met.	
D10	Out-of-Hours Works – Community Consultation on Respite	
	In order to undertake out-of-hours work outside the hours specified under Condition D3, the appropriate respite periods must be identified for the out-of-hours work in consultation with the community at each affected location on a regular basis. This consultation must include (but not be limited to) providing the community with:	
	a. A progressive schedule for periods no less than three (3) months, of likely out-of-hours work;	
	b. A description of the potential work, location and duration of the out-of-hours work;	
	c. The noise characteristics and likely noise levels of the work; and	
	d. Likely mitigation and management measures which aim to achieve the relevant noise management levels and vibration criteria under Condition D12 and D15 (including the circumstances of when respite or relocation offers will be available and details about how the affected community can access these offers).	
	The outcomes of the community consultation, the identified respite periods and the scheduling of the likely out-of-hour work must be provided to the ER, EPA and the Planning Secretary for information prior to undertaking the work scheduled for the subject period.	
	Note: Respite periods can be any combination of days or hours where out-of-hours work would not be more than 5 dB(A) above the rating background noise level at any residence.	

# 8. Conclusion

A noise impact assessment has been undertaken for the modification to the Belmont Drought Response Desalination Plant (SSI-8896). The assessment covers all aspects of project construction noise which may be affected by the proposed modification.

Sound power levels associated with the site construction stages were adjusted based on the revised construction noise and equipment proposed for the relevant construction stages. Generally, onshore stages have been predicted to increase in noise levels by up to 3 dB(A) during standard hours, and decrease in noise levels by 1 to 2 dB(A) at the nearest residential receivers during Outside of Standard Hours. Offshore stages, on the other hand may increase in noise source emissions by 9 dB(A) to 17 dB(A) however this would result in negligible change in noise levels at receivers due to the large distances from the offshore noise sources.

It has been assumed as a result of the proposed changes, that the only acoustic change to the construction of the project was associated with the SWL of the construction (i.e. the locations of the stages (with the exception of the relocated DOI), topography, receiver locations etc. have not changed). Due to this, the predicted noise at the nearby receivers can be linearly adjusted in line with the proposed SWL change to determine the predicted noise level change as a result of the proposed modification. The assessment predicted that no stages would produce noise greater than the already defined standard hours and out of hours works NML at nearby receivers during on site construction stages.

Due to this, the noise management and mitigation measures described in the EIS NVIA (2019) have been deemed to still be applicable and suitable for the project. A further mitigation measure to address the total construction noise if two construction noise stages overlap has been added to avoid more noise than predicted reaching nearby receivers.

Due to the construction traffic associated with the modification, the closest receivers along the Pacific Highway, Beach Street, Hudson Street, Ocean Park Road will experience traffic noise greater than the applicable traffic noise assessment level.

It is noted that due to the significant existing traffic on the Pacific Highway, the construction traffic would not increase the overall traffic noise level on the Pacific Highway by more than 2 dB(A) and hence any actual change in traffic noise would not be subjectively noticeable.

A number of noise management measures have been provided to address the noise impacts associated with the construction traffic movements.

Helicopter  $L_{Aeq}$  and  $L_{Amax}$  noise levels have been predicted to remain well below the respective noise performance benchmarks at all nearby suburbs.

While the night L<sub>Aeq</sub> noise levels remain below the noise performance benchmark, the ENCM from which the benchmarks are derived makes it clear that helicopter flights between 10PM and 7AM should be avoided where possible due to the additional noise sensitivity of residential receivers during these times. As such, extra care and consideration should be undertaken when planning helicopter flights during the night period.

Noise from helicopter movements at Lake Macquarie Airport to the jack-up barge would be undertaken in terms of the airport's existing approval and Environmental Protection Licence. As a result, noise impacts associated with take-off and landing at the Lake Macquarie Airport and the proposed flight paths to the jack-up barge have not been assessed.

# 9. References

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DECC, (2009). Interim Construction Noise Guideline. DECC, Sydney South, NSW

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