# Bayview Seawall Design

## Draft Review of Environmental Factors

Northern Beaches Council

29 September 2022

The Power of Commitment

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|---|---|
| **Project name** | Bayview Seawall Design |
| **Document title** | Bayview Seawall Design \| Draft Review of Environmental Factors |
| **Project number** | 12542425 |
| **File name** | 12542425 Bayview Seawall Design Draft REF_rev0.2.docx |

| Revision | Author | Reviewer | | Approved for issue | | |
|---|---|---|---|---|---|---|
| | | Name | Signature | Name | Signature | Date |
| 0.1 | V.Donat and A.Mihalatos | K.Panayotou |  | | | |
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# Glossary of terms

| Term | Definition |
|---|---|
| AHIMS | Aboriginal Heritage Information Management System |
| AHO | Aboriginal Heritage Office |
| ASS | Acid sulfate soils |
| BC Act | *Biodiversity Conservation Act 2016* (NSW) |
| BoM | Bureau of Meteorology |
| CBD | Central Business District |
| CEMP | Construction Environmental Management Plan |
| CLM Act | *Contaminated Land Management Act 1997* (NSW) |
| DA | Development application |
| DPE | NSW Department of Planning and Environment |
| EPA | Environment Protection Authority |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) |
| EPL | Environment Protection Licence |
| EP&A Act | *Environmental Planning and Assessment Act 1979* (NSW) |
| EP&A Regulation | Environmental Planning and Assessment Regulation 2021 (NSW) |
| FM Act | *Fisheries Management Act 1994* (NSW) |
| INCG | *Interim Noise Construction Guidelines* |
| LEP | Local environmental plan |
| LGA | Local Government Area |
| NML | Noise management level |
| NTA | *Native Title Act 1993* (Commonwealth) |
| MNES | Matters of National Environmental Significance |
| NPW Act | *National Parks and Wildlife Act 1974* (NSW) |
| PASS | Potential acid sulfate soils |
| PCT | Plant community type |
| PMST | Protected Matters Search Tool |
| POEO Act | *Protection of the Environment Operations Act 1997* (NSW) |
| RBL | Rating background levels |
| REF | Review of Environmental Factors |
| Resilience and Hazards SEPP | State Environmental Planning Policy (Resilience and Hazards) 2021 |
| SEPP | State Environmental Planning Policy |
| SWMP | Soil and Water Management Plan |
| TEC | Threatened ecological communities |
| Transport and Infrastructure SEPP | State Environmental Planning Policy (Transport and infrastructure) 2021 |
| TMP | Traffic Management Plan |
| WM Act | *Water Management Act 2000* (NSW) |

# 1. Introduction

## 1.1 Background

Northern Beaches Council proposes to a repair an existing seawall and construct a new shared pathway (the 'proposal') along Pittwater Road, between the Bayview Sea Scouts Hall and the Bayview Baths and adjacent to the Pittwater. Northern Beaches Council has identified potential public safety and environmental risks associated with the poor condition and varied failure of the existing seawall, including erosion of the embankment as a result of the damaged existing seawall. The seawall and landside embankment are critical to supporting the foundation materials of the existing footpath and road, and therefore upgrading of the seawall is required to stabilise the embankment and prevent further erosion.

The bend in Pittwater Road has also been identified as a high-risk area for cyclists. The seawall upgrade presents an opportunity for Northern Beaches Council to extend its safe cycling network as part of Council's recently adopted bike plan.

GHD Pty (GHD) has been engaged by Northern Beaches Council to prepare a Review of Environmental Factors (REF) to assess the potential impacts of the proposal on the natural and built environments.

This REF has been prepared under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to assess the potential impacts of the proposal. It describes the proposal and the existing natural and social environment; assesses the potential impacts of the proposal on the environment; and presents mitigation measures to minimise and/ or avoid these identified impacts.

Northern Beaches Council is the proponent and determining authority for this proposal.

## 1.2 Purpose of this report

This REF has been prepared to provide Northern Beaches Council with information on matters affecting or likely to affect the environment for the proposal. The REF would allow Council to comply with the legislative requirements, particularly Division 5.1 Subdivision 2 of the EP&A Act, where determining authorities are required to "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity", and Section 171 of the Environmental Planning and Assessment Regulation 2021.

## 1.3 Scope of this report

All assessments within this REF have been prepared based on review of existing and current information including aerials, publicly available databases, information provided by Council, and findings of the following site investigations:

– *Preliminary Environmental Investigation – Shared Pathway from Bayview Baths to Tennis Courts* (Cardno, 2019), provided as Appendix F
– *Geotechnical Investigation for Proposed Footpath Routes at Bayview Tennis Club to Bayview Baths* (JK Geotechnics, 2018), provided as Appendix G.

No other specialist studies were undertaken for the proposal.

# 2. Overview of the proposal site

## 2.1 Existing environment

The proposal is located along Pittwater Road in the suburb of Bayview, approximately 31 kilometres north of the Sydney Central Business District (CBD) and approximately 2.3 kilometres from Mona Vale. Bayview is located within the Pittwater Ward of the Northern Beaches Local Government Area (LGA), in the northern suburbs of Greater Sydney. The proposal is located along Pittwater Road, between the Bayview Sea Scouts Hall and the Bayview Baths (the 'proposal site').

Pittwater Road is a regional road in the north-eastern suburbs of Sydney and runs from Manly to Church Point, on the southern shore of Pittwater. Pittwater Road runs in a north-south direction from the Bayview Sea Scout Hall before turning approximately 90 degrees and running in an east-west direction to Bayview Baths. An existing footpath runs parallel to Pittwater Road.

The Gibson Marina Bayview is located adjacent to the western extent of the proposal site and includes public amenities and retail services that overlook Pittwater. The Bayview Tennis Club and Sea Scouts Hall is located adjacent to the eastern extent of the proposal site and includes a relatively cleared landscape and car park.

The proposal site is located at the starting point of the Bayview Church Point Pittwater walking trail. The walk is a popular 7.2 kilometre scenic trail along the shoreline of Pittwater through the northern beaches. The trail connects users to surrounding amenities, services, and recreational areas from the Bayview Tennis Courts to Church Point Wharf.

The proposal site contains the road, an existing footpath, and an embankment and retaining wall. The existing footpath was constructed in the late 1980's over fill material and protected via a rubble wall foreshore. The embankment comprises a sandstone block seawall ranging between 0.5 metres and 1.6 metres in height. The western half of the seawall is displaying the greatest extent of failure, where the blockwork has been replaced with undersized sandstone rock armour. Fill material in this area is currently exposed and has been subjected to scour resulting in recession of the crest of the embankment to within approximately 2.5 metres of Pittwater Road.

The proposal site is bounded by a Grey Mangrove-River Mangrove Forest along the northern boundary of the existing concrete pedestrian path. The proposal site comprises an existing barricade separating the pedestrian path from Pittwater Road, and an existing stormwater pipe and sewer line that runs along the northern parameters of the seawall.

The proposal site and surrounding area is shown in Figure 2.1.

## 2.2 Land use zoning

The proposal is located in the Pittwater electorate of the Northern Beaches Council LGA and is subject to the provisions of the *Pittwater Local Environmental Plan* (LEP) *2014*.

The land along the route of the proposal is zoned C4 Environmental Living and C2 Environmental Conservation towards the northern portion of the road bounding Pittwater.

## 2.3 Land ownership

The proposal is located partly within the road reserve, managed by Northern Beaches Council and partly on land below the mean high water mark (MHWM) known as Pittwater which is owned and managed by Crown Lands. Two further land parcels are within the south-eastern extent of the proposal site:

– Lot 7047 DP93802 – owned by the Department of Industry and utilised by Scouts Australia
– Public reserve Lot 23 DP4010 – owned and managed by Northern Beaches Council.

The proposal would not result in direct impacts to privately owned property.

## 2.4 Surrounding development

Bayview is a primarily residential area with limited commercial space and accommodates several recreational uses. The proposal, located at the starting point of the Bayview Church Point Pittwater walking trail, is a high amenity and recreational route which is located close to:

– Residential properties along the southern boundary of Pittwater Road and Fermoy Avenue
– Bayview Tennis Club
– Bayview Dog Park to the east and Maybanke Cove to the west
– Gibson Marina Bayview to the west and Bei Loon Dragon Boat Club
– Individual business properties and local services.


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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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**Northern Beaches Council**
**Bayview Seawall Design**
**Review of Environmental Factors**

Project No. **12542425**
Revision No. **A**
Date **8/10/2022**

## The proposal site

# FIGURE 2.1

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# 3. Proposal description

## 3.1 Proposal overview

The proposal includes upgrades to the existing seawall and a new shared pathway to stabilise the embankment and prevent further erosion and improve pedestrian access along Pittwater Road and for the Bayview Church Point Pittwater walking trail.

The proposal would include:

– Removal of the existing footpath and replacement with a new wider 2.2-metre-wide footpath
– Removal of existing armour rock and reuse in the toe berm
– Installation of sandstone blocks to form a new sandstone seawall
– Installation of a hardwood beam on top of the sandstone block seawall to prevent risk of fall
– Temporary removal of the existing guardrail to facilitate access during construction
– Installation of concrete seawall footing
– Installation of new pipe outlets for the existing stormwater infrastructure.

The key features of the proposal are shown in Figure 3.1.

## 3.2 Alternative options

Alternatives to the proposal include the following:

– Do nothing: no upgrade to the existing embankment and footpath
– Construction of a boardwalk which extends into the waters of Pittwater and is around 250 metres in length.

Doing nothing would likely result in progressive damage to the embankment and retaining wall and an associated impact to the receiving environment and ongoing safety and access issues for pedestrians and cyclists. As such, the 'Do nothing' option was discounted as it was not considered a viable alternative to the proposal.

Construction of the boardwalk would require piling in the intertidal zone for the installation of the boardwalk structure, integration of the Sea Scout launch ramp into the structure, and possibility of being designed for vessel impacts. This option was considered to comprise a greater environmental and socio-economic impact compared with the proposal. Additionally, there were engineering constraints with this option as the minimum clearance between Pittwater Road and the sewer pipeline could not be achieved. As such, this option was also discounted as it was not considered a viable alternative to the proposal.

## 3.3 Construction activities

### 3.3.1 Methodology

A construction contractor has not yet been engaged for the proposal and as such the exact construction methodology is unknown. However, an indicative construction methodology has been provided in Table 3.1 to inform the environmental impact assessment.

***Table 3.1 Indicative construction methodology***

| Construction phase | Key activities |
|---|---|
| **Site preparation and mobilisation** | – Establishment of the proposal site and compound site, including erosion and sediment controls<br>– Clearing of trees on the edge of Pittwater Road to provide access for plant and equipment<br>– Mobilisation of plant and equipment from landside. |

| Construction phase | Key activities |
|---|---|
| **Removal of existing infrastructure** | – Removal of the existing footpath and retaining wall materials<br>– Progressive profiling of the existing slope progressively to tie in the new embankment retaining structure. Existing sandstone blockwork would be left in place where possible<br>– Profiling of the existing foreshore slope, including excavation of existing foreshore sediments to facilitate construction of the proposed footing<br>– Stockpiling of excavated material onsite and assessment for suitability as foreshore nourishment material. Material considered unsuitable would be trucked to an appropriate disposal or reuse site and may require treatment with lime if found to be potential acid sulfate soils (PASS). |
| **Embankment rehabilitation** | – Use of excavators to place blocks and armour rock along the foreshore. The blocks and armour rock would be delivered throughout the construction from a truck and moved into position using an excavator bucket. |
| **Demobilisation** | – Removal of erosion and sediment controls, plant and equipment, and materials<br>– Demobilisation of the proposal site and compound site<br>– Reinstatement or rehabilitation of the compound site. |

The construction methodology would be confirmed during the detailed design and planning stage of the works before the engagement of the contactor.

### 3.3.2 Construction hours and duration

The proposal works would occur during the recommended standard hours for construction work as outlined in the *Interim Construction Noise Guidelines* (ICNG) (DECC, 2009) which are:

– Monday to Friday 7 am to 5 pm
– Saturday 8 am to 1 pm
– No works on Sundays or Public Holidays.

Works outside of these hours is unlikely to be required. Should works outside these hours be required, nearby residents would be notified. This would involve justifying why works are required outside the standard hours and outlining the timing, duration and potentially expected noise levels.

Works are anticipated to commence in February 2023 and estimated to be completed within a three-to-four-month period.

### 3.3.3 Workforce

It is estimated that a workforce of up to about five to 10 personnel would be required at different stages during the construction phase.

### 3.3.4 Plant, equipment, and materials

A range of plant and equipment would be used during construction. An indicative list of plant and equipment is as follows:

– Road truck
– Light vehicles
– Hand tools
– Front end loader
– Excavator (tracked) 20 – 35 tonnes
– Excavator mulcher
– Power generator
– Chainsaw.

A range of materials would be used during construction, including:

– Sandstone blocks
– Armour rock
– Railway ballast
– Hardwood beam
– Geotextiles
– Concrete
– Lime (if material requires treatment prior to offsite disposal).

### 3.3.5 Construction compound

A construction compound would be located adjacent to Pittwater Road south of the proposal site (see Figure 3.1). This would contain light worker vehicles and a temporary compound for the storage of plant, equipment, and materials.

### 3.3.6 Access and heavy vehicle routes

The proposal site would be accessed via Pittwater Road. It is anticipated that access through the Mona Vale Commercial Centre would be avoided, and therefore access from Mona Vale Road to the proposal site would be via Pittwater Road, Barrenjoey Road, Darley Street and back to Pittwater Road,

Heavy machinery using Pittwater Road may damage the road surface which would be assessed against a pre-construction dilapidation survey and rectified as needed.

### 3.3.7 Environmental management during works

A Construction Environmental Management Plan (CEMP) would be prepared for the works by the appointed contractor. The CEMP would document the mechanisms for achieving compliance with the commitments made in this REF.

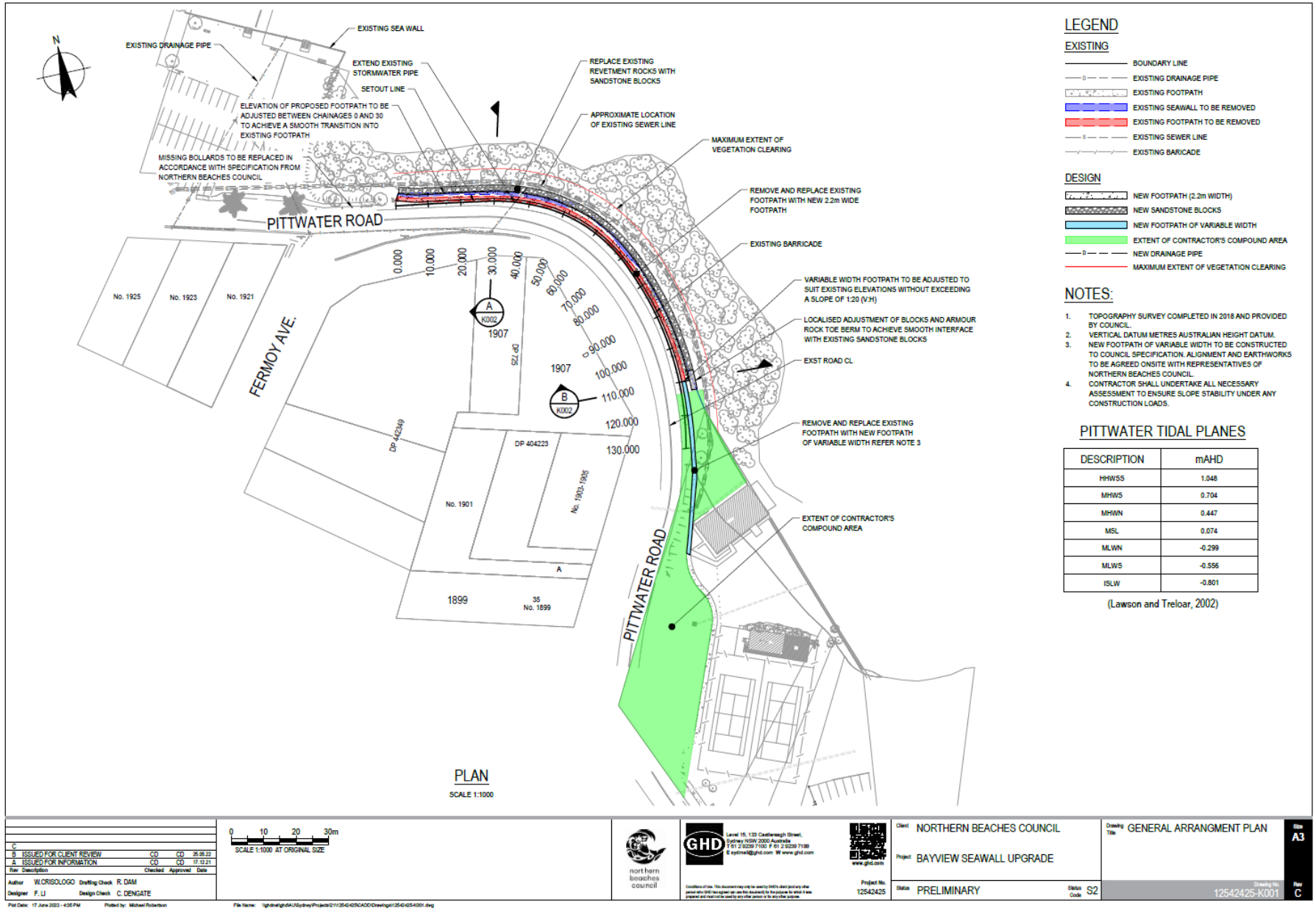



***Figure 3.1 The proposal***

# 4. Statutory and planning framework

This chapter provides the statutory and planning framework for the proposal and considers provisions of relevant State and Commonwealth legislation, plans and policies.

## 4.1 Environmental Planning and Assessment Act 1979

The EP&A Act and the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) provide the statutory basis for planning and environmental assessment in NSW. The EP&A Act provides the framework for environmental planning and development approvals and includes provisions to ensure that the potential environmental impacts of a development are assessed and considered in the decision-making process.

The key requirements of the EP&A Act in relation to the assessment and determination of the proposal are described below.

The proposal is development permitted without consent (refer to Section 4.1.1) and is subject to assessment under Division 5.1 of the EP&A Act. This REF has been prepared to provide Northern Beaches Council with information on matters affecting or likely to affect the environment and to comply with the requirements of the EP&A Act.

### 4.1.1 Environmental Planning Instruments

#### State Environmental Planning Policy (Transport and Infrastructure) 2021

Chapter 2 Infrastructure of the State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP) aims to facilitate the effective delivery of infrastructure across the State, improving regulatory certainty and efficiency by applying a consistent planning regime for infrastructure and the provision of services.

Under Division 17 section 2.109 development for the purpose of a road or road infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land. Under Division 17 section 2.108 of the Transport and Infrastructure SEPP, road infrastructure facilities are defined as:

*(a) tunnels, ventilation shafts, emergency accessways, vehicle or pedestrian bridges, causeways, road-ferries, retaining walls, toll plazas, toll booths, security systems, bus lanes, transit lanes, transitways, transitway stations, rest areas and road related areas (within the meaning of the Road Transport Act 2013), and*

*(b) associated public transport facilities for roads used to convey passengers by means of regular bus services, and*

*(c) bus layovers that are integrated or associated with roads (whether or not the roads are used to convey passengers by means of regular bus services), and*

*(d) bus depots, and*

*(e) bus stops and bus shelters, and*

*(f) traffic control facilities (within the meaning of Part 6 of the Transport Administration Act 1988), TfNSW road safety training facilities and safety works, and*

*(g) (premises used for the purposes of testing and inspecting heavy vehicles (within the meaning of the Road Transport Act 2013) under the TfNSW Heavy Vehicle Authorised Inspection Scheme.*

Road related areas in section 2.108(a), as defined by Part 1.2 section 4 the *Road Transport Act 2013*, includes:

*(a) an area that divides a road, or*

*(b) a footpath or nature strip adjacent to a road, or*

*(c) an area that is open to the public and is designated for use by cyclists or animals, or*

*(d) an area that is not a road and that is open to or used by the public for driving, riding or parking vehicles, or*

*(e) a shoulder of a road, or*

*(f) any other area that is open to or used by the public and that has been declared under section 18 to be an area to which specified provisions of this Act or the statutory rules apply.*

The new shared path component of the proposal meets the definitions of Part 1.2 section 4(c) and (c) of road related areas. As the proposal would be undertaken by Northern Beaches Council as the public authority, the proposal is permissible without consent under the Transport and Infrastructure SEPP.

## State Environmental Planning Policy (Resilience and Hazards) 2021

Chapter 2 Coastal Management of the State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) aims to promote an integrated and coordinated land use approach to land use planning in the coastal zone and in a manner consistent with the objectives of the *Coastal Management Act 2016.*

Under Part 2.3 section 2.16 of the Resilience and Hazards SEPP, development for the purpose of coastal protection works may be carried out on land to which Chapter 2 applies by or on behalf of a public authority

*(a) without development consent—if the coastal protection works are—*

*i. identified in the relevant certified coastal management program, or*

*ii. beach nourishment, or*

*iii. the placing of sandbags for a period of not more than 90 days, or*

*iv. routine maintenance works or repairs to any existing coastal protection works, or*

*(b) with development consent—in any other case.*

As the aim of the proposal is to reinstate and repair the foreshore protection, the proposal classifies as repairs to the existing coastal protection works at Bayview. As such, the proposal may be undertaken by Council without development consent.

The proposal site is not identified as a Coastal Wetland or as proximity area for Coastal Wetlands. Under Chapter 2 of the Resilience and Hazards SEPP, the proposal site is mapped as a 'Coastal Environment Area' (Division 3) and a 'Coastal Use Area' (Division 4). Section 2.10 and 2.11 identify several matters that are to be considered by Council when determining a proposal on land in these mapped zones.

Section 2.10 (1) requires the consent authority to consider whether the proposed development is likely to cause an adverse impact on the following prior to granting development consent:

*(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,*

*(b) coastal environmental values and natural coastal processes,*

*(c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014**,** in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,*

*(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,*

*(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,*

*(f) Aboriginal cultural heritage, practices and places*

*(g) the use of the surf zone.*

In addition, Section 2.11 (1) requires the consent authority to consider whether the proposed development is likely to cause an adverse impact on the following prior to granting development consent:

*(a) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,*

*(b) overshadowing, wind funneling and the loss of views from public places to foreshores,*

*(c) he visual amenity and scenic qualities of the coast, including coastal headlands,*

*(d) Aboriginal cultural heritage, practices and places,*

*(e) cultural and built environment heritage.*

Given the existing use of the proposal site, the proposed works are not anticipated to have a significant impact upon the coastal environment and coastal use of the area. The following is noted regarding Section 2.10 and Section 2.11 of the Resilience and Hazards SEPP:

– Disturbance of acid sulfate soils and any potential impacts on the surrounding waterways and biota have been assessed in Section 6.3
– As the proposal scope seeks to replace the existing footpath and seawall, proposal is not considered to generate any long-term adverse impacts on the coastal environmental values or coastal natural processes. Including any long-term impacts to the water quality of the marine estate
– The proposal would not result in any long-term adverse impacts to marine and native vegetation, fauna and habitats. Potential impacts to biodiversity have been addressed in Section 6.5
– The proposal would result in short-term impacts on access to the foreshore and public open spaces during demolition and/or construction works. Potential impacts to transport, traffic and access have been addressed in Section 6.2. Upon completion, access would be improved for the public with an increase in safety and amenity as well as improved access for persons with a disability
– No Aboriginal items or places are located within the proposal extent. The proposal is not anticipated to have any adverse impacts on identified Aboriginal items or places of significance located in proximity to the project area. Potential impacts to Aboriginal heritage have been addressed in Section 6.6
– Visual amenity would be impacted during a short-term period of construction works. Minor visual impacts may result with the removal of vegetation along the northern boundary of the existing footpath to facilitate the construction of the new footpath. Potential impacts to the landscape, social and visual environment have been addressed in Section 6.8.

## Pittwater Local Environmental Plan 2014

The proposal is located within the local government area of Northern Beaches Council. The relevant local environment plan is the *Pittwater Local Environmental Plan 2012* (Pittwater LEP). Under the Pittwater LEP, the proposed footprint is comprised of the following zones:

– C2 Environmental Conservation
– C4 Environmental Living
– RE1 Public Recreation
– R2 Low Density Residential.

The proposal site is zoned C2 Environmental Conservation, C4 Environmental Living, and RE1 Public Recreation. Construction works would be undertaken primarily within the C2 and C4 land zones. Some path widening works and the location of the site compound would be within the R2 land zone. A small portion of the proposal site is located within R2 Low Density Residential zone, however it is unlikely that construction works would occur within the R2 land zone (refer to Figure 4.1). The objectives of the RE1 zone under the Pittwater LEP are as follows:

– To enable land to be used for public open space or recreational purposes
– To provide a range of recreational settings and activities and compatible land uses
– To protect and enhance the natural environment for recreational purposes
– To allow development that does not substantially diminish public use of, or access to, public open space resources
– To provide passive and active public open space resources, and ancillary development, to meet the needs of the community.

Under the Pittwater LEP, the proposal can be classified as being *environmental protection works* which is permitted with consent under the RE1 zone. Under the LEP, *environmental protection works* are defined as works

associated with the rehabilitation of land towards its natural state or any work to protect land from environmental degradation including erosion protection works.

Although the proposal is permitted with consent under the Pittwater LEP, the Transport and Infrastructure SEPP overrides the provisions of the Pittwater LEP and development consent under Division 4.1 of the EP&A Act is therefore not required. As the proposal is permitted without consent under the Transport and Infrastructure SEPP, the consent requirements of the Pittwater LEP do not apply to the proposal.

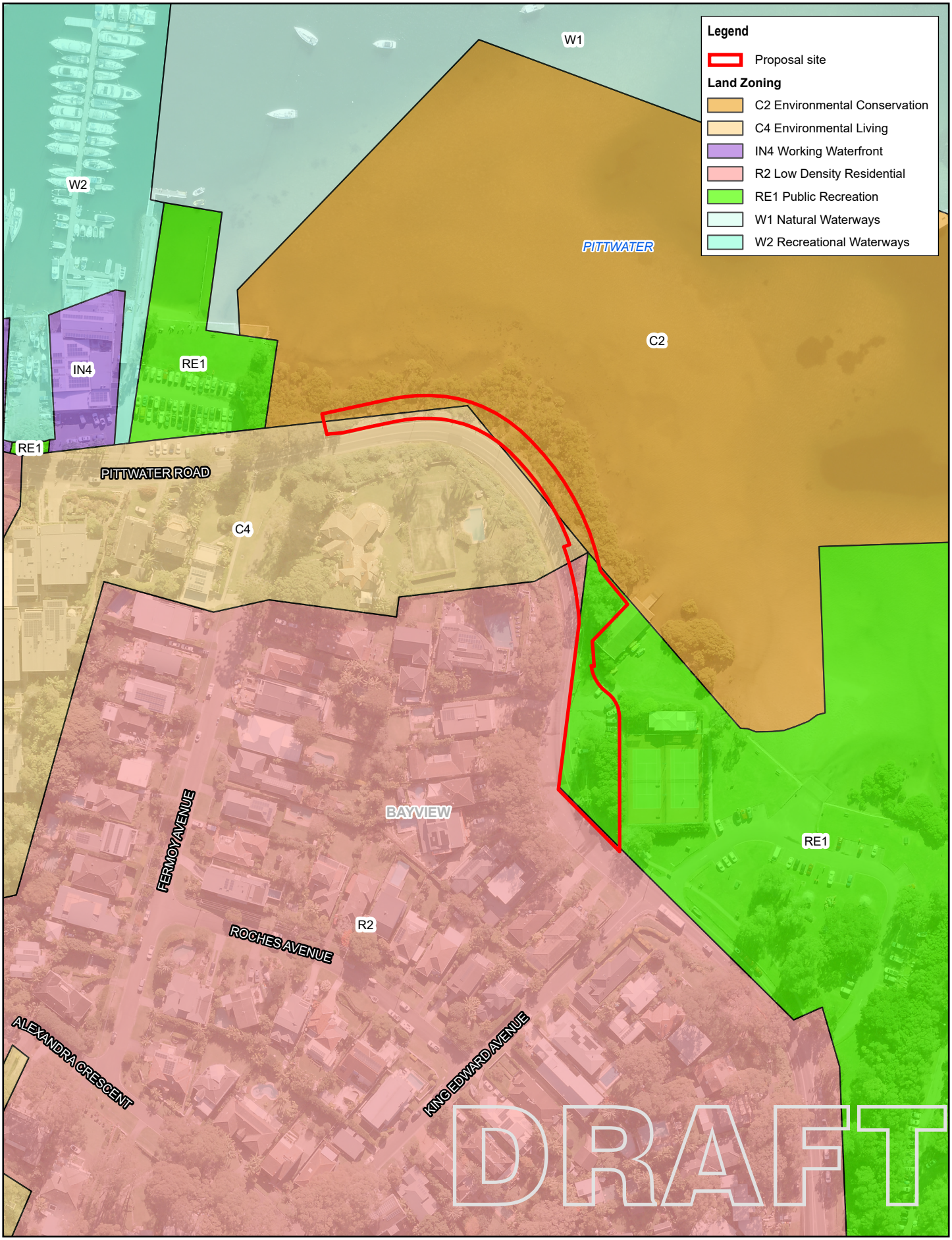
## Northern Beaches: Pittwater 21 Development Control Plan 2004

*The Pittwater 21 Development Control Plan 2004* (Pittwater 21 DCP) applies to the LGA of Pittwater within the Northern Beaches Council. The relevant controls applicable to the project under the Pittwater 21 DCP have been addressed below in Table 4.1.

***Table 4.1 Pittwater 21 DCP controls***

| Control | Requirements relevant to proposal | Consideration |
|---|---|---|
| B3.4 Coastline (Bluff) Hazard | *All development on land to which this control applies must comply with the requirements of the Geotechnical Risk Management Policy for Pittwater.*<br>*Development must be designed and constructed to ensure that every reasonable and practical means available is used to remove risk to an acceptable level as defined by the management policy.*<br>*Development must not be adversely or be adversely affected by geotechnical and coastal processes nor must it increase the level of risk for any people, assets and infrastructure in the vicinity due to geotechnical and coastal processes.* | Uses to which this control applies, among others, includes demolition and earthworks and is therefore applicable to the proposal.<br>As the purpose of the proposal is to replace the existing footpath and seawall due to failure and erosion, the proposal is considered consistent with this control.<br>A Geotechnical Report (JK Geotechnics, 2018) has been prepared and is included in Appendix G. |
| B4.12 Mangrove Conservation | *Development shall not adversely impact on existing mangroves or their habitat*<br>*Development shall provide an adequate buffer to mangroves* | Uses to which this control applies, among others, includes earthworks and is therefore applicable to the proposal.<br>The proposal would result in the removal of 0.01 ha of mangroves, relevant biodiversity impacts have been assessed in Section 6.5.<br>The mangrove habitat has been subject to previous disturbances due to historical construction and infrastructure servicing. In addition, the removal of a small area of mangroves is not considered likely to place the mangrove corridor within the proposal site at risk of degradation, fragmentation, or further loss. |
| B8.5 Construction and Demolition – Works in the Public Domain | *All works undertaken within the public road reserve must be protected in a manner to always ensure pedestrian and vehicular safety.*<br>*All works undertaken on site or in the public road reserve must make provision for pedestrian and traffic flow and not adverse nuisance.*<br>*All works undertaken on a site or in the public road reserve must make good any damage or disruption to the public infrastructure.* | Uses to which this control applies, among others, includes demolition and earthworks and is therefore applicable to the proposal.<br>Potential impacts to traffic, transport and access and the relevant mitigation measures have been addressed in Section 6.2.<br>The proposal is not expected to result in negative impacts on traffic, transport and access within Bayview and is considered consistent with this control. |
| D2.12 Construction, retaining walls, terracing, and undercroft areas in the | *Lightweight construction and pier and beam footings should be used in environmentally sensitive areas.*<br>*Retaining walls and terracing shall be kept to a* | Uses to which this control applies, among others, includes earthworks and is therefore applicable to the proposal.<br>The proposal involves the replacement of the existing footpath including the |

| Control | Requirements relevant to proposal | Consideration |
|---|---|---|
| Bayview Heights Locality | *minimum.*<br><br>*On steeper slopes, preference is given to the use of stable rock ledges and escarpments to reduce the visual bulk of buildings. Where retaining walls and terracing are visible from a public place, preference is given to the use of sandstone or sandstone like materials.* | installation of sandstone blocks, a hardwood beam to secure a new seawall, and concrete footing at the base of the seawall.<br>The proposal is considered consistent with this control including the following associated outcomes:<br>*To protect and minimise disturbance to natural landforms; and*<br>*To encourage building design to respond sensitively to natural topography* |




Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

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**Northern Beaches Council**
**Bayview Seawall Design**
**Review of Environmental Factors**

Project No. **12542425**
Revision No. **A**
Date **12/08/2022**

## Land zoning of the proposal site

**FIGURE 4.1**

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Data source: DPE: Land Zoning, 2022. LPI: DTDB, 2017. Metromap Tile Service: . Created by: kpsroba

## 4.2 Other State legislation

Other State legislation that may be applicable to the proposal is discussed in Table 4.2 below.

***Table 4.2 Consideration of State legislation applicable to the proposal***

| State legislation | Purpose | Consideration |
|---|---|---|
| *Crown Land Management Act 2016* | The *Crown Land Management Act 2016* acknowledges the importance of Crown land and its spiritual, cultural, social and economic values to both Aboriginal and non-Indigenous peoples.<br>It also recognises and facilitates Aboriginal involvement in the management of Crown land. The Act allows the governance of Crown reserves across NSW and in recognition of the role that local councils have in this governance; the Act enables local councils to manage Crown land under the *Local Government Act 1993*. | The proposal site is located on Crown Land that is owned and managed by Crown Lands. The proposal site also encroaches on a crown reserve located to the southeast on Lot 7047 DP93802.<br>The proposal would not result in direct impacts to privately owned property.<br>Under Division 2.4 of this Act, the use of dedicated of reserved Crown land may only be used for the following purposes:<br>a) The purposes for which its dedicated or reserved<br>b) Any purpose incidental or ancillary to a purpose for which it is dedicated or reserved<br>c) Any other purpose authorised by or under this Act or another act.<br>The proposal is considered consistent with this provision and the purposes of the Crown Land given the current use of the site and the nature of the proposal to replace the existing footpath and seawall. |
| *Fisheries Management Act 1994* (FM Act) | The FM Act aims to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. It includes provisions to list threatened species of fish and marine vegetation, including endangered populations, ecological communities and key threatening processes.<br>One of the objectives of the FM Act is to 'conserve key fish habitats' which includes aquatic habitats that are important to the maintenance of fish populations generally and the survival and recovery of threatened aquatic species.<br>A permit under Part 7 of the FM Act is required for the following works on 'water land':<br>– Activities involving dredging and reclamation work<br>– Activities temporarily or permanently obstructing fish passage<br>– Using explosives and other dangerous substances<br>– Harming marine vegetation.<br>Water land is defined in section 198A as land that is permanently of intermittently submerged by water. Further, dredging work is defined as any work that involves excavating water land, while reclamation work is using any material to fill in or reclaim water land. | The proposal would involve excavation or reclamation on land that is intermittently submerged by water. As a result, the proposal would also remove mangroves and intertidal rocky shore for the rehabilitation of the embankment and seawall. As such, a Part 7 permit under Section 205 is required for the removal of mangroves and under Section 200 for the removal of intertidal rocky shore. |
| *Coastal Management Act 2016* | The Coastal Management Act establishes the strategic framework and objectives for managing coastal issues in NSW. The Act defines the coastal zone and outlines the management objectives for management of the coastal zone and coastal areas. | The proposal site is located within a coastal environment and coastal use area. The management framework for the coastal zones, as outlined by the Coastal Management Act, is provided in the Chapter 2 of the Resilience and Hazards SEPP. This REF provides an assessment of the proposal on the coastal environment and coastal use of the area. |

| State legislation | Purpose | Consideration |
|---|---|---|
| | | A review of the provisions of the Resilience and Hazards SEPP for the proposal is provided in Section 4.1.1. |
| *Biosecurity Act 2015* | The Biosecurity Act specifies the duties of public and private landholders as to the control of priority weeds. section 22 requires any person who deals with a biosecurity matter has a duty to ensure that in so far as is reasonably practicable, the potential biosecurity risk is prevented, eliminated or minimised. | Appropriate management methods would be implemented during construction if declared noxious weeds in Northern Beaches Council are identified. |
| *Contaminated Land Management Act 1997* (CLM Act) | The CLM Act established a process for investigating and remediating land where contamination presents a "significant risk of harm" to human health or the environment.<br>Section 60 of the CLM Act imposes a duty on landowners to notify the Office of Environment and Heritage, and potentially investigate and remediate land if contamination is above Environment Protection Authority (EPA) guideline levels. | The proposal site has not been declared under the CLM Act as being significantly contaminated (refer to Section 6.3). |
| *Heritage Act 1977* | The *Heritage Act 1977* is concerned with all aspects of heritage conservation ranging from basic protection against indiscriminate damage and demolition of buildings and sites, through to restoration and enhancement.<br>Approval under section 57(1) for works to a place, building, work, relic, moveable object, precinct, or land listed on the State Heritage Register. The form of the application for approval is specified by section 60. An excavation permit is required under sections 139(1) and (2) to disturb or excavate any land containing or likely to contain a relic. The form of the application for a permit is specified by section 140. | There are no items of heritage significance listed on the State Heritage Register within 200 metres of the proposal site (refer to Section 6.7). |
| *Roads Act 1993* | The *Roads Act 1993* governs activities in, on, under, or over a public road. This Act is governed by Transport for NSW, the local council or the NSW Land and Property Management Authority depending on the road classification. TfNSW has authority over classified roads, and the local council over local roads.<br>Approval under section 138 for works to a public road is required for temporary road closures. Under section 5(1) of Schedule 2, a public authority is not required to obtain a roads authority's consent for the exercise of the authority's functions in, on or over an unclassified road. | The proposal would involve works on local roads managed and maintained by Northern Beaches Council. A Road Occupancy Licence under section 138 of the Roads Act would be required for temporary road closures. |
| *Biodiversity Conservation Act 2016* (BC Act) | The BC Act provides for the listing of threatened species and communities, establishes a framework to avoid, minimise and offset the impacts of proposed development.<br>A biodiversity impact assessment is required to assess any impacts on threatened biota under Section 7.3 of the BC Act. | Determination of activities under Part 5 of the EP&A Act requires an assessment of the impacts of the proposal on land that is critical habitat or is likely to significantly affect threatened species, populations or ecological communities, or their habitats, as listed under the BC Act.<br>The potential presence or likely occurrence of threatened biota on the subject site and potential impacts on threatened biota are addressed in section 6.5 and concludes that the proposal is consistent with the requirements of the BC Act. |
| *National Parks and Wildlife Act 1974* (NPW Act) | The NPW Act aims to protect flora and fauna and the integrity of Aboriginal heritage items in NSW. The NPW Act also provides for the protection of national parks, historic sites, nature reserves, state recreation areas, | There are no listed Aboriginal heritage items or places located on or in the vicinity of the proposal site. As a result of the existing levels of site disturbance, there is |

| State legislation | Purpose | Consideration |
|---|---|---|
| | regional parks and designated wilderness areas. Under the NPW Act, protected species, threatened biota and any Aboriginal artefacts or sites cannot be harmed, removed or disturbed without a licence, permit or other authority from the NSW Heritage Council.<br>A heritage impact permit is required under section 87 of the NPW Act to harm or desecrate an Aboriginal heritage object. | a low likelihood that unknown items of Aboriginal heritage significance would be present (refer Section 6.6). |
| *Protection of the Environment Operations Act 1997* (POEO Act) | The POEO Act aims to protect, restore and enhance the quality of the environment. It prescribes offences mainly regarding pollution of the environment and establishes a regime for the licensing of certain scheduled activities.<br>An environment protection licence (EPL) is required for scheduled activities or scheduled development work. | The proposal is not considered to be a scheduled activity or development work under this Act, and therefore an EPL is not required for construction or operation. |
| *Water Management Act 2000* (WM Act) | The objective of the WM Act is the sustainable and integrated management of the state's water for the benefit of both present and future generations.<br>Section 91 (E) of the WM Act outlines that 'a person who carries out a controlled activity in, on or under waterfront land and does not hold a controlled activity approval for that activity is guilty of an offence'.<br>Notwithstanding the above, section 38 of the Water Management (General) Regulation 2011 states that 'a public authority is exempt from section 91(E) of the WM Act in relation to all controlled activities that it carries out in, on or under waterfront land'. | Northern Beaches Council do not require approval for undertaking a controlled activity in, on or under waterfront land in accordance with section 38 of the Water Management (General) Regulation 2011. |

## 4.3 Commonwealth legislation

### 4.3.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Commonwealth's principal environmental protection legislation. The EPBC Act functions to protect matters of national environmental significance (MNES). These MNES matters, and their applicability to the proposal can be seen in Table 4.3. summary of the search results can be seen in Appendix D.

***Table 4.3 Consideration of the proposal on EPBC Act MNES***

| EPBC Act protected matter | Matter located within 2 km radius | Comments | Potential impact |
|---|---|---|---|
| World Heritage Property | None | The proposal would not impact on any World Heritage properties. | Nil |
| National Heritage Places | 1 | The Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves National Heritage Place is located around 1.8 kilometres west of the proposal site. The proposal would not impact on any National Heritage properties. | Nil |
| Wetlands of international significance (Ramsar sites) | None | The proposal would not impact on any wetlands. | Nil |
| Threatened ecological communities | 8 | The proposal would not impact on any threatened ecological communities. | Nil |
| Threatened species | 97 | The proposal would not impact on any threatened species. | Nil |

| EPBC Act protected matter | Matter located within 2 km radius | Comments | Potential impact |
|---|---|---|---|
| Listed migratory species | 62 | The proposal would not impact on any migratory species. | Nil |
| Nuclear actions | None | The proposal does not involve a nuclear action. | Nil |
| Commonwealth Marine Areas | None | No Commonwealth marine areas are located within the search radius. | Nil |
| Great Barrier Reef Marine Park | None | The Great Barrier Reef Marine Park is outside the search radius. | Nil |
| Commonwealth land | 9 | The proposal would not impact on any Commonwealth land. | Nil |
| Commonwealth Heritage Places | None | The proposal would not impact on any Commonwealth Heritage properties. | Nil |
| A water resource, in relation to coal seam gas development and large coal mining development | Not relevant to proposal | Not relevant to proposal | Nil |

### 4.3.2 Native Title Act 1993

The *Native Title Act 1993* (NTA) provides for the recognition and protection of native title for Aboriginal peoples and Torres Strait Islanders. The NTA recognises native title for land over which native title has not been extinguished and where persons can prove continuous use, occupation or other classes of behaviour and actions consistent with the traditional cultural possession of those lands. It also makes provision for Indigenous Land Use Agreements to be formed as a framework for notification of Native Title Stakeholders for certain future acts on land where native title has not been extinguished.

Searches of the National Native Title Register, Register of Native Title Claims and Register of Indigenous Land Use Agreements were undertaken on 13 July 2022 for the Northern Beaches LGA. These searches returned no relevant native title determinations, claims or land use agreements.

# 5. Stakeholder and community consultation

## 5.1 Transport and Infrastructure SEPP consultation

Part 2.2 Division 1 of the Transport and Infrastructure SEPP outlines the requirements for consultation with councils and other public authorities for infrastructure development carried out by or on behalf of a public authority that meets the requirements under these clauses. As can be seen in Appendix A, the proposal triggers consultation with the following agencies under the Transport and Infrastructure SEPP:

– Department of Primary Industries – Fisheries (DPI Fisheries) and Marine Planning in relation to potential impacts to marine vegetation
– Northern Beaches Council in relation to minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance
– Northern Beaches Council in relation to the presence of local heritage items, or a heritage conservation area within the proposal site and whether potential impacts to the heritage significance of the item/area are more than minor or inconsequential.

No further consultation requirements under legislation have been identified.

In addition to the list above, Council consulted with the Aboriginal Heritage Office during the preparation of the REF. The comments received during consultation with external stakeholders is outlined in Table 5.1.

***Table 5.1 Summary of comments raised during consultation with external stakeholders***

| Stakeholder | Comments raised | Where addressed in the REF |
|---|---|---|
| Aboriginal Heritage Office | No sites are recorded in the current development area and the area of works has been subject to previous disturbance reducing the likelihood of surviving unrecorded Aboriginal sites.<br>Whilst the area of works does not contain Aboriginal sites or Aboriginal heritage sensitivity other portions of the DA area do. According to the Due Diligence Code of Practice, any land within 200 metres of water is considered to have Aboriginal heritage sensitivity and the potential to contain Aboriginal sites. Given the presence of these landscape features in the proposal area there is potential that the works may harm unrecorded Aboriginal sites which are protected under the NPW Act.<br>Inadvertent impacts are considered harm under the NPW Act. During construction all workers and contractors should be made aware of their obligations to avoid harm to Aboriginal sites and areas of Aboriginal sensitivity. Under the NPW Act all Aboriginal objects are protected. Should anything thought to be Aboriginal Cultural Heritage items be uncovered during earthworks, works should cease in the area and the Aboriginal Heritage Office be contacted. In line with advice for sandy areas, the Aboriginal Heritage Office recommends that the development conditions should provide for stop work provisions (unexpected discovery protocol) in the unlikely event that human remains are uncovered. Should human remains be uncovered, works must cease and the NSW Police must be contacted.<br>Should any Aboriginal Cultural Heritage items be uncovered during earthworks, works should cease in the area and the Aboriginal Heritage Office assess the finds. Under Section 89a of the NPW Act should the objects be found to be Aboriginal, Heritage NSW and the Metropolitan Local Aboriginal Land Council should be contacted. | Proposed mitigation measures to minimise potential impacts to Aboriginal heritage are outlined in Section 6.6.3. |

Consultation with Northern Beaches Council was undertaken internally by Northern Beaches Council with the following internal stakeholders:

– Bushland and Biodiversity
– Development Advisory Services Team

– Coast and Catchments
– Transport and Civil Infrastructure
– Parks and Recreation.

The comments received during consultation with internal stakeholders is outlined in Table 5.2.

*Table 5.2 Summary of comments raised during consultation with internal stakeholders*

| Stakeholder | Comments raised | Where addressed in the REF |
|---|---|---|
| Bushland & Biodiversity | – Impacts to native vegetation resulting from the proposal should be avoided and minimised wherever possible.<br>– Replacement tree planting and mangrove rehabilitation should be undertaken post works.<br>– Retained trees and vegetation must be appropriately protected prior to commencement of any construction.<br>– All avoidance and mitigation should be incorporated into the CEMP. | Potential impacts to biodiversity are addressed in Section 6.5.2.<br>Proposed mitigation measures to minimise potential impacts to biodiversity are outlined in Section 6.5.3. |

## 5.2 Agency consultation

Agency consultation would be conducted by the construction contractor prior to construction. Sydney Water sewer assets were identified in the proposal site. Other service providers including NBN, Ausgrid, Optus and Telstra had assets close to the proposal site, including power poles with overhead wires above the proposal site.

## 5.3 Community consultation

The proposal is unlikely to directly impact residential dwellings nearby the proposal. There may be some indirect impacts discussed in Chapter 6. Council has undertaken community consultation with the community groups to provide details of the proposal and identify potential issues

*Table 5.3 Summary of comments raised during community consultation*

| Stakeholder | Comments raised | Where addressed in the REF |
|---|---|---|
| Bayview Residents Association | – Primary concern is the current safety issues of the existing pathway | The proposed design to address current safety issues is outlined in Section 3.1. |
| Bayview Tennis Club | – Access to be retained during competition events on Wednesday mornings and Saturday afternoons and the need for parking at these times. | Potential impacts to access and parking are addressed in Section 6.2.2.<br>Proposed mitigation measures to minimise potential impacts to access and parking are outlined in Section 6.2.3. |
| Sea Scouts | – The need to keep the grassed area south of the building free for scouts' activities<br>– The boats on the northern side of the building needing to be moved<br>– The need for access to the building to be maintained<br>– The need to adjust the retaining wall around the building if the path next to it is to be widened. | Potential impacts to access and parking are addressed in Section 6.2.2. Proposed mitigation measures to minimise potential impacts to access and parking are outlined in Section 6.2.3.<br>Potential impacts to land use are addressed in Section 6.8.2. Proposed mitigation measures to minimise potential impacts to land use are outlined in 6.8.3 |

| Stakeholder | Comments raised | Where addressed in the REF |
|---|---|---|
| | | The proposed design is outlined in Section 3.1. |

Council would continue to consult with community stakeholders alerting them of planned work and work hours prior to construction of the proposal.

# 6. Environmental Assessment

This chapter contains an assessment of the impacts of the proposal in accordance with the matters for consideration under section 79C of the EP&A Act. It describes the existing environment, assesses the potential environmental impacts of the proposal, and recommends mitigation measures.

## 6.1 Noise and vibration

### 6.1.1 Existing environment

The proposal site is located in a mix of residential, commercial, and recreational areas. Sensitive land uses surrounding the proposal site include:

– Residential areas immediately to the south of the Pittwater Road bend
– Passive and active recreation areas southeast of the proposal site
– Commercial premises including several boating businesses, cafes, and architecture businesses located to the west of the proposal site at the Gibson Marina and Bayview Anchorage.

The full list of noise sensitive receivers is provided in the *Bayview Seawall Noise and Vibration Impact Assessment* (GHD, 2022) in Appendix C.

The existing noise environment at the nearest sensitive receivers to the proposal site can be characterised by a typical suburban environment with sounds such as birds, wind, coastal activities and some road traffic. A conservative approach has been taken to establish the noise goals during construction using the minimum rating background levels (RBLs) from the Noise Policy for Industry (NPfI) (EPA, 2017). The minimum RBLs as presented in Table 2.1 of the NPfI are shown in Table 6.1.

***Table 6.1 Minimum assumed RBLs for the proposal***

| Time of day | Minimum assumed rating background noise level dBA |
|---|---|
| Day | 35 |
| Evening | 30 |
| Night | 30 |

### 6.1.2 Criteria

#### Construction noise

##### Construction noise management levels

The ICNG (DECC, 2009) states that the potential for construction noise impacts can be assessed by comparing the predicted noise at the assessment locations with the noise management levels (NML) provided by the ICNG. Construction is considered to have the potential to cause a noise impact if the predicted noise exceeds the noise management levels.

Table 6.2 details the ICNG (DECC, 2009) construction NMLs for residential receptors for works during standard construction hours and outside of standard hours. NMLs for other sensitive land uses are provided in Table 6.3 and only apply when the properties are in use.

***Table 6.2 Noise management levels for residential receivers***

| Time of day | Noise management level, $L_{Aeq(15min)}$ | Application notes |
|---|---|---|
| Recommended standard hours | Noise affected:<br>RBL + 10 dBA | The noise affected level represents the point above which there may be some community reaction to noise. |

| Time of day | Noise management level, $L_{Aeq(15min)}$ | Application notes |
|---|---|---|
| | | 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<br>the proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details. |
| | Highly noise affected:<br>75 dBA | The highly noise affected level represents the point above which there may be strong community reaction to noise.<br>Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level.<br>If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided. |
| Outside recommended standard hours | Noise affected:<br>RBL + 5 dBA | A strong justification would typically be required for works outside the recommended standard hours.<br>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.<br>Where all feasible and reasonable measures have been applied and noise is more than 5 dBA above the noise affected level, the proponent should consult with the community.<br>For guidance on negotiating agreements see Section 7.2.2 of the *Interim Construction Noise Guideline*. |

***Table 6.3 Noise management levels for other sensitive land uses***

| Land Use | Noise management level, $L_{Aeq(15\ min)}$ dBA |
|---|---|
| Commercial premises | 70 (external) |
| Industrial premises | 75 (external) |
| Educational institutes | 45 (internal) |
| Hospital wards and operating theatres | 45 (internal) |
| Places of worship | 45 (internal) |
| Active recreation areas | 65 (external) |
| Passive recreation areas | 60 (external) |

### Proposal noise management levels

The NMLs at sensitive receivers surrounding the proposal site are summarised in Table 6.4 and have been based on the minimum RBLs from the NPfI.

***Table 6.4 Project noise management levels***

| Receiver type | Time of day | | Minimum assumed rating background noise level (dBA) | Minimum project intrusiveness noise levels ($L_{Aeq,15min}$ dBA) |
|---|---|---|---|---|
| Residential | Recommended standard hours | | 35 | 45 |
| | Outside recommended standard hours | Day | 35 | 40 |
| | | Evening | 30 | 35 |
| | | Night | 30 | 35 |
| Commercial | When in use | | | 70 (external) |

| Receiver type | Time of day | Minimum assumed rating background noise level (dBA) | Minimum project intrusiveness noise levels ($L_{Aeq,15min}$ dBA) |
|---|---|---|---|
| Passive Recreation | When in use | | 45 (internal)<br>55 (external) |
| Active Recreation | When in use | | 65 (external) |
| Educational Institute | When in use | | 60 (external) |

### Construction traffic

The *Road Noise Policy* (DECCW, 2011) provides road traffic noise criteria for residential land uses affected by construction traffic on the public road network.

The Road Noise Policy application notes state that any increase in the total noise level at existing residences and other sensitive land uses affected by traffic generation on existing roads should be limited to 2 dBA above current levels. This limit only applies when the noise level without the development is within 2 dBA or exceeds the road traffic noise criterion provided in the Road Noise Policy.

This has been used to identify potential impacts as a result of noise produced by construction traffic. If road traffic noise increases as a result of construction works within 2 dBA of current levels, then the objectives of the Road Noise Policy are considered to be met and no specific mitigation measures would be required. Where construction traffic increases the existing road traffic noise levels by more than 2 dBA then further assessment against the road traffic noise criteria in Table 6.5 is required.

***Table 6.5 Road traffic noise criteria (dBA)***

| Type of development | Day, $L_{Aeq(15\ hour)}$ 7am to 10pm | Night, $L_{Aeq(9\ hour)}$ 10pm to 7am |
|---|---|---|
| Existing residence affected by additional traffic on freeway/arterial/sub-arterial roads | 60 | 55 |
| Existing residence affected by additional traffic on local roads | 55 | 50 |

## Construction vibration

Vibration from construction plant and activities has the potential to impact human comfort or result in structural damage to buildings. The predominant vibration for most construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers and excavators occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range).

Acceptable vibration levels for human comfort have been set with consideration to *Assessing Vibration: a technical guideline* (DEC, 2006) which is based on the guidelines contained in *British Standard BS 6472 – 1992, Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*. The effects of transient vibration on structures are considered in *BS 7385 Part 2 – 1993 Evaluation and measurement for vibration in buildings*. The detailed breakdown of vibration criteria from each guideline is provided in Section 3 of Appendix C,

Using the vibration criteria for human comfort and general structures, the recommended safe working distances for vibration intensive plant were determined for the proposal, as provided in Table 6.6.

***Table 6.6 Recommended safe working distances for vibration intensive plant***

| Activity | Human comfort | Structural damage | |
|---|---|---|---|
| | | Standard structures | Heritage buildings/structures |
| Piling rig – Bored | N/A | 2 m (nominal) | 4 m (nominal) |
| Piling rig – Hammer | 50 m | 15 m | 30 m |
| Vibratory roller (>18 tonnes) | 100 m | 25 m | 50 m |
| Vibratory roller (13-18 tonnes) | 100 m | 20 m | 40 m |

| Activity | Human comfort | Structural damage | |
|---|---|---|---|
| | | Standard structures | Heritage buildings/structures |
| Vibratory roller (7-13 tonnes) | 100 m | 15 m | 30 m |
| Vibratory roller (4-6 tonnes) | 40 m | 12 m | 24 m |
| Vibratory roller (2-4 tonnes) | 20 m | 6 m | 12 m |
| Vibratory roller (1-2 tonnes) | 15 m | 5 m | 10 m |
| Large hydraulic hammer | 73 m | 22 m | 44 m |
| Jackhammer | Avoid contact with structure | 1 m (nominal) | 2 m (nominal) |

### 6.1.3 Potential impacts

#### Construction

##### Construction noise

Three construction scenarios were created based on construction equipment likely to be operating simultaneously at any given time and located in the location that creates the maximum received noise level for each receiver. Although this is unlikely to occur, the 'worst-case' scenario was assumed to identify where the proposal would result in the greatest noise impacts.

Up to 182 sensitive receivers surrounding the proposal site are likely to experience noise levels above the noise management level during the construction scenario with the greatest impacts. The construction scenario predicted to have the greatest impact is site preparation, where works may involve excavators and chainsaws operating concurrently whilst clearing land (including existing footpath) and establishing the proposal work site. The most heavily impacted residential receivers would be those located immediately south of Pittwater Road; these receivers would be likely to experience noise levels that exceed the NML by up to 25 dBA during site preparation, mobilisation and demobilisation, and as a result the perceived noise level may be considered highly noise intrusive.

The passive and active recreational facilities which are likely to experience exceedances are the Bayview Sea Scouts group and the Bayview Tennis Club respectively, due to the proximity to the proposal site. Commercial receivers are not expected to experience any exceedances of the NML, with the worst affected receiver being the commercial premises located at the Gibson Marina west of the proposal site. This receiver is predicted to have a noise level of up to 62 dBA during site preparation works.

Exceedances of the construction noise management levels are typical for projects of this scale. The noise impacts would be limited to the construction period only and would not have any lasting effects on the community. The maximum noise impacts expected are during the site establishment and preparation scenario where excavators and chainsaws have the potential to be used. However, as all construction equipment would be operated intermittently and not continuously, impacts to receivers would only occur over brief periods of time.

##### Construction traffic

The proposal would result in additional light and heavy vehicles travelling along Pittwater Road to access the proposal site and compound site. As described in Section 6.2.2, this increase in vehicles is expected to be minor and temporary in nature.

The predicted construction road traffic noise levels show that the expected increase is significantly less than the 2 dB noise criteria presented in the Road Noise Policy (DECCW, 2011). As such the objectives of the Road Noise Policy are considered to be met and no specific mitigation measures are required.

**Construction vibration**

Construction and demolition work have the potential to impact human comfort and / or cause structural damage to buildings. Potential vibration inducing activities identified during construction and demolition works include:

– Piling, grinding, and cutting, generating impulsive vibration emissions
– Bulk earthworks, construction traffic movements and demolition work, generating intermittent or continuous vibration.

No residential properties have been identified within the cosmetic damage minimum working distances. However, the residences southwest and southeast of the proposal site may experience human comfort vibration impacts during these works.

The Bayview Sea Scouts Hall is located adjacent to the proposal site and existing seawall and is a locally listed heritage structure. Excavation works of the existing footpath and seawall is estimated to have similar vibration impacts to the use of jackhammers, therefore excavation works should adopt a minimum buffer distance of two metres from the Bayview Sea Scouts Hall to ensure no structural damage to the building. In the event that excavation works are required within two metres of the structure, such as to excavate the existing footpath, a dilapidation report of the Scout Hall should be completed, and specific vibration goals established prior to the commencement of works.

### Operation

The proposal would not result in operational noise and vibration impacts to the area surrounding the proposal site. Additionally, the proposal would not introduce any noise or vibration generating elements to the proposal site.

## 6.1.4 Mitigation measures

Mitigation measures to prevent or minimise noise and vibration impacts during construction and operation of the proposal are detailed in Table 6.8 below.

***Table 6.7 Mitigation measures to minimise potential noise and vibration impacts***

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| Construction noise and vibration | All work would be carried out within standard construction hours:<br>– Monday to Friday: 7 am to 5 pm<br>– Saturday: 8 am to 1 pm<br>No construction activities would occur on Sundays and public holidays. | Contractor | Construction |
| | Notification would be provided to potentially affected receivers about upcoming construction activities. The notification should include:<br>– Details and timeframe of construction works<br>– Contact details of the site manager / project manager<br>Contact details would also be provided on a site board. | Contractor | Construction |
| | A complaints register would be maintained throughout construction detailing:<br>– Contact details and address of the complainant<br>– The time and nature of complaint<br>– Review of work activities<br>– Measures undertaken in response to the complaint.<br>Staff would be briefed on current and future construction activities and notified of any complaints from the community. | Contractor | Construction |
| | All employees, contractors and subcontractors would receive an environmental induction. The induction must at least include:<br>– All relevant project specific and standard noise mitigation measures | Contractor | Construction |

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| | – Relevant licence and approval conditions<br>– Permissible hours of work<br>– Location of nearest sensitive receivers<br>– Construction employee parking areas<br>– Designated loading/ unloading areas and procedures<br>– Complaints register procedure. | | |
| | The following behaviours would be adopted onsite:<br>– No unnecessary shouting or loud stereos/radios would occur on onsite<br>– No dropping of Materials from height, throwing of metal items and slamming of doors. | Contractor | Construction |
| | The simultaneous use of construction equipment would be avoided where possible. Equipment would be turned off when not in use. Equipment would be serviced and maintained regularly. | Contractor | Construction |
| | Quieter construction methods would be used where reasonable and feasible. | Contractor | Construction |
| | Stationary noise sources would be silenced, enclosed or shielded where feasible and reasonable or located so as not to impact residences. | Contractor | Construction |
| | A dilapidation report would be carried out and specific vibration criteria for the structure be developed if vibration intensive works, such as during excavation of the existing footpath, are required within two metres of the Bayview Sea Scouts Hall. The report would be prepared prior to the commencement of works to prevent vibration impacts. | Contractor | Construction |

# 6.2 Traffic, transport and access

## 6.2.1 Existing environment

### Road network and public access

The proposal site is accessed from and located along Pittwater Road at Bayview. Pittwater Road is a main road within the Northern Beaches locality, providing access between Manly and Church Point. Pittwater Road at Bayview is a council-managed regional road, with two lanes divided by lane markings. It generally has a sign posted speed limit of 50 kilometre/hour due to its residential nature through Bayview, though has a warning sign and advisory speed limit of 35 kilometre/hour adjacent to the proposal site due to the curve of the road along the waterfront of Pittwater (see Figure 6.1 and Figure 6.2).

Traffic volume surveys for Pittwater Road between Barrenjoey Road and McCarrs Road were undertaken over a 7-day period in November 2018 and identified the following traffic trends:

– On average there were 7,580 vehicles travelling southbound per day, compared to 6,660 vehicles travelling northbound per day
– 9:00am to 10:00am and 5:00pm to 6:00pm had the highest average southbound traffic volumes of 658 and 610 vehicles, respectively
– 5:00pm to 6:00pm and 6:00pm to 7:00pm had the highest average northbound traffic volumes of 550 and 541 vehicles, respectively.

A concrete footpath is located on the northern side of Pittwater Road which provides pedestrian access along Pittwater waterfront (see Figure 6.2 and Figure 6.3).

*Figure 6.1 Pittwater Road facing eastbound*

*Figure 6.2 Pittwater Road and the narrow concrete footpath, facing westbound*

*Figure 6.3 The existing narrow footpath within the proposal site along Pittwater Road*

### Public and marine transport

Gibson Marina Bayview is located 70 metres northwest of the proposal site and contains numerous berths for local boats and a public car park for over 50 cars. Access to the Gibson Marina is approximately 50 metres east of the project site along Pittwater Road.

There are currently four bus stops within proximity to the proposal site:

– Gibson Marina, Pittwater Road – services route 156 eastbound
– Pittwater Road opposite Gibson Marina – services route 156 westbound
– Bayview Park, Pittwater Road – services route 156 eastbound
– Pittwater Road opposite Bayview Park – services route 156 westbound.

## 6.2.2 Potential impacts

### Construction

#### Construction traffic

Access to the construction site and adjoining compound site would be via Pittwater Road. Construction of the proposal would create traffic associated with:

– Delivery of construction materials
– Delivery and removal of construction equipment and machinery
– Movement of construction personnel, including contractors and workers.

It is anticipated that the contractor worker trips would primarily be inbound in morning periods and outbound in afternoon/evening periods, while heavy vehicle activity would occur over the course of the day.

Pittwater Road is a high traffic road that would not be impacted by a small increase in vehicles as a result of the proposal. However, any increase in traffic numbers on Pittwater Road through Bayview would likely be noticeable. However, given the minimal number of vehicles expected during construction, a negative impact to road users of Pittwater Road is not expected. Further, all vehicles and equipment would be parked / stored off the road in the

designated cleared area. As such, access to residential, commercial and recreation properties would not be obstructed.

Heavy machinery using Pittwater Road may damage the road surface which would be assessed against a pre-construction dilapidation survey and rectified as needed.

**Road and footpath access**

It is anticipated that traffic would be temporarily restricted to a single lane with temporary traffic lights for the duration of construction to facilitate the safe undertaking of works and to maintain traffic movements along Pittwater Road. Similarly, pedestrian access between the Gibson Marina and the Bayview Tennis Club would be temporarily restricted and diverted to surrounding streets.

**Parking**

The temporary construction compound would contain up to five parking spaces for construction workers and light construction vehicles. Overflow parking would also be available south of the proposal site at the Bayview Tennis Club or the Rowland Reserve parking area. However, it is not expected that the proposal would result in a reduction in parking spaces available to the community due to the ample number of parking areas surrounding the proposal site, the relatively small number of daily construction workers requiring parking, and the provision of worker car parking within the compound site.

**Marine transport**

The proposal would be undertaken adjacent to the parking area for the Gibson Marina. The proposed works would be contained within the road corridor and intertidal zone and would not enter Pittwater. As such, it is not anticipated that the proposal would impact access to, and operations of, the Gibson Marina. The proposal would not impact boating operations surrounding the proposal site.

### Operation

The proposal would provide a new shared path access for both pedestrians and cyclists along Pittwater Road between the Gibson Marina and Bayview Tennis Club. The new shared path would provide the following benefits during operation:

– Improved accessibility for community members within Bayview
– Improved safety for pedestrians between community recreational areas
– Improved safety for cyclists when travelling around the bend along Pittwater Road (utilising the shared path instead of the road)
– The enabling of a greater appreciation of the local natural environment and heritage
– Improved infrastructure at the commencement of the Bayview Church Point Pittwater walking trail.

The proposal is not expected to result in negative impacts on land or marine traffic, transport and access within Bayview.

## 6.2.3 Mitigation measures

Mitigation measures to prevent or minimise impacts to traffic and access during construction and operation of the proposal are detailed in Table 6.8 below.

***Table 6.8 Mitigation measures to minimise potential impacts on traffic, transport and access***

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| Traffic and access | A pre-construction dilapidation survey of the proposal site, compound site and Pittwater Road adjacent to the proposal site would be undertaken prior to works commencing. Any damages would be rectified prior to construction works being completed. | Contractor | Pre-construction/post-construction |

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| | A Traffic Management Plan (TMP) would be prepared and approved by Council prior to construction commencing. The TMP would include the following:<br>– Traffic control measures in construction works areas to maintain local traffic movements along Pittwater Road<br>– Restrictions on the delivery of materials to site during peak traffic periods<br>– Appropriate entry/exit points for the proposed construction compound areas<br>– The maintenance of safe and alternative pedestrian and cyclist access with consideration to temporary security fencing and wayfinding being implemented for each construction stage<br>– Designated parking for construction workforce that minimises impacts on public car parking spaces at the Gibson Marina and Bayview Tennis Club.<br>– Preparation of a Road Traffic Control Plan in accordance with the '*Traffic control at work sites manual*' (Transport for NSW, 2022) and Australian Standard 1742.3 *Manual of uniform traffic control devices, Part 3: Traffic control for works on roads* for any planned traffic disruptions or road occupancy of Pittwater Road. | Contractor | Pre-construction/ construction |
| | Appropriate exclusion barriers, signage and site supervision would be employed at all times to ensure that the construction boundary is controlled, and that unauthorised vehicles and pedestrians are excluded from the works area. | Contractor | Construction |
| | Signage, including contractor details and contact numbers, would be erected near the gate at the site. The signage would remain displayed on the site entrance throughout the duration of the proposed works. | Contractor | Construction |
| | Only existing roads and access roads are to be utilised by construction vehicles and workers. | Contractor | Construction |
| | The community is to be kept informed about the proposal through advertisements in the local media, notices and / or signs. | Northern Beaches Council / Contractor | Construction |
| | All traffic control devices are to be in accordance with *AS 1742.3-2009 – Manual of uniform traffic control Devices: Traffic control for works on roads* and Transport for NSW *Traffic control at worksites manual*. | Contractor | Construction |

# 6.3 Soils and contamination

## 6.3.1 Existing environment

**Geology and soil landscape**

The 1:100,000 geological map of Sydney (Geological Survey of NSW, Geological Series Sheet 9130) indicates that the proposal site is underlain by interbedded laminite, shale and sandstone of the Narrabeen Group. In general, a relatively thin fill layer overlays sands that in turn overlays sandstone bedrock (JK Geotechnics, 2018).

The proposal site is located adjacent to Pittwater, which is characterised as the Newport Formation and Garie Formation of the Narrabeen Group, and comprised of interbedded laminate, shale, and quartz, to lithic-quartz sandstone.

**Acid sulfate soils**

Acid sulfate soil (ASS) occurs in areas rich in iron sulphide. These soils generate sulphuric acid if exposed to the air (oxygen). The acid is an issue as well as causing the mobilisation of metals (e.g. aluminium, iron, manganese) which may lead to a detrimental environmental impact. ASS can also decrease the amount of dissolved oxygen in surface waters, leading to eutrophic conditions and fish kills.

A review of the ASRIS National Acid Sulfate Soil database indicated that there is an extremely high probability of occurrence of ASS within the proposal site. Additionally, the proposal site is within areas classified as Class 1 and Class 5 on the Pittwater LEP ASS mapping, indicating ASS are likely to be found on and below the natural ground surface

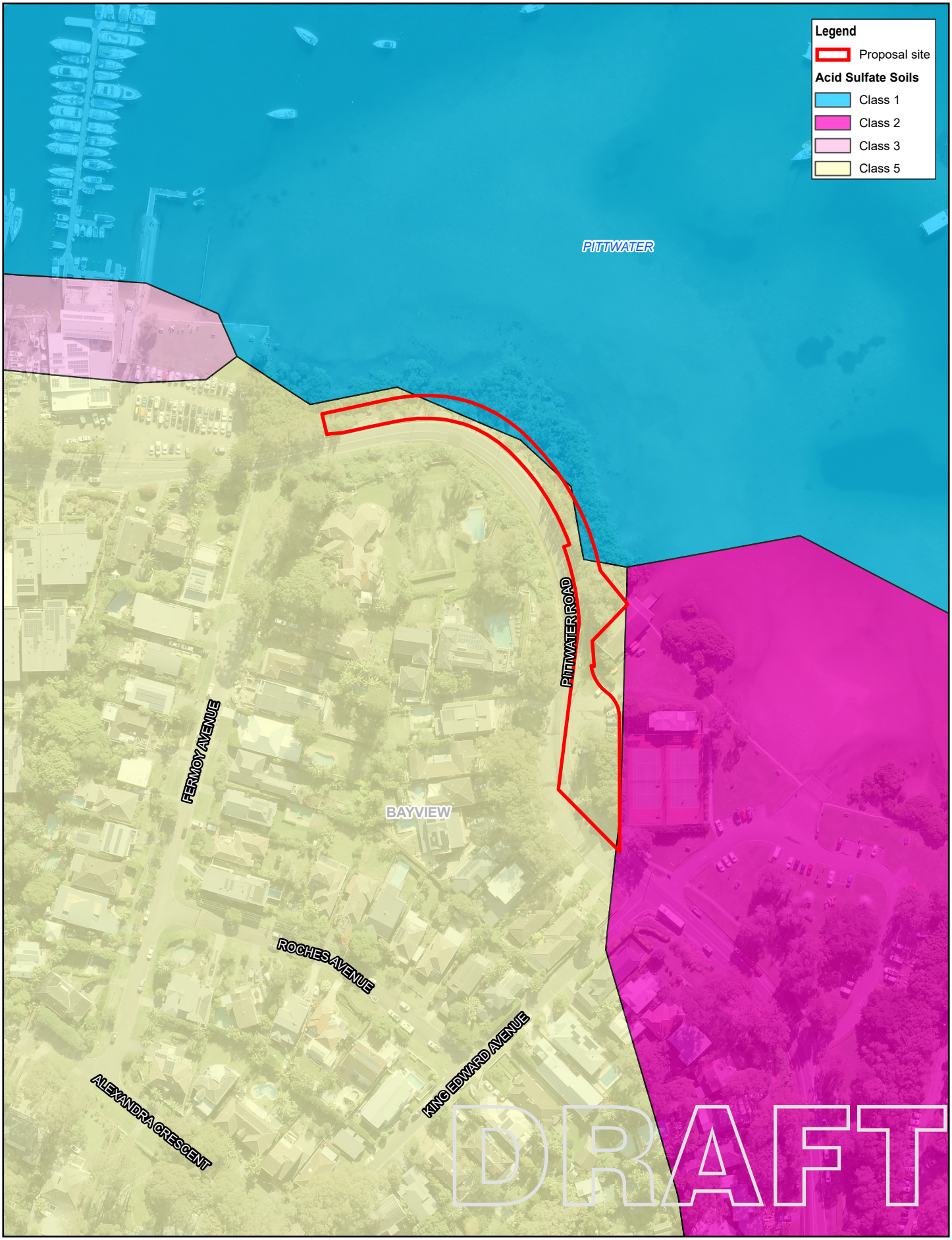
ASS in or near the proposal site is shown in Figure 6.4.

**Contamination**

The NSW Environment Protection Authority's Contaminated Lands Register was searched on 13 July 2022 for the Northern Beaches LGA. No contaminated sites were identified in the vicinity of the proposal site. Two current notices were identified for the Mona Vale Bus Depot, located approximately two kilometres southeast of the proposal site.

There is potential for some contamination to be present within or adjacent to the proposal site from:

– Fuels, grease or oils from boats used for recreation and transport
– Litter from the pedestrian pathway and road on Pittwater Road.




Paper Size ISO A4

0 10 20 30 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

**Northern Beaches Council**
**Bayview Seawall Design**
**Review of Environmental Factors**

## Acid sulfate soils in or near the proposal site

Project No. **12542425**
Revision No. **A**
Date **8/10/2022**

# FIGURE 6.4

\\ghdnet\ghd\AU\Sydney\Projects\21\12542425\GIS\Maps\12542425_REF.aprx
Print date: 10 Aug 2022 - 19:54

Data source: DPE: ASS, 2022. LPI: DTDB, 2017. Metromap Tile Service: . Created by: kpsroba

## 6.3.2 Potential impacts

### Construction

#### Exposure of soil to erosion

Soil would be disturbed during construction for earthworks and vegetation clearing activities. These activities increase the exposure of soils to erosion, particularly in the event of rain or exposure of the lower lying areas to the tidal forces. If not managed appropriately, there is risk of localised collapse of soil, localised foundation hazard and associated release of sediments to the receiving environment.

#### Disturbance of acid sulfate soils

There is a high risk of ASS occurrence in the proposal site. Due to this, it is likely that ASS would be exposed during excavation of the soil. Disturbance of potential ASS during construction may lead to the production of acid sulphate leachate due to the iron sulphides contained within ASS reacting with oxygen to create sulphuric acid. In addition, the acid can cause metals such as iron and aluminium in the soil to be more soluble and therefore be released in toxic amounts (NSW Acid Sulfate Soil Management Advisory Committee, 1998).

The acid and heavy metals can have damaging effects on the receiving environment, including reducing survival and growth rates for aquatic flora and fauna, corrosion of materials and health impacts to humans and animals from toxic water and dust. However, the effects this would have on the environment are governed by the volume of disturbance and the connection of acidic leachate with natural water bodies.

#### Accidental contamination

During construction, there would be a requirement for several fuel-powered vehicles and equipment. There is potential for accidental spillage or leaks of hydrocarbon during works. While this would present a negative impact, the volumes of potential spillages would be relatively minor so would not be anticipated to result in a significant impact although mitigation measures would be put in place to reduce the potential for spills.

### Operation

The proposal would stabilise the embankment and prevent further erosion of the shoreline and intertidal area, resulting in beneficial impacts during its operation.

## 6.3.3 Mitigation measures

Mitigation measures to prevent or minimise impacts to soils and contamination during construction and operation of the proposal are detailed in Table 6.9 below.

***Table 6.9 Mitigation measures to minimise potential impacts on soils and contamination***

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| Erosion and sedimentation | A Soil and Water Management Plan (SWMP) would be prepared and implemented as part of the CEMP.<br>The SWMP would identify all reasonably foreseeable risks relating to soil erosion, sediment dispersion and water pollution and describe how these risks would be addressed during construction.<br>Erosion and sediment control measures would be implemented and maintained (in accordance with the *Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines 2004* (the Blue Book)) to:<br>– Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets<br>– Reduce water velocity and capture sediment on site | Contractor | Pre-construction |

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| | – Minimise the amount of material transported from site to surrounding waters and pavement surfaces<br>– Divert clean water around the site.<br>The SWMP would include, but not be limited to, the following erosion and sediment control measures:<br>– Sediment and erosion controls would be implemented before any construction commences and inspected regularly, particularly after a rainfall event and maintained to ensure effective operation.<br>– All erosion and sediment control measures would be established before ground disturbance work commences and are to remain in place until all surfaces have been fully restored and stabilised. Restoration requires achievement of 70% groundcover.<br>– Install sediment control devices parallel with the bank of the waterway to prevent runoff into the marine environment during high tide.<br>– Sediment and erosion control devices would be inspected regularly, maintained to ensure effectiveness over the entire duration of the proposal.<br>– If a stockpile is inactive on-site during construction for more than 20 days, it is required to have a coverage of 50%<br>Topsoil and subsoil would be stockpiled separately to ensure no mixture occurs. | | |
| | During earthworks, stockpile topsoils well away from the banks of the waterway. Only conduct earthworks in low tide or with water away from exposed soil. | Contractor | Construction |
| | Minimise the disturbance and exposure of sediment and/or the underlying soils to oxygen. | Contractor | Construction |
| | Fence areas of the proposal where necessary and practicable. Rehabilitated areas may need to be fenced to prevent access until site stability is established. | Contractor | Construction |
| | Any spoil material storage areas or stockpiles would have appropriate erosion control devices installed to prevent erosion, control runoff and prevent sedimentation. | Contractor | Construction |
| | Excess spoil would be removed from site and disposed offsite at an appropriately licenced waste disposal facility. | Contractor | Construction |
| | In the event of a failure of sediment controls, DPI Fisheries would be immediately notified, and Northern Beaches Council would need to monitor the aquatic reserve for any impacts in consultation with DPI Fisheries. | Contractor | Construction |
| | Fixed silt fences would be installed around any significant excavation and stockpiling activities seaward of the existing seawall. Silt fences should be installed as close as possible to the works area and may be removed after the first low tide following completion of excavation and stockpiling activities within each portion of the work area. | Contractor | Construction |
| Spoil management | The CEMP would include measures for spoil management, including but not limited to:<br>– Identification of materials during excavations including contaminated, ASS, excavated natural material or virgin excavated natural material<br>– Tracking of materials incoming and outgoing from site (e.g. as waste, quality of imported material).<br>Soils that require offsite disposal would be classified using the six-step process and criteria detailed in *Waste Classification Guidelines – Part 1: Classification of Waste* (NSW EPA, 2014). | Contractor | Pre-construction |

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| | Earthworks would be undertaken during the following conditions to prevent dispersal of potential ASS via runoff or wind:<br>– No rainfall is forecast<br>– It is low tide<br>– Stabilisation would occur immediately following excavation works. | Contractor | Construction |
| Accidental contamination from leaks or spills of fuels, chemicals etc. | An Incident Emergency Spill Plan would be prepared as part of the CEMP and implemented during construction. The plan would include procedures for the storage and handling of hazardous materials including fuel and chemicals within the CEMP, including but not limited to:<br>– No refuelling to occur on-site unless appropriate bunded hardstand and spill protection / spill plan is prepared.<br>– Storage of hazardous materials on-site to be kept to a minimum and would be in accordance with national guidelines and the Safety Data Sheets relating to<br>– bunding, coverage, storage of incompatible materials, etc.<br>– Keep a spill kit on site. | Contractor | Pre-construction |
| Unexpected discovery of contaminated soils | Should unexpected, contaminated soils be identified during any ground works, advice would be sought from a suitably qualified environmental consultant.<br>Works would be ceased in the immediate vicinity of any areas of suspected contamination that are identified prior to or during work. These areas would not be disturbed and blocked off as a safety risk.<br>Any additional investigations would be completed in general accordance with guidelines developed or endorsed by NSW EPA.<br>Indications of potential contamination may include:<br>– Stained or discoloured fill, soils or seepage water<br>– Odorous materials<br>– Imported materials such as ash or slag.<br>Contingency plans for unexpected finds protocols for contaminated soils would be included in the CEMP. | Contractor | Construction |
| Acid sulphate soils | An Acid Sulfate Soils (ASS) Management Plan would be prepared as part of the CEMP and implemented during construction. The plan would include the requirement to remove excavated soil off site or to the construction compound immediately and not stockpiling near the waterway. Excavated soil would be tested to determine whether it is PASS or ASS, and appropriately managed in accordance with the ASS Management Plan. | Contractor | Pre-construction |

# 6.4 Water quality and hydrology

## 6.4.1 Existing environment

**Surface water**

The proposal site is adjacent to Pittwater. Pittwater is a tide-dominated drowned valley estuary that flows north towards its mouth into Broken Bay, between West Head and Barrenjoey Head before flowing into the Tasman Sea. Broken Bay is a major estuarine junction that also receives water from Brisbane Water from the north and the Hawkesbury-Nepean River from the west.

Pittwater drains a catchment area of 5,100 hectares, approximately 28.5 per cent of which is urbanised and the remainder bushland. Pittwater has two main tributaries of McCarrs Creek, 2.3 kilometres northwest of the proposal site, and Cahill Creek, 630 metres southeast of the proposal site. There are also several smaller tributaries flowing into Pittwater from the eastern side of the Ku-ring-gai Chase National Park. The area comprises wetlands, bushland, lagoons, a waterway, rock platforms and beaches.

Pittwater has a tidal range of approximately one metre with the influence of astronomical tides greatest at the northern end and wind-driven circulation of greater importance at the southern end. Water levels are also influenced by flood discharges from the Hawkesbury-Nepean River (Lawson Treloar Pty Ltd, 2003).

Water quality in Pittwater is typical of moderately developed estuaries. This means that the same pressures on water quality in urbanised estuaries apply to Pittwater including:

– Runoff, stormwater, industrial and wastewater overflows
– Waterway usage and development
– Heavy metal contamination.

The Beachwatch State of the Beaches (OEH, 2018) provides a summary of the water quality at Pittwater. The report indicates that microbial water quality at the beach is suitable for swimming most of the time but is susceptible to pollution following rain and during dry weather conditions. Bayview Baths are subject to low levels of flushing, which means that following storm water events the water can take longer than other beaches in the area to recover.

An existing sewer runs roughly parallel along the seaward-side of the existing retaining wall. Culverts are present along the retaining wall, allowing for storm water to drain from Pittwater Road and the surrounding areas into the Pittwater.

#### Groundwater

A search of the NSW Department of Primary Industries Real-time water data indicates the closest groundwater bore is 680 metres southeast of the proposal site. The bore identifies the standing water level at around two metres below the ground surface. However, due to the tidal nature of the proposal site the water levels vary from above the surface levels at high tide to some depts below the surface (JK Geotechnics, 2018).

#### Flooding

No flood planning data is available for the proposal site. However, the proposal site is classified as ‘Geotechnical Hazard H1’ under the Pittwater LEP mapping, which indicates the proposal site is within an area with the likelihood of instability is assessed as possible, likely, or almost certain.

### 6.4.2 Potential impacts

#### Construction

Excavations and disturbance of the soils by machinery may cause mobilisation of soil/sediment that could be released into the marine environment. Further, due to the use of equipment and machinery in close proximity to the waterway, an accidental spill of fuel would likely reach the receiving marine environment and have the potential to affect water quality.

Accidental sedimentation of the marine environment in close proximity to the proposal site would be unlikely to cause a significant impact given the lack of sensitive habitats and disturbed nature of the area. Given the fast current and expanse of water adjacent to the proposal, any sediment or accidental spill would also be dispersed and diluted quickly, reducing the level of impact. However, implementation of mitigation measures would be required to prevent mobilisation of sediments or accidental spills to the marine environment.

#### Operation

The proposal would prevent further erosion of the road verge and stabilise the embankment adjacent to Pittwater. Stabilisation of the embankment would reduce the amount of sediment being eroded and brought into the intertidal

environment where the mangroves are located. As such, it is likely that the proposal would have a positive impact on the intertidal and marine environment within and adjacent to the proposal site.

### 6.4.3 Mitigation measures

Mitigation measures to prevent or minimise impacts to water quality and hydrology during construction and operation of the proposal are detailed in Table 6.10 below.

***Table 6.10 Mitigation measures to minimise potential impacts on water quality and hydrology***

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| Water quality | An Incident Management Plan would be prepared as part of the CEMP and include a contingency plan and emergency procedures for dealing with the potential spillage of fuel or other environmental incidents that may occur during the proposed works. | Contractor | Pre-construction |
| | There is to be no release of dirty water into drainage lines and waterways. | Contractor | Construction |
| | Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt fences or erosion and sediment controls. | Contractor | Construction |
| | The bulk of construction works that are closest to the water would be scheduled during low tide to minimise the potential impact the water quality. | Contractor | Construction |
| | The storage and handling of fuels and chemicals would be undertaken in accordance with Australian Standard AS1940. | Contractor | Construction |
| | All erosion and sediment control measures described in Section 6.3.3 would be implemented to prevent mobilisation of sediments to the marine environment. | Contractor | Construction |

## 6.5 Biodiversity

### 6.5.1 Existing environment

**Terrestrial vegetation**

A desktop review of NSW vegetation mapping identified one plant community type (PCT) within the proposal site, namely the Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion (PCT 920). Three terrestrial vegetation types were recorded within the proposal site during a field survey for the biodiversity assessment (Cardno, 2019):

– Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion
– Native/exotic landscape planting
– Exotic verge/park.

The *Swamp Oak swamp forest fringing estuaries* vegetation type formed part of a remnant vegetation community (a PCT) and a threatened ecological community (TEC). Swamp Oak forest comprised the highest value native terrestrial vegetation in the proposal site and was limited to a thin riparian strip between intertidal mangroves and the existing footpath (see Figure 6.5). This community was characterised by a dominance of mature canopy species swamp oak (*Casuarina glauca*) with a minor occurrence of bangalay (*Eucalyptus botryoides*) in the eastern portion. This vegetation was considered to be of moderate condition, with a well-established canopy throughout but a cleared and mixed exotic/native understory. It is considered to conform to the TEC of Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, which is listed as endangered under the BC Act, based on the following key characteristics:

– Located on an estuarine fringe

– Canopy dominated by *Casuarina glauca*
– Presence of understory species, predominately *Commeliana cyanea.*

Due to the small patch sizes of this PCT, it did not meet the minimum condition thresholds for its listing as Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland Ecological Community (endangered) under the EPBC Act.

***Figure 6.5 Patches of Swamp oak Forest within the proposal site adjacent to the existing footpath***

### Marine vegetation

The intertidal areas of the proposal site mostly consisted of grey mangroves (*Avicennia marina*). Succession was evident with several seedlings observed in the understorey. Most of the understorey within the mangrove corridor was comprised of bare soft sediment and rocky debris (see Figure 6.6 and Figure 6.7).

***Figure 6.6 Mangroves adjacent to the existing embankment and footpath***

*Figure 6.7 Mangroves and succession plantings located within the intertidal zone, at the base of the embankment*

**Fauna habitat**

Fauna habitats such as hollow-bearing trees or large woody debris were not observed within the proposal site, however the vegetation types present would provide habitats for a range of native fauna. Mature native riparian vegetation can provide seed and nectar foraging, roosting and nesting resources for native arboreal birds and mammals. Gaps within the retaining wall were observed to be used by fauna for refuge.

**Threatened species and listed migratory species and populations**

A review of the NSW BioNet database, NSW DPI Threatened Species Lists website, vegetation mapping, and the EPBC Act protected matters search tool identified the potential for the following to occur in or within one kilometre of the proposal site:

– Eight threatened ecological communities
– One protected vegetation community under the FM Act
– 97 listed threatened species, including 38 bird, six fish, three frog, 12 mammal, one coral, 25 plant, six reptile, five shark, and one snail species
– 62 listed migratory species.

No threatened flora species or populations were detected during the field survey, and none are considered likely to occur based on the habitat characteristics of the proposal site.

The 97 listed threatened species and 62 migratory species with the potential to occur in or within proximity to the proposal site were considered unlikely to occur or have a low likelihood of occurring due to the lack of suitable or optimal habitat for these species. Some of these species have the potential to transit (fly/swim) through, however are unlikely to persist in the proposal site. These transient species also have a large habitat range, and the proposal site would only constitute suboptimal foraging habitat for these species.

The mangrove vegetation is considered to provide suitable refuge habitat for threatened shore/wading birds such as the Australian bittern (*Botaurus poiciloptilus*), listed as endangered under the BC Act and EPBC Act, and the black bittern (*Ixobrychus flavicollis*), listed as vulnerable under the BC Act. There was minimal open intertidal sand/mud flat habitat suitable for several other threatened/migratory shore/wading birds, though some may forage during low tide. For example, the Bush Stone-curlew (*Burhinus grallarius*) has been observed in nearby mangroves and shore areas of Bayview. However, this habitat is not considered to be of high quality for these

species due to the small size, relatively open canopy (for the bitterns), the close proximity to an off-leash dog beach, and urbanised landscape.

#### Priority weeds

Three priority weeds were identified during in and around the proposal site during the field survey, including African boxthorn (*Lycium ferocissimum*), Climbing asparagus (*Asparagus africanus*) and Ground asparagus (*Asparagus aethipicus*).

## 6.5.2 Potential impacts

### Construction

#### Vegetation clearing

Construction of the proposal would require the clearing of some vegetation within the proposal site to facilitate the removal and reconstruction of the existing seawall and footpath. It is anticipated that the proposal would require the removal of:

– Up to 0.03 hectares of the Swamp Oak Forest TEC
– Up to 0.01 hectares of mangroves
– Up to 0.03 hectares of exotic/non-native vegetation.

The removal of the Swamp Oak Forest would include some mature trees and foraging habitat resources. A five-part Test of Significance under the BC Act was undertaken by Cardno in 2019 for the Swamp Oak Forest TEC, which determined that the removal of up to 0.03 hectares of Swamp Oak Forest is not considered to be significant to the local occurrence of the TEC within and surrounding the proposal site. As such, a Species Impact Statement or entry into the Biodiversity Offset Scheme would not be required for the proposal.

#### Marine vegetation and habitat removal

Construction of the proposal would require removal of up to 0.01 hectares of mangroves along the northern edge of the proposal site. Vegetation within and surrounding the proposal site has been subject to previous disturbances historically from boating operations, construction of Pittwater Road and maintenance of the seawall, and installation of utilities such as the sewer pipeline. As such, the removal of a small area of mangroves is not considered likely to place the mangrove corridor within the proposal site at risk of degradation, fragmentation, or further loss.

Construction would also remove the intertidal rocky shore habitat (i.e. retaining wall) within the proposal site. Appropriate materials, such as rip rap toe, would be used in construction at the base of the retaining wall to provide improved habitat creation opportunities. Over time, habitat would be reinstated, and recruitment of existing community is likely to occur following the completion of construction.

All marine vegetation could be susceptible to indirect impacts during construction activities. The disturbance of fill materials at the current footpath location and potential disturbance of ASS during construction could result in the mobilisation of contaminants.

Removal of mangroves and the intertidal rocky shore habitat would require a Part 7 Permit under Section 205 and 200 of the FM Act, respectively, prior to the commencement of construction.

#### Impacts to terrestrial fauna and habitat

Construction of the proposal would reduce the availability of fauna habitat within the proposal site through the removal of the Swamp Oak Forest. Several mature swamp oak trees containing mistletoes (nectar resources) would be removed as well as disturbance of the existing retaining wall habitat. The retaining wall is considered unlikely to support microbat roosts or shelter for threatened terrestrial mammals.

Due to the urbanised landscape, the fauna species likely to occur within adjoining vegetated areas are those typical of modified urban areas that are unlikely to be affected by noise and activity associated with the construction of the proposal.

**Introduction and spread of weeds and pathogens**

Disturbance associated with minor vegetation clearing, vehicle traffic, soil movement and construction work associated with the proposal would increase the potential for the introduction, establishment and spread of new weed species, and diseases and pathogens. Diseases and pathogens can be introduced or spread to site via dirt or organic material attached to machinery, vehicles, equipment, and employees. The potential for significant or new impacts associated with these pathogens is relatively low, given the existing modification, urbanisation, and extent of human visitation across the proposal site and surrounding area.

### Operation

The proposal would result in the stabilisation of the embankment, reducing erosion and reducing the potential for sedimentation impacts in the intertidal area and mangroves. It is also anticipated that the mangroves would regenerate following the completion of construction, as succession of mangroves via seedlings were noticed following disturbances for the construction of Pittwater Road and the installation of the sewer pipeline and other utilities within the project site.

## 6.5.3 Mitigation measures

Mitigation measures to prevent or minimise impacts to biodiversity during construction and operation of the proposal are detailed in Table 6.11 below.

***Table 6.11 Mitigation measures to minimise potential impacts on biodiversity***

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| Biodiversity | Notify DPI (Fisheries) would be notified in accordance with section 199 of the FM Act.<br>A permit under section 200 and 205 of the FM Act would be obtained prior to construction commencing to address harm to mangroves and the intertidal rocky habitat. | Northern Beaches Council | Detailed design / Pre-construction |
| | Rip rap toe would be included at the base of the retaining wall to provide improved habitat creation opportunities. | Contractor | Detailed design |
| | All workers would be provided with an environmental induction prior to starting work on site. This would include information on protection measures to be implemented to protect biodiversity values, and penalties for breaches. | Contractor | Pre-construction / Construction |
| | Management of flora and fauna would be included in the CEMP, incorporating recommendations made herein, and expanding on specific details where necessary. | Contractor | Pre-construction |
| | Management of weed and pest species would be incorporated into the project CEMP to manage weeds and pathogens during the construction and operational phase of the proposal. | Contractor | Pre-construction |
| | Erosion and sediment control plans would be prepared and established prior to the commencement of construction and would be updated and managed throughout as relevant to the activities during the construction phase. | Contractor | Pre-construction |
| | Sediment fences would be installed to prevent transfer of sediment into adjacent vegetation. | Contractor | Pre-construction |
| | Limit trimming of overhanging vegetation to the minimum necessary to undertake the proposal. No works would be undertaken in adjacent vegetation. | Contractor | Construction |
| | Overhanging vegetation that needs to be trimmed should be inspected prior to works commencing, to make sure no birds or other native fauna species are nesting in it. If any fauna species are located in vegetation to be trimmed, NSW Wildlife Information Rescue and Education Service, Sydney Wildlife or a suitably qualified ecologist or fauna handler should be | Contractor | Construction |

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| | contacted and tasked with relocating the animal to a safe location. | | |
| | Measures to suppress dust, prevent erosion and sedimentation would be implemented during construction works associated with the site remediation. | Contractor | Construction |
| | Erosion and sediment controls would be regularly inspected, particularly following rainfall events, to ensure their ongoing functionality. | Contractor | Construction |
| | DPI Fisheries (1800 043 536) and the EPA (131 555) would be notified immediately if any fish kill occurs in the vicinity of construction activities. In such cases, all works other than emergency response procedures would cease until the issue is rectified and approval is given by DPI Fisheries and/or the EPA for the works to proceed. | Contractor | Construction |
| | Mangrove seedlings would be replanted following the completion of construction to offset the mangroves removed and rehabilitate the intertidal zone disturbed during construction. | Contractor | Post-construction |

# 6.6 Aboriginal heritage

## 6.6.1 Existing environment

A search of the Aboriginal Heritage Information Management Systems (AHIMS) database was undertaken on 13 July 2022 of the proposal site to identify any Aboriginal heritage items of significance in the vicinity of the proposal site. The search identified four listed Aboriginal sites in or within 200 metres of the project site. An extensive search was undertaken to identify the locations of the registered sites

As summarised in Table 6.12, the search identified one Aboriginal heritage site within 50 metres of the proposal site. The extensive search report is provided in Appendix E.

***Table 6.12 AHIMS search results***

| Site ID | Site name | Site feature | Approximate distance from proposal site |
|---|---|---|---|
| 45-6-1566 | Bayview | Shell – artefact (midden) | 49 metres northeast |
| 45-6-2689 | 1927 Pittwater Rd Midden 2 | Shell – artefact | 182 metres southwest |
| 45-6-2789 | 1927 Pittwater Rd – PAD | Potential archaeological deposit (PAD) | 198 metres southwest |
| 45-6-2688 | 1927 Pittwater Rd Midden 1 | Shell – artefact | 117 metres west |

## 6.6.2 Potential impacts

### Construction

The proposal is unlikely to result in impacts to Aboriginal heritage as no registered sites have been identified within or immediately adjacent to the proposal site. Additionally, the project site and surrounding environment has been subject to extensive disturbance for the establishment of Pittwater Road and neighbouring developments, and the installation of other existing infrastructure, including the stormwater and sewer pipelines.

There is a risk that unidentified Aboriginal sites or places may be encountered during demolition and construction works as any land within 200 metres of water is considered to have Aboriginal heritage sensitivity and the potential to contain Aboriginal sites. However, the site would have been disturbed considerably during the construction of Pittwater Road and the existing footpath, so it is considered that the potential for Aboriginal archaeology is unlikely.

The proposal site has been previously heavily disturbed and the potential impacts on Aboriginal heritage during operation of the proposal are not expected. An unexpected finds protocol is proposed to address residual risk to Aboriginal heritage.

### Operation

The proposal would not result in any potential impacts to Aboriginal heritage during operation.

## 6.6.3 Mitigation measures

Mitigation measures to prevent or minimise impacts to Aboriginal heritage during construction and operation of the proposal are detailed in Table 6.13 below.

***Table 6.13 Mitigation measures to minimise potential impacts on Aboriginal heritage***

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| Aboriginal heritage | Site information for AHIMS site 45-6-1566 would be updated on the AHIMS register to reflect the current extent and condition of the site as observed during further investigation. | Northern Beaches Council | Pre-construction |
| | The construction timing would be communicated with the Aboriginal Heritage Office (AHO) before site establishment, and notification of earthworks would be provided to the AHO seven days before commencement | Contractor | Pre-construction |
| | Preparation of unanticipated discovery protocol documentation would be the responsibility of the Contractor, and would be prepared by a suitably qualified environmental consultant | Contractor | Pre-construction |
| | The Contractor and any sub-contractors would be responsible for minimising the footprint of construction and keeping all works to areas designated and marked out on the approved plans | Contractor | Construction |
| | During construction all workers and contractors would be made aware of their obligations to avoid harm to Aboriginal sites and areas of Aboriginal sensitivity.<br>Relevant staff and contractors working in sensitive areas to complete any Aboriginal Sites Awareness course or equivalent. | Contractor | Pre-construction/ Construction |
| | Any suspicious or unusual finds would be immediately referred to Northern Beaches Council and the AHO for assessment. If the objects be found to be Aboriginal, Heritage NSW and the Metropolitan Local Aboriginal Land Council should be contacted.<br>Should any Aboriginal archaeological evidence or Aboriginal heritage items be uncovered, work would temporarily cease within the area and the Unanticipated Discovery Protocol would be followed. | Contractor | Pre-construction/ Construction |
| | Stop work provisions (unexpected discovery protocol) would be developed and implemented in the unlikely event that human remains are uncovered. Should human remains be uncovered, works would cease and the NSW Police would be contacted. | Contractor | Pre-construction/ Construction |

# 6.7 Non-Aboriginal heritage

## 6.7.1 Existing environment

A search of the following databases was undertaken to identify listed heritage sites in or adjacent to the project site:

– Australian Heritage Database

– State Heritage Register

– Section 170 Register (undertaken via the State Heritage Inventory search tool)

– *Pittwater Local Environmental Plan 2014*.

The desktop searches identified no items on the Commonwealth, National or State Heritage Register within the proposal site or immediate surrounds. Listed heritage items within the vicinity of the proposal are summarised in Table 6.14 and shown in Figure 6.8.

***Table 6.14 Heritage items within the vicinity of the proposal***

| Item name | Item number | Address | Listing | Position in relation to the proposal site |
|---|---|---|---|---|
| Sea Scout Hall | Item #2270406 | 1672 and 1678 Pittwater Road (grounds of Lot 23 DP 4010 and Lot 7047 DP 93802 Bayview Park) | Pittwater LEP | Immediately adjacent (southeast) |
| Sandstone Retaining Wall | Item #2270057 | Within road reserve at Pittwater Road and Fermoy Avenue junction | Pittwater LEP | Around 10 metres south |
| Street trees – *Araucaria* species | | Pittwater Road and Fermoy Avenue (within road reserve) | Pittwater LEP | Around 20 metres south |
| Street Trees - 1 Bunya Pine (*Araucaria Bidwillii*), 2 Norfolk Island Pines (*Araucaria Heterophylla*) | Item #2270046 | Adjacent to 1710 and 1712 Pittwater Road (within road reserve) | Pittwater LEP | Around 60 metres west |
| Maybank House ("Stoneleigh") and plaque | Item #2270340 | 1945 Pittwater Road | Pittwater LEP | Around 250 metres southwest |
| World War II Tank Traps | Item #2270357 | Adjacent to 1734 Pittwater Road | Pittwater LEP | Around 290 metres northwest |


Paper Size ISO A4

0 10 20 30 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

**Northern Beaches Council**
**Bayview Seawall Design**
**Review of Environmental Factors**

## Non-Aboriginal heritage items in or near the proposal site

Project No. **12542425**
Revision No. **A**
Date **2/09/2022**

# FIGURE 6.8

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Print date: 02 Sep 2022 - 17:04

Data source: DPE: Heritage, 2022. LPI: DTDB, 2017. Metromap Tile Service: . Created by: kpsroba

The Sea Scout Hall is a one-storey timber structure and is located at the south-eastern point of the proposal site. The structure is supported on concrete piers and has a timber boat ramp providing access to Pittwater. The existing footpath along Pittwater Road runs adjacent to the Sea Scout Hall (refer to Figure 6.9).

*Figure 6.9 View of the Sea Scout Hall and existing footpath along Pittwater Road (left: facing south; right: facing north)*

The street trees, of the genus *Araucaria* are conifers within the road reserve, west of the proposal site.

The sandstone retaining wall is located on the embankment on the southern side of Pittwater Road. The wall is directly across the road from the proposal site.

## 6.7.2 Potential impacts

### Construction

The proposal is located adjacent to the Sea Scout Hall. The south-eastern portion of the proposal site and the proposed compound site are located within the curtilage of the Sea Scout Hall. Construction works for the removal and replacement of the existing footpath would also be undertaken within the curtilage of the Sea Scout Hall, as the footpath is located adjacent to Pittwater Road and would need to be replaced to align with the new shared path (refer to. These works are not anticipated to result in any direct impacts to the heritage item as the works would be limited to the footpath area. The proposed compound sites would have fencing installed to ensure the placement of materials, plant or equipment would not impact the heritage item.

The proposal may result in an indirect visual impact to the heritage value of the building due to construction activities and fencing, however these impacts would be temporary and short-term in nature. The landscape surrounding the Sea Scout Hall would be reinstated or rehabilitated where required at the completion of construction.

The proposal may result in indirect impacts to the Sandstone Retaining Wall, as the sandstone wall is located across from the proposal site. These indirect impacts may include dust and vibration impacts as a result of construction activities being undertaken in a close proximity. However, these impacts would also be temporary and short-term in nature and not considered to result in damage to the Sandstone Retaining Wall.

The proposal would not impact on the street trees as the proposal has been designed to avoid these heritage items.

### Operation

The proposal would not result in any potential impacts to non-Aboriginal heritage during operation.

## 6.7.3 Mitigation measures

Mitigation measures to prevent or minimise impacts to non-Aboriginal heritage during construction and operation of the proposal are detailed in Table 6.15 below.

*Table 6.15 Mitigation measures to minimise potential impacts on non-Aboriginal heritage*

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| Non-Aboriginal heritage | The location of heritage items within proximity to the proposal site (in particular Bayview Sea Scouts Hall, Sandstone Retaining Wall, and Street trees) would be clearly demarcated on all environmental site plans. | Contractor | Pre-construction |
| | Prior to the commencement of works, site personnel are to be briefed as to the location and management of non-Aboriginal heritage listed items in close proximity to the site. | Contractor | Pre-construction |
| | Materials and equipment are not to be stored within close proximity to an identified heritage item. | Contractor | Construction |
| | Where feasible, maintain a sufficient buffer from identified heritage item, or implement protective exclusion fencing, or similar, in order to minimise damage or disturbance to the item. | Contractor | Construction |
| | All work the affected area would be ceased in the event of an unexpected find of an archaeological deposit (or suspected item), and the Heritage Division NSW would be notified in accordance with Section 146 of the *Heritage Act 1977*. | Contractor | Construction |

# 6.8 Land use, social and visual environment

## 6.8.1 Existing environment

Pittwater Road is a regional road connecting Bayview to Mona Vale to the south and Church Point to the north and is also used as part of the Church Point Pittwater walking trail heavily used by residents and visitors. The proposal would be undertaken within Council land zoned under the Pittwater LEP as C4 Environmental Living. The existing pedestrian walkway provides access points to the Gibson Marina and Bayview Baths to the north and the Bayview Tennis Club, Bayview Sea Scouts and Bayview Park to the south. The varied failure of the existing seawall running along the northern verge of the bend in Pittwater Road has caused erosion of the embankment to occur resulting in safety concerns regarding the narrowness, restricted disabled accessibility and closeness to vehicular traffic of the existing footpath also.

The suburb of Bayview supports land uses for predominantly recreational and residential purposes and accommodate several retail stores and cafes. The area surrounding the proposal site generally comprises of low-density residential dwellings on the southern side of Pittwater Road, stands of native vegetation and mangroves, recreational areas and commercial areas at the northern and southern extent of the proposal site.

The waters of Pittwater are to the north of the proposal site with a vista of the water, boats, marinas and bushland in the background. Due to the proximity to water and the foreshore, the area is considered to be of high scenic quality. Pittwater is located around the northern and eastern edge of Bayview and is used for multiple recreation and commercial purposes for both on shore and offshore activities which occur within the estuary including boating, recreational fishing, swimming and ferry operations. The proposal site is surrounded by several recreational areas including Bayview Baths, Bayview Tennis Courts, passive recreational areas, the foreshore and Rowland Reserve. Gibson Marina, including a café and other businesses, lies on the western extend of the proposal site.

## 6.8.2 Potential impacts

The proposal involves the removal of the existing footpath and armour rock and the construction of a new 2.2 metre wide footpath, including the installation of sandstone blocks and a hardwood beam to secure a new seawall. The proposal would be limited to the embankment, footpath and the area immediately adjacent to the seawall (north). As such, it is considered that the proposal would not have any adverse impacts on neighbouring land

uses. The proposal would facilitate safe and accessible recreational passage for the public and prevent further erosion through stabilisation of the embankment.

Direct impacts on land use during construction of the proposal would primarily relate to the short-term closure of the Bayview Church Point Pittwater walking trail that commences at the project site, and the presence of construction equipment, vehicles and personnel on Pittwater Road. This would restrict pedestrian access and the recreational use of the area in the immediate vicinity of the site.

Construction may also temporarily impact vehicular access in the immediate vicinity of the works. Potential traffic and access impacts are considered in Section 6.2.2.

During operation, the proposal would result in an additional visual element to the walking trail and seawall, however, would not result in a change of land use on the site.

**Social issues**

The proposed works would have impacts on recreational users of the area and patrons of the cafes and business at Gibson Marina during construction through amenity impacts, changes access arrangements and potential parking restrictions. Construction of the proposal may result in minor short term amenity impacts on the local community due to the following:

– Potential increase in construction traffic due to the delivery of plant, materials and construction personnel and disruption to access
– Increases in noise due to the operation of plant and equipment and increased traffic
– Potential dust disturbance due to exposed soils and stockpiles.

These issues have been outlined and assessed in other sections of this report, as follows:

– Noise and vibration (refer to Section 6.1)
– Traffic (refer to Section 6.2)
– Air quality (refer to Section 6.9).

Amenity impacts would be temporary and appropriately managed with the safeguards provided in the relevant sections above. Amenity in the broader area is unlikely to be impacted by construction as impacts would be localised and limited to areas immediately adjacent to the site.

**Visual**

Construction activities would be visible from residencies located along Pittwater Road in the vicinity of the proposal, and recreational foreshore users including users of the Gibson Marina, Bayview Tennis Club and Sea Scouts Hall. Following the completion of construction works and during operation, visual amenity would be impacted. Temporary visual impacts may occur as a result of construction works including ground disturbance, the presence of equipment and materials within the site and the presence of construction vehicles and personnel. Potential construction impacts would be localised and limited to a short-term construction period. Loss of vegetation along Pittwater Road and within the mangrove corridor has the potential to reduce the visual amenity of the proposal site.

The construction of a new footpath and sandstone seawall would be of similar visual characteristics to the existing infrastructure and provide a vantage point for the public to view the Pittwater Estuary and enhance safety and accessibility.

### 6.8.3 Mitigation measures

Mitigation measures to prevent or minimise impacts to land use and the social and visual environment during construction and operation of the proposal are detailed in Table 6.16 below.

***Table 6.16 Mitigation measures to minimise potential impacts on land use, social and visual environment***

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| Land use, social and visual environment | Notification signage would be displayed onsite at least seven days prior to construction to notify pedestrian and cyclist users of any access restrictions. | Contractor | Pre-construction |
| | All work equipment and materials would be contained within the designated boundaries of the work site and compound site. | Contractor | Construction |
| | Access to the Bayview Sea Scouts Hall and Bayview Tennis Club would be maintained throughout construction. | Contractor | Construction |
| | Construction areas would be maintained in a clean and tidy condition. | Contractor | Construction |
| | Construction vehicles and personnel onsite would be limited to those needed for that activity. All excess equipment would be moved offsite to reduce visual impacts. | Contractor | Construction |
| | All waste generated during the course of the works would be removed from the work area as soon as practicable or at the end of each work day and disposed of in accordance with the measures identified in Section 6.10. | Contractor | Construction |

# 6.9 Air quality

## 6.9.1 Existing environment

The area surrounding the proposal site is characterised by open water to the north, recreational areas to the southeast and west, commercial properties to the west and low-density residences to the south and southwest.

The nearest sensitive receivers are the residential properties located on Pittwater Road and Fermoy Avenue.

Climate data for Bayview was obtained from the Bureau of Meteorology (BoM) Terrey Hills automatic weather station (site number 066059), which is the closest site with long-term data to the proposal site. On average, January is the hottest month with an average maximum temperature of 26.8 degrees. July is the coldest month, with average minimum temperature of 7.7 degrees. March is the wettest month with an average 190.2 millimetres of rainfall. May is the driest month, where 54.5 millimetres of rain falls on average (BoM, 2022).

A review of the National Pollutant Inventory revealed that there are no scheduled industries operating within the proposal site. The nearest scheduled industry is the Warriewood Sewerage Treatment Plant which is approximately 3.5 kilometres south of the proposal site. Given the distance of Warriewood Sewerage Treatment Plant from the proposal site, it is unlikely air quality in the proposal site would be affected.

Existing air quality at the proposal site is likely to be representative of a residential area, with influence of fugitive emissions from local road traffic.

## 6.9.2 Potential impacts

### Construction

Construction activities for the proposal have the potential to result in the following impacts to air quality:

– Emissions from the operation of construction vehicles, machinery and equipment
– Generation of dust from exposed, disturbed soil surfaces under high wind speeds or as a result of the operation of construction vehicles and equipment.

Impacts to air quality due to the generation of dust and exhaust emissions would be highly localised, short term and temporary. These impacts would be minimised by the implementation of appropriate mitigation measures.

### Operation

The proposal would rehabilitate the existing seawall and replace the existing footpath and would not alter the land use of the proposal site. As such, no air quality impacts are anticipated during operation of the proposal.

## 6.9.3 Mitigation measures

Mitigation measures to prevent or minimise air quality impacts during construction and operation of the proposal are detailed in Table 6.17 below.

***Table 6.17 Mitigation measures for potential air quality impacts***

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| Air quality | No materials would be burned on site. | Contractor | Construction |
| | Dust impacts would be minimised during construction through:<br>– Dust generated during construction would be visually monitored by construction staff. If dust generation is evident, measures such as water sprays, minimising vehicle movements and reducing vehicle speed limits would be carried out to reduce dust emissions<br>– Stockpiles would be stabilised to minimise wind erosion and the generation of dust<br>– Stabilisation and revegetation of disturbed areas would be undertaken as soon as practicable<br>– Any dust complaints would be investigated as soon as possible, and measures taken to manage any impacts identified<br>– During transportation, loads would be adequately covered. | Contractor | Construction |
| Energy and emissions | Maintain construction plant and equipment in good working condition. | Contractor | Construction |
| | Turn off plant and machinery when not in use as much as practicable and fit with emission control devices complying with Australian design standards. | Contractor | Construction |

# 6.10 Waste management

## 6.10.1 Existing environment

The proposal site consists of an existing seawall and concrete footpath and does not generate waste. Minimal waste may occur on site due to littering by the public or passing vehicles, or waste washing up on shore from Pittwater.

## 6.10.2 Potential impacts

Construction activities would generate various waste streams that would need to be managed and disposed of. Potential wastes include:

– Waste fuels, oils, liquids and chemicals
– Packaging wastes such as cardboard, timber, paper and plastic
– General garbage and sewage from the temporary compound
– Potential for ASS in the marine environment
– Potential for contaminated soils and sediment
– Various building material wastes (including metals, timbers, plastics and concrete)
– Earthworks spoil
– Asphalt and concrete

– General waste, including food, litter and other wastes generated by the construction workers.

Landside ancillary facilities would be contained within the site compound, and include a portable toilet, and small shipping container/shed. Minimal storage of materials is anticipated but may include precast materials and some plant and equipment. All waste removed from the proposal footprint would be transferred by a licenced contractor to a licenced receiving facility.

Any excavated material would be reused where suitable or classified before being disposed to an appropriately licenced facility in accordance with *Waste Classification Guidelines: Part 1 Classifying Waste* (EPA, 2014). Where necessary, this would include sampling and analysis.

## 6.10.3 Mitigation measures

Mitigation measures to prevent or minimise waste impacts during construction and operation of the proposal are described in Table 6.18 below.

***Table 6.18 Mitigation measures to manage waste for the proposal***

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| Waste generation and disposal | Follow the resource management hierarchy principles:<br>– Avoid unnecessary resource consumption as a priority<br>– Re-use materials, reprocess, recycle and recover energy<br>– Dispose as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*. | Contractor | Pre-construction / Construction |
| | Manage all waste in accordance with the POEO Act, *Waste Classification Guidelines* (EPA, 2014) and the *Waste Avoidance Resource Recovery Strategy* (EPA, 2014). | Contractor | Construction |
| | Undertake a daily site clean-up and provide labelled waste receptacles to promote the segregation of waste and recycle materials where appropriate. | Contractor | Construction |
| | Contain liquid waste in appropriate sealed containers. | Contractor | Construction |
| | Test all excavated materials in accordance with the requirements of the *Waste Classification Guidelines* (EPA, 2014). Dispose of any contaminated material in accordance with the Waste Classification Guidelines, while management of ASS is to be in accordance with an ASS management plan attached to the CEMP. | Contractor | Construction |
| | Reuse or remove all waste generated during the course of the works from the work areas as soon as practicable. | Contractor | Construction |
| | Seal and label all vessels used for contaminated or hazardous waste according to their contents, and store within bunded areas until their removal from the construction boundary. | | |
| | Leave the proposal site clean and free of weeds, debris and other rubbish at the end of works. | Contractor | Construction |
| | Provide portable toilets for construction workers and manage to ensure the appropriate disposal of sewage (i.e. removed by a licensed supplier). Portable toilets should be located away from drainage lines. | Contractor | Construction |
| | Follow mitigation measures for weed disposal as defined in Section 6.5.3. | Contractor | Construction |

# 6.11 Cumulative impacts

## 6.11.1 Existing environment

The proposal site is located within the suburb of Bayview, in the Northern Beaches LGA. A search of the Department of Planning and Environment (DPE) major project register was undertaken on 13 July 2022 to identify any current or proposed developments in the locality. The search identified no current or proposed major developments occurring within the immediate vicinity of the proposal site. The closest major projects identified within the locality are detailed in Table 6.19 below.

***Table 6.19 NSW DPIE major projects identified within the locality***

| ID | Project name | Location | Stage | Approximate distance from proposal site |
|---|---|---|---|---|
| SSD-10291 | St Luke's Grammar School – Senior School Campus and Sports Centre | 210 Headland Road, Dee Why<br>224 Headland Road, North Curl<br>800 Pittwater Road, Dee Why | Assessment | 13 km south of proposal site |
| SSD-6980 | Brookvale Community Health Centre | 612, 620 and 624 Pittwater Road, Brookvale | Determination | 14 km south-east of proposal site |
| DA7/98-Mod-6 | Mod 6 – ABC Paper Mill – Wetherill Park | 620 Pittwater Road, Brookvale | Determination | 14 km south-east of proposal site |

In addition, a search of the Northern Beaches Council's development application tracking database was also undertaken to identify any determined or submitted DA's in the locality. The search identified no determined or submitted DA's occurring within the immediate vicinity of the proposal site.

The closest DAs identified within the locality are detailed in Table 6.20 below.

***Table 6.20 Current development applications within the Bayview locality***

| DA No. | Address | Status | Approximate distance from proposal site |
|---|---|---|---|
| DA2022/1150 | 11 Valley Close, Bayview | Current | 950 metres southwest of proposal site |
| Mod2022/0385 | 9 Ilya Avenue, Bayview | Under Assessment | 1.2 kilometres west of proposal site |
| DA2022/1127 | 26 Gilwinga Drive, Bayview | Current | 2.6 kilometres southwest of proposal site |

## 6.11.2 Potential impacts

Due to the location of the projects identified, there is limited opportunity for the developments in the locality to result in cumulative impacts.

There is potential for the proposal to result in a minor increase in construction vehicles and light traffic along Pittwater Road during construction, however any impacts would be temporary and short-term in nature.

No operational cumulative impacts are anticipated.

## 6.11.3 Mitigation measures

Mitigation measures to prevent or minimise cumulative impacts during construction and operation of the proposal are described in Table 6.21 below.

*Table 6.21 Mitigation measures to manage potential cumulative impacts of the proposal*

| Environmental aspect | Mitigation measure | Responsibility | Timing |
|---|---|---|---|
| Cumulative construction impacts | Construction would include notification prior to the start of the works. Updates on any delays or changes to the construction period would also be communicated. | Northern Beaches Council / Contractor | Pre-construction / Construction |

# 7. Environmental management

The proposal requires environmental mitigation measures to a suitable standard that would be implemented through a CEMP or equivalent, to reduce any potential adverse impact arising from the proposed works on the surrounding natural and built environment.

The CEMP would also identify the requirements for compliance with relevant legislation and other regulatory requirements to ensure environmental mitigation measures described throughout this REF are implemented.

The mitigation measures indicated in Table 7.1 would be incorporated into the Contractor's CEMP that would form part of the contractual obligations. This is a general list of mitigation measures that would be implemented as necessary and in accordance with the particular location and activity being undertaken.

***Table 7.1 Summary of mitigation measures***

| Aspect | Mitigation measure |
|---|---|
| **General** | A CEMP would be prepared, implemented and monitored by the contractor on behalf of Council for the proposal. The key objectives of the CEMP would include:<br>– Ensuring that the works are carried out in accordance with statutory requirements and relevant non-statutory policies<br>– Ensuring that the works are carried out in accordance with the assessments detailed in this REF to mitigate the potential for adverse environmental impacts<br>– Ensuring that employees engaged to undertake the works comply with the conditions detailed in the CEMP<br>– Identifying management responsibilities and reporting requirements to demonstrate compliance with the CEMP.<br>The CEMP would be a working document and would be amended should strategies initially implemented be found to be inadequate to manage environmental impacts. The CEMP would typically:<br>– Establish environmental goals and objectives<br>– Detail the conditions of approval or determination<br>– List actions, timing and responsibilities for implementing actions that arise from the mitigation measure recommended in this REF<br>– Detail statutory requirements<br>– Provide a framework for reporting on relevant matters on an ongoing basis<br>– Outline emergency procedures, including contact names and corrective actions<br>– Detail process surveillance and auditing procedures<br>– List complaint handling procedures<br>– Detail quality assurance procedures. |
| **Community consultation** | Complaints received will be recorded and attended to promptly. On receiving a complaint, works will be reviewed to determine whether issues relating to the complaint can be avoided or minimised. Feedback will be provided to the complainant explaining what remedial actions were taken. |
| **Construction noise and vibration** | All work would be carried out within standard construction hours:<br>– Monday to Friday: 7 am to 5 pm<br>– Saturday: 8 am to 1 pm<br>No construction activities would occur on Sundays and public holidays. |
| | Notification would be provided to potentially affected receivers about upcoming construction activities. The notification should include:<br>– Details and timeframe of construction works<br>– Contact details of the site manager / project manager<br>Contact details would also be provided on a site board. |
| | A complaints register would be maintained throughout construction detailing:<br>– Contact details and address of the complainant<br>– The time and nature of complaint<br>– Review of work activities |

| Aspect | Mitigation measure |
|---|---|
| | – Measures undertaken in response to the complaint.<br>Staff would be briefed on current and future construction activities and notified of any complaints from the community. |
| | All employees, contractors and subcontractors would receive an environmental induction. The induction must at least include:<br>– All relevant project specific and standard noise mitigation measures<br>– Relevant licence and approval conditions<br>– Permissible hours of work<br>– Location of nearest sensitive receivers<br>– Construction employee parking areas<br>– Designated loading/ unloading areas and procedures<br>Complaints register procedure. |
| | The following behaviours would be adopted onsite:<br>– No unnecessary shouting or loud stereos/radios would occur on onsite<br>No dropping of Materials from height, throwing of metal items and slamming of doors. |
| | The simultaneous use of construction equipment would be avoided where possible. Equipment would be turned off when not in use. Equipment would be serviced and maintained regularly. |
| | Quieter construction methods would be used where reasonable and feasible. |
| | Stationary noise sources would be silenced, enclosed or shielded where feasible and reasonable or located so as not to impact residences. |
| | A dilapidation report would be carried out and specific vibration criteria for the structure be developed if vibration intensive works, such as during excavation of the existing footpath, are required within two metres of the Bayview Sea Scouts Hall. The report would be prepared prior to the commencement of works to prevent vibration impacts. |
| **Traffic, transport and access** | A pre-construction dilapidation survey of the proposal site, compound site and Pittwater Road adjacent to the proposal site would be undertaken prior to works commencing. Any damages would be rectified prior to construction works being completed. |
| | A Traffic Management Plan (TMP) would be prepared and approved by Council prior to construction commencing. The TMP would include the following:<br>– Traffic control measures in construction works areas to maintain local traffic movements along Pittwater Road<br>– Restrictions on the delivery of materials to site during peak traffic periods<br>– Appropriate entry/exit points for the proposed construction compound areas<br>– The maintenance of safe and alternative pedestrian and cyclist access with consideration to temporary security fencing and wayfinding being implemented for each construction stage<br>– Designated parking for construction workforce that minimises impacts on public car parking spaces at the Gibson Marina and Bayview Tennis Club.<br>Preparation of a Road Traffic Control Plan in accordance with the '*Traffic control at work sites manual*' (Transport for NSW, 2022) and Australian Standard 1742.3 *Manual of uniform traffic control devices, Part 3: Traffic control for works on roads* for any planned traffic disruptions or road occupancy of Pittwater Road. |
| | Appropriate exclusion barriers, signage and site supervision would be employed at all times to ensure that the construction boundary is controlled, and that unauthorised vehicles and pedestrians are excluded from the works area. |
| | Signage, including contractor details and contact numbers, would be erected near the gate at the site. The signage would remain displayed on the site entrance throughout the duration of the proposed works. |
| | Only existing roads and access roads are to be utilised by construction vehicles and workers. |
| | The community is to be kept informed about the proposal through advertisements in the local media, notices and / or signs. |
| | All traffic control devices are to be in accordance with *AS 1742.3-2009 – Manual of uniform traffic control Devices: Traffic control for works on roads* and Transport for NSW *Traffic control at worksites manual*. |

| Aspect | Mitigation measure |
|---|---|
| **Soils and contamination** | A Soil and Water Management Plan (SWMP) would be prepared and implemented as part of the CEMP.<br>The SWMP would identify all reasonably foreseeable risks relating to soil erosion, sediment dispersion and water pollution and describe how these risks would be addressed during construction.<br>Erosion and sediment control measures would be implemented and maintained (in accordance with the *Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines 2004* (the Blue Book)) to:<br>– Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets<br>– Reduce water velocity and capture sediment on site<br>– Minimise the amount of material transported from site to surrounding waters and pavement surfaces<br>– Divert clean water around the site.<br>The SWMP would include, but not be limited to, the following erosion and sediment control measures:<br>– Sediment and erosion controls would be implemented before any construction commences and inspected regularly, particularly after a rainfall event and maintained to ensure effective operation<br>– All erosion and sediment control measures would be established before ground disturbance work commences and are to remain in place until all surfaces have been fully restored and stabilised. Restoration requires achievement of 70% groundcover<br>– Install sediment control devices parallel with the bank of the waterway to prevent runoff into the marine environment during high tide<br>– Sediment and erosion control devices would be inspected regularly, maintained to ensure effectiveness over the entire duration of the proposal<br>– If a stockpile is inactive on-site during construction for more than 20 days, it is required to have a coverage of 50 per cent.<br>Topsoil and subsoil would be stockpiled separately to ensure no mixture occurs. |
| | During earthworks, stockpile topsoils well away from the banks of the waterway. Only conduct earthworks in low tide or with water away from exposed soil. |
| | Minimise the disturbance and exposure of sediment and/or the underlying soils to oxygen. |
| | Fence areas of the proposal where necessary and practicable. Rehabilitated areas may need to be fenced to prevent access until site stability is established. |
| | Any spoil material storage areas or stockpiles would have appropriate erosion control devices installed to prevent erosion, control runoff and prevent sedimentation. |
| | Excess spoil would be removed from site and disposed offsite at an appropriately licenced waste disposal facility. |
| | In the event of a failure of sediment controls, DPI Fisheries would be immediately notified, and Northern Beaches Council would need to monitor the aquatic reserve for any impacts in consultation with DPI Fisheries. |
| | Fixed silt fences would be installed around any significant excavation and stockpiling activities seaward of the existing seawall. Silt fences should be installed as close as possible to the works area and may be removed after the first low tide following completion of excavation and stockpiling activities within each portion of the work area. |
| | The CEMP would include measures for spoil management, including but not limited to:<br>– Identification of materials during excavations including contaminated, ASS, excavated natural material or virgin excavated natural material<br>– Tracking of materials incoming and outgoing from site (e.g. as waste, quality of imported material).<br>Soils that require offsite disposal would be classified using the six-step process and criteria detailed in *Waste Classification Guidelines – Part 1: Classification of Waste* (NSW EPA, 2014). |
| | Earthworks would be undertaken during the following conditions to prevent dispersal of potential ASS via runoff or wind:<br>– No rainfall is forecast<br>– It is low tide.<br>Stabilisation would occur immediately following excavation works. |

| Aspect | Mitigation measure |
|---|---|
| | An Incident Emergency Spill Plan would be prepared as part of the CEMP and implemented during construction. The plan would include procedures for the storage and handling of hazardous materials including fuel and chemicals within the CEMP, including but not limited to:<br>– No refuelling to occur on-site unless appropriate bunded hardstand and spill protection / spill plan is prepared<br>– Storage of hazardous materials on-site to be kept to a minimum and would be in accordance with national guidelines and the Safety Data Sheets relating to bunding, coverage, storage of incompatible materials, etc.<br>– A spill kit would be kept on site. |
| | Should unexpected, contaminated soils be identified during any ground works, advice would be sought from a suitably qualified environmental consultant.<br>Works would be ceased in the immediate vicinity of any areas of suspected contamination that are identified prior to or during work. These areas would not be disturbed and blocked off as a safety risk.<br>Any additional investigations would be completed in general accordance with guidelines developed or endorsed by NSW EPA.<br>Indications of potential contamination may include:<br>– Stained or discoloured fill, soils or seepage water<br>– Odorous materials<br>– Imported materials such as ash or slag.<br>Contingency plans for unexpected finds protocols for contaminated soils would be included in the CEMP. |
| | An Acid Sulfate Soils (ASS) Management Plan would be prepared as part of the CEMP and implemented during construction. The plan would include the requirement to remove excavated soil off site or to the construction compound immediately and not stockpiling near the waterway. Excavated soil would be tested to determine whether it is PASS or ASS, and appropriately managed in accordance with the ASS Management Plan. |
| **Water quality** | An Incident Management Plan would be prepared as part of the CEMP and include a contingency plan and emergency procedures for dealing with the potential spillage of fuel or other environmental incidents that may occur during the proposed works. |
| | There is to be no release of dirty water into drainage lines and waterways. |
| | Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt fences or erosion and sediment controls. |
| | The bulk of construction works that are closest to the water would be scheduled during low tide to minimise the potential impact the water quality. |
| | The storage and handling of fuels and chemicals would be undertaken in accordance with Australian Standard AS1940. |
| | All erosion and sediment control measures described in Section 6.3.3 would be implemented to prevent mobilisation of sediments to the marine environment. |
| **Biodiversity** | Rip rap toe would be included at the base of the retaining wall to provide improved habitat creation opportunities. |
| | All workers would be provided with an environmental induction prior to starting work on site. This would include information on protection measures to be implemented to protect biodiversity values, and penalties for breaches. |
| | Management of flora and fauna would be included in the CEMP, incorporating recommendations made herein, and expanding on specific details where necessary. |
| | Management of weed and pest species would be incorporated into the project CEMP to manage weeds and pathogens during the construction and operational phase of the proposal. |
| | Erosion and sediment control plans would be prepared and established prior to the commencement of construction and would be updated and managed throughout as relevant to the activities during the construction phase. |
| | Sediment fences would be installed to prevent transfer of sediment into adjacent vegetation. |
| | Limit trimming of overhanging vegetation to the minimum necessary to undertake the proposal. No works would be undertaken in adjacent vegetation. |

| Aspect | Mitigation measure |
|---|---|
| | Overhanging vegetation that needs to be trimmed should be inspected prior to works commencing, to make sure no birds or other native fauna species are nesting in it. If any fauna species are located in vegetation to be trimmed, NSW Wildlife Information Rescue and Education Service, Sydney Wildlife or a suitably qualified ecologist or fauna handler should be contacted and tasked with relocating the animal to a safe location. |
| | Measures to suppress dust, prevent erosion and sedimentation would be implemented during construction works associated with the site remediation. |
| | Erosion and sediment controls would be regularly inspected, particularly following rainfall events, to ensure their ongoing functionality. |
| | DPI Fisheries (1800 043 536) and the EPA (131 555) would be notified immediately if any fish kill occurs in the vicinity of construction activities. In such cases, all works other than emergency response procedures would cease until the issue is rectified and approval is given by DPI Fisheries and/or the EPA for the works to proceed. |
| | Mangrove seedlings would be replanted following the completion of construction to offset the mangroves removed and rehabilitate the intertidal zone disturbed during construction. |
| **Aboriginal heritage** | The construction timing would be communicated with the Aboriginal Heritage Office (AHO) before site establishment, and notification of earthworks would be provided to the AHO seven days before commencement |
| | Preparation of unanticipated discovery protocol documentation would be the responsibility of the Contractor, and would be prepared by a suitably qualified environmental consultant |
| | The Contractor and any sub-contractors would be responsible for minimising the footprint of construction and keeping all works to areas designated and marked out on the approved plans |
| | During construction all workers and contractors would be made aware of their obligations to avoid harm to Aboriginal sites and areas of Aboriginal sensitivity.<br>Relevant staff and contractors working in sensitive areas would complete any Aboriginal Sites Awareness course or equivalent. |
| | Any suspicious or unusual finds would be immediately referred to Northern Beaches Council and the AHO for assessment. If the objects be found to be Aboriginal, Heritage NSW and the Metropolitan Local Aboriginal Land Council should be contacted.<br>Should any Aboriginal archaeological evidence or Aboriginal heritage items be uncovered, work would temporarily cease within the area and the Unanticipated Discovery Protocol would be followed. |
| | Stop work provisions (unexpected discovery protocol) would be developed and implemented in the unlikely event that human remains are uncovered. Should human remains be uncovered, works would cease and the NSW Police would be contacted. |
| **Non-Aboriginal heritage** | The location of heritage items within proximity to the proposal site (in particular Bayview Sea Scouts Hall, Sandstone Retaining Wall, and Street trees) would be clearly demarcated on all environmental site plans. |
| | Prior to the commencement of works, site personnel are to be briefed as to the location and management of non-Aboriginal heritage listed items in close proximity to the site. |
| | Materials and equipment are not to be stored within close proximity to an identified heritage item. |
| | Where feasible, maintain a sufficient buffer from identified heritage item, or implement protective exclusion fencing, or similar, in order to minimise damage or disturbance to the item. |
| | All work the affected area would be ceased in the event of an unexpected find of an archaeological deposit (or suspected item), and the Heritage Division NSW would be notified in accordance with Section 146 of the *Heritage Act 1977*. |
| **Land use, social and visual environment** | Notification signage would be displayed on site at least seven days prior to construction to notify pedestrian and cyclist users of any access restrictions |
| | All work equipment and materials would be contained within the designated boundaries of the work site. |
| | Access to the Bayview Sea Scouts Hall and Bayview Tennis Club would be maintained throughout construction. |
| | Construction areas would be maintained in a clean and tidy condition. |

| Aspect | Mitigation measure |
|---|---|
| | Construction vehicles and personnel on site would be limited to those needed for that activity. All excess equipment would be moved offsite to reduce visual impacts |
| | All waste generated during the course of the works would be removed from the work area as soon as practicable or at the end of each work day and disposed of in accordance with the measures identified in Section 6.10. |
| **Air quality** | No materials would be burned on site. |
| | Dust impacts would be minimised during construction through:<br>– Dust generated during construction would be visually monitored by construction staff. If dust generation is evident, measures such as water sprays, minimising vehicle movements and reducing vehicle speed limits would be carried out to reduce dust emissions<br>– Stockpiles would be stabilised to minimise wind erosion and the generation of dust<br>– Stabilisation and revegetation of disturbed areas would be undertaken as soon as practicable<br>– Any dust complaints would be investigated as soon as possible, and measures taken to manage any impacts identified.<br>During transportation, loads would be adequately covered. |
| **Energy and emissions** | Maintain construction plant and equipment in good working condition. |
| | Turn off plant and machinery when not in use as much as practicable and fit with emission control devices complying with Australian design standards. |
| **Waste generation and disposal** | Follow the resource management hierarchy principles:<br>– Avoid unnecessary resource consumption as a priority<br>– Re-use materials, reprocess, recycle and recover energy<br>– Dispose as a last resort (in accordance with the *Waste Avoidance and Resource Recovery Act 2001*. |
| | Manage all waste in accordance with the POEO Act, *Waste Classification Guidelines* (EPA, 2014) and the *Waste Avoidance Resource Recovery Strategy* (EPA, 2014). |
| | Undertake a daily site clean-up and provide labelled waste receptacles to promote the segregation of waste and recycle materials where appropriate. |
| | Contain liquid waste in appropriate sealed containers. |
| | Test all excavated materials in accordance with the requirements of the *Waste Classification Guidelines* (EPA, 2014). Dispose of any contaminated material in accordance with the Waste Classification Guidelines, while management of ASS is to be in accordance with an ASS management plan attached to the CEMP. |
| | Reuse or remove all waste generated during the course of the works from the work areas as soon as practicable. |
| | Seal and label all vessels used for contaminated or hazardous waste according to their contents, and store within bunded areas until their removal from the construction boundary. |
| | Leave the proposal site clean and free of weeds, debris and other rubbish at the end of works. |
| | Provide portable toilets for construction workers and manage to ensure the appropriate disposal of sewage (i.e. removed by a licensed supplier). Portable toilets should be located away from drainage lines. |
| | Follow mitigation measures for weed disposal as defined in Section 6.5.3. |
| **Cumulative construction impacts** | Construction would include notification prior to the start of the works.<br>Updates on any delays or changes to the construction period would also be communicated. |

# 8. Environmental checklist

## 8.1 Section 171 considerations

Section 171 of the EP&A Regulation provides a list of factors that should be considered in determining the likely impacts of any activity on the natural and build environment. These factors are considered in Table 8.1 with reference to the proposal.

***Table 8.1 Section 171 considerations***

| Section 171 factor | REF finding | Potential impact |
|---|---|---|
| (a) Any environmental impact on a community | The proposal has the potential to result in short-term amenity related impacts in the vicinity of the works associated with the construction phase. These impacts would be managed through the implementation of the proposal CEMP. | Short-term – minor negative<br><br>Long-term – nil |
| (b) Any transformation of a locality | The proposal would be located within an existing road corridor with existing pedestrian facilities, with the proposal consistent with the existing and prior uses of the proposal site.<br>Any transformation of the locality as a result of the widened pedestrian path would be minor and consistent with the existing environment. | Nil |
| (c) Any environmental impact on the ecosystems of the locality | The biodiversity assessment identified that while there would be some removal of Swamp Oak Forest and mangrove vegetation, the vegetation removal was not considered likely to significantly impact the local occurrence of the Swamp Oak Forest within and surrounding the proposal site and would not place the mangrove corridor within the proposal site at risk of degradation, fragmentation, or further loss. | Minor |
| (d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality | The proposal would not result in any reduction of these qualities or values. The proposal would reduce the erosion occurring within the intertidal zone at Bayview and improve the safety and accessibility of the footpaths along Pittwater Road for both pedestrians and cyclists. | Nil |
| (e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations | The proposal would not impact on a locality, place or building with aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value. | Nil |
| (f) Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*) | No impacts on protected fauna within the meaning of the *NPW Act* are predicted. | Nil |
| (g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air | The proposal would not endanger any species of plant, animal or other form of life. | Nil |
| (h) Any long-term effects on the environment | The proposal would replace and rehabilitate existing elements in the landscape that are consistent with the land use zoning of the site. The proposal would have positive long-term benefits on the environment by stabilising the embankment and reducing erosion of the road verge adjacent to the intertidal zone. | Positive |

| Section 171 factor | REF finding | Potential impact |
|---|---|---|
| (i) Any degradation of the quality of the environment | The proposal has the potential to result in minor impacts to the quality of the environment associated with vegetation removal, visual amenity, drainage and dust, traffic and parking during construction. These impacts would be managed through the implementation of mitigation measures. No long-term impacts to the quality of the environment are predicted. | Minor |
| (j) Any risk to the safety of the environment | The construction of the proposal is not considered to result in any risk to the safety of the environment. Safety in the vicinity of the proposal would be managed by the contractor/s. | Nil |
| (k) Any reduction in the range of beneficial uses of the environment | The proposal would require closure of the existing footpath during construction to facilitate construction activities. Detours and other pedestrian access would be provided. Any impacts associated with the closure of the footpath would be short-term nature.<br>The proposal would not result in any long-term reduction in the range of beneficial uses of the environment. | Short-term – minor negative<br><br>Long-term – nil |
| (l) Any pollution of the environment | The proposal has the potential to result in minor short-term erosion and air quality impacts during construction. These impacts would be managed through the implementation of the CEMP. Operation of the proposal would not produce any emissions and no long-term pollution impacts are predicted. | Short-term - minor negative<br><br>Long-term – nil |
| (m) Any environmental problems associated with the disposal of waste | Waste created during the works period would be disposed of offsite at an appropriate licenced waste facility and recycled where possible. | Nil |
| (n) Any increased demands on resources (natural or otherwise) that are, or are likely to become in short supply | The proposal would not increase the demand on any resources that are or are likely to become in short supply. | Nil |
| (o) Any cumulative environmental effect with other existing or likely future activities | No significant cumulative impacts were identified as a result of the interaction of the proposal with other projects. | Nil |
| (p) any impact on coastal processes and coastal hazards, including those under projected climate change conditions | The proposal would not impact coastal processes and coastal hazards. | Nil |
| (q) applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1 | Refer to Section 4.1.1. | Nil |
| (r) other relevant environmental factors. | In considering the potential impacts of this proposal all relevant environmental factors have been considered, refer to Chapter 6 of this assessment. | Short-term – minor |

# 9. Conclusion

The proposal involves replacement of the existing seawall and footpath along Pittwater Road in Bayview. The proposal is subject to assessment under Division 5.1 of the EP&A Act. The review of environmental factors has examined and considered to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity under Section 171 of the Environmental Planning and Assessment Regulation 2021.

This REF assesses the potential impacts of the proposal and recommends mitigation measures to manage the identified impacts. On balance the proposal is considered justified with the benefits outweighing the adverse impacts.

The proposal would involve the clearing of mangroves and Swamp Oak Forest, which belongs to an endangered ecological community, although this would not result in a significant impact. A part 7 fisheries permit is also required for dredging and reclamation works and harm to marine vegetation on water land.

The proposal has the potential to result in other minor adverse impacts associated with construction. These include impacts on water quality, noise, air quality, traffic and the visual environment. There would also be restricted access to the proposal site (particularly the pedestrian footpath) during construction. These impacts would be temporary and localised in nature. Mitigation measures would be implemented to minimise these potential impacts.

Overall, the potential negative impacts associated with the proposal are considered to be minor and able to be adequately managed by implementing the mitigation measures listed in Chapter 7. The proposal is unlikely to have a significant impact on the environment and, accordingly, an environmental impact statement is not required.

In the long term, the proposal would result in an improvement to the area compared with existing conditions as it would protect the infrastructure and minimise future erosion of the bank. The proposal would also have a positive impact on the community by providing improved footpath safety and accessibility for pedestrians and cyclists using Pittwater Road.

# 10. References


Bureau of Meteorology (2022), *Climate statistics for Australian locations – Terry Hills AWS*. Bureau of Meteorology. Available: **Climate statistics for Australian locations (bom.gov.au)**

Cardno (2019), *Preliminary Environmental Investigation – Shared Pathway from Bayview Baths to Tennis Courts*

Department of Environment and Climate Change (2009), *Interim Construction Noise Guideline.*

Department of Environment. Climate Change and Water (2011), *Road Noise Policy*.

NSW Environment Protection Agency (2014) *Waste Classification Guidelines*.

NSW Environment Protection Authority (2017), *Noise Policy for Industry*.

GHD (2021), *Bayview Seawall Upgrade – Design Options Report*.

JK Geotechnics (2018), *Geotechnical Investigation for Proposed Footpath Routes at Bayview Tennis Club to Bayview Baths*.

Lawson Treloar Pty Ltd (2003), *Pittwater Estuary Processes Study*.

NSW Acid Sulfate Soil Management Advisory Committee (1998), *Acid Sulfate Soil Manual*.

Transport for NSW (2016), *Construction Noise and Vibration Guideline*.

# 11. Limitations

This report has been prepared by GHD for Northern Beaches Council and may only be used and relied on by Northern Beaches Council for the purpose agreed between GHD and Northern Beaches Council as set out in section 1 of this report.

GHD otherwise disclaims responsibility to any person other than Northern Beaches Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Northern Beaches Council and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

# Appendices

# Appendix A

## Transport and Infrastructure SEPP consultation requirements

## Certain development types

| Development type | Description | Yes/No | If 'yes consult with | TISEPP section |
|---|---|---|---|---|
| **Car Park** | Does the project include a car park intended for the use by commuters using regular bus services? | No | | Section 2.110 |
| **Bus Depots** | Does the project propose a bus depot? | No | | Section 2.110 |
| **Permanent road maintence depot and associated infrastructure** | Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities? | No | | Section 2.110 |

## Development within the Coastal Zone

| Issue | Description | Yes/No | If 'yes consult with | TISEPP section |
|---|---|---|---|---|
| **Development with impacts on certain land within the coastal zone?** | Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to the land? | No | | Section 2.14 |

Note: See interactive map here: **https://www.planning.nsw.gov.au/policy-and-legislation/coastal-management**. Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program

## Council related infrastructure or services

| Issue | Potential impact | Yes/No | If 'yes consult with | TISEPP section |
|---|---|---|---|---|
| **Stormwater** | Is the work likely to have a *substantial* impact on the stormwater management services which are provided by council? | No | | Section 2.10(1)(a) |
| **Traffic** | Is the work likely to generate traffic to an extent that will *strain* the capacity of the existing road system in a local government area? | No | | Section 2.10(1)(b) |
| **Sewerage system** | Will the work involve connection to a council owned sewerage system? If so, will this connection have a *substantial* impact on the capacity of any part of the system? | No | | Section 2.10(1)(c) |
| **Water usage** | Would the work involve connection to a council owned water supply system? If so, would this require the use of a *substantial* volume of water? | No | | Section 2.10(1)(d) |
| **Temporary structures** | Would the work involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, would this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow? | No | | Section 2.10(1)(e) |
| **Road and footpath excavation** | Would the work involve more than *minor* or *inconsequential* excavation of a road or | Yes | Northern Beaches Council | Section 2.10(1)(f) |

| Issue | Potential impact | Yes/No | If 'yes consult with | TISEPP section |
|---|---|---|---|---|
| | adjacent footpath for which council is the roads authority and responsible for maintenance? | | | |
| **Local heritage** | Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the work? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than *minor* or *inconsequential?* | Yes (the proposal is within the curtilage of a heritage item; however, the proposal would not impact its heritage significance). | Northern Beaches Council | Section 2.11 |

## Flood liable land

| Issue | Potential impact | Yes/No | If 'yes consult with | TISEPP section |
|---|---|---|---|---|
| **Flood liable land** | Is the work located on flood liable land? If so, would the work change flood patterns to more than a *minor* extent? | No | | Section 2.12 |
| **Flood liable land** | Is the work located on flood liable land? (to any extent). If so, does the work comprise more than minor alterations or additions to, or the demolition of, a building, emergency work or routine maintenance? | No | | Section 2.13 |

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled *Floodplain Development Manual: the management of flood liable* land published by the New South Wales Government.

## Public authorities other than councils

| Issue | Potential impact | Yes/No | If 'yes consult with | TISEPP section |
|---|---|---|---|---|
| **National parks and reserves** | Is the work adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act? | No | | Section 2.15(2)(a) |
| **National parks and reserves** | Is the work on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone? | No | | Section 2.15(2)(b) |
| **Navigable waters** | Is the work comprising a fixed or floating structure in or over navigable waters? | No | | Section 2.15(2)(c) |
| **Artificial light** | Would the work increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory) | No | | Section 2.15(2)(d) |
| **Defence communications buffer land** | Is the work on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in sections 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011. | No | | Section 2.15(2)(e) |

| Issue | Potential impact | Yes/No | If 'yes consult with | TISEPP section |
|---|---|---|---|---|
| **Mine subsidence land** | Is the work on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*? | No | | Section 2.15(2)(f) |

## Consideration of Planning for Bush Fire Protection

| Issue | Potential impact | Yes/No | If 'yes consult with | TISEPP section |
|---|---|---|---|---|
| **Bush fire prone land** | Is the work for the purpose of health services facilities, correctional centres or residential accommodation in bush fire prone land? | No | | Section 2.16(1) |

# Appendix B

## Consultation letters

16 September 2022

Stephen Watson
Manager, Transport & Civil Infrastructure Assets
Northern Beaches Council
stephen.watson@northernbeaches.nsw.gov.au

Our Ref: 2022/616939

Dear Mr Watson,

**TISEPP Consultation – Bayview Seawall Design Project**

Northern Beaches Council – Park Assets is writing to advise Northern Beaches Council that a project to repair and upgrade the seawall and construct a new shared pathway at Bayview is planned to be undertaken ('the proposal'). The proposal involves the construction of a new seawall to reinforce the existing seawall, and removal of the existing pedestrian footpath and replacement with a wider shared pathway (refer to Figure 1). A Review of Environmental Factors is currently being prepared and will be determined by Northern Beaches Council prior to the commencement of construction. Northern Beaches Council, as a public authority, is planning to carry out the proposal and therefore is the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Division 1 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP) outlines the matters when consultation with councils and other public agencies is required, based on the potential impacts of a proposal. The proposal requires consultation under the following clauses of Division 1 of the Transport and Infrastructure SEPP:

- Clause 1.20(1)(f) – road and footpath excavation
- Section 2.11 – local heritage.

The proposed impacts on the identified matters are discussed below.

**Road and footpath excavation**

The proposal involves the removal of the existing footpath and construction of a new shared path along Pittwater Road between the Gibson Marina and Bayview Tennis Club. These removal and construction activities would temporarily restrict pedestrian access along Pittwater Road between the Gibson Marina and Bayview Tennis Club. Pedestrian access would be diverted to surrounding streets. Traffic along Pittwater Road at Bayview would also be temporarily restricted to a single lane with temporary traffic lights to facilitate the safe undertaking of works and maintain traffic movements.

Accordingly, it is considered that the proposed works would result in more than a minor or inconsequential excavation of a footpath for which Council is the roads authority and

responsible for maintenance. Construction is anticipated to take three to four months, however, after this time, the new shared footpath would be opened for use. The proposal would result in the following benefits for the local community:

- Improved accessibility for community members within Bayview
- Improved safety for pedestrians between community recreational areas
- Improved safety for cyclists when travelling around the bend along Pittwater Road (utilising the shared path instead of the road)
- The enabling of a greater appreciation of the local natural environment and heritage
- Improved infrastructure at the commencement of the Bayview Church Point Pittwater walking trail.

**Local heritage**

During investigations for this proposal, a heritage item of local significance has been identified within the southern extent of the proposal site. The heritage listed item is recorded within the Pittwater Local Environment Plan 2014 (Pittwater LEP) as item no 2270406 – Sea Scout Hall (refer to Figure 2).

As part of the REF, it has been determined that there would be no direct impacts to the heritage item, however footpath works, and the proposed construction compound site would be located within the curtilage of the heritage item. Access to the Sea Scout Hall from Pittwater Road may also be temporarily restricted throughout construction for the proposed footpath works and the use of the carpark adjacent to the hall for the proposal compound site. Access to the Sea Scout Hall and vehicular parking would still be available through the Bayview Tennis Club.

One local heritage item (item no A2270057 – Sandstone retaining wall) was also identified around 10 metres southwest of the proposal site, however the proposal is not expected to directly or indirectly impact the Sandstone retaining wall.

In terms of Transport and Infrastructure SEPP considerations, the proposal is not anticipated to impact the heritage item in a way that is more than minor or inconsequential and therefore no further investigations or assessments are warranted

**Conclusion**

Please advise Park Assets if Northern Beaches Council has any questions or comments on this approach within the relevant statutory timeframes (21 days of receiving this notice). Should you require any further information or assistance in this matter, please contact my office on (02) 8495 5223.

Kind regards,

Jeremy Smith | Manager, Park Assets – Planning Design & Delivery

# Appendix C

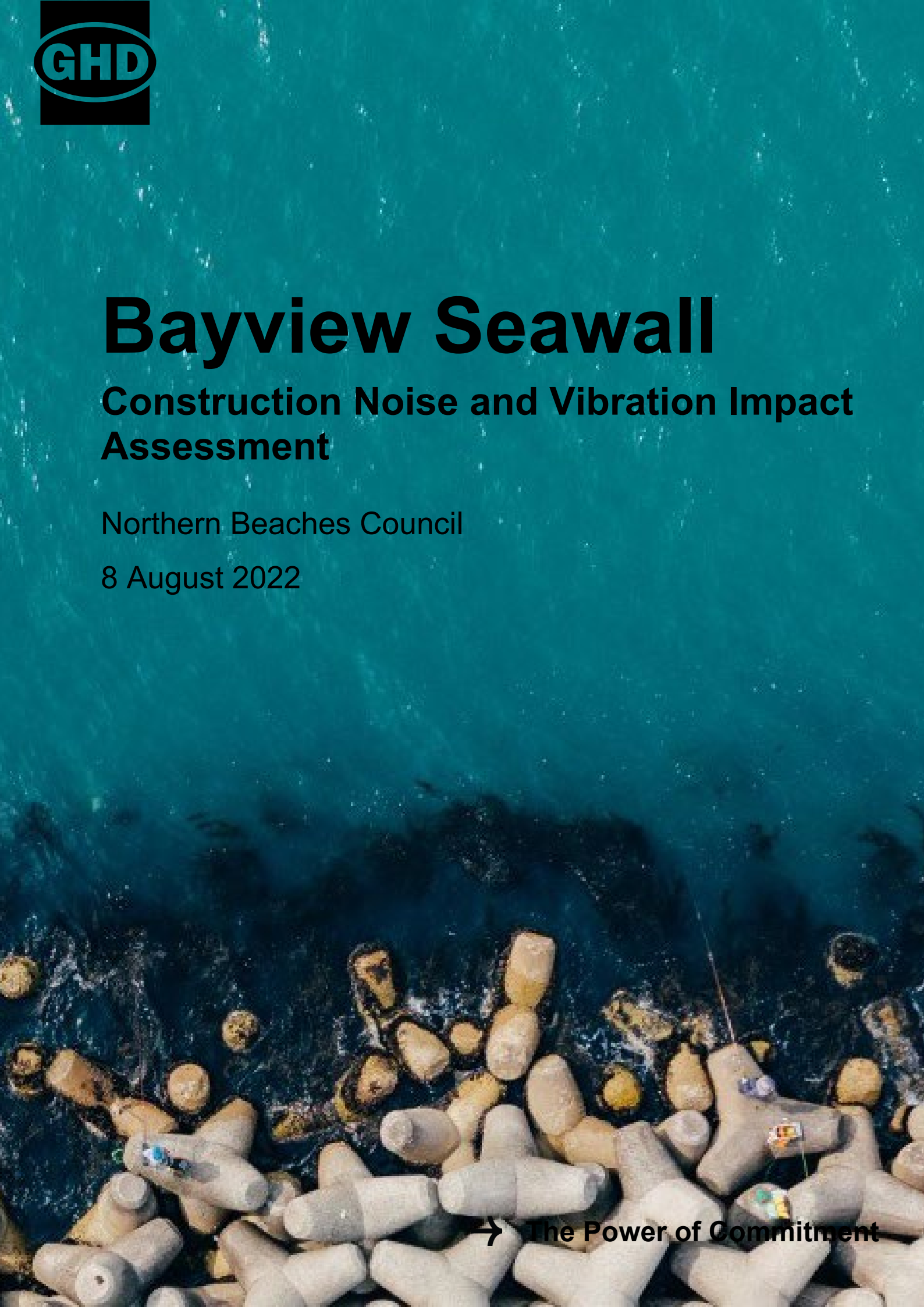
## Noise and Vibration Impact Assessment

# Bayview Seawall

## Construction Noise and Vibration Impact Assessment

Northern Beaches Council

8 August 2022



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| Project name | | Bayview Seawall Design | | | | | |
|---|---|---|---|---|---|---|---|
| Document title | | Bayview Seawall \| Construction Noise and Vibration Impact Assessment | | | | | |
| Project number | | 12542425 | | | | | |
| Status Code | Revision | Author | Reviewer | | Approved for issue | | |
| | | | Name | Signature | Name | Signature | Date |
| S3 | A | C Doyle | R. Browell<br>E Milton | | | | |
| [Status code] | | | | | | | |
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# 1. Introduction

## 1.1 Purpose of this report

This construction Noise and Vibration Impact Assessment (NVIA) is being prepared to assess the potential noise and vibration impacts arising from the construction of the Proposal on the surrounding residential properties, commercial businesses, and recreational areas. This NVIA report forms part of the Review of Environmental Factors (REF) stage of the Bayview Seawall Design methodology.

## 1.2 Key features of Proposal

The proposal includes upgrades to the existing seawall and a new shared pathway to stabilise the embankment and prevent further erosion and improve pedestrian access along Pittwater Road and for the Bayview Church Point Pittwater walking trail. The proposal would include:

- Removal of the existing footpath and replacement with a new wider 2.2-metre-wide footpath
- Removal of existing armour rock and reuse in the toe berm
- Installation of sandstone blocks to form a new sandstone seawall
- Installation of a hardwood beam on top of the sandstone block seawall to prevent risk of fall
- Temporary removal of the existing guardrail to facilitate access during construction
- Installation of concrete seawall footing
- Installation of new pipe outlets for the existing stormwater infrastructure.

## 1.3 Scope

The scope of this construction NVIA involves the following:

- Determination of construction Noise Management Levels (NMLs)
- Identification of surrounding sensitive receivers potentially impacted by construction noise and vibration
- Review of potential noise impacts due to construction traffic generation
- Development of construction scenarios to be modelled based upon the proposed construction methodology
- Assess construction noise impacts on identified sensitive receivers against the developed noise management levels
- Provision of construction mitigation measures to minimise potential noise and vibration impacts on surrounding receivers

This report has been prepared with consideration to the following documents:

- *Interim Construction Noise Guideline* (ICNG) (DECC, 2009)
- *Road Noise Policy* (RNP) (DECCW, 2011)
- *Assessing Vibration: a technical guideline* (EPA, 2006)
- *Noise Policy for Industry* (NPfI) (EPA, 2017).

Minimum assumed background levels as defined in the NPfI (EPA, 2017) have been adopted in this assessment and are provided in Table .

## 1.4 Limitations

*This report: has been prepared by GHD for Northern Beaches Council and may only be used and relied on by Northern Beaches Council for the purpose agreed between GHD and Northern Beaches Council as set out in section 1.1 of this report.*

*GHD otherwise disclaims responsibility to any person other than Northern Beaches Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.*

*The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.*

*The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.*

*The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.4 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.*

# 2. Existing Environment

## 2.1 Proposal location

The Proposal is located in the Northern Beaches suburb of Bayview, along the northern verge of the bend in Pittwater Road between the Bayview Sea Scouts Hall and the Bayview Baths. The area is on land zoned as C4 Environmental Living and R2 Low Density Residential under the *Pittwater Local Environmental Plan 2014.* The Proposal site is located adjacent areas zoned as R2 Low Density Residential and RE1 Public Recreation.

## 2.2 Sensitive receivers and land use

Noise and vibration sensitive receivers are defined by the type of occupancy and the activities performed within the land parcel. The receivers are classified within the following categories:

– residential premises
– classrooms at educational institutes
– hospital wards and operating theatres
– places of worship
– passive and active recreation areas
– commercial or industrial premises.

The Proposal is located in a mix of residential, commercial, and recreational areas. Sensitive land uses surrounding the Proposal site include:

– Residential areas immediately to the south of the Pittwater Road bend
– Passive and active recreation areas south east of the site
– Commercial premises including several boating businesses, cafes, and architecture businesses located to the west of the site at the Gibson Marina and Bayview Anchorage.

The full list of noise sensitive receivers is provided in Appendix B. Noise sensitive receivers and the indicative construction footprint are shown in Figure .

## 2.3 Noise environment

The existing noise environment at the nearest sensitive receivers to the Proposal site can be characterised by a typical suburban environment with sounds such as birds, wind, coastal activities and some road traffic. A conservative approach has been taken to establish the noise goals during construction using the minimum rating background levels (RBLs) from the NPfI. The minimum RBLs as presented in Table 2.1 of the NPfI are shown in Table 2.1.

***Table 2.1 Minimum assumed RBLs***

| Time of day | Minimum assumed rating background noise level dBA |
|---|---|
| Day | 35 |
| Evening | 30 |
| Night | 30 |


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Northern Bayview Sea Wall Design

**Figure 2.1: Proposal site and noise sensitive receivers**

Project No. **12542425**
Revision No. **-**
Date. **08/08/2022**

**FIGURE 2.1**

Document Path:

Print Date:

Data Source:

Created By: Christopher Doyle

# 3. Criteria

## 3.1 Construction noise criteria

### 3.1.1 Proposed construction hours

Construction noise management levels for the Proposal are based on the *Interim Construction Noise Guideline* (ICNG). Subject to planning approval, construction is expected to commence in February 2023 and take approximately 4 months to complete.

Construction works would be conducted during ICNG recommended standard construction hours, as defined:

– Monday to Friday 7am to 6pm
– Saturday 8am to 1pm
– no work on Sundays or public holidays.

Works outside of these hours is unlikely to be required. Should works outside these hours be required, nearby residents would be notified. This would involve justifying why works are required outside the standard hours and outlining the timing, duration and potentially expected noise levels.

Emergency response and replacement of major equipment or infrastructure may require out of hours work. This would be undertaken in accordance with the ICNG and road permits for oversize vehicles if relevant.

### 3.1.2 Construction noise management levels

Construction noise management levels for residential premises and other sensitive land uses are provided in Table 2 and Table 3 of the *Interim Construction Noise Guideline*. The method to determine the noise management levels for residentials receivers in accordance with the ICNG is outlined in Table 3.1. Noise management levels for other sensitive land uses are provided in Table 3.2 and only apply when the properties are in use.

***Table 3.1 Noise management levels for residential receivers***

| Time of day | Noise management level, $L_{Aeq(15min)}$ | Application notes |
|---|---|---|
| Recommended standard hours | Noise affected:<br>RBL + 10 dBA | The noise affected level represents the point above which there may be some community reaction to noise.<br>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<br>the proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details. |
| | Highly noise affected:<br>75 dBA | The highly noise affected level represents the point above which there may be strong community reaction to noise.<br>Where noise is above this level, the proponent should consider very carefully if there is any other feasible and reasonable way to reduce noise to below this level.<br>If no quieter work method is feasible and reasonable, and the works proceed, the proponent should communicate with the impacted residents by clearly explaining the duration and noise level of the works, and by describing any respite periods that will be provided. |
| Outside recommended standard hours | Noise affected:<br>RBL + 5 dBA | A strong justification would typically be required for works outside the recommended standard hours.<br>The proponent should apply all feasible and reasonable work practices to meet the noise affected level. |

| Time of day | Noise management level, $L_{Aeq(15min)}$ | Application notes |
|---|---|---|
| | | Where all feasible and reasonable measures have been applied and noise is more than 5 dBA above the noise affected level, the proponent should consult with the community.<br>For guidance on negotiating agreements see Section 7.2.2 of the *Interim Construction Noise Guideline*. |

***Table 3.2 Noise management levels for other sensitive land uses***

| Land Use | Noise management level, $L_{Aeq(15\ min)}$ dBA |
|---|---|
| Commercial premises | 70 (external) |
| Industrial premises | 75 (external) |
| Educational institutes | 45 (internal) |
| Hospital wards and operating theatres | 45 (internal) |
| Places of worship | 45 (internal) |
| Active recreation areas | 65 (external) |
| Passive recreation areas | 60 (external) |

### 3.1.3 Proposal noise management levels

The noise management levels at sensitive receivers in the study area are summarised in Table 3.3 and have been based on Table 2.1 using the minimum RBLs from the NPfI as outlined in Section 2.3.

***Table 3.3 Project noise management levels***

| Receiver type | Time of day | | Minimum assumed rating background noise level (dBA) | Minimum project intrusiveness noise levels ($L_{Aeq,15min}$ dBA) |
|---|---|---|---|---|
| Residential | Recommended standard hours | | 35 | 45 |
| | Outside recommended standard hours | Day | 35 | 40 |
| | | Evening | 30 | 35 |
| | | Night | 30 | 35 |
| Commercial | When in use | | | 70 (external) |
| Passive Recreation | When in use | | | 45 (internal)<br>55 (external) |
| Active Recreation | When in use | | | 65 (external) |
| Educational Institute | When in use | | | 60 (external) |

## 3.2 Construction traffic noise criteria

The *Road Noise Policy* (RNP) provides road traffic noise criteria for residential land uses affected by construction traffic on the public road network.

The RNP application notes state that any increase in the total noise level at existing residences and other sensitive land uses affected by traffic generation on existing roads should be limited to 2 dBA above current levels. This limit only applies when the noise level without the development is within 2 dBA or exceeds the road traffic noise criterion provided in the *Road Noise Policy*.

This has been used to identify potential impacts as a result of noise produced by construction traffic. If road traffic noise increases as a result of construction works within 2 dBA of current levels, then the objectives of the RNP are considered to be met and no specific mitigation measures would be required.

Where construction traffic increases the existing road traffic noise levels by more than 2 dBA then further assessment against the road traffic noise criteria in Table 3.4 is required.

*Table 3.4 Road traffic noise criteria, dBA*

| Type of development | Day, $L_{Aeq(15\ hour)}$ 7am to 10pm | Night, $L_{Aeq(9\ hour)}$ 10pm to 7am |
|---|---|---|
| Existing residence affected by additional traffic on freeway/arterial/sub-arterial roads | 60 | 55 |
| Existing residence affected by additional traffic on local roads | 55 | 50 |

# 3.3 Construction vibration criteria

## 3.3.1 Human comfort

Acceptable vibration levels for human comfort have been set with consideration to *Assessing Vibration: a technical guideline* (DEC, 2006) which is based on the guidelines contained in British Standard *BS 6472 – 1992, Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz)*.

Typically, construction activities generate ground vibration of an intermittent nature. Intermittent vibration is assessed using the vibration dose value. Acceptable values of vibration dose are presented in Table 3.5 for sensitive receivers.

*Table 3.5 Human comfort intermittent vibration limits (BS 6472-1992)*

| Receiver type | Period | Intermittent vibration dose value ($m/s^{1.75}$) | |
|---|---|---|---|
| | | Preferred value | Maximum value |
| Residential | Day (7 am to 10 pm) | 0.2 | 0.4 |
| | Night (10 pm to 7 am) | 0.13 | 0.26 |
| Offices, schools, educational institutes and places of worship | When in use | 0.4 | 0.8 |

Whilst the assessment of response to vibration in BS 6472:1992 is based on vibration dose value and weighted acceleration, for construction related vibration, it is considered more appropriate to provide guidance in terms of a peak value, since this parameter is likely to be more routinely measured based on the more usual concern over potential building damage.

Humans are capable of detecting vibration at levels which are well below those causing risk of damage to a building. The degrees of perception for humans are suggested by the vibration level categories given in British Standard, *BS 5228.2 – 2009, Code of Practice Part 2 Vibration for noise and vibration on construction and open sites – Part 2: Vibration* and are shown below in Table 3.6.

*Table 3.6 Guidance on effects of vibration levels for human comfort*

| Vibration level | Effect |
|---|---|
| 0.14 mm/s | Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. |
| 0.3 mm/s | Vibration might be just perceptible in residential environments. |
| 1.0 mm/s | It is likely that vibration at this level in residential environments will cause complaints but can be tolerated if prior warning and explanation has been given to residents. |
| 10 mm/s | Vibration is likely to be intolerable for any more than a very brief exposure. |

### 3.3.2 Guidelines for general structures

The effects of transient vibration on structures are considered in *BS 7385 Part 2 – 1993 Evaluation and measurement for vibration in buildings*. The criteria provided in BS 7385 are presented in Table 3.7.

*Table 3.7 Transient vibration guide values – minimal risk of cosmetic damage*

| Type of building | Peak component particle velocity in frequency range of predominant pulse | |
|---|---|---|
| | 4 Hz to 15 Hz | 15 Hz and above |
| Reinforced of framed structures. Industrial and heavy commercial buildings | 50 mm/s at 4 Hz and above | 50 mm/s at 4 Hz and above |
| Unreinforced or light framed structures. Residential or light commercial type building | 15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz | 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above |

The guide values in Table 3.7 relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings. Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at lower frequencies, then the guide values may need to be reduced by up to 50 per cent.

The predominant vibration for most construction activities involving intermittent vibration sources such as rock breakers, piling rigs, vibratory rollers and excavators occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, a conservative vibration damage screening level per receiver type is given below:

– reinforced or framed structures: 25.0 mm/s
– unreinforced or light framed structures: 7.5 mm/s.

### 3.3.3 Guidelines for vibration sensitive structures

Heritage buildings and structures would be assessed using the guide values in Table 3.7. A heritage building or structure should not be assumed to be more sensitive to vibration unless they are found to be structurally unsound. If a heritage building or structure is found to be structurally unsound (following inspection) a more conservative cosmetic damage criterion of 3 mm/s peak component particle velocity (from DIN 4150) should be considered.

Heritage listed structures and buildings within the study area are provided below in Table 3.8.

*Table 3.8 Heritage listed structures and buildings in the study area*

| Structure | Address | Distance to construction footprint |
|---|---|---|
| Bayview Sea Scouts Hall | Bayview Park, Pittwater Rd, Bayview NSW 2104 | <10 metre |
| Curry House 2 | 5 Pindari Place Bayview | 420 metres |

# 4. Impact assessment

## 4.1 Construction noise

### 4.1.1 Construction methodology

The plant and equipment likely to be required during each stage of construction have been used to develop source sound levels for each construction scenario developed. The predicted noise levels resulting from the construction scenarios modelled were assessed against the construction noise management levels identified in Section 3.1.3.

#### 4.1.1.1 Construction staging

Construction scenarios have been created based on construction equipment likely to be operating simultaneously at any given time and located in the location that creates the maximum received noise level for each receiver. Although this is unlikely to occur, the modelling assumes the 'worst-case' scenario to identify where noise impacts could be a concern and require mitigation.

The proposed construction staging and key activities for the Proposal are shown in Table 4.1. Based upon these construction stages and key activities, 3 construction scenarios have been developed to model the construction stages and are also provided in Table 4.1.

*Table 4.1 Indicative construction staging for key activities*

| Stage | Construction Scenario | Activities | Proposed working hours |
|---|---|---|---|
| Mobilisation | CS01 | – Establishing site<br>– Traffic control | Recommended standard hours |
| Site preparation | CS01 | – Clearing of trees, bushland, and site<br>– Establishing site | Recommended standard hours |
| Removal of existing infrastructure | CS02 | – Excavating existing footpath and existing wall<br>– Stockpiling of excavated wall materials for potential re-use<br>– Removing of un-usable excavated material via road truck<br>– Profiling of foreshore slope | Recommended standard hours |
| Embankment rehabilitation | CS03 | – Placing of blocks and armour rocks to build sea wall<br>– Delivery of materials | Recommended standard hours |
| demobilisation | CS01 | – Traffic control | Recommended standard hours |

#### 4.1.1.2 Construction compound

A temporary construction compound and laydown area will be required during construction works. This site is planned to be located south east of the construction site, adjacent the Bayview Sea Scouts Hall.

#### 4.1.1.3 Noise generating equipment

Plant and equipment needed for the Proposal would be determined during the construction planning phase. Noise level data has been obtained from Table F.1 of the *Construction Noise and Vibration Guideline* (CNVG) (TfNSW, 2016) and Table A.1 of Australian Standards *AS2436 – Guide to noise and vibration control on construction, demolition and maintenance sites*. Other equipment may be used; however, it is anticipated that they would produce similar net noise emissions when used concurrently with the equipment listed.

The magnitude of off-site noise impacts associated with construction is dependent upon a number of factors:

– the intensity and location of construction activities
– the type of equipment used
– existing background noise levels
– intervening terrain and structures
– weather conditions during construction works.

Construction machinery would likely move about the Proposal site altering the received noise for individual receivers. During any given period, the machinery items to be used would operate at maximum sound power levels for only brief stages. At other times, the machinery would produce lower sound levels while carrying out activities not requiring full power. It is highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time. Certain types of construction machinery would be present in the Proposal site for only brief periods during construction. Therefore, noise predictions are considered conservative.

Table 4.2 presents the construction equipment proposed for each construction scenario. The activity sound power level has been calculated based on the two noisiest plant to determine the worst-case noise impacts during construction. The activity noise levels have been used to predict the noise levels that would be expected during construction.

***Table 4.2 Construction scenario sound power levels***

| Plant description | Sound power level | Source | Construction Scenario | | | |
|---|---|---|---|---|---|---|
| | | | CS01 | CS02 | CS03 | CC |
| Standard construction hours | | | ✓ | ✓ | ✓ | ✓ |
| Excavator (tracked) 35 t | 110 | CNVG | ✓ | ✓ | ✓ | |
| Road truck | 108 | CNVG | ✓ | ✓ | ✓ | |
| Truck (medium rigid) | 103 | CNVG | ✓ | ✓ | ✓ | ✓ |
| Hand Tools | 102 | AS2436 | ✓ | ✓ | | |
| Chainsaw 4-5hp | 114 | CNVG | ✓ | | | |
| Front end loader 23 t | 112 | CNVG | | ✓ | | |
| Power generator | 103 | CNVG | | | | ✓ |
| **Activity sound power level, $L_{Aeq(15min)}$ dBA** | | | **115** | **114** | **112** | **106** |

## 4.1.2 Construction noise modelling

Noise modelling was undertaken using SoundPLAN 8.2. SoundPLAN is a computer program for the calculation, assessment and prognosis of noise exposure. SoundPLAN calculates environmental noise propagation according to *ISO 9613-2 'Acoustics – Attenuation of sound during propagation outdoors'*.

The following noise modelling assumptions were made:

– surrounding land was modelled assuming a mix of 75 per cent soft and 25 per cent hard ground with a ground absorption coefficient of 0.75. The portion of the study area occupied by water was modelled as having a value of 0.
– Receivers were modelled at 1.5 metres above the building ground level for ground floor and an additional 1.5 metres for each floor above.
– atmospheric absorption was based on an average temperature of 10°C and an average humidity of 70 per cent
– atmospheric propagation conditions were modelled with noise enhancing wind conditions for noise propagation (downwind conditions) or an equivalently well-developed moderate ground-based temperature inversions

– modelled scenarios take into account the shielding effect from surrounding buildings and structures on and adjacent to the site

### 4.1.3 Construction noise impacts

Predicted construction noise levels from each construction scenario are presented in Appendix B. A summary of exceedances of the noise management levels during standard construction hours for all receiver types is presented in Table 4.3.

Of the 492 receivers within the study area, up to 182 receivers are predicted to experience noise levels above the noise management level during the construction scenario with the greatest impacts. The construction scenario predicted to have the greatest impact is CS01 (site preparation) where works may involve excavators and chainsaws operating concurrently whilst clearing land (including existing footpath) and establishing site. The most heavily impacted residential receivers are those located immediately south of the Pittwater Road bend from 1903 to 1907 Pittwater Road. These receivers are predicted to experience noise levels that exceed the NML by up to 25 dBA during site preparation, mobilisation and demobilisation and as a result the perceived noise level may be considered highly noise intrusive.

The passive and active recreational facilities predicted to experience exceedances are the Bayview Sea Scouts group and the Bayview Tennis Club respectively, occurring in both during the construction compound scenario, and also for all other scenarios for the Tennis Club. Commercial receivers are not expected to experience any exceedances of the NML, with the worst affected receiver being the commercial premises located at the Gibson Marina to the west of the Proposal site. This receiver is predicted to have a noise level of up to 62 dBA during CS01.

Exceedances of the construction noise management levels are typical for construction projects of this scale. The noise impacts would be limited to the construction period only and would not have any lasting effects on the community. The maximum noise impacts expected are during the site establishment and preparation scenario where excavators and chainsaws have the potential to be used. However, as all construction equipment would be operated intermittently and not continuously, impacts to receivers would only occur over brief periods of time.

All feasible and reasonable work practices would be applied to minimise noise during construction. It is unlikely however that mitigation measures would reduce the construction noise levels to below the noise management levels. The magnitude of construction noise impacts is dependent upon a number of factors including the intensity and location of activities, the type of equipment used, background noise levels during the construction period and weather conditions. Based on these parameters, the predicted construction noise levels are generally conservative and do not represent a constant noise emission that would be experienced by the community on a daily basis throughout the project construction period.

Construction noise impacts on the community and surrounding environment would not be permanent and would be limited to the duration of the construction period. These impacts can be minimised by implementing the noise mitigation measures detailed in Section 5.

***Table 4.3 Summary of noise management exceedances for all receiver types – standard hours***

| Receiver type | | CS01 | CS02 | CS03 | CC |
|---|---|---|---|---|---|
| Residential | Number of exceedances above NML (55 dBA) | 181 | 161 | 99 | 35 |
| | Highest noise level (dBA) | 70 | 69 | 67 | 65 |
| | Highest exceedance (dB) | 25 | 24 | 22 | 20 |
| | Worst affected receiver | R482 | R482 | R482 | R448 |
| Commercial | Number of exceedances above NML (55 dBA) | 0 | 0 | 0 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| | Highest noise level (dBA) | 62 | 61 | 59 | 43 |
| | Highest exceedance (dB) | - | - | - | - |
| | Worst affected receiver | R430 | R430 | R430 | R372 |
| Educational institute | Number of exceedances above NML (55 dBA) | 0 | 0 | 0 | 0 |
| | Highest noise level (dBA) | 50 | 49 | 47 | 31 |
| | Highest exceedance (dB) | - | - | - | - |
| | Worst affected receiver | R085 | R085 | R085 | R036 |
| Passive recreation | Number of exceedances above NML (55 dBA) | 0 | 0 | 0 | 1 |
| | Highest noise level (dBA) | 56 | 55 | 53 | 72 |
| | Highest exceedance (dB) | - | - | - | 12 |
| | Worst affected receiver | R451 | R451 | R451 | R451 |
| Active recreation | Number of exceedances above NML (55 dBA) | 1 | 1 | 1 | 1 |
| | Highest noise level (dBA) | 82 | 81 | 79 | 71 |
| | Highest exceedance (dB) | 17 | 16 | 14 | 6 |
| | Worst affected receiver | R454 | R454 | R454 | R454 |

## 4.2 Construction traffic

The RNP recommends that “any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding ‘without construction’ scenario.” Construction would generate heavy vehicle movements associated with the transportation of construction machinery, equipment and materials to the site. Light vehicle movements would be associated with employees and smaller deliveries.

Access to site would be from Pittwater Road via Mona Vale Road, Barrenjoey Road and Darley Street. A review of a 2018 traffic volume counts along Pittwater Road between Barrenjoey Road and McCarrs tallied an average of 14,250 daily vehicles . Assuming a yearly traffic increase of 2%, the current daily traffic count is approximately 15,300 vehicles. To increase traffic noise by 2 dB (a doubling of traffic roughly equates to a 3 dB increase), the number of vehicles would be required to increase by approximately 10,200 vehicles a day. As such the objectives of the RNP are considered to be met and no specific mitigation measures would be required.

## 4.3 Construction vibration

### 4.3.1 Assessment methodology

Vibration from surface construction plant and equipment was predicted and assessed with consideration to *Assessing Vibration: A Technical Guideline* and British Standard *BS 7385 Part 2 – 1993 Evaluation and measurement for vibration in buildings*. Where noise and vibration levels were predicted to exceed the construction noise management levels, appropriate construction noise and vibration mitigation measures were provided to minimise impacts from each construction phase.

Energy from construction equipment is transmitted into the ground and transformed into vibrations, which attenuates with distance. The magnitude and attenuation of ground vibration is dependent on the following:

– the efficiency of the energy transfer mechanism of the equipment (impulsive; reciprocating, rolling or rotating equipment)
– the frequency contents
– the impact medium stiffness
– the type of wave (surface or body)
– the ground type and topography.

Construction and demolition work have the potential to impact human comfort and / or cause structural damage to buildings. Potential vibration inducing activities identified during construction and demolition works include:

– piling, grinding and cutting will generate impulsive vibration emissions
– bulk earthworks, construction traffic movements and demolition works will be a source of intermittent or continuous vibration.

Safe working buffer distances to comply with the human comfort, cosmetic damage and heritage structural damage criteria were taken from the CNVG and are provided in Table 4.4. Safe working buffer distances for heritage buildings were estimated by doubling the buffer distance for standard structures.

***Table 4.4 Vibration safe working buffer distances, meters***

| Activity | Human comfort | Structural damage | |
|---|---|---|---|
| | | Standard structures | Heritage buildings/structures |
| Piling rig – Bored | N/A | 2 m (nominal) | 4 m (nominal) |
| Piling rig – Hammer | 50 m | 15 m | 30 m |
| Vibratory roller (>18 tonnes) | 100 m | 25 m | 50 m |
| Vibratory roller (13-18 tonnes) | 100 m | 20 m | 40 m |

| Activity | Human comfort | Structural damage | |
|---|---|---|---|
| | | Standard structures | Heritage buildings/structures |
| Vibratory roller (7-13 tonnes) | 100 m | 15 m | 30 m |
| Vibratory roller (4-6 tonnes) | 40 m | 12 m | 24 m |
| Vibratory roller (2-4 tonnes) | 20 m | 6 m | 12 m |
| Vibratory roller (1-2 tonnes) | 15 m | 5 m | 10 m |
| Large hydraulic hammer | 73 m | 22 m | 44 m |
| Jackhammer | Avoid contact with structure | 1 m (nominal) | 2 m (nominal) |

### 4.3.2 Construction vibration impacts

The Bayview Sea Scouts Hall is located adjacent to the proposed sea wall and is a listed heritage structure. Excavation works of the existing footpath and sea wall is estimated to have similar vibration impacts to the use of jackhammers, therefore excavation works should adopt a minimum buffer distance of 2 metres from the Bayview Sea Scouts Hall to ensure no structural damage to the building. In the event that excavation works are required within 2 metres of the structure, such as to excavate the existing footpath, a dilapidation report of the Scout Hall should be completed and specific vibration goals established prior to the commencement of works.

# 5. Mitigation measures

## 5.1 Noise mitigation measures

Mitigation recommendations are provided in Table 5.1 to reduce the noise levels during construction activities. These standard mitigation measures shall be applied to mitigate noise and vibration impacts of the Proposal where reasonable and feasible.

*Table 5.1 Construction noise mitigation measures*

| Action required | Details |
|---|---|
| **Management measures** | |
| Construction hours | All work will be carried out within standard construction hours:<br>– Monday to Friday: 7 am to 5 pm<br>– Saturday: 8 am to 1 pm<br>– Sunday and public holidays: No construction activities. |
| Implement community consultation measures | Provide notification to potentially affected receivers about upcoming construction activities. The notification should include:<br>– Details and timeframe of construction works<br>– Provide contact details on a site board |
| Complaints handling | A complaints register will be maintained throughout construction detailing:<br>– Contact details and address of the complainant<br>– The time and nature of complaint<br>– Review of work activities<br>– Measures undertaken in response to the complaint.<br>Staff should be briefed on current and future construction activities and notified of any complaints from the community. |
| Site inductions | All employees, contractors and subcontractors will receive an environmental induction. The induction must at least include:<br>– all relevant project specific and standard noise mitigation measures<br>– relevant licence and approval conditions<br>– permissible hours of work<br>– location of nearest sensitive receivers<br>– construction employee parking areas<br>– designated loading/ unloading areas and procedures<br>– complaints register procedure |
| Behavioural practices | No unnecessary shouting or loud stereos/radios on site.<br>No dropping of materials from height, throwing of metal items and slamming of doors. |
| **Source controls** | |
| Equipment operation | Avoid simultaneous use of construction equipment where possible. Equipment should be turned off when not in use. Equipment should be serviced and maintained regularly. |
| Equipment selection | Use quieter construction methods where reasonable and feasible. |
| **Path controls** | |
| Shield stationary noise sources such as generators or compressors | Stationary noise sources should be silenced, enclosed or shielded where feasible and reasonable or located so as not to impact residences. |

## 5.2 Vibration mitigation measures

If vibration intensive works are to be conducted within two metres of the Bayview Sea Scouts Hall, such as during the excavation of the existing footpath nearest the hall. A dilapidation report should be carried out and specific vibration criteria for the structure be developed prior to the commencement of works to prevent vibration impacts.

# 6. Conclusion

Noise and vibration impacts resulting from the construction of the proposed Bayview Sea Wall have been assessed. The report included the assessment of the predicted construction noise impacts at all identified sensitive receivers against the appropriate construction noise criteria developed.

During construction there is the potential for exceedances of the noise management levels Mitigation measures to reduce construction noise impacts have been provided in Section 5. It is typical for construction projects to exceed the construction noise management levels. Any impacts due to construction works from the Proposal are temporary in nature and would not represent a permanent impact on the community or surrounding environment. All construction activities are scheduled to occur during standard hours only where receivers are generally least sensitive to noise. Additionally, the predicted noise levels are considered conservative and would only be experienced by receivers for limited periods during construction, if at all. Impacts may be reduced through the introduction of feasible and reasonable mitigation measures which have been recommended in Section 5.

Traffic noise impacts from construction vehicles are not expected along Pittwater Road due to the high levels of existing traffic. Additionally, a minimum safe working buffer distance of 2 metres should be maintained for any excavation works nearby the Bayview Sea Scouts Hall. If vibration intensive works must be carried out within this distance, a dilapidation report of the Scouts Hall should be undertaken and specific vibration goals for the structure outlined prior to the commencement of works.

# References


– *Road Noise Policy* (RNP) (DECCW, 2011)
– *Assessing Vibration: a technical guideline* (EPA, 2006)
– British Standard *BS 6472 – 1992, Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz).*
– *Interim Construction Noise Guideline* (ICNG) (DECC, 2009)
– *Noise Policy for Industry* (NPfI) (EPA, 2017).
– Australian Standard *AS2436 – Guide to noise and vibration control on construction, demolition and maintenance sites*

# Appendices

# Appendix A

## Acoustic concepts and terminology

# Acoustic concepts and terminology

## Definition of ‘noise’

Sound may be defined as any pressure variation that the human ear can detect. The terms “sound” and “noise” are more or less interchangeable however, “noise” is generally often referred to as unwanted sound.

## Factors that contribute the environmental noise

Noise from an activity such as construction noise or noise during the operation of a facility at a given receiver location can be affected by a number of different factors, including:

– How loud the source activity is and the type of source:
  - Point (e.g. a pump or motor)
  - Line (e.g. a road or railway line)
  - Area (e.g. the external façades of an industrial building)
– The distance from the source to receiver
– The type of ground between the sound and receiver locations (e.g. hard surfaces or porous ground)
– The ground topography between the source and the receiver, e.g. is it flat or hilly? Blocking the line of sight will generally reduce the noise level for the receiver
– Obstacles that may block the line of sight between the source and the receiver (e.g. buildings or noise walls
– Atmospheric absorption (dependent on humidity and temperature)
– Meteorological conditions that may increase or reduce environmental sound propagation (e.g. wind direction or temperature inversions)

## Noise measurements

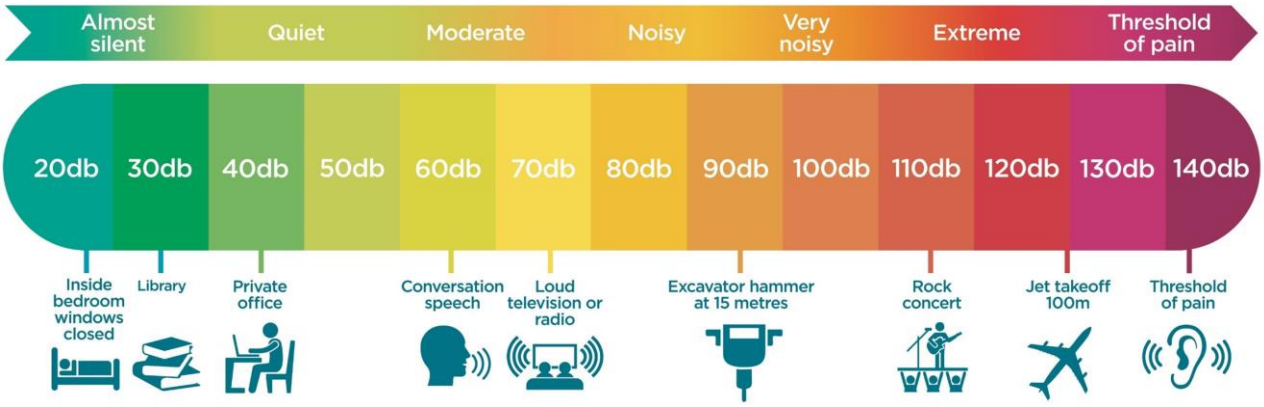
Noise is generally measured using a specially designed ‘sound level meter’ (SLM) and must meet internationally recognized performance standards. To avoid expressing sound or noise in terms of Pa, which could involve some unmanageable numbers, the logarithmic decibel or dB scale is used. The scale uses the hearing threshold of 20 µPa or 20 x $10^{-6}$ Pa as the reference level and is defined as 0 dB.

## Typical noise levels

The figure below presents typical noise sources for each various sound pressure levels and a corresponding subjective noise level description.

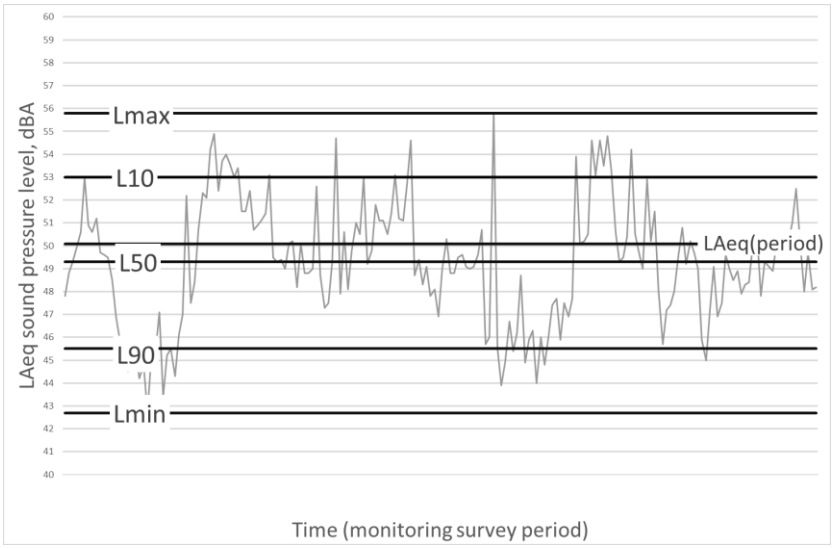
**Noise level comparisons**

People's perception of noise is strongly influenced by their environment.
A noise level that is perceived as loud in one situation may apear quiet in another.




## Typical noise descriptors

Noise is represented by the descriptor $L_{AN}$, representing a statistical sound measurement recorded on the 'A' weighted scale. A typical noise monitoring chart is shown in the graph below along with the noise descriptors.




Where:

- $L_{Amax}$: The maximum sound level recorded during the measurement period.
- $L_{Amin}$: The minimum sound level recorded during the measurement period.
- $L_{A10(period)}$: The A-weighted sound pressure level that is exceeded for 10% of the measurement period.
- $L_{Aeq(period)}$: Equivalent sound pressure leve, the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
- $L_{A90(period)}$: The A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured. This is considered to represent the background noise e.g. $L_{A90(15min)}$.

## Changes in noise levels

The table below presents a qualitative description of average human responses to changes in noise levels.

| Difference | Human response |
|---|---|
| Difference of 2 dBA | Generally imperceptible by the human ear |
| Difference of 5 dBA | Considered significant |
| Difference of 10 dBA | Perceived as a doubling (or halving) of the noise source |
| Addition of two identical noise levels | Increase levels by 3 dBA |
| Addition of second noise level of similar character | If the secondary noise level is a minimum 8 dBA below the primary noise level, the noise level will not significantly increase |
| Doubling of distance between source and receiver | Results in a 3 dBA decrease for a line source and 6 dBA for a point source |
| A doubling of traffic volume | Results in a 3 dBA increase in noise |

## Audibility of noise

The table below presents quantitative guidance and qualitative descriptions regarding the audibility of noise.

| Audibility | Description |
|---|---|
| Inaudible | Noise source cannot be heard. The noise level is generally less than the background noise level, potentially by more than 10 dBA or greater |
| Barely audible | Characteristics of the noise is difficult to define or masked by extraneous noise. The noise level is generally 5-7 dBA below the background noise or ambient noise level, depending on the nature of the noise e.g. constant or intermittent |
| Just audible | Characteristics of the noise can be defined but extraneous noise sources are also contributing to the received noise. The noise level is typically below the background and ambient noise level. |
| Audible | Characteristics of the noise can be easily defined. The noise level may be at the level of the background noise and above. |
| Dominant | The noise source is significantly ‘louder’ than all other noise sources. The noise level will likely be significantly greater than the background noise level. |

## Types of noise sources

The table below offers a qualitative description of various noise types and provides the noise descriptor that is typically used to measure the type of noise.

| Duration of the noise | Description |
|---|---|
| Continuous noise | Continuous noise is produced by equipment or activities that operates without interruption in the same mode, for e.g. blowers, pumps and processing equipment. Measuring for just a few minutes with hand-held equipment is sufficient to determine the noise level. If tones or low frequencies are heard, the frequency spectrum can be measured for documentation and further analysis. Continuous noise sources are generally captured by the $L_{90}$ noise descriptor. |
| Intermittent noise | Intermittent noise is a noise level that increases and decreases rapidly. This might be caused by a train passing by, factory equipment that operates in cycles, or aircraft flying above. Intermittent noise is measured in a similar way to continuous noise, with a sound level meter. The duration of each occurrence and the time between each event is important to note. To gain a more reliable estimate of the noise level, multiple occurrences of the noise source is measured to gain a reliable estimate. Intermittent noise sources are generally captured by the $L_{eq}$ noise descriptor. |

| Duration of the noise | Description |
|---|---|
| Impulsive noise | The noise from impacts or explosions, for e.g. from a pile driver, punch press or gunshot, is called impulsive noise. It is brief and abrupt, and its startling effect causes greater annoyance than would be expected from a simple measurement of sound pressure level. To quantify the impulsiveness of noise, the difference between a quickly responding and a slowly responding parameter can be used. Impulsive noise sources are generally captured by the $L_{max}$ or $L_{peak}$ noise descriptor. |
| Frequency content | Description |
| Low frequency | Noise containing major components in the low-frequency range (10 hertz [Hz] to 160 Hz) of the frequency spectrum |
| Tonal noise | Tonal noise contains one or more prominent tones (i.e. distinct frequency components), and is normally regarded as more offensive than 'broad band' noise |
| Defining characteristic | Description |
| Extraneous noise | Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous. |
| Subject noise | The noise in question removed from any extraneous noise in the area |
| Offensive noise | The definition of offensive noise in the POEO Act is noise:<br>(a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:<br>(i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or<br>(ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or<br>(b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations. |

## Frequency analysis

Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers. The units for frequency are Hertz (Hz), which represent the number of cycles per second. Frequency analysis can be in:

– Octave bands (where the centre frequency and width of each band is double the previous band)
– 1/3 octave bands (3 bands in each octave band)
– Narrow band (where the spectrum is divided into 400 or more bands of equal width)

# Vibration

## Definition of ‘vibration’

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity.

## Vibration descriptors

These may be expressed in terms of ‘peak’ velocity or ‘rms’ velocity. The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as ‘peak particle velocity’, or PPV. The latter incorporates ‘root mean squared’ averaging over some defined time period. Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse. The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level ($10^{-9}$ m/s). Care is required in this regard, as other reference levels may be used by some organisations.

## Types of vibration

Vibration in buildings can be caused by many different external sources, including industrial, construction and transportation activities. The vibration may be continuous (with magnitudes varying or remaining constant with time), impulsive (such as in shocks) or intermittent (with the magnitude of each event being either constant or varying with time). A description of each vibration type including examples are presented in the table below.

| Vibration type | Description | Examples |
|---|---|---|
| Continuous vibration | Vibration continues uninterrupted for a defined period (usually throughout daytime and/or night-time). This type of vibration is assessed on the basis of weighted rms acceleration values | Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery) |
| Impulsive vibration | A vibration source (continuous or intermittent) which has a rapid build up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). This type of vibration is assessed on the basis of weighted rms acceleration values | Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading. |
| Intermittent vibration | Interrupted periods of continuous (for e.g. a drill) or repeated periods of impulsive vibration (for e.g. a pile driver), or continuous vibration that varies significantly in magnitude. This type of vibration is assessed on the basis of vibration dose values | Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer this would be assessed against impulsive vibration criteria |

## How humans perceive vibration

People are able to ‘feel’ vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as ‘normal’ in a car, bus or train is considerably higher than what is perceived as ‘normal’ in a shop, office or dwelling.

## Typical vibration levels

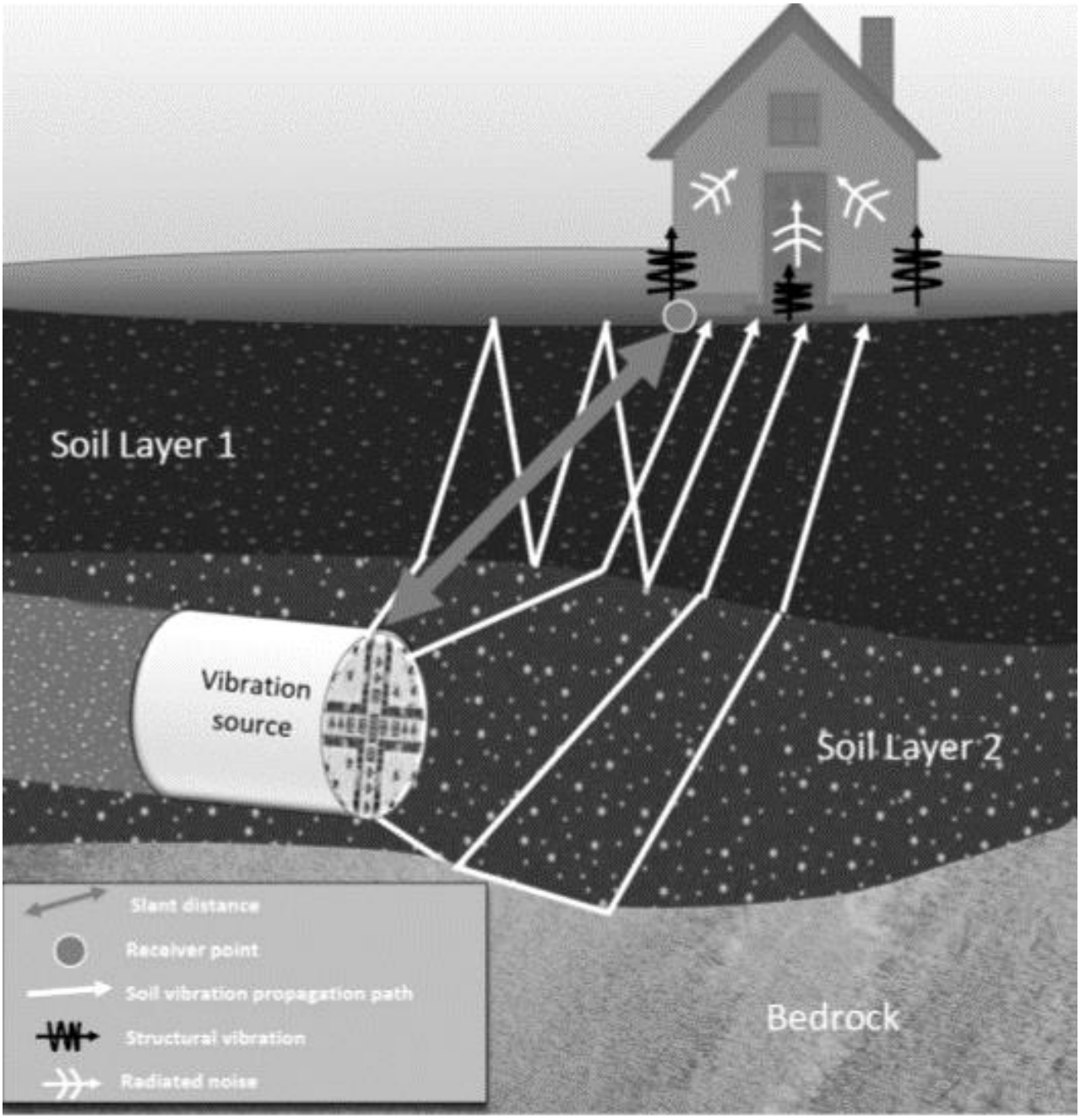
Typical ground vibration from civil construction activities occurs in the frequency range of approximately 8 Hz to 100 Hz. Within this frequency range, building contents such as blinds and pictures would commence visible movement at 0.5 mm/s. At vibration levels higher than 0.9 mm/s, rattling of windows, crockery or loose objects would be audible and annoying.

| Velocity level (mm/s) | Typical source | Response |
|---|---|---|
| 0.01 | Typical background vibration level | Scanning electron microscopes to 50000 x amplification |
| 0.03 | | 500x amplification bench microscopes |
| 0.1 | Average passenger train vibration | Approximate threshold for human perception of vibration |
| 0.3 | Average freight train vibration<br>Max passenger train vibration | Approx. residential annoyance for train passbys |
| 1 | Large rock breaker | Vibration level that will generally result in complaints |
| 3 | Blasting/ Impact pile driving | Threshold for minor cosmetic damage |

## Ground-borne noise and vibration

Noise that propagates through a structure as vibration and is radiated by vibrating wall, ceiling and floor surfaces is termed “ground-borne noise”, “regenerated noise”, or sometimes “structure borne noise”. Ground-borne noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air. Typical sources of ground-borne noise include tunnelling construction works or underground railway operations.

The figure below presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities that occur below the ground level (for e.g. a tunnel boring machine).



# Acronyms and abbreviations

| Term | Definition |
|---|---|
| AWS | Automatic Weather Station |
| BOM | Bureau of Meteorology |
| dB | Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics. |
| dBA | Decibel expressed with the frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at low and high frequencies. |
| dBZ or dBL | The unit used to measure 'Z-weighted' sound pressure levels with no weighting applied, linear. |
| CEMP | Construction Environmental Management Plan |
| DECC | Department of Environment and Climate Change |
| DECCW | Department of Environment, Climate Change and Water |
| EPA | Environmental Protection Authority |
| ICNG | *Interim Construction Noise Guideline* (DECC, 2009). |
| NPfI | *Noise Policy for Industry* (EPA, 2017). |
| $L_{Aeq(period)}$ | Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring. |
| $L_{A10(period)}$ | The noise level exceeded for 10 per cent of the time and is approximately the average of the maximum noise levels. |
| $L_{A90(period)}$ | The sound pressure level that is exceeded for 90% of the measurement period. |
| $L_{Amax}$ | The absolute maximum noise level in a noise sample |
| NSW | New South Wales |
| OOHW | Out-of-hours Works |
| PPV | Peak particle velocity is the maximum vector sum of three orthogonal time-synchronized velocity components regardless of whether these component maxima occurred simultaneously. |
| RBL | Rating Background Level . The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period. |
| rms | Root Mean Square Amplitude (rms) is the square root of the average of the squared values of the waveform. In the case of the sine wave, the RMS value is 0.707 times the peak value, but this is only true in the case of the sine wave. |
| RNP | *Road Noise Policy* (DECCW, 2011). |
| SEARs | Secretary's Environmental Assessment Requirements |
| SPL | Sound Pressure Level |
| SWL | Sound Power Level |
| SWRO | Seawater Reverse Osmosis |
| Rw | Weighted Sound Reduction Index which provides a single-number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies |
| TBM | Tunnel Boring Machine |
| VDV | Vibration dose value - As defined in BS6472 – 2008, VDV is given by the fourth root of the integral of the fourth power of the frequency weighted acceleration. |
| WFP | Water Filtration Plant |

# Common Terms

| Term | Definition |
|---|---|
| A weighting | The human ear responds more to frequencies between 500 Hz and 8 kHz and is less sensitive to very low-pitch or high-pitch noises. The frequency weightings used in sound level measurements are often related to the response of the human ear to ensure that the meter better responds to what you actually hear |
| Adverse weather | Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter). |
| Ambient noise | The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far. This is described using the Leq descriptor |
| Background noise | The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L90 descriptor |
| Compliance | The process of checking that source noise levels meet with the noise limits in a statutory context. |
| Determining authority | Defined by Section 110 of the *Environmental Planning and Assessment Act 1979* as 'a Minister or public authority and, in relation to any activity, means the Minister or public authority by or on whose behalf the activity is or is to be carried out or any Minister or public authority whose approval is required in order to enable the activity to be carried out.' |
| Extraneous noise | Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous |
| EIS | Environmental Impact Assessment |
| Feasible and reasonable measures | Feasibility relates to engineering considerations and what is practical to build. reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: -<br>Noise mitigation benefits (amount of noise reduction provided, number of people protected);<br>Cost of mitigation (cost of mitigation versus benefit provided);<br>Community views (aesthetic impacts and community wishes);<br>Noise levels for affected land uses (existing and future levels, and changes in noise levels) |
| Ground-borne noise | Noise heard within a building that is generated by vibration transmitted through the ground into the structure from construction works, sometimes referred to as 'regenerated noise' or 'structure-borne noise'. Ground-borne noise can be more noticeable than airborne noise for underground works such as tunnelling. The ground-borne noise levels are only applicable when ground-borne noise levels are higher than airborne noise levels. |
| Ground-borne vibration | Vibration transmitted from a source to a receptor via the ground |
| Hertz | The measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz. |
| Masking | The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street. |
| Maximum noise event | The loudest event or events within a given period of time. This is generally described using the $L_{max}$ descriptor |
| Meteorological conditions | Wind and temperature inversion conditions |
| Most-affected location | Location(s) that experience (or will likely experience) the greatest noise impact from the construction works under consideration. In determining these locations, existing background noise levels, noise source location(s), distance and any shielding between the construction works (or proposed works) and the residences and other sensitive land uses need to be considered. |

| Term | Definition |
|---|---|
| Noise management level | The Noise Management Level (NML) as defined as the EPA's ICNG. To be measured and assessed at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the residential property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most affected point within 30 m of the residence. |
| Noise sensitive receiver | An area or place potentially affected by noise which includes:<br>a residential dwelling<br>an educational institution, library, childcare centre or kindergarten<br>a hospital, surgery or other medical institution<br>an active (e.g. sports field, golf course) or passive (e.g. national park) recreational area<br>commercial or industrial premises<br>a place of worship. |
| Non-compliance | Development is deemed to be in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit (exceptions may be given if the noise level exceeds by less than 2 dB) |
| Octave | A division of the frequency range into bands, the upper frequency limit |
| Project noise trigger level | Target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. Which of the two criteria is the most stringent is determined by measuring the level and nature of existing noise in the area surrounding the actual or propose noise generating facility. |
| Proposal | The construction and operation of the SWRO site, the modifications to the Illawarra WFP site and associated infrastructure including the power route, the delivery pipeline, the se and the intake and outlet tunnels. |
| proposal site | The immediate location of the proposal, which is the area that has the potential to be directly disturbed by construction and operation. |
| Resonance | Resonance describes the phenomenon of increased amplitude that occurs when the frequency of a periodically applied force is equal or close to a natural frequency of the system on which it acts. |
| Study area | Land in the vicinity of, and including, the proposal site. The 'study area' is the wider area surrounding the proposal site. |
| Temperature inversion | An atmospheric condition in which temperature increases with height above the ground. |
| Third-octave | Single octave bands divided into three parts. |

# Appendix B

## Predicted construction noise levels

*Predicted construction noise levels: Standard construction hours*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable / Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R001 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R002 | 48 ANNAM RD, BAYVIEW | Residential | NCA01 | 17 | 16 | 14 | 11 | - |
| R003 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R004 | 54 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R005 | 58 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R006 | 97 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R007 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R008 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R009 | 60 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R010 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 14 | - |
| R011 | 1 UTINGU PL, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 16 | - |
| R012 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R013 | 56 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R014 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R015 | 52 ANNAM RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R016 | 68 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 13 | - |
| R017 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R018 | 91 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R019 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R020 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R021 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R022 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R023 | 95 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 15 | - |
| R024 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R025 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 14 | - |
| R026 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R027 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R028 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 13 | - |
| R029 | 1782 PITTWATER RD, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 28 | - |
| R031 | 66 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 34 | - |
| R032 | 1784 PITTWATER RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 26 | - |
| R033 | 25 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 25 | - |
| R034 | 7 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 44 | 43 | 41 | 22 | - |
| R035 | 75 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 38 | - |
| R036 | 1977 PITTWATER RD, BAYVIEW | Educational institute | NCA01 | 49 | 48 | 46 | 31 | - |
| R037 | 4 JENDI AV, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 31 | - |
| R039 | 3 PINDARI PL, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 37 | - |
| R040 | 31 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 17 | - |
| R041 | 20 JENDI AV, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 16 | - |
| R042 | 8 JENDI AV, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 30 | - |
| R043 | 18 JENDI AV, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 28 | - |
| R044 | 13 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 21 | - |
| R045 | 1750A PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 33 | - |
| R046 | 1 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 28 | - |
| R049 | 68 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 34 | - |
| R050 | 2003 PITTWATER RD, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 24 | - |
| R051 | 2015 PITTWATER RD, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 26 | - |
| R053 | 29 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 17 | - |
| R054 | 12 JENDI AV, BAYVIEW | Residential | NCA01 | 44 | 43 | 41 | 29 | - |
| R056 | 2007 PITTWATER RD, BAYVIEW | Residential | NCA01 | 36 | 35 | 33 | 21 | - |
| R057 | 6 JENDI AV, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 31 | - |
| R058 | 14 JENDI AV, BAYVIEW | Residential | NCA01 | 44 | 43 | 41 | 29 | - |
| R059 | 33 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 17 | - |
| R060 | 5 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 28 | - |
| R061 | 24 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 25 | - |
| R062 | 1758 PITTWATER RD, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 22 | - |
| R063 | 1 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 21 | - |
| R065 | 7 PAMELA CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 16 | - |
| R066 | 1778 PITTWATER RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 22 | - |
| R067 | 10 JENDI AV, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 29 | - |

*Predicted construction noise levels: Standard construction hours*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable / Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R068 | 3 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 25 | - |
| R069 | 1744 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | - |
| R070 | 1756A PITTWATER RD, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 26 | - |
| R071 | 1985 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 31 | - |
| R072 | 1991 PITTWATER RD, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 28 | - |
| R073 | 1967 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 29 | - |
| R074 | 22 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 39 | 38 | 36 | 22 | - |
| R076 | 72 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 31 | - |
| R077 | 26A SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 30 | - |
| R078 | 2019 PITTWATER RD, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 24 | - |
| R080 | 60A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | - |
| R081 | 1A JENDI AV, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 31 | - |
| R082 | 7 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 44 | 43 | 41 | 29 | - |
| R083 | 70 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 33 | - |
| R084 | 1770 PITTWATER RD, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 21 | - |
| R085 | 1973 PITTWATER RD, BAYVIEW | Educational institute | NCA01 | 50 | 49 | 47 | 30 | - |
| R086 | 25 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 37 | - |
| R087 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 41 | - |
| R089 | 3 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | 45 | 43 | 40 | - |
| R090 | 7 VISTA AV, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 34 | - |
| R091 | 3 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 25 | - |
| R092 | 24 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R093 | 12 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 27 | - |
| R094 | 13 REDNAL ST, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 32 | - |
| R096 | 8 GERROA AV, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 35 | - |
| R097 | 19 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 31 | - |
| R098 | 112 WATERVIEW ST, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 34 | - |
| R099 | 21 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 25 | - |
| R100 | 1835 PITTWATER RD, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 25 | - |
| R101 | 10 GERROA AV, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 37 | - |
| R102 | 115 WATERVIEW ST, MONA VALE | Residential | NCA01 | 36 | 35 | 33 | 30 | - |
| R103 | 8 VISTA AV, BAYVIEW | Residential | NCA01 | 44 | 43 | 41 | 40 | - |
| R104 | 27 UTINGU PL, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 17 | - |
| R105 | 5 BELAIR PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 22 | - |
| R106 | 6 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 37 | - |
| R107 | 6 VISTA AV, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 37 | - |
| R108 | 2 LUCINDA PL, MONA VALE | Residential | NCA01 | 41 | 40 | 38 | 33 | - |
| R109 | 6 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R110 | 5 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | 45 | 43 | 40 | - |
| R111 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 32 | 31 | 29 | 28 | - |
| R112 | 97 WATERVIEW ST, MONA VALE | Residential | NCA01 | 42 | 41 | 39 | 34 | - |
| R113 | 8 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 28 | - |
| R114 | 9 BIMBIMBIE PL, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 19 | - |
| R116 | 12 REDNAL ST, MONA VALE | Residential | NCA01 | 39 | 38 | 36 | 33 | - |
| R117 | 5 REDNAL ST, MONA VALE | Residential | NCA01 | 31 | 30 | 28 | 23 | - |
| R118 | 17 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 40 | - |
| R119 | 113 WATERVIEW ST, MONA VALE | Residential | NCA01 | 42 | 41 | 39 | 36 | - |
| R120 | 1853 PITTWATER RD, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 34 | - |
| R121 | 2A BAYVIEW PL, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R122 | 26 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 26 | - |
| R123 | 5 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 36 | - |
| R124 | 1 LUCINDA PL, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 33 | - |
| R125 | 109 WATERVIEW ST, MONA VALE | Residential | NCA01 | 40 | 39 | 37 | 34 | - |
| R126 | 15 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R127 | 12 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 21 | - |
| R128 | 5 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 24 | - |
| R129 | 2 GERROA AV, BAYVIEW | Residential | NCA01 | 36 | 35 | 33 | 33 | - |
| R130 | 7 THE ESPLANADE , MONA VALE | Residential | NCA01 | 41 | 40 | 38 | 36 | - |
| R131 | 38 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 23 | - |
| R132 | 3 GERROA AV, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 29 | - |

*Predicted construction noise levels: Standard construction hours*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable / Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R133 | 11 VISTA AV, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 37 | - |
| R134 | 128 WATERVIEW ST, MONA VALE | Residential | NCA01 | 44 | 43 | 41 | 40 | - |
| R135 | 4 HALESMITH RD, MONA VALE | Residential | NCA01 | 45 | 44 | 42 | 40 | - |
| R136 | 16 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 35 | - |
| R137 | 2 HALESMITH RD, MONA VALE | Residential | NCA01 | 45 | 44 | 42 | 39 | - |
| R138 | 1A BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R139 | 6 GERROA AV, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 33 | - |
| R140 | 7 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 39 | - |
| R141 | 10 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 29 | - |
| R142 | 12 GERROA AV, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 36 | - |
| R143 | 11 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 24 | - |
| R144 | 15 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 22 | - |
| R145 | 9 VISTA AV, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 37 | - |
| R146 | 105 WATERVIEW ST, MONA VALE | Residential | NCA01 | 39 | 38 | 36 | 32 | - |
| R147 | 1863 PITTWATER RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 33 | - |
| R148 | 18 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 19 | - |
| R149 | 1855 PITTWATER RD, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 38 | - |
| R150 | 31 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 37 | - |
| R151 | 1 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 33 | - |
| R152 | 121 WATERVIEW ST, MONA VALE | Residential | NCA01 | 42 | 41 | 39 | 35 | - |
| R153 | 108 WATERVIEW ST, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 32 | - |
| R154 | 7 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | 45 | 43 | 40 | - |
| R156 | 14 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 35 | - |
| R158 | 106 WATERVIEW ST, MONA VALE | Residential | NCA01 | 40 | 39 | 37 | 35 | - |
| R159 | 8 HALESMITH RD, MONA VALE | Residential | NCA01 | 41 | 40 | 38 | 34 | - |
| R160 | 5 THE ESPLANADE , MONA VALE | Residential | NCA01 | 41 | 40 | 38 | 37 | - |
| R161 | 19 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 28 | - |
| R162 | 28 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R163 | 3 REDNAL ST, MONA VALE | Residential | NCA01 | 34 | 33 | 31 | 27 | - |
| R164 | 12 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 28 | - |
| R165 | 9 GERROA AV, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 34 | - |
| R166 | 6 THE ESPLANADE , MONA VALE | Residential | NCA01 | 41 | 40 | 38 | 37 | - |
| R167 | 11 GERROA AV, BAYVIEW | Residential | NCA01 | 39 | 38 | 36 | 37 | - |
| R168 | 4 REDNAL ST, MONA VALE | Residential | NCA01 | 44 | 43 | 41 | 37 | - |
| R170 | 7 REDNAL ST, MONA VALE | Residential | NCA01 | 41 | 40 | 38 | 34 | - |
| R171 | 114 WATERVIEW ST, MONA VALE | Residential | NCA01 | 39 | 38 | 36 | 35 | - |
| R172 | 125 WATERVIEW ST, MONA VALE | Residential | NCA01 | 42 | 41 | 39 | 37 | - |
| R173 | 9 REDNAL ST, MONA VALE | Residential | NCA01 | 39 | 38 | 36 | 33 | - |
| R174 | 101 WATERVIEW ST, MONA VALE | Residential | NCA01 | 36 | 35 | 33 | 30 | - |
| R175 | 4 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R176 | 107 WATERVIEW ST, MONA VALE | Residential | NCA01 | 42 | 41 | 39 | 33 | - |
| R177 | 103 WATERVIEW ST, MONA VALE | Residential | NCA01 | 35 | 34 | 32 | 30 | - |
| R178 | 16 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 32 | - |
| R179 | 123 WATERVIEW ST, MONA VALE | Residential | NCA01 | 42 | 41 | 39 | 37 | - |
| R180 | 110 WATERVIEW ST, MONA VALE | Residential | NCA01 | 41 | 40 | 38 | 34 | - |
| R181 | 2 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 32 | - |
| R182 | 33B ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 39 | - |
| R183 | 9 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | 45 | 43 | 40 | - |
| R184 | 10 HALESMITH RD, MONA VALE | Residential | NCA01 | 41 | 40 | 38 | 34 | - |
| R185 | 20 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 35 | - |
| R186 | 4 GERROA AV, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 31 | - |
| R187 | 8 BIMBIMBIE PL, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 16 | - |
| R188 | 20 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 20 | - |
| R189 | 120 WATERVIEW ST, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 34 | - |
| R190 | 102-104 WATERVIEW ST, MONA VALE | Residential | NCA01 | 41 | 40 | 38 | 36 | - |
| R191 | 8 UTINGU PL, BAYVIEW | Residential | NCA01 | 24 | 23 | 21 | 20 | - |
| R192 | 17 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 34 | - |
| R193 | 6 HALESMITH RD, MONA VALE | Residential | NCA01 | 44 | 43 | 41 | 38 | - |
| R194 | 18 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 36 | - |
| R195 | 9 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 24 | - |

*Predicted construction noise levels: Standard construction hours*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable / Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R196 | 18 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 34 | - |
| R197 | 1 GERROA AV, BAYVIEW | Residential | NCA01 | 44 | 43 | 41 | 38 | - |
| R198 | 7 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | **46** | - |
| R199 | 1881 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | **57** | N, V |
| R200 | 4 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | 38 | - |
| R201 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 41 | - |
| R202 | 1953 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 30 | - |
| R203 | 18 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 37 | - |
| R204 | 1941 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | 33 | N, V |
| R205 | 1893 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | **59** | N, V |
| R206 | 3 ROCHES AV, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **47** | - |
| R207 | 5A KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **46** | - |
| R208 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 33 | - |
| R209 | 2 ROCHES AV, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | **51** | - |
| R210 | 75 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 38 | - |
| R211 | 20 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 37 | - |
| R212 | 17 FERMOY AV, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 44 | - |
| R213 | 56 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 36 | - |
| R214 | 1891 PITTWATER RD, BAYVIEW | Residential | NCA01 | **58** | **57** | **55** | **60** | N, V |
| R215 | 1923 PITTWATER RD, BAYVIEW | Residential | NCA01 | **65** | **64** | **62** | 32 | N, V |
| R216 | 12 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 34 | - |
| R217 | 10A MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | 39 | - |
| R218 | 9 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | **46** | - |
| R219 | 52 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 35 | - |
| R220 | 15 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 45 | - |
| R221 | 1738A PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 32 | - |
| R222 | 8A ROCHES AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **55** | - |
| R223 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **62** | **61** | **59** | 33 | N, V |
| R224 | 9 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 45 | - |
| R225 | 3 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | 45 | 37 | - |
| R226 | 1937 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | 35 | N, V |
| R227 | 1 MITALA ST, NEWPORT | Residential | NCA01 | 37 | 36 | 34 | 31 | - |
| R228 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 31 | - |
| R229 | 42A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 34 | - |
| R230 | 116 IRRUBEL RD, NEWPORT | Residential | NCA01 | 45 | 44 | 42 | 36 | - |
| R231 | 29 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 35 | - |
| R232 | 128 IRRUBEL RD, NEWPORT | Residential | NCA01 | 33 | 32 | 30 | 27 | - |
| R233 | 1885 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | **58** | N, V |
| R234 | 1887 PITTWATER RD, BAYVIEW | Residential | NCA01 | **58** | **57** | **55** | **60** | N, V |
| R235 | 1873 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **50** | - |
| R236 | 1925 PITTWATER RD, BAYVIEW | Residential | NCA01 | **64** | **63** | **61** | 29 | N, V |
| R237 | 1A PRINCE ALFRED PDE, NEWPORT | Residential | NCA01 | **46** | 45 | 43 | 35 | - |
| R238 | 33 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 34 | - |
| R239 | 132 IRRUBEL RD, NEWPORT | Residential | NCA01 | 42 | 41 | 39 | 33 | - |
| R240 | 130 IRRUBEL RD, NEWPORT | Residential | NCA01 | 38 | 37 | 35 | 29 | - |
| R241 | 23 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 42 | - |
| R242 | 11 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **47** | - |
| R243 | 1875 PITTWATER RD, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **54** | - |
| R244 | 4 FERMOY AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | 35 | - |
| R245 | 3 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **47** | - |
| R246 | 1 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **49** | - |
| R247 | 83 IRRUBEL RD, NEWPORT | Residential | NCA01 | 44 | 43 | 41 | 34 | - |
| R248 | 10 ROCHES AV, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **54** | - |
| R249 | 5 ROCHES AV, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 44 | - |
| R250 | 1943 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | 31 | N, V |
| R251 | 9 MITALA ST, NEWPORT | Residential | NCA01 | 42 | 41 | 39 | 34 | - |
| R252 | 6A FERMOY AV, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | 41 | N, V |
| R253 | 7 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **47** | - |
| R254 | 1879 PITTWATER RD, BAYVIEW | Residential | NCA01 | **55** | **54** | **52** | **56** | N, V |
| R255 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | 38 | N, V |

*Predicted construction noise levels: Standard construction hours*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable / Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R256 | 1935 PITTWATER RD, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | 30 | - |
| R257 | 4 ROCHES AV, BAYVIEW | Residential | NCA01 | **55** | **54** | **52** | **52** | - |
| R258 | 6 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | **55** | - |
| R259 | 65 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 38 | - |
| R261 | 5 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | 45 | 37 | - |
| R262 | 1738 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | - |
| R263 | 13 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 45 | - |
| R264 | 6 PRINCES ST, NEWPORT | Residential | NCA01 | **48** | **47** | 45 | 40 | - |
| R265 | 121 IRRUBEL RD, NEWPORT | Residential | NCA01 | 36 | 35 | 33 | 34 | - |
| R266 | 1895 PITTWATER RD, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | **62** | N, V |
| R267 | 1899 PITTWATER RD, BAYVIEW | Residential | NCA01 | **63** | **62** | **60** | **65** | N, V |
| R268 | 21 FERMOY AV, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 36 | - |
| R270 | 1 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 45 | - |
| R271 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | - |
| R272 | 44 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 29 | - |
| R273 | 1951 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | - |
| R274 | 36 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 27 | - |
| R275 | 60A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | - |
| R276 | 95 IRRUBEL RD, NEWPORT | Residential | NCA01 | 34 | 33 | 31 | 28 | - |
| R277 | 33A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 32 | - |
| R278 | 2 CRYSTAL ST, NEWPORT | Residential | NCA01 | 36 | 35 | 33 | 26 | - |
| R279 | 8 PRINCES ST, NEWPORT | Residential | NCA01 | **49** | **48** | **46** | 41 | - |
| R280 | 4A MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | 45 | 37 | - |
| R281 | 1889 PITTWATER RD, BAYVIEW | Residential | NCA01 | **59** | **58** | **56** | **60** | N, V |
| R282 | 48-50 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 35 | - |
| R283 | 123 IRRUBEL RD, NEWPORT | Residential | NCA01 | 39 | 38 | 36 | 27 | - |
| R284 | 16 MITALA ST, NEWPORT | Commercial | NCA01 | 52 | 51 | 49 | 42 | - |
| R285 | 8 FERMOY AV, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 33 | - |
| R286 | 34 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 29 | - |
| R287 | 12 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **46** | - |
| R288 | 134 IRRUBEL RD, NEWPORT | Residential | NCA01 | 41 | 40 | 38 | 32 | - |
| R289 | 122 IRRUBEL RD, NEWPORT | Residential | NCA01 | **46** | 45 | 43 | 37 | - |
| R290 | 2A CRYSTAL ST, NEWPORT | Residential | NCA01 | 39 | 38 | 36 | 31 | - |
| R291 | 85 IRRUBEL RD, NEWPORT | Residential | NCA01 | 43 | 42 | 40 | 36 | - |
| R292 | 1740 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 32 | - |
| R293 | 1B JENDI AV, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 31 | - |
| R294 | 15 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 44 | - |
| R295 | 9 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **47** | - |
| R296 | 13 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 26 | - |
| R298 | 19-21 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 40 | - |
| R299 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 45 | - |
| R300 | 13 GERROA AV, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R301 | 9 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 36 | - |
| R302 | 1740 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 32 | - |
| R303 | 6 MITALA ST, NEWPORT | Residential | NCA01 | **49** | **48** | **46** | 39 | - |
| R304 | 1736 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | - |
| R305 | 19-21 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 40 | - |
| R306 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 42 | - |
| R307 | 2 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 39 | - |
| R308 | 67 ANNAM RD, BAYVIEW | Residential | NCA01 | 24 | 23 | 21 | 17 | - |
| R309 | 10 KARA CR, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 32 | - |
| R310 | 1 NANGANA RD, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 16 | - |
| R311 | 62 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 15 | - |
| R312 | 50 ANNAM RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 13 | - |
| R313 | 1A LENTARA RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R314 | 9B KARA CR, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 20 | - |
| R316 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R317 | 53-55 ANNAM RD, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 15 | - |
| R318 | 3 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 38 | - |
| R320 | 9 KARA CR, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 37 | - |

*Predicted construction noise levels: Standard construction hours*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable / Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R321 | 2 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 39 | - |
| R322 | 1746 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | - |
| R323 | 1987 PITTWATER RD, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 30 | - |
| R325 | 1965 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 29 | - |
| R326 | 1768 PITTWATER RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 20 | - |
| R327 | 7B LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 21 | - |
| R328 | 20 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 23 | - |
| R329 | 21 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 20 | - |
| R331 | 79 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 37 | - |
| R332 | 1742 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 29 | - |
| R333 | 1963 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 30 | - |
| R334 | 1754A PITTWATER RD, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 33 | - |
| R335 | 1961 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 31 | - |
| R336 | 1772 PITTWATER RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 24 | - |
| R337 | 8A LOQUAT VALLEY RD, BAYVIEW | Educational institute | NCA01 | 49 | 48 | 46 | 30 | - |
| R338 | 1762 PITTWATER RD, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 21 | - |
| R339 | 9 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 25 | - |
| R340 | 4 PINDARI PL, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 39 | - |
| R341 | 1748 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 31 | - |
| R342 | 1754A PITTWATER RD, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 26 | - |
| R343 | 77 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 37 | - |
| R344 | 1989 PITTWATER RD, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 29 | - |
| R345 | 43 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 21 | - |
| R346 | 5 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 23 | - |
| R347 | 1 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 38 | - |
| R348 | 15 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 20 | - |
| R349 | 2 LENTARA RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 26 | - |
| R350 | 62 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 28 | - |
| R351 | 2009 PITTWATER RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 21 | - |
| R352 | 2005 PITTWATER RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 22 | - |
| R353 | 16 JENDI AV, BAYVIEW | Residential | NCA01 | 44 | 43 | 41 | 29 | - |
| R354 | 4 LENTARA RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 25 | - |
| R355 | 1957 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 28 | - |
| R356 | 3 JENDI AV, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 29 | - |
| R357 | 4 PINDARI PL, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 38 | - |
| R358 | 1981 PITTWATER RD, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 25 | - |
| R359 | 81 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 38 | - |
| R360 | 28 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 18 | - |
| R361 | 6 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 44 | 43 | 41 | 29 | - |
| R362 | 23 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 23 | - |
| R363 | 8 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 24 | - |
| R364 | 27 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 16 | - |
| R365 | 89 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 21 | - |
| R366 | 1756A PITTWATER RD, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 22 | - |
| R367 | 9 JENDI AV, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 23 | - |
| R368 | 7A LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 31 | - |
| R369 | 1752 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 33 | - |
| R370 | 2 PINDARI PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 24 | - |
| R371 | 8A KARA CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 23 | - |
| R372 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 45 | 44 | 42 | 43 | - |
| R373 | 1849 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 29 | - |
| R374 | 1 THE ESPLANADE , MONA VALE | Residential | NCA01 | 45 | 44 | 42 | 40 | - |
| R375 | 39 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 38 | - |
| R376 | 15 REDNAL ST, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 32 | - |
| R377 | 11 REDNAL ST, MONA VALE | Residential | NCA01 | 34 | 33 | 31 | 28 | - |
| R378 | 14 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 32 | - |
| R379 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 45 | - |
| R380 | 8 KARA CR, BAYVIEW | Residential | NCA01 | 36 | 35 | 33 | 31 | - |
| R381 | 13 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 39 | - |
| R382 | 2 REDNAL ST, MONA VALE | Residential | NCA01 | 45 | 44 | 42 | 38 | - |

*Predicted construction noise levels: Standard construction hours*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable / Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R383 | 22 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 37 | - |
| R384 | 8 KARA CR, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 31 | - |
| R385 | 6 KARA CR, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 35 | - |
| R386 | 10 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R387 | 5 GERROA AV, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 29 | - |
| R388 | 7 UTINGU PL, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 21 | - |
| R389 | 126 WATERVIEW ST, MONA VALE | Residential | NCA01 | 42 | 41 | 39 | 36 | - |
| R390 | 22 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 22 | - |
| R391 | 25 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 41 | - |
| R392 | 10 GERROA AV, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 41 | - |
| R393 | 1859 PITTWATER RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 35 | - |
| R394 | 17 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 26 | - |
| R395 | 12A KAMILAROI RD, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 39 | - |
| R396 | 19 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 40 | - |
| R397 | 4 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 39 | - |
| R398 | 2A THE ESPLANADE , MONA VALE | Commercial | NCA01 | 42 | 41 | 39 | 38 | - |
| R399 | 20 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 35 | - |
| R400 | 7 KARA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 43 | - |
| R401 | 10 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 35 | - |
| R402 | 3 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 39 | 38 | 36 | 34 | - |
| R403 | 1865 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 32 | - |
| R404 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 43 | - |
| R405 | 27 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 41 | - |
| R406 | 1871 PITTWATER RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 37 | - |
| R407 | 1831A PITTWATER RD, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R408 | 4 REDNAL ST, MONA VALE | Residential | NCA01 | 45 | 44 | 42 | 38 | - |
| R409 | 27A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 41 | - |
| R410 | 8 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 26 | - |
| R411 | 7 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 39 | 38 | 36 | 35 | - |
| R412 | 6 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 23 | - |
| R413 | 17 KING EDWARD AV, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 40 | - |
| R414 | 29A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 38 | - |
| R415 | 1845 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 30 | - |
| R416 | 27A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 43 | - |
| R417 | 14 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 40 | - |
| R418 | 27B ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 40 | - |
| R419 | 6 KARA CR, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 39 | - |
| R420 | 1839 PITTWATER RD, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 28 | - |
| R421 | 3 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 38 | - |
| R422 | 12 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 42 | 41 | 39 | 39 | - |
| R423 | 27 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 41 | - |
| R424 | 11 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | 45 | 43 | 40 | - |
| R425 | 1857 PITTWATER RD, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 32 | - |
| R426 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 45 | 44 | 42 | 43 | - |
| R427 | 126 WATERVIEW ST, MONA VALE | Residential | NCA01 | 43 | 42 | 40 | 39 | - |
| R428 | 8 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 32 | - |
| R429 | 10 PRINCES ST, NEWPORT | Residential | NCA01 | **48** | **47** | 45 | 39 | - |
| R430 | 1712 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 62 | 61 | 59 | 31 | - |
| R431 | 14 MITALA ST, NEWPORT | Commercial | NCA01 | 48 | 47 | 45 | 36 | - |
| R432 | 5 FERMOY AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **49** | - |
| R433 | 14 MITALA ST, NEWPORT | Commercial | NCA01 | 49 | 48 | 46 | 39 | - |
| R434 | 26-28 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 42 | - |
| R435 | 118 IRRUBEL RD, NEWPORT | Residential | NCA01 | 45 | 44 | 42 | 36 | - |
| R436 | 63A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 37 | - |
| R437 | 12 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | 39 | - |
| R438 | 39 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 38 | - |
| R439 | 63 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 34 | - |
| R440 | 24 FERMOY AV, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 36 | - |
| R441 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 45 | - |
| R442 | 30 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 44 | 43 | 41 | 44 | - |

*Predicted construction noise levels: Standard construction hours*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable / Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R443 | 79 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 37 | - |
| R444 | 7 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | **47** | - |
| R445 | 1714 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 56 | 55 | 53 | 31 | - |
| R446 | 1935B PITTWATER RD, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 31 | - |
| R447 | 2 MITALA ST, NEWPORT | Residential | NCA01 | 43 | 42 | 40 | 33 | - |
| R448 | 1903 PITTWATER RD, BAYVIEW | Residential | NCA01 | **68** | **67** | **65** | **65** | N, V |
| R449 | 6 FERMOY AV, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | 40 | N, V |
| R450 | 11 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | 45 | 38 | - |
| R451 | 1678 PITTWATER RD, BAYVIEW | Passive recreation | NCA01 | 56 | 55 | 53 | 72 | N |
| R452 | 7 MITALA ST, NEWPORT | Residential | NCA01 | 45 | 44 | 42 | 34 | - |
| R453 | 14 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 44 | - |
| R454 | 1678 PITTWATER RD, BAYVIEW | Active recreation | NCA01 | 82 | 81 | 79 | 71 | N |
| R455 | 1933 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 28 | - |
| R456 | 1953 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 28 | - |
| R457 | 77 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 37 | - |
| R458 | 1897 PITTWATER RD, BAYVIEW | Residential | NCA01 | **59** | **58** | **56** | **63** | N, V |
| R459 | 1A FERMOY AV, BAYVIEW | Residential | NCA01 | **61** | **60** | **58** | **53** | N, V |
| R460 | 71 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 36 | - |
| R461 | 140 IRRUBEL RD, NEWPORT | Residential | NCA01 | **48** | **47** | 45 | 36 | - |
| R463 | 79 IRRUBEL RD, NEWPORT | Residential | NCA01 | 44 | 43 | 41 | 32 | - |
| R464 | 1935A PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 27 | - |
| R465 | 1871 PITTWATER RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 37 | - |
| R466 | 1957 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 28 | - |
| R467 | 2 FERMOY AV, BAYVIEW | Residential | NCA01 | **65** | **64** | **62** | 34 | N, V |
| R468 | 4A MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | 45 | 37 | - |
| R469 | 1901C PITTWATER RD, BAYVIEW | Residential | NCA01 | **61** | **60** | **58** | **57** | N, V |
| R470 | 24 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 43 | - |
| R471 | 3 FERMOY AV, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | **55** | N, V |
| R472 | 2 MITALA ST, NEWPORT | Residential | NCA01 | **47** | **46** | 44 | 33 | - |
| R473 | 29A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 38 | - |
| R474 | 4 CRYSTAL ST, NEWPORT | Residential | NCA01 | 40 | 39 | 37 | 29 | - |
| R475 | 2 FERMOY AV, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | 35 | N, V |
| R476 | 40 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 43 | 42 | 40 | 29 | - |
| R477 | 4 MITALA ST, NEWPORT | Residential | NCA01 | **47** | **46** | 44 | 34 | - |
| R478 | 40 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | - |
| R479 | 37 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | 44 | 35 | - |
| R480 | 136 IRRUBEL RD, NEWPORT | Residential | NCA01 | 42 | 41 | 39 | 33 | - |
| R481 | 11 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **46** | - |
| R482 | 1907 PITTWATER RD, BAYVIEW | Residential | NCA01 | **70** | **69** | **67** | **49** | N, V |
| R483 | 16 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 37 | - |
| R484 | 12 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | 39 | - |
| R485 | 1879 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | 45 | 45 | - |
| R486 | 10 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 35 | - |
| R487 | 1754B PITTWATER RD, BAYVIEW | Residential | NCA01 | 45 | 44 | 42 | 32 | - |
| R489 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 42 | - |
| R490 | 8 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 41 | 40 | 38 | 36 | - |
| R491 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **46** | 45 | 43 | 42 | - |
| R492 | 7 GERROA AV, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 28 | - |

*Predicted construction noise levels: OOHW Period 1 (Day)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R001 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R002 | 48 ANNAM RD, BAYVIEW | Residential | NCA01 | 17 | 16 | 14 | 11 | - |
| R003 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R004 | 54 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R005 | 58 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R006 | 97 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R007 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R008 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R009 | 60 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R010 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 14 | - |
| R011 | 1 UTINGU PL, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 16 | - |
| R012 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R013 | 56 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R014 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R015 | 52 ANNAM RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R016 | 68 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 13 | - |
| R017 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R018 | 91 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R019 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R020 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R021 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R022 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R023 | 95 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 15 | - |
| R024 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R025 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 14 | - |
| R026 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R027 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R028 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 13 | - |
| R029 | 1782 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 28 | - |
| R031 | 66 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 34 | PN |
| R032 | 1784 PITTWATER RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 26 | - |
| R033 | 25 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 25 | - |
| R034 | 7 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 22 | - |
| R035 | 75 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 38 | PN |
| R036 | 1977 PITTWATER RD, BAYVIEW | Educational institute | NCA01 | 49 | 48 | 46 | 31 | - |
| R037 | 4 JENDI AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 31 | PN |
| R039 | 3 PINDARI PL, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 37 | PN |
| R040 | 31 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 17 | - |
| R041 | 20 JENDI AV, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 16 | - |
| R042 | 8 JENDI AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 30 | PN |
| R043 | 18 JENDI AV, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 28 | - |
| R044 | 13 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 21 | - |
| R045 | 1750A PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 33 | PN |
| R046 | 1 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 28 | - |
| R049 | 68 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 34 | PN |
| R050 | 2003 PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 24 | - |
| R051 | 2015 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 26 | - |
| R053 | 29 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 17 | - |
| R054 | 12 JENDI AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | - |
| R056 | 2007 PITTWATER RD, BAYVIEW | Residential | NCA01 | 36 | 35 | 33 | 21 | - |
| R057 | 6 JENDI AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN |
| R058 | 14 JENDI AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | - |
| R059 | 33 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 17 | - |
| R060 | 5 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 28 | - |
| R061 | 24 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 25 | - |
| R062 | 1758 PITTWATER RD, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 22 | - |
| R063 | 1 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 21 | - |
| R065 | 7 PAMELA CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 16 | - |

*Predicted construction noise levels: OOHW Period 1 (Day)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R066 | 1778 PITTWATER RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 22 | - |
| R067 | 10 JENDI AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 29 | - |
| R068 | 3 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 25 | - |
| R069 | 1744 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | PN |
| R070 | 1756A PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 26 | - |
| R071 | 1985 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 31 | PN |
| R072 | 1991 PITTWATER RD, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 28 | - |
| R073 | 1967 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN |
| R074 | 22 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 39 | 38 | 36 | 22 | - |
| R076 | 72 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 31 | PN |
| R077 | 26A SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 30 | - |
| R078 | 2019 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 24 | - |
| R080 | 60A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | PN |
| R081 | 1A JENDI AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 31 | PN |
| R082 | 7 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | - |
| R083 | 70 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 33 | PN |
| R084 | 1770 PITTWATER RD, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 21 | - |
| R085 | 1973 PITTWATER RD, BAYVIEW | Educational institute | NCA01 | 50 | 49 | 47 | 30 | - |
| R086 | 25 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 37 | - |
| R087 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **41** | - |
| R089 | 3 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | 40 | PN |
| R090 | 7 VISTA AV, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 34 | - |
| R091 | 3 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 25 | - |
| R092 | 24 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R093 | 12 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 27 | - |
| R094 | 13 REDNAL ST, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 32 | - |
| R096 | 8 GERROA AV, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 35 | - |
| R097 | 19 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 31 | - |
| R098 | 112 WATERVIEW ST, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 34 | - |
| R099 | 21 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 25 | - |
| R100 | 1835 PITTWATER RD, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 25 | - |
| R101 | 10 GERROA AV, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 37 | - |
| R102 | 115 WATERVIEW ST, MONA VALE | Residential | NCA01 | 36 | 35 | 33 | 30 | - |
| R103 | 8 VISTA AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 40 | - |
| R104 | 27 UTINGU PL, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 17 | - |
| R105 | 5 BELAIR PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 22 | - |
| R106 | 6 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 37 | - |
| R107 | 6 VISTA AV, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 37 | - |
| R108 | 2 LUCINDA PL, MONA VALE | Residential | NCA01 | **41** | 40 | 38 | 33 | - |
| R109 | 6 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R110 | 5 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | 40 | PN |
| R111 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 32 | 31 | 29 | 28 | - |
| R112 | 97 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | 39 | 34 | - |
| R113 | 8 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 28 | - |
| R114 | 9 BIMBIMBIE PL, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 19 | - |
| R116 | 12 REDNAL ST, MONA VALE | Residential | NCA01 | 39 | 38 | 36 | 33 | - |
| R117 | 5 REDNAL ST, MONA VALE | Residential | NCA01 | 31 | 30 | 28 | 23 | - |
| R118 | 17 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 40 | - |
| R119 | 113 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | 39 | 36 | - |
| R120 | 1853 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 34 | - |
| R121 | 2A BAYVIEW PL, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R122 | 26 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 26 | - |
| R123 | 5 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 36 | - |
| R124 | 1 LUCINDA PL, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 33 | - |
| R125 | 109 WATERVIEW ST, MONA VALE | Residential | NCA01 | 40 | 39 | 37 | 34 | - |
| R126 | 15 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R127 | 12 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 21 | - |
| R128 | 5 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 24 | - |

*Predicted construction noise levels: OOHW Period 1 (Day)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R129 | 2 GERROA AV, BAYVIEW | Residential | NCA01 | 36 | 35 | 33 | 33 | - |
| R130 | 7 THE ESPLANADE , MONA VALE | Residential | NCA01 | **41** | 40 | 38 | 36 | - |
| R131 | 38 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 23 | - |
| R132 | 3 GERROA AV, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 29 | - |
| R133 | 11 VISTA AV, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 37 | - |
| R134 | 128 WATERVIEW ST, MONA VALE | Residential | NCA01 | **44** | **43** | **41** | 40 | - |
| R135 | 4 HALESMITH RD, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | 40 | - |
| R136 | 16 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 35 | - |
| R137 | 2 HALESMITH RD, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | 39 | - |
| R138 | 1A BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R139 | 6 GERROA AV, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 33 | - |
| R140 | 7 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 39 | - |
| R141 | 10 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 29 | - |
| R142 | 12 GERROA AV, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 36 | - |
| R143 | 11 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 24 | - |
| R144 | 15 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 22 | - |
| R145 | 9 VISTA AV, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 37 | - |
| R146 | 105 WATERVIEW ST, MONA VALE | Residential | NCA01 | 39 | 38 | 36 | 32 | - |
| R147 | 1863 PITTWATER RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 33 | - |
| R148 | 18 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 19 | - |
| R149 | 1855 PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 38 | - |
| R150 | 31 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 37 | PN |
| R151 | 1 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 33 | - |
| R152 | 121 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | 39 | 35 | - |
| R153 | 108 WATERVIEW ST, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 32 | - |
| R154 | 7 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | 40 | PN |
| R156 | 14 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 35 | - |
| R158 | 106 WATERVIEW ST, MONA VALE | Residential | NCA01 | 40 | 39 | 37 | 35 | - |
| R159 | 8 HALESMITH RD, MONA VALE | Residential | NCA01 | **41** | 40 | 38 | 34 | - |
| R160 | 5 THE ESPLANADE , MONA VALE | Residential | NCA01 | **41** | 40 | 38 | 37 | - |
| R161 | 19 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 28 | - |
| R162 | 28 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R163 | 3 REDNAL ST, MONA VALE | Residential | NCA01 | 34 | 33 | 31 | 27 | - |
| R164 | 12 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 28 | - |
| R165 | 9 GERROA AV, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 34 | - |
| R166 | 6 THE ESPLANADE , MONA VALE | Residential | NCA01 | **41** | 40 | 38 | 37 | - |
| R167 | 11 GERROA AV, BAYVIEW | Residential | NCA01 | 39 | 38 | 36 | 37 | - |
| R168 | 4 REDNAL ST, MONA VALE | Residential | NCA01 | **44** | **43** | **41** | 37 | - |
| R170 | 7 REDNAL ST, MONA VALE | Residential | NCA01 | **41** | 40 | 38 | 34 | - |
| R171 | 114 WATERVIEW ST, MONA VALE | Residential | NCA01 | 39 | 38 | 36 | 35 | - |
| R172 | 125 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | 39 | 37 | - |
| R173 | 9 REDNAL ST, MONA VALE | Residential | NCA01 | 39 | 38 | 36 | 33 | - |
| R174 | 101 WATERVIEW ST, MONA VALE | Residential | NCA01 | 36 | 35 | 33 | 30 | - |
| R175 | 4 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R176 | 107 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | 39 | 33 | - |
| R177 | 103 WATERVIEW ST, MONA VALE | Residential | NCA01 | 35 | 34 | 32 | 30 | - |
| R178 | 16 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 32 | - |
| R179 | 123 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | 39 | 37 | - |
| R180 | 110 WATERVIEW ST, MONA VALE | Residential | NCA01 | **41** | 40 | 38 | 34 | - |
| R181 | 2 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 32 | - |
| R182 | 33B ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 39 | PN |
| R183 | 9 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | 40 | PN |
| R184 | 10 HALESMITH RD, MONA VALE | Residential | NCA01 | **41** | 40 | 38 | 34 | - |
| R185 | 20 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 35 | - |
| R186 | 4 GERROA AV, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 31 | - |
| R187 | 8 BIMBIMBIE PL, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 16 | - |
| R188 | 20 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 20 | - |
| R189 | 120 WATERVIEW ST, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 34 | - |

*Predicted construction noise levels: OOHW Period 1 (Day)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R190 | 102-104 WATERVIEW ST, MONA VALE | Residential | NCA01 | **41** | 40 | 38 | 36 | - |
| R191 | 8 UTINGU PL, BAYVIEW | Residential | NCA01 | 24 | 23 | 21 | 20 | - |
| R192 | 17 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 34 | - |
| R193 | 6 HALESMITH RD, MONA VALE | Residential | NCA01 | **44** | **43** | **41** | 38 | - |
| R194 | 18 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 36 | - |
| R195 | 9 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 24 | - |
| R196 | 18 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 34 | - |
| R197 | 1 GERROA AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 38 | - |
| R198 | 7 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **46** | PN |
| R199 | 1881 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | **57** | PN, V, SN, RO |
| R200 | 4 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | 38 | PN |
| R201 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **41** | - |
| R202 | 1953 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 30 | PN |
| R203 | 18 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 37 | PN |
| R204 | 1941 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | 33 | PN, V, SN, RO |
| R205 | 1893 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **59** | PN, V, SN, RO |
| R206 | 3 ROCHES AV, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **47** | PN |
| R207 | 5A KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **46** | PN |
| R208 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 33 | PN |
| R209 | 2 ROCHES AV, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | **51** | PN |
| R210 | 75 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 38 | PN |
| R211 | 20 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 37 | PN |
| R212 | 17 FERMOY AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **44** | PN |
| R213 | 56 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 36 | PN |
| R214 | 1891 PITTWATER RD, BAYVIEW | Residential | NCA01 | **58** | **57** | **55** | **60** | PN, V, SN, RO |
| R215 | 1923 PITTWATER RD, BAYVIEW | Residential | NCA01 | **65** | **64** | **62** | 32 | PN, V, SN, RO |
| R216 | 12 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 34 | PN |
| R217 | 10A MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | 39 | PN |
| R218 | 9 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **46** | PN |
| R219 | 52 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 35 | PN |
| R220 | 15 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **45** | PN |
| R221 | 1738A PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 32 | PN |
| R222 | 8A ROCHES AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **55** | PN |
| R223 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **62** | **61** | **59** | 33 | PN, V, SN, RO |
| R224 | 9 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **45** | PN |
| R225 | 3 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | 37 | PN |
| R226 | 1937 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | 35 | PN, V, SN, RO |
| R227 | 1 MITALA ST, NEWPORT | Residential | NCA01 | 37 | 36 | 34 | 31 | - |
| R228 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 31 | PN |
| R229 | 42A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 34 | PN |
| R230 | 116 IRRUBEL RD, NEWPORT | Residential | NCA01 | **45** | **44** | **42** | 36 | - |
| R231 | 29 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 35 | PN |
| R232 | 128 IRRUBEL RD, NEWPORT | Residential | NCA01 | 33 | 32 | 30 | 27 | - |
| R233 | 1885 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | **58** | PN, V, SN, RO |
| R234 | 1887 PITTWATER RD, BAYVIEW | Residential | NCA01 | **58** | **57** | **55** | **60** | PN, V, SN, RO |
| R235 | 1873 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **50** | PN |
| R236 | 1925 PITTWATER RD, BAYVIEW | Residential | NCA01 | **64** | **63** | **61** | 29 | PN, V, SN, RO |
| R237 | 1A PRINCE ALFRED PDE, NEWPORT | Residential | NCA01 | **46** | **45** | **43** | 35 | PN |
| R238 | 33 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 34 | PN |
| R239 | 132 IRRUBEL RD, NEWPORT | Residential | NCA01 | **42** | **41** | 39 | 33 | - |
| R240 | 130 IRRUBEL RD, NEWPORT | Residential | NCA01 | 38 | 37 | 35 | 29 | - |
| R241 | 23 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **42** | PN |
| R242 | 11 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **47** | PN |
| R243 | 1875 PITTWATER RD, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **54** | PN |
| R244 | 4 FERMOY AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | 35 | PN |
| R245 | 3 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **47** | PN |
| R246 | 1 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **49** | PN |
| R247 | 83 IRRUBEL RD, NEWPORT | Residential | NCA01 | **44** | **43** | **41** | 34 | - |

*Predicted construction noise levels: OOHW Period 1 (Day)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R248 | 10 ROCHES AV, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **54** | PN |
| R249 | 5 ROCHES AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **44** | - |
| R250 | 1943 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | 31 | PN, V, SN, RO |
| R251 | 9 MITALA ST, NEWPORT | Residential | NCA01 | **42** | **41** | 39 | 34 | - |
| R252 | 6A FERMOY AV, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | **41** | PN, V, SN, RO |
| R253 | 7 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **47** | PN |
| R254 | 1879 PITTWATER RD, BAYVIEW | Residential | NCA01 | **55** | **54** | **52** | **56** | PN, V, SN, RO |
| R255 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | 38 | PN, V, SN, RO |
| R256 | 1935 PITTWATER RD, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | 30 | PN |
| R257 | 4 ROCHES AV, BAYVIEW | Residential | NCA01 | **55** | **54** | **52** | **52** | PN |
| R258 | 6 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **55** | PN |
| R259 | 65 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 38 | PN |
| R261 | 5 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | 37 | PN |
| R262 | 1738 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | PN |
| R263 | 13 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN |
| R264 | 6 PRINCES ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | 40 | PN |
| R265 | 121 IRRUBEL RD, NEWPORT | Residential | NCA01 | 36 | 35 | 33 | 34 | - |
| R266 | 1895 PITTWATER RD, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | **62** | PN, V, SN, RO |
| R267 | 1899 PITTWATER RD, BAYVIEW | Residential | NCA01 | **63** | **62** | **60** | **65** | PN, V, SN, RO |
| R268 | 21 FERMOY AV, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 36 | - |
| R270 | 1 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN |
| R271 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | PN |
| R272 | 44 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN |
| R273 | 1951 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | PN |
| R274 | 36 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 27 | - |
| R275 | 60A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | PN |
| R276 | 95 IRRUBEL RD, NEWPORT | Residential | NCA01 | 34 | 33 | 31 | 28 | - |
| R277 | 33A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 32 | - |
| R278 | 2 CRYSTAL ST, NEWPORT | Residential | NCA01 | 36 | 35 | 33 | 26 | - |
| R279 | 8 PRINCES ST, NEWPORT | Residential | NCA01 | **49** | **48** | **46** | **41** | PN |
| R280 | 4A MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | 37 | PN |
| R281 | 1889 PITTWATER RD, BAYVIEW | Residential | NCA01 | **59** | **58** | **56** | **60** | PN, V, SN, RO |
| R282 | 48-50 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 35 | PN |
| R283 | 123 IRRUBEL RD, NEWPORT | Residential | NCA01 | 39 | 38 | 36 | 27 | - |
| R284 | 16 MITALA ST, NEWPORT | Commercial | NCA01 | 52 | 51 | 49 | 42 | - |
| R285 | 8 FERMOY AV, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 33 | - |
| R286 | 34 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 29 | - |
| R287 | 12 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **46** | PN |
| R288 | 134 IRRUBEL RD, NEWPORT | Residential | NCA01 | **41** | 40 | 38 | 32 | - |
| R289 | 122 IRRUBEL RD, NEWPORT | Residential | NCA01 | **46** | **45** | **43** | 37 | PN |
| R290 | 2A CRYSTAL ST, NEWPORT | Residential | NCA01 | 39 | 38 | 36 | 31 | - |
| R291 | 85 IRRUBEL RD, NEWPORT | Residential | NCA01 | **43** | **42** | 40 | 36 | - |
| R292 | 1740 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 32 | PN |
| R293 | 1B JENDI AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN |
| R294 | 15 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **44** | PN |
| R295 | 9 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **47** | PN |
| R296 | 13 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 26 | - |
| R298 | 19-21 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 40 | PN |
| R299 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN |
| R300 | 13 GERROA AV, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R301 | 9 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 36 | - |
| R302 | 1740 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 32 | PN |
| R303 | 6 MITALA ST, NEWPORT | Residential | NCA01 | **49** | **48** | **46** | 39 | PN |
| R304 | 1736 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | PN |
| R305 | 19-21 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 40 | PN |
| R306 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **42** | - |
| R307 | 2 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 39 | PN |
| R308 | 67 ANNAM RD, BAYVIEW | Residential | NCA01 | 24 | 23 | 21 | 17 | - |

*Predicted construction noise levels: OOHW Period 1 (Day)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R309 | 10 KARA CR, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 32 | - |
| R310 | 1 NANGANA RD, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 16 | - |
| R311 | 62 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 15 | - |
| R312 | 50 ANNAM RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 13 | - |
| R313 | 1A LENTARA RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R314 | 9B KARA CR, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 20 | - |
| R316 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R317 | 53-55 ANNAM RD, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 15 | - |
| R318 | 3 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 38 | PN |
| R320 | 9 KARA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 37 | - |
| R321 | 2 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 39 | PN |
| R322 | 1746 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | PN |
| R323 | 1987 PITTWATER RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 30 | - |
| R325 | 1965 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 29 | PN |
| R326 | 1768 PITTWATER RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 20 | - |
| R327 | 7B LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 21 | - |
| R328 | 20 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 23 | - |
| R329 | 21 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 20 | - |
| R331 | 79 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 37 | PN |
| R332 | 1742 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN |
| R333 | 1963 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 30 | PN |
| R334 | 1754A PITTWATER RD, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 33 | PN |
| R335 | 1961 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN |
| R336 | 1772 PITTWATER RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 24 | - |
| R337 | 8A LOQUAT VALLEY RD, BAYVIEW | Educational institute | NCA01 | 49 | 48 | 46 | 30 | - |
| R338 | 1762 PITTWATER RD, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 21 | - |
| R339 | 9 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 25 | PN |
| R340 | 4 PINDARI PL, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 39 | PN |
| R341 | 1748 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 31 | PN |
| R342 | 1754A PITTWATER RD, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 26 | - |
| R343 | 77 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 37 | PN |
| R344 | 1989 PITTWATER RD, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 29 | PN |
| R345 | 43 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 21 | - |
| R346 | 5 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 23 | - |
| R347 | 1 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 38 | PN |
| R348 | 15 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 20 | - |
| R349 | 2 LENTARA RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 26 | - |
| R350 | 62 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 28 | - |
| R351 | 2009 PITTWATER RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 21 | - |
| R352 | 2005 PITTWATER RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 22 | - |
| R353 | 16 JENDI AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | - |
| R354 | 4 LENTARA RD, BAYVIEW | Residential | NCA01 | 38 | 37 | 35 | 25 | - |
| R355 | 1957 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 28 | PN |
| R356 | 3 JENDI AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN |
| R357 | 4 PINDARI PL, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 38 | PN |
| R358 | 1981 PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 25 | - |
| R359 | 81 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 38 | PN |
| R360 | 28 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 18 | - |
| R361 | 6 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | - |
| R362 | 23 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 23 | - |
| R363 | 8 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 24 | - |
| R364 | 27 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 16 | - |
| R365 | 89 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 21 | - |
| R366 | 1756A PITTWATER RD, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 22 | - |
| R367 | 9 JENDI AV, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 23 | - |
| R368 | 7A LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN |
| R369 | 1752 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 33 | PN |
| R370 | 2 PINDARI PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 24 | - |

*Predicted construction noise levels: OOHW Period 1 (Day)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R371 | 8A KARA CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 23 | - |
| R372 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 45 | 44 | 42 | 43 | - |
| R373 | 1849 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 29 | - |
| R374 | 1 THE ESPLANADE , MONA VALE | Residential | NCA01 | **45** | **44** | **42** | 40 | - |
| R375 | 39 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 38 | PN |
| R376 | 15 REDNAL ST, MONA VALE | Residential | NCA01 | 38 | 37 | 35 | 32 | - |
| R377 | 11 REDNAL ST, MONA VALE | Residential | NCA01 | 34 | 33 | 31 | 28 | - |
| R378 | 14 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 32 | - |
| R379 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **45** | PN |
| R380 | 8 KARA CR, BAYVIEW | Residential | NCA01 | 36 | 35 | 33 | 31 | - |
| R381 | 13 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 39 | - |
| R382 | 2 REDNAL ST, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | 38 | - |
| R383 | 22 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 37 | - |
| R384 | 8 KARA CR, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 31 | - |
| R385 | 6 KARA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 35 | - |
| R386 | 10 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R387 | 5 GERROA AV, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 29 | - |
| R388 | 7 UTINGU PL, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 21 | - |
| R389 | 126 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | 39 | 36 | - |
| R390 | 22 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 22 | - |
| R391 | 25 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **41** | PN |
| R392 | 10 GERROA AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **41** | - |
| R393 | 1859 PITTWATER RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 35 | - |
| R394 | 17 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 26 | - |
| R395 | 12A KAMILAROI RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 39 | - |
| R396 | 19 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 40 | PN |
| R397 | 4 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 39 | PN |
| R398 | 2A THE ESPLANADE , MONA VALE | Commercial | NCA01 | 42 | 41 | 39 | 38 | - |
| R399 | 20 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 35 | - |
| R400 | 7 KARA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **43** | PN |
| R401 | 10 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 35 | - |
| R402 | 3 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 39 | 38 | 36 | 34 | - |
| R403 | 1865 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 32 | - |
| R404 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **43** | PN |
| R405 | 27 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **41** | PN |
| R406 | 1871 PITTWATER RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 37 | - |
| R407 | 1831A PITTWATER RD, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R408 | 4 REDNAL ST, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | 38 | - |
| R409 | 27A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **41** | PN |
| R410 | 8 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 26 | - |
| R411 | 7 KAMILAROI RD, BAYVIEW | Residential | NCA01 | 39 | 38 | 36 | 35 | - |
| R412 | 6 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 23 | - |
| R413 | 17 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 40 | - |
| R414 | 29A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 38 | PN |
| R415 | 1845 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 30 | - |
| R416 | 27A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **43** | PN |
| R417 | 14 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 40 | - |
| R418 | 27B ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 40 | PN |
| R419 | 6 KARA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 39 | PN |
| R420 | 1839 PITTWATER RD, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 28 | - |
| R421 | 3 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 38 | PN |
| R422 | 12 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **42** | **41** | 39 | 39 | - |
| R423 | 27 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **41** | PN |
| R424 | 11 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | 40 | PN |
| R425 | 1857 PITTWATER RD, BAYVIEW | Residential | NCA01 | 37 | 36 | 34 | 32 | - |
| R426 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 45 | 44 | 42 | 43 | - |
| R427 | 126 WATERVIEW ST, MONA VALE | Residential | NCA01 | **43** | **42** | 40 | 39 | - |
| R428 | 8 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 32 | - |

*Predicted construction noise levels: OOHW Period 1 (Day)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R429 | 10 PRINCES ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | 39 | PN |
| R430 | 1712 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 62 | 61 | 59 | 31 | - |
| R431 | 14 MITALA ST, NEWPORT | Commercial | NCA01 | 48 | 47 | 45 | 36 | - |
| R432 | 5 FERMOY AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **49** | PN |
| R433 | 14 MITALA ST, NEWPORT | Commercial | NCA01 | 49 | 48 | 46 | 39 | - |
| R434 | 26-28 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **42** | - |
| R435 | 118 IRRUBEL RD, NEWPORT | Residential | NCA01 | **45** | **44** | **42** | 36 | - |
| R436 | 63A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 37 | PN |
| R437 | 12 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | 39 | PN |
| R438 | 39 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 38 | PN |
| R439 | 63 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 34 | PN |
| R440 | 24 FERMOY AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 36 | - |
| R441 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **45** | PN |
| R442 | 30 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | **44** | - |
| R443 | 79 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 37 | PN |
| R444 | 7 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **47** | PN |
| R445 | 1714 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 56 | 55 | 53 | 31 | - |
| R446 | 1935B PITTWATER RD, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 31 | PN |
| R447 | 2 MITALA ST, NEWPORT | Residential | NCA01 | **43** | **42** | 40 | 33 | - |
| R448 | 1903 PITTWATER RD, BAYVIEW | Residential | NCA01 | **68** | **67** | **65** | **65** | PN, V, SN, RO, RP, DR |
| R449 | 6 FERMOY AV, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | 40 | PN, V, SN, RO |
| R450 | 11 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | 38 | PN |
| R451 | 1678 PITTWATER RD, BAYVIEW | Passive recreation | NCA01 | 56 | 55 | 53 | 72 | N |
| R452 | 7 MITALA ST, NEWPORT | Residential | NCA01 | **45** | **44** | **42** | 34 | - |
| R453 | 14 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **44** | PN |
| R454 | 1678 PITTWATER RD, BAYVIEW | Active recreation | NCA01 | 82 | 81 | 79 | 71 | N |
| R455 | 1933 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 28 | PN |
| R456 | 1953 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 28 | PN |
| R457 | 77 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 37 | PN |
| R458 | 1897 PITTWATER RD, BAYVIEW | Residential | NCA01 | **59** | **58** | **56** | **63** | PN, V, SN, RO |
| R459 | 1A FERMOY AV, BAYVIEW | Residential | NCA01 | **61** | **60** | **58** | **53** | PN, V, SN, RO |
| R460 | 71 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 36 | PN |
| R461 | 140 IRRUBEL RD, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | 36 | PN |
| R463 | 79 IRRUBEL RD, NEWPORT | Residential | NCA01 | **44** | **43** | **41** | 32 | - |
| R464 | 1935A PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 27 | PN |
| R465 | 1871 PITTWATER RD, BAYVIEW | Residential | NCA01 | 40 | 39 | 37 | 37 | - |
| R466 | 1957 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 28 | PN |
| R467 | 2 FERMOY AV, BAYVIEW | Residential | NCA01 | **65** | **64** | **62** | 34 | PN, V, SN, RO |
| R468 | 4A MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | 37 | PN |
| R469 | 1901C PITTWATER RD, BAYVIEW | Residential | NCA01 | **61** | **60** | **58** | **57** | PN, V, SN, RO |
| R470 | 24 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **43** | PN |
| R471 | 3 FERMOY AV, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | **55** | PN, V, SN, RO |
| R472 | 2 MITALA ST, NEWPORT | Residential | NCA01 | **47** | **46** | **44** | 33 | PN |
| R473 | 29A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 38 | PN |
| R474 | 4 CRYSTAL ST, NEWPORT | Residential | NCA01 | 40 | 39 | 37 | 29 | - |
| R475 | 2 FERMOY AV, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | 35 | PN, V, SN, RO |
| R476 | 40 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **43** | **42** | 40 | 29 | - |
| R477 | 4 MITALA ST, NEWPORT | Residential | NCA01 | **47** | **46** | **44** | 34 | PN |
| R478 | 40 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | PN |
| R479 | 37 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 35 | PN |
| R480 | 136 IRRUBEL RD, NEWPORT | Residential | NCA01 | **42** | **41** | 39 | 33 | - |
| R481 | 11 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **46** | PN |
| R482 | 1907 PITTWATER RD, BAYVIEW | Residential | NCA01 | **70** | **69** | **67** | **49** | PN, V, SN, RO, RP, DR |
| R483 | 16 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 37 | PN |
| R484 | 12 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | 39 | PN |
| R485 | 1879 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN |
| R486 | 10 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 35 | PN |
| R487 | 1754B PITTWATER RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 32 | - |

*Predicted construction noise levels: OOHW Period 1 (Day)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| **Residential:** Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>**Non-residential:** Exceeds noise management level | | | | | | | | |
| R489 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **42** | PN |
| R490 | 8 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | 40 | 38 | 36 | - |
| R491 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **42** | PN |
| R492 | 7 GERROA AV, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 28 | - |

*Predicted construction noise levels: OOHW Period 1 (Evening)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R001 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R002 | 48 ANNAM RD, BAYVIEW | Residential | NCA01 | 17 | 16 | 14 | 11 | - |
| R003 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R004 | 54 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R005 | 58 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R006 | 97 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R007 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R008 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R009 | 60 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R010 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 14 | - |
| R011 | 1 UTINGU PL, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 16 | - |
| R012 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R013 | 56 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R014 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R015 | 52 ANNAM RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R016 | 68 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 13 | - |
| R017 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R018 | 91 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R019 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R020 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R021 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R022 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R023 | 95 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 15 | - |
| R024 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R025 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 14 | - |
| R026 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R027 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R028 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 13 | - |
| R029 | 1782 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 28 | PN |
| R031 | 66 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 34 | PN |
| R032 | 1784 PITTWATER RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 26 | - |
| R033 | 25 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 25 | PN |
| R034 | 7 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 22 | PN |
| R035 | 75 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **38** | PN, V, SN, RO |
| R036 | 1977 PITTWATER RD, BAYVIEW | Educational institute | NCA01 | 49 | 48 | 46 | 31 | - |
| R037 | 4 JENDI AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 31 | PN |
| R039 | 3 PINDARI PL, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **37** | PN |
| R040 | 31 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 17 | - |
| R041 | 20 JENDI AV, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 16 | - |
| R042 | 8 JENDI AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 30 | PN |
| R043 | 18 JENDI AV, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 28 | PN |
| R044 | 13 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 21 | PN |
| R045 | 1750A PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 33 | PN |
| R046 | 1 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 28 | PN |
| R049 | 68 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 34 | PN |
| R050 | 2003 PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 24 | PN |
| R051 | 2015 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 26 | PN |
| R053 | 29 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 17 | - |
| R054 | 12 JENDI AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | PN |
| R056 | 2007 PITTWATER RD, BAYVIEW | Residential | NCA01 | **36** | 35 | 33 | 21 | - |
| R057 | 6 JENDI AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN |
| R058 | 14 JENDI AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | PN |
| R059 | 33 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 17 | - |
| R060 | 5 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 28 | PN |
| R061 | 24 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 25 | PN |
| R062 | 1758 PITTWATER RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 22 | PN |
| R063 | 1 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 21 | PN |
| R065 | 7 PAMELA CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 16 | - |

*Predicted construction noise levels: OOHW Period 1 (Evening)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R066 | 1778 PITTWATER RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 22 | - |
| R067 | 10 JENDI AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 29 | PN |
| R068 | 3 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 25 | PN |
| R069 | 1744 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | PN |
| R070 | 1756A PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 26 | PN |
| R071 | 1985 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 31 | PN |
| R072 | 1991 PITTWATER RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 28 | PN |
| R073 | 1967 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN |
| R074 | 22 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **39** | **38** | **36** | 22 | - |
| R076 | 72 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 31 | PN |
| R077 | 26A SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 30 | PN |
| R078 | 2019 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 24 | - |
| R080 | 60A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | PN, V, SN, RO |
| R081 | 1A JENDI AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 31 | PN |
| R082 | 7 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | PN |
| R083 | 70 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 33 | PN |
| R084 | 1770 PITTWATER RD, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 21 | - |
| R085 | 1973 PITTWATER RD, BAYVIEW | Educational institute | NCA01 | 50 | 49 | 47 | 30 | - |
| R086 | 25 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | **37** | - |
| R087 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **41** | PN |
| R089 | 3 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | **40** | PN |
| R090 | 7 VISTA AV, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 34 | - |
| R091 | 3 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 25 | - |
| R092 | 24 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R093 | 12 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 27 | - |
| R094 | 13 REDNAL ST, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 32 | - |
| R096 | 8 GERROA AV, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 35 | - |
| R097 | 19 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 31 | - |
| R098 | 112 WATERVIEW ST, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 34 | - |
| R099 | 21 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 25 | - |
| R100 | 1835 PITTWATER RD, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 25 | - |
| R101 | 10 GERROA AV, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | **37** | PN |
| R102 | 115 WATERVIEW ST, MONA VALE | Residential | NCA01 | **36** | 35 | 33 | 30 | - |
| R103 | 8 VISTA AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | **40** | PN |
| R104 | 27 UTINGU PL, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 17 | - |
| R105 | 5 BELAIR PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 22 | - |
| R106 | 6 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **37** | PN |
| R107 | 6 VISTA AV, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | **37** | PN |
| R108 | 2 LUCINDA PL, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | 33 | PN |
| R109 | 6 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R110 | 5 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | **40** | PN |
| R111 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 32 | 31 | 29 | 28 | - |
| R112 | 97 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | 34 | PN |
| R113 | 8 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 28 | - |
| R114 | 9 BIMBIMBIE PL, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 19 | - |
| R116 | 12 REDNAL ST, MONA VALE | Residential | NCA01 | **39** | **38** | **36** | 33 | - |
| R117 | 5 REDNAL ST, MONA VALE | Residential | NCA01 | 31 | 30 | 28 | 23 | - |
| R118 | 17 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **40** | PN |
| R119 | 113 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | **36** | PN |
| R120 | 1853 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 34 | PN |
| R121 | 2A BAYVIEW PL, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R122 | 26 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 26 | - |
| R123 | 5 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **36** | PN |
| R124 | 1 LUCINDA PL, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 33 | - |
| R125 | 109 WATERVIEW ST, MONA VALE | Residential | NCA01 | **40** | **39** | **37** | 34 | - |
| R126 | 15 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R127 | 12 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 21 | - |
| R128 | 5 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 24 | - |

*Predicted construction noise levels: OOHW Period 1 (Evening)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R129 | 2 GERROA AV, BAYVIEW | Residential | NCA01 | **36** | 35 | 33 | 33 | - |
| R130 | 7 THE ESPLANADE , MONA VALE | Residential | NCA01 | **41** | **40** | **38** | **36** | PN |
| R131 | 38 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 23 | - |
| R132 | 3 GERROA AV, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 29 | - |
| R133 | 11 VISTA AV, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | **37** | PN |
| R134 | 128 WATERVIEW ST, MONA VALE | Residential | NCA01 | **44** | **43** | **41** | **40** | PN |
| R135 | 4 HALESMITH RD, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | **40** | PN |
| R136 | 16 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 35 | - |
| R137 | 2 HALESMITH RD, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | **39** | PN |
| R138 | 1A BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R139 | 6 GERROA AV, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 33 | - |
| R140 | 7 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **39** | - |
| R141 | 10 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 29 | - |
| R142 | 12 GERROA AV, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **36** | PN |
| R143 | 11 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 24 | - |
| R144 | 15 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 22 | - |
| R145 | 9 VISTA AV, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | **37** | PN |
| R146 | 105 WATERVIEW ST, MONA VALE | Residential | NCA01 | **39** | **38** | **36** | 32 | - |
| R147 | 1863 PITTWATER RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 33 | - |
| R148 | 18 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 19 | - |
| R149 | 1855 PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | **38** | PN |
| R150 | 31 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **37** | PN |
| R151 | 1 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 33 | - |
| R152 | 121 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | 35 | PN |
| R153 | 108 WATERVIEW ST, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 32 | - |
| R154 | 7 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | **40** | PN |
| R156 | 14 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 35 | PN |
| R158 | 106 WATERVIEW ST, MONA VALE | Residential | NCA01 | **40** | **39** | **37** | 35 | - |
| R159 | 8 HALESMITH RD, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | 34 | PN |
| R160 | 5 THE ESPLANADE , MONA VALE | Residential | NCA01 | **41** | **40** | **38** | **37** | PN |
| R161 | 19 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 28 | - |
| R162 | 28 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R163 | 3 REDNAL ST, MONA VALE | Residential | NCA01 | 34 | 33 | 31 | 27 | - |
| R164 | 12 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 28 | - |
| R165 | 9 GERROA AV, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 34 | - |
| R166 | 6 THE ESPLANADE , MONA VALE | Residential | NCA01 | **41** | **40** | **38** | **37** | PN |
| R167 | 11 GERROA AV, BAYVIEW | Residential | NCA01 | **39** | **38** | **36** | **37** | - |
| R168 | 4 REDNAL ST, MONA VALE | Residential | NCA01 | **44** | **43** | **41** | **37** | PN |
| R170 | 7 REDNAL ST, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | 34 | PN |
| R171 | 114 WATERVIEW ST, MONA VALE | Residential | NCA01 | **39** | **38** | **36** | 35 | - |
| R172 | 125 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | **37** | PN |
| R173 | 9 REDNAL ST, MONA VALE | Residential | NCA01 | **39** | **38** | **36** | 33 | - |
| R174 | 101 WATERVIEW ST, MONA VALE | Residential | NCA01 | **36** | 35 | 33 | 30 | - |
| R175 | 4 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R176 | 107 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | 33 | PN |
| R177 | 103 WATERVIEW ST, MONA VALE | Residential | NCA01 | 35 | 34 | 32 | 30 | - |
| R178 | 16 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 32 | - |
| R179 | 123 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | **37** | PN |
| R180 | 110 WATERVIEW ST, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | 34 | PN |
| R181 | 2 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 32 | - |
| R182 | 33B ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **39** | PN |
| R183 | 9 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | **40** | PN |
| R184 | 10 HALESMITH RD, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | 34 | PN |
| R185 | 20 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 35 | - |
| R186 | 4 GERROA AV, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 31 | - |
| R187 | 8 BIMBIMBIE PL, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 16 | - |
| R188 | 20 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 20 | - |
| R189 | 120 WATERVIEW ST, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 34 | - |

*Predicted construction noise levels: OOHW Period 1 (Evening)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R190 | 102-104 WATERVIEW ST, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | **36** | PN |
| R191 | 8 UTINGU PL, BAYVIEW | Residential | NCA01 | 24 | 23 | 21 | 20 | - |
| R192 | 17 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 34 | - |
| R193 | 6 HALESMITH RD, MONA VALE | Residential | NCA01 | **44** | **43** | **41** | **38** | PN |
| R194 | 18 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | **36** | - |
| R195 | 9 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 24 | - |
| R196 | 18 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 34 | - |
| R197 | 1 GERROA AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | **38** | PN |
| R198 | 7 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **46** | PN |
| R199 | 1881 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | **57** | PN, V, SN, RO |
| R200 | 4 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | **38** | PN |
| R201 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **41** | PN |
| R202 | 1953 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 30 | PN, V, SN, RO |
| R203 | 18 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **37** | PN |
| R204 | 1941 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | 33 | PN, V, SN, RO |
| R205 | 1893 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **59** | PN, V, SN, RO |
| R206 | 3 ROCHES AV, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **47** | PN, V, SN, RO |
| R207 | 5A KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **46** | PN |
| R208 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 33 | PN |
| R209 | 2 ROCHES AV, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | **51** | PN, V, SN, RO |
| R210 | 75 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **38** | PN, V, SN, RO |
| R211 | 20 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **37** | PN |
| R212 | 17 FERMOY AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **44** | PN |
| R213 | 56 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **36** | PN, V, SN, RO |
| R214 | 1891 PITTWATER RD, BAYVIEW | Residential | NCA01 | **58** | **57** | **55** | **60** | PN, V, SN, RO |
| R215 | 1923 PITTWATER RD, BAYVIEW | Residential | NCA01 | **65** | **64** | **62** | 32 | PN, V, SN, RO, RP, DR |
| R216 | 12 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 34 | PN |
| R217 | 10A MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | **39** | PN |
| R218 | 9 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **46** | PN |
| R219 | 52 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 35 | PN, V, SN, RO |
| R220 | 15 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **45** | PN |
| R221 | 1738A PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 32 | PN, V, SN, RO |
| R222 | 8A ROCHES AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **55** | PN, V, SN, RO |
| R223 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **62** | **61** | **59** | 33 | PN, V, SN, RO, RP, DR |
| R224 | 9 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **45** | PN |
| R225 | 3 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **37** | PN |
| R226 | 1937 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | 35 | PN, V, SN, RO |
| R227 | 1 MITALA ST, NEWPORT | Residential | NCA01 | **37** | **36** | 34 | 31 | - |
| R228 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 31 | PN, V, SN, RO |
| R229 | 42A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 34 | PN |
| R230 | 116 IRRUBEL RD, NEWPORT | Residential | NCA01 | **45** | **44** | **42** | **36** | PN |
| R231 | 29 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 35 | PN |
| R232 | 128 IRRUBEL RD, NEWPORT | Residential | NCA01 | 33 | 32 | 30 | 27 | - |
| R233 | 1885 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | **58** | PN, V, SN, RO |
| R234 | 1887 PITTWATER RD, BAYVIEW | Residential | NCA01 | **58** | **57** | **55** | **60** | PN, V, SN, RO |
| R235 | 1873 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **50** | PN |
| R236 | 1925 PITTWATER RD, BAYVIEW | Residential | NCA01 | **64** | **63** | **61** | 29 | PN, V, SN, RO, RP, DR |
| R237 | 1A PRINCE ALFRED PDE, NEWPORT | Residential | NCA01 | **46** | **45** | **43** | 35 | PN |
| R238 | 33 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 34 | PN |
| R239 | 132 IRRUBEL RD, NEWPORT | Residential | NCA01 | **42** | **41** | **39** | 33 | PN |
| R240 | 130 IRRUBEL RD, NEWPORT | Residential | NCA01 | **38** | **37** | 35 | 29 | - |
| R241 | 23 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **42** | PN |
| R242 | 11 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **47** | PN |
| R243 | 1875 PITTWATER RD, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **54** | PN, V, SN, RO |
| R244 | 4 FERMOY AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | 35 | PN, V, SN, RO |
| R245 | 3 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **47** | PN |
| R246 | 1 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **49** | PN, V, SN, RO |
| R247 | 83 IRRUBEL RD, NEWPORT | Residential | NCA01 | **44** | **43** | **41** | 34 | PN |

*Predicted construction noise levels: OOHW Period 1 (Evening)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R248 | 10 ROCHES AV, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **54** | PN, V, SN, RO |
| R249 | 5 ROCHES AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **44** | PN |
| R250 | 1943 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | 31 | PN, V, SN, RO |
| R251 | 9 MITALA ST, NEWPORT | Residential | NCA01 | **42** | **41** | **39** | 34 | PN |
| R252 | 6A FERMOY AV, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | **41** | PN, V, SN, RO |
| R253 | 7 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **47** | PN |
| R254 | 1879 PITTWATER RD, BAYVIEW | Residential | NCA01 | **55** | **54** | **52** | **56** | PN, V, SN, RO |
| R255 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | **38** | PN, V, SN, RO |
| R256 | 1935 PITTWATER RD, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | 30 | PN, V, SN, RO |
| R257 | 4 ROCHES AV, BAYVIEW | Residential | NCA01 | **55** | **54** | **52** | **52** | PN, V, SN, RO |
| R258 | 6 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **55** | PN, V, SN, RO |
| R259 | 65 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **38** | PN |
| R261 | 5 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **37** | PN |
| R262 | 1738 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | PN, V, SN, RO |
| R263 | 13 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN |
| R264 | 6 PRINCES ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **40** | PN |
| R265 | 121 IRRUBEL RD, NEWPORT | Residential | NCA01 | **36** | 35 | 33 | 34 | - |
| R266 | 1895 PITTWATER RD, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | **62** | PN, V, SN, RO, RP, DR |
| R267 | 1899 PITTWATER RD, BAYVIEW | Residential | NCA01 | **63** | **62** | **60** | **65** | PN, V, SN, RO, RP, DR |
| R268 | 21 FERMOY AV, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | **36** | PN |
| R270 | 1 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN |
| R271 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | PN, V, SN, RO |
| R272 | 44 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN |
| R273 | 1951 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | PN, V, SN, RO |
| R274 | 36 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 27 | PN |
| R275 | 60A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | PN, V, SN, RO |
| R276 | 95 IRRUBEL RD, NEWPORT | Residential | NCA01 | 34 | 33 | 31 | 28 | - |
| R277 | 33A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 32 | PN |
| R278 | 2 CRYSTAL ST, NEWPORT | Residential | NCA01 | **36** | 35 | 33 | 26 | - |
| R279 | 8 PRINCES ST, NEWPORT | Residential | NCA01 | **49** | **48** | **46** | **41** | PN |
| R280 | 4A MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **37** | PN |
| R281 | 1889 PITTWATER RD, BAYVIEW | Residential | NCA01 | **59** | **58** | **56** | **60** | PN, V, SN, RO |
| R282 | 48-50 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 35 | PN, V, SN, RO |
| R283 | 123 IRRUBEL RD, NEWPORT | Residential | NCA01 | **39** | **38** | **36** | 27 | - |
| R284 | 16 MITALA ST, NEWPORT | Commercial | NCA01 | 52 | 51 | 49 | 42 | - |
| R285 | 8 FERMOY AV, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 33 | PN |
| R286 | 34 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 29 | PN |
| R287 | 12 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **46** | PN |
| R288 | 134 IRRUBEL RD, NEWPORT | Residential | NCA01 | **41** | **40** | **38** | 32 | PN |
| R289 | 122 IRRUBEL RD, NEWPORT | Residential | NCA01 | **46** | **45** | **43** | **37** | PN |
| R290 | 2A CRYSTAL ST, NEWPORT | Residential | NCA01 | **39** | **38** | **36** | 31 | - |
| R291 | 85 IRRUBEL RD, NEWPORT | Residential | NCA01 | **43** | **42** | **40** | **36** | PN |
| R292 | 1740 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 32 | PN, V, SN, RO |
| R293 | 1B JENDI AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN |
| R294 | 15 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **44** | PN |
| R295 | 9 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **47** | PN, V, SN, RO |
| R296 | 13 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 26 | - |
| R298 | 19-21 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **40** | PN |
| R299 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN |
| R300 | 13 GERROA AV, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R301 | 9 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | **36** | - |
| R302 | 1740 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 32 | PN, V, SN, RO |
| R303 | 6 MITALA ST, NEWPORT | Residential | NCA01 | **49** | **48** | **46** | **39** | PN |
| R304 | 1736 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | PN, V, SN, RO |
| R305 | 19-21 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **40** | PN |
| R306 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **42** | PN |
| R307 | 2 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **39** | PN |
| R308 | 67 ANNAM RD, BAYVIEW | Residential | NCA01 | 24 | 23 | 21 | 17 | - |

*Predicted construction noise levels: OOHW Period 1 (Evening)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R309 | 10 KARA CR, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 32 | PN |
| R310 | 1 NANGANA RD, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 16 | - |
| R311 | 62 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 15 | - |
| R312 | 50 ANNAM RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 13 | - |
| R313 | 1A LENTARA RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R314 | 9B KARA CR, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 20 | - |
| R316 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R317 | 53-55 ANNAM RD, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 15 | - |
| R318 | 3 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **38** | PN |
| R320 | 9 KARA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **37** | PN |
| R321 | 2 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **39** | PN |
| R322 | 1746 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | PN |
| R323 | 1987 PITTWATER RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 30 | PN |
| R325 | 1965 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 29 | PN |
| R326 | 1768 PITTWATER RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 20 | - |
| R327 | 7B LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 21 | PN |
| R328 | 20 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 23 | - |
| R329 | 21 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 20 | - |
| R331 | 79 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **37** | PN, V, SN, RO |
| R332 | 1742 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN |
| R333 | 1963 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 30 | PN |
| R334 | 1754A PITTWATER RD, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 33 | PN |
| R335 | 1961 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN |
| R336 | 1772 PITTWATER RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 24 | - |
| R337 | 8A LOQUAT VALLEY RD, BAYVIEW | Educational institute | NCA01 | 49 | 48 | 46 | 30 | - |
| R338 | 1762 PITTWATER RD, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 21 | - |
| R339 | 9 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 25 | PN |
| R340 | 4 PINDARI PL, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **39** | PN |
| R341 | 1748 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 31 | PN |
| R342 | 1754A PITTWATER RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 26 | PN |
| R343 | 77 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **37** | PN, V, SN, RO |
| R344 | 1989 PITTWATER RD, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 29 | PN |
| R345 | 43 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 21 | - |
| R346 | 5 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 23 | - |
| R347 | 1 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **38** | PN |
| R348 | 15 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 20 | - |
| R349 | 2 LENTARA RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 26 | - |
| R350 | 62 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 28 | PN |
| R351 | 2009 PITTWATER RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 21 | - |
| R352 | 2005 PITTWATER RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 22 | - |
| R353 | 16 JENDI AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | PN |
| R354 | 4 LENTARA RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 25 | - |
| R355 | 1957 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 28 | PN |
| R356 | 3 JENDI AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN |
| R357 | 4 PINDARI PL, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **38** | PN |
| R358 | 1981 PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 25 | PN |
| R359 | 81 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **38** | PN, V, SN, RO |
| R360 | 28 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 18 | - |
| R361 | 6 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | PN |
| R362 | 23 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 23 | PN |
| R363 | 8 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 24 | PN |
| R364 | 27 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 16 | - |
| R365 | 89 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 21 | - |
| R366 | 1756A PITTWATER RD, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 22 | - |
| R367 | 9 JENDI AV, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 23 | PN |
| R368 | 7A LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN |
| R369 | 1752 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 33 | PN |
| R370 | 2 PINDARI PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 24 | - |

*Predicted construction noise levels: OOHW Period 1 (Evening)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R371 | 8A KARA CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 23 | - |
| R372 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 45 | 44 | 42 | 43 | - |
| R373 | 1849 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 29 | - |
| R374 | 1 THE ESPLANADE , MONA VALE | Residential | NCA01 | **45** | **44** | **42** | **40** | PN |
| R375 | 39 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **38** | PN |
| R376 | 15 REDNAL ST, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 32 | - |
| R377 | 11 REDNAL ST, MONA VALE | Residential | NCA01 | 34 | 33 | 31 | 28 | - |
| R378 | 14 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 32 | - |
| R379 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **45** | PN |
| R380 | 8 KARA CR, BAYVIEW | Residential | NCA01 | **36** | 35 | 33 | 31 | - |
| R381 | 13 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | **39** | PN |
| R382 | 2 REDNAL ST, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | **38** | PN |
| R383 | 22 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **37** | PN |
| R384 | 8 KARA CR, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 31 | - |
| R385 | 6 KARA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 35 | PN |
| R386 | 10 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R387 | 5 GERROA AV, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 29 | - |
| R388 | 7 UTINGU PL, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 21 | - |
| R389 | 126 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | **36** | PN |
| R390 | 22 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 22 | - |
| R391 | 25 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **41** | PN |
| R392 | 10 GERROA AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **41** | PN |
| R393 | 1859 PITTWATER RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 35 | - |
| R394 | 17 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 26 | - |
| R395 | 12A KAMILAROI RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **39** | PN |
| R396 | 19 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **40** | PN |
| R397 | 4 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **39** | PN |
| R398 | 2A THE ESPLANADE , MONA VALE | Commercial | NCA01 | 42 | 41 | 39 | 38 | - |
| R399 | 20 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 35 | - |
| R400 | 7 KARA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **43** | PN |
| R401 | 10 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 35 | - |
| R402 | 3 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **39** | **38** | **36** | 34 | - |
| R403 | 1865 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 32 | - |
| R404 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **43** | PN |
| R405 | 27 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **41** | PN |
| R406 | 1871 PITTWATER RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | **37** | - |
| R407 | 1831A PITTWATER RD, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R408 | 4 REDNAL ST, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | **38** | PN |
| R409 | 27A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **41** | PN |
| R410 | 8 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 26 | - |
| R411 | 7 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **39** | **38** | **36** | 35 | - |
| R412 | 6 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 23 | - |
| R413 | 17 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **40** | - |
| R414 | 29A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **38** | PN |
| R415 | 1845 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 30 | - |
| R416 | 27A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **43** | PN |
| R417 | 14 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **40** | PN |
| R418 | 27B ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **40** | PN |
| R419 | 6 KARA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **39** | PN |
| R420 | 1839 PITTWATER RD, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 28 | - |
| R421 | 3 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **38** | PN |
| R422 | 12 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | **39** | PN |
| R423 | 27 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **41** | PN |
| R424 | 11 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | **40** | PN |
| R425 | 1857 PITTWATER RD, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 32 | - |
| R426 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 45 | 44 | 42 | 43 | - |
| R427 | 126 WATERVIEW ST, MONA VALE | Residential | NCA01 | **43** | **42** | **40** | **39** | PN |
| R428 | 8 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 32 | - |

*Predicted construction noise levels: OOHW Period 1 (Evening)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R429 | 10 PRINCES ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **39** | PN |
| R430 | 1712 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 62 | 61 | 59 | 31 | - |
| R431 | 14 MITALA ST, NEWPORT | Commercial | NCA01 | 48 | 47 | 45 | 36 | - |
| R432 | 5 FERMOY AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **49** | PN, V, SN, RO |
| R433 | 14 MITALA ST, NEWPORT | Commercial | NCA01 | 49 | 48 | 46 | 39 | - |
| R434 | 26-28 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **42** | PN |
| R435 | 118 IRRUBEL RD, NEWPORT | Residential | NCA01 | **45** | **44** | **42** | **36** | PN |
| R436 | 63A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **37** | PN |
| R437 | 12 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | **39** | PN |
| R438 | 39 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **38** | PN |
| R439 | 63 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 34 | PN |
| R440 | 24 FERMOY AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **36** | PN |
| R441 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **45** | PN |
| R442 | 30 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | **44** | PN |
| R443 | 79 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **37** | PN, V, SN, RO |
| R444 | 7 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **47** | PN |
| R445 | 1714 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 56 | 55 | 53 | 31 | - |
| R446 | 1935B PITTWATER RD, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 31 | PN, V, SN, RO |
| R447 | 2 MITALA ST, NEWPORT | Residential | NCA01 | **43** | **42** | **40** | 33 | PN |
| R448 | 1903 PITTWATER RD, BAYVIEW | Residential | NCA01 | **68** | **67** | **65** | **65** | PN, V, SN, RO, RP, DR |
| R449 | 6 FERMOY AV, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | **40** | PN, V, SN, RO |
| R450 | 11 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **38** | PN |
| R451 | 1678 PITTWATER RD, BAYVIEW | Passive recreation | NCA01 | 56 | 55 | 53 | 72 | N |
| R452 | 7 MITALA ST, NEWPORT | Residential | NCA01 | **45** | **44** | **42** | 34 | PN |
| R453 | 14 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **44** | PN |
| R454 | 1678 PITTWATER RD, BAYVIEW | Active recreation | NCA01 | 82 | 81 | 79 | 71 | N |
| R455 | 1933 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 28 | PN |
| R456 | 1953 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 28 | PN |
| R457 | 77 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **37** | PN, V, SN, RO |
| R458 | 1897 PITTWATER RD, BAYVIEW | Residential | NCA01 | **59** | **58** | **56** | **63** | PN, V, SN, RO, RP, DR |
| R459 | 1A FERMOY AV, BAYVIEW | Residential | NCA01 | **61** | **60** | **58** | **53** | PN, V, SN, RO, RP, DR |
| R460 | 71 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **36** | PN, V, SN, RO |
| R461 | 140 IRRUBEL RD, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **36** | PN |
| R463 | 79 IRRUBEL RD, NEWPORT | Residential | NCA01 | **44** | **43** | **41** | 32 | PN |
| R464 | 1935A PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 27 | PN, V, SN, RO |
| R465 | 1871 PITTWATER RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | **37** | - |
| R466 | 1957 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 28 | PN |
| R467 | 2 FERMOY AV, BAYVIEW | Residential | NCA01 | **65** | **64** | **62** | 34 | PN, V, SN, RO, RP, DR |
| R468 | 4A MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **37** | PN |
| R469 | 1901C PITTWATER RD, BAYVIEW | Residential | NCA01 | **61** | **60** | **58** | **57** | PN, V, SN, RO, RP, DR |
| R470 | 24 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **43** | PN |
| R471 | 3 FERMOY AV, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | **55** | PN, V, SN, RO |
| R472 | 2 MITALA ST, NEWPORT | Residential | NCA01 | **47** | **46** | **44** | 33 | PN |
| R473 | 29A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **38** | PN |
| R474 | 4 CRYSTAL ST, NEWPORT | Residential | NCA01 | **40** | **39** | **37** | 29 | - |
| R475 | 2 FERMOY AV, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | 35 | PN, V, SN, RO |
| R476 | 40 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 29 | PN |
| R477 | 4 MITALA ST, NEWPORT | Residential | NCA01 | **47** | **46** | **44** | 34 | PN |
| R478 | 40 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | PN |
| R479 | 37 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 35 | PN |
| R480 | 136 IRRUBEL RD, NEWPORT | Residential | NCA01 | **42** | **41** | **39** | 33 | PN |
| R481 | 11 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **46** | PN |
| R482 | 1907 PITTWATER RD, BAYVIEW | Residential | NCA01 | **70** | **69** | **67** | **49** | PN, V, SN, RO, RP, DR |
| R483 | 16 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **37** | PN |
| R484 | 12 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | **39** | PN |
| R485 | 1879 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN |
| R486 | 10 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 35 | PN |
| R487 | 1754B PITTWATER RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 32 | PN |

*Predicted construction noise levels: OOHW Period 1 (Evening)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| **Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive Bold Highly noise affected**<br>**Non-residential: Exceeds noise management level** | | | | | | | | |
| R489 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **42** | PN |
| R490 | 8 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **36** | PN |
| R491 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **42** | PN |
| R492 | 7 GERROA AV, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 28 | - |

*Predicted construction noise levels: OOHW Period 2 (Night)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R001 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R002 | 48 ANNAM RD, BAYVIEW | Residential | NCA01 | 17 | 16 | 14 | 11 | - |
| R003 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R004 | 54 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R005 | 58 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R006 | 97 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R007 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R008 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R009 | 60 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R010 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 14 | - |
| R011 | 1 UTINGU PL, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 16 | - |
| R012 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 12 | - |
| R013 | 56 ANNAM RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R014 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R015 | 52 ANNAM RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R016 | 68 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 13 | - |
| R017 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R018 | 91 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R019 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R020 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 12 | - |
| R021 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R022 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 14 | - |
| R023 | 95 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 15 | - |
| R024 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R025 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 14 | - |
| R026 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R027 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R028 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 13 | - |
| R029 | 1782 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 28 | PN, V |
| R031 | 66 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 34 | PN, V |
| R032 | 1784 PITTWATER RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 26 | PN |
| R033 | 25 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 25 | PN, V |
| R034 | 7 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 22 | PN, V |
| R035 | 75 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **38** | PN, V, SN, RP, DR |
| R036 | 1977 PITTWATER RD, BAYVIEW | Educational institute | NCA01 | 49 | 48 | 46 | 31 | - |
| R037 | 4 JENDI AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 31 | PN, V |
| R039 | 3 PINDARI PL, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **37** | PN, V |
| R040 | 31 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 17 | - |
| R041 | 20 JENDI AV, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 16 | - |
| R042 | 8 JENDI AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 30 | PN, V |
| R043 | 18 JENDI AV, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 28 | PN, V |
| R044 | 13 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 21 | PN, V |
| R045 | 1750A PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 33 | PN, V |
| R046 | 1 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 28 | PN, V |
| R049 | 68 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 34 | PN, V |
| R050 | 2003 PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 24 | PN, V |
| R051 | 2015 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 26 | PN, V |
| R053 | 29 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 17 | - |
| R054 | 12 JENDI AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | PN, V |
| R056 | 2007 PITTWATER RD, BAYVIEW | Residential | NCA01 | **36** | 35 | 33 | 21 | PN |
| R057 | 6 JENDI AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN, V |
| R058 | 14 JENDI AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | PN, V |
| R059 | 33 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 17 | - |
| R060 | 5 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 28 | PN, V |
| R061 | 24 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 25 | PN, V |
| R062 | 1758 PITTWATER RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 22 | PN, V |
| R063 | 1 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 21 | PN, V |
| R065 | 7 PAMELA CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 16 | - |

*Predicted construction noise levels: OOHW Period 2 (Night)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R066 | 1778 PITTWATER RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 22 | PN |
| R067 | 10 JENDI AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 29 | PN, V |
| R068 | 3 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 25 | PN, V |
| R069 | 1744 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | PN, V |
| R070 | 1756A PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 26 | PN, V |
| R071 | 1985 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 31 | PN, V |
| R072 | 1991 PITTWATER RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 28 | PN, V |
| R073 | 1967 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN, V |
| R074 | 22 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **39** | **38** | **36** | 22 | PN |
| R076 | 72 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 31 | PN, V |
| R077 | 26A SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 30 | PN, V |
| R078 | 2019 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 24 | PN |
| R080 | 60A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | PN, V, SN, RP, DR |
| R081 | 1A JENDI AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 31 | PN, V |
| R082 | 7 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | PN, V |
| R083 | 70 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 33 | PN, V |
| R084 | 1770 PITTWATER RD, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 21 | PN |
| R085 | 1973 PITTWATER RD, BAYVIEW | Educational institute | NCA01 | 50 | 49 | 47 | 30 | - |
| R086 | 25 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | **37** | PN |
| R087 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **41** | PN, V |
| R089 | 3 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | **40** | PN, V |
| R090 | 7 VISTA AV, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 34 | PN |
| R091 | 3 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 25 | - |
| R092 | 24 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R093 | 12 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 27 | - |
| R094 | 13 REDNAL ST, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 32 | PN |
| R096 | 8 GERROA AV, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 35 | PN |
| R097 | 19 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 31 | - |
| R098 | 112 WATERVIEW ST, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 34 | PN |
| R099 | 21 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 25 | - |
| R100 | 1835 PITTWATER RD, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 25 | - |
| R101 | 10 GERROA AV, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | **37** | PN, V |
| R102 | 115 WATERVIEW ST, MONA VALE | Residential | NCA01 | **36** | 35 | 33 | 30 | PN |
| R103 | 8 VISTA AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | **40** | PN, V |
| R104 | 27 UTINGU PL, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 17 | - |
| R105 | 5 BELAIR PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 22 | - |
| R106 | 6 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **37** | PN, V |
| R107 | 6 VISTA AV, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | **37** | PN, V |
| R108 | 2 LUCINDA PL, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | 33 | PN, V |
| R109 | 6 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R110 | 5 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | **40** | PN, V |
| R111 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 32 | 31 | 29 | 28 | - |
| R112 | 97 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | 34 | PN, V |
| R113 | 8 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 28 | - |
| R114 | 9 BIMBIMBIE PL, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 19 | - |
| R116 | 12 REDNAL ST, MONA VALE | Residential | NCA01 | **39** | **38** | **36** | 33 | PN |
| R117 | 5 REDNAL ST, MONA VALE | Residential | NCA01 | 31 | 30 | 28 | 23 | - |
| R118 | 17 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **40** | PN, V |
| R119 | 113 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | **36** | PN, V |
| R120 | 1853 PITTWATER RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 34 | PN, V |
| R121 | 2A BAYVIEW PL, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R122 | 26 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 26 | - |
| R123 | 5 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **36** | PN, V |
| R124 | 1 LUCINDA PL, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 33 | PN |
| R125 | 109 WATERVIEW ST, MONA VALE | Residential | NCA01 | **40** | **39** | **37** | 34 | PN |
| R126 | 15 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R127 | 12 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 21 | - |
| R128 | 5 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 24 | - |

*Predicted construction noise levels: OOHW Period 2 (Night)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R129 | 2 GERROA AV, BAYVIEW | Residential | NCA01 | **36** | 35 | 33 | 33 | PN |
| R130 | 7 THE ESPLANADE , MONA VALE | Residential | NCA01 | **41** | **40** | **38** | **36** | PN, V |
| R131 | 38 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 23 | - |
| R132 | 3 GERROA AV, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 29 | - |
| R133 | 11 VISTA AV, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | **37** | PN, V |
| R134 | 128 WATERVIEW ST, MONA VALE | Residential | NCA01 | **44** | **43** | **41** | **40** | PN, V |
| R135 | 4 HALESMITH RD, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | **40** | PN, V |
| R136 | 16 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 35 | PN |
| R137 | 2 HALESMITH RD, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | **39** | PN, V |
| R138 | 1A BAYVIEW PL, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R139 | 6 GERROA AV, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 33 | - |
| R140 | 7 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **39** | PN |
| R141 | 10 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 29 | - |
| R142 | 12 GERROA AV, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **36** | PN, V |
| R143 | 11 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 24 | - |
| R144 | 15 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 22 | - |
| R145 | 9 VISTA AV, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | **37** | PN, V |
| R146 | 105 WATERVIEW ST, MONA VALE | Residential | NCA01 | **39** | **38** | **36** | 32 | PN |
| R147 | 1863 PITTWATER RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 33 | PN |
| R148 | 18 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 19 | - |
| R149 | 1855 PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | **38** | PN, V |
| R150 | 31 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **37** | PN, V |
| R151 | 1 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 33 | PN |
| R152 | 121 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | 35 | PN, V |
| R153 | 108 WATERVIEW ST, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 32 | PN |
| R154 | 7 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | **40** | PN, V |
| R156 | 14 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 35 | PN, V |
| R158 | 106 WATERVIEW ST, MONA VALE | Residential | NCA01 | **40** | **39** | **37** | 35 | PN |
| R159 | 8 HALESMITH RD, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | 34 | PN, V |
| R160 | 5 THE ESPLANADE , MONA VALE | Residential | NCA01 | **41** | **40** | **38** | **37** | PN, V |
| R161 | 19 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 28 | - |
| R162 | 28 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R163 | 3 REDNAL ST, MONA VALE | Residential | NCA01 | 34 | 33 | 31 | 27 | - |
| R164 | 12 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 28 | - |
| R165 | 9 GERROA AV, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 34 | PN |
| R166 | 6 THE ESPLANADE , MONA VALE | Residential | NCA01 | **41** | **40** | **38** | **37** | PN, V |
| R167 | 11 GERROA AV, BAYVIEW | Residential | NCA01 | **39** | **38** | **36** | **37** | PN |
| R168 | 4 REDNAL ST, MONA VALE | Residential | NCA01 | **44** | **43** | **41** | **37** | PN, V |
| R170 | 7 REDNAL ST, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | 34 | PN, V |
| R171 | 114 WATERVIEW ST, MONA VALE | Residential | NCA01 | **39** | **38** | **36** | 35 | PN |
| R172 | 125 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | **37** | PN, V |
| R173 | 9 REDNAL ST, MONA VALE | Residential | NCA01 | **39** | **38** | **36** | 33 | PN |
| R174 | 101 WATERVIEW ST, MONA VALE | Residential | NCA01 | **36** | 35 | 33 | 30 | PN |
| R175 | 4 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 25 | - |
| R176 | 107 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | 33 | PN, V |
| R177 | 103 WATERVIEW ST, MONA VALE | Residential | NCA01 | 35 | 34 | 32 | 30 | - |
| R178 | 16 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 32 | - |
| R179 | 123 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | **37** | PN, V |
| R180 | 110 WATERVIEW ST, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | 34 | PN, V |
| R181 | 2 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 32 | PN |
| R182 | 33B ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **39** | PN, V |
| R183 | 9 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | **40** | PN, V |
| R184 | 10 HALESMITH RD, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | 34 | PN, V |
| R185 | 20 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 35 | PN |
| R186 | 4 GERROA AV, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 31 | - |
| R187 | 8 BIMBIMBIE PL, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 16 | - |
| R188 | 20 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 22 | 21 | 19 | 20 | - |
| R189 | 120 WATERVIEW ST, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 34 | PN |

*Predicted construction noise levels: OOHW Period 2 (Night)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R190 | 102-104 WATERVIEW ST, MONA VALE | Residential | NCA01 | **41** | **40** | **38** | **36** | PN, V |
| R191 | 8 UTINGU PL, BAYVIEW | Residential | NCA01 | 24 | 23 | 21 | 20 | - |
| R192 | 17 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 34 | PN |
| R193 | 6 HALESMITH RD, MONA VALE | Residential | NCA01 | **44** | **43** | **41** | **38** | PN, V |
| R194 | 18 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | **36** | PN |
| R195 | 9 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 24 | - |
| R196 | 18 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 34 | PN |
| R197 | 1 GERROA AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | **38** | PN, V |
| R198 | 7 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **46** | PN, V |
| R199 | 1881 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | **57** | PN, V, SN, RP, DR |
| R200 | 4 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | **38** | PN, V |
| R201 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **41** | PN, V |
| R202 | 1953 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 30 | PN, V, SN, RP, DR |
| R203 | 18 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **37** | PN, V |
| R204 | 1941 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | 33 | PN, V, SN, RP, DR |
| R205 | 1893 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **59** | PN, V, SN, RP, DR |
| R206 | 3 ROCHES AV, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **47** | PN, V, SN, RP, DR |
| R207 | 5A KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **46** | PN, V |
| R208 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 33 | PN, V |
| R209 | 2 ROCHES AV, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | **51** | PN, V, SN, RP, DR |
| R210 | 75 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **38** | PN, V, SN, RP, DR |
| R211 | 20 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **37** | PN, V |
| R212 | 17 FERMOY AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **44** | PN, V |
| R213 | 56 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **36** | PN, V, SN, RP, DR |
| R214 | 1891 PITTWATER RD, BAYVIEW | Residential | NCA01 | **58** | **57** | **55** | **60** | PN, V, SN, RP, DR |
| R215 | 1923 PITTWATER RD, BAYVIEW | Residential | NCA01 | **65** | **64** | **62** | 32 | PN, V, SN, AA, RP, DR |
| R216 | 12 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 34 | PN, V |
| R217 | 10A MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | **39** | PN, V |
| R218 | 9 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **46** | PN, V |
| R219 | 52 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 35 | PN, V, SN, RP, DR |
| R220 | 15 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **45** | PN, V |
| R221 | 1738A PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 32 | PN, V, SN, RP, DR |
| R222 | 8A ROCHES AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **55** | PN, V, SN, RP, DR |
| R223 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **62** | **61** | **59** | 33 | PN, V, SN, AA, RP, DR |
| R224 | 9 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **45** | PN, V |
| R225 | 3 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **37** | PN, V |
| R226 | 1937 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | 35 | PN, V, SN, RP, DR |
| R227 | 1 MITALA ST, NEWPORT | Residential | NCA01 | **37** | **36** | 34 | 31 | PN |
| R228 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 31 | PN, V, SN, RP, DR |
| R229 | 42A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 34 | PN, V |
| R230 | 116 IRRUBEL RD, NEWPORT | Residential | NCA01 | **45** | **44** | **42** | **36** | PN, V |
| R231 | 29 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 35 | PN, V |
| R232 | 128 IRRUBEL RD, NEWPORT | Residential | NCA01 | 33 | 32 | 30 | 27 | - |
| R233 | 1885 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | **58** | PN, V, SN, RP, DR |
| R234 | 1887 PITTWATER RD, BAYVIEW | Residential | NCA01 | **58** | **57** | **55** | **60** | PN, V, SN, RP, DR |
| R235 | 1873 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **50** | PN, V |
| R236 | 1925 PITTWATER RD, BAYVIEW | Residential | NCA01 | **64** | **63** | **61** | 29 | PN, V, SN, AA, RP, DR |
| R237 | 1A PRINCE ALFRED PDE, NEWPORT | Residential | NCA01 | **46** | **45** | **43** | 35 | PN, V |
| R238 | 33 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 34 | PN, V |
| R239 | 132 IRRUBEL RD, NEWPORT | Residential | NCA01 | **42** | **41** | **39** | 33 | PN, V |
| R240 | 130 IRRUBEL RD, NEWPORT | Residential | NCA01 | **38** | **37** | 35 | 29 | PN |
| R241 | 23 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **42** | PN, V |
| R242 | 11 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **47** | PN, V |
| R243 | 1875 PITTWATER RD, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **54** | PN, V, SN, RP, DR |
| R244 | 4 FERMOY AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | 35 | PN, V, SN, RP, DR |
| R245 | 3 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **47** | PN, V |
| R246 | 1 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **49** | PN, V, SN, RP, DR |
| R247 | 83 IRRUBEL RD, NEWPORT | Residential | NCA01 | **44** | **43** | **41** | 34 | PN, V |

*Predicted construction noise levels: OOHW Period 2 (Night)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R248 | 10 ROCHES AV, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **54** | PN, V, SN, RP, DR |
| R249 | 5 ROCHES AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **44** | PN, V |
| R250 | 1943 PITTWATER RD, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | 31 | PN, V, SN, RP, DR |
| R251 | 9 MITALA ST, NEWPORT | Residential | NCA01 | **42** | **41** | **39** | 34 | PN, V |
| R252 | 6A FERMOY AV, BAYVIEW | Residential | NCA01 | **56** | **55** | **53** | **41** | PN, V, SN, RP, DR |
| R253 | 7 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **47** | PN, V |
| R254 | 1879 PITTWATER RD, BAYVIEW | Residential | NCA01 | **55** | **54** | **52** | **56** | PN, V, SN, RP, DR |
| R255 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | **38** | PN, V, SN, RP, DR |
| R256 | 1935 PITTWATER RD, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | 30 | PN, V, SN, RP, DR |
| R257 | 4 ROCHES AV, BAYVIEW | Residential | NCA01 | **55** | **54** | **52** | **52** | PN, V, SN, RP, DR |
| R258 | 6 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **55** | PN, V, SN, RP, DR |
| R259 | 65 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **38** | PN, V |
| R261 | 5 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **37** | PN, V |
| R262 | 1738 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | PN, V, SN, RP, DR |
| R263 | 13 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN, V |
| R264 | 6 PRINCES ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **40** | PN, V |
| R265 | 121 IRRUBEL RD, NEWPORT | Residential | NCA01 | **36** | 35 | 33 | 34 | PN |
| R266 | 1895 PITTWATER RD, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | **62** | PN, V, SN, AA, RP, DR |
| R267 | 1899 PITTWATER RD, BAYVIEW | Residential | NCA01 | **63** | **62** | **60** | **65** | PN, V, SN, AA, RP, DR |
| R268 | 21 FERMOY AV, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | **36** | PN, V |
| R270 | 1 ROCHES AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN, V |
| R271 | 1927-1931 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | PN, V, SN, RP, DR |
| R272 | 44 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN, V |
| R273 | 1951 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | PN, V, SN, RP, DR |
| R274 | 36 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 27 | PN, V |
| R275 | 60A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 34 | PN, V, SN, RP, DR |
| R276 | 95 IRRUBEL RD, NEWPORT | Residential | NCA01 | 34 | 33 | 31 | 28 | - |
| R277 | 33A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 32 | PN, V |
| R278 | 2 CRYSTAL ST, NEWPORT | Residential | NCA01 | **36** | 35 | 33 | 26 | PN |
| R279 | 8 PRINCES ST, NEWPORT | Residential | NCA01 | **49** | **48** | **46** | **41** | PN, V |
| R280 | 4A MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **37** | PN, V |
| R281 | 1889 PITTWATER RD, BAYVIEW | Residential | NCA01 | **59** | **58** | **56** | **60** | PN, V, SN, RP, DR |
| R282 | 48-50 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 35 | PN, V, SN, RP, DR |
| R283 | 123 IRRUBEL RD, NEWPORT | Residential | NCA01 | **39** | **38** | **36** | 27 | PN |
| R284 | 16 MITALA ST, NEWPORT | Commercial | NCA01 | 52 | 51 | 49 | 42 | - |
| R285 | 8 FERMOY AV, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 33 | PN, V |
| R286 | 34 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 29 | PN, V |
| R287 | 12 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **46** | PN, V |
| R288 | 134 IRRUBEL RD, NEWPORT | Residential | NCA01 | **41** | **40** | **38** | 32 | PN, V |
| R289 | 122 IRRUBEL RD, NEWPORT | Residential | NCA01 | **46** | **45** | **43** | **37** | PN, V |
| R290 | 2A CRYSTAL ST, NEWPORT | Residential | NCA01 | **39** | **38** | **36** | 31 | PN |
| R291 | 85 IRRUBEL RD, NEWPORT | Residential | NCA01 | **43** | **42** | **40** | **36** | PN, V |
| R292 | 1740 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 32 | PN, V, SN, RP, DR |
| R293 | 1B JENDI AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN, V |
| R294 | 15 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **44** | PN, V |
| R295 | 9 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **47** | PN, V, SN, RP, DR |
| R296 | 13 BAYVIEW PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 26 | - |
| R298 | 19-21 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **40** | PN, V |
| R299 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN, V |
| R300 | 13 GERROA AV, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R301 | 9 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | **36** | PN |
| R302 | 1740 PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 32 | PN, V, SN, RP, DR |
| R303 | 6 MITALA ST, NEWPORT | Residential | NCA01 | **49** | **48** | **46** | **39** | PN, V |
| R304 | 1736 PITTWATER RD, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | 30 | PN, V, SN, RP, DR |
| R305 | 19-21 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **40** | PN, V |
| R306 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **42** | PN, V |
| R307 | 2 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **39** | PN, V |
| R308 | 67 ANNAM RD, BAYVIEW | Residential | NCA01 | 24 | 23 | 21 | 17 | - |

*Predicted construction noise levels: OOHW Period 2 (Night)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R309 | 10 KARA CR, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 32 | PN, V |
| R310 | 1 NANGANA RD, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 16 | - |
| R311 | 62 ANNAM RD, BAYVIEW | Residential | NCA01 | 21 | 20 | 18 | 15 | - |
| R312 | 50 ANNAM RD, BAYVIEW | Residential | NCA01 | 19 | 18 | 16 | 13 | - |
| R313 | 1A LENTARA RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R314 | 9B KARA CR, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 20 | - |
| R316 | 36-42 CABBAGE TREE RD, BAYVIEW | Residential | NCA01 | 20 | 19 | 17 | 13 | - |
| R317 | 53-55 ANNAM RD, BAYVIEW | Residential | NCA01 | 23 | 22 | 20 | 15 | - |
| R318 | 3 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **38** | PN, V |
| R320 | 9 KARA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **37** | PN, V |
| R321 | 2 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **39** | PN, V |
| R322 | 1746 PITTWATER RD, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | PN, V |
| R323 | 1987 PITTWATER RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 30 | PN, V |
| R325 | 1965 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 29 | PN, V |
| R326 | 1768 PITTWATER RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 20 | PN |
| R327 | 7B LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 21 | PN, V |
| R328 | 20 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 23 | PN |
| R329 | 21 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | 31 | 30 | 28 | 20 | - |
| R331 | 79 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **37** | PN, V, SN, RP, DR |
| R332 | 1742 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN, V |
| R333 | 1963 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 30 | PN, V |
| R334 | 1754A PITTWATER RD, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 33 | PN, V |
| R335 | 1961 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN, V |
| R336 | 1772 PITTWATER RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 24 | PN |
| R337 | 8A LOQUAT VALLEY RD, BAYVIEW | Educational institute | NCA01 | 49 | 48 | 46 | 30 | - |
| R338 | 1762 PITTWATER RD, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 21 | - |
| R339 | 9 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 25 | PN, V |
| R340 | 4 PINDARI PL, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **39** | PN, V |
| R341 | 1748 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 31 | PN, V |
| R342 | 1754A PITTWATER RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 26 | PN, V |
| R343 | 77 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **37** | PN, V, SN, RP, DR |
| R344 | 1989 PITTWATER RD, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | 29 | PN, V |
| R345 | 43 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 21 | - |
| R346 | 5 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 23 | PN |
| R347 | 1 KARA CR, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **38** | PN, V |
| R348 | 15 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 20 | - |
| R349 | 2 LENTARA RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 26 | PN |
| R350 | 62 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 28 | PN, V |
| R351 | 2009 PITTWATER RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 21 | PN |
| R352 | 2005 PITTWATER RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 22 | PN |
| R353 | 16 JENDI AV, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | PN, V |
| R354 | 4 LENTARA RD, BAYVIEW | Residential | NCA01 | **38** | **37** | 35 | 25 | PN |
| R355 | 1957 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 28 | PN, V |
| R356 | 3 JENDI AV, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 29 | PN, V |
| R357 | 4 PINDARI PL, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **38** | PN, V |
| R358 | 1981 PITTWATER RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 25 | PN, V |
| R359 | 81 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **38** | PN, V, SN, RP, DR |
| R360 | 28 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 18 | - |
| R361 | 6 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | 29 | PN, V |
| R362 | 23 SUNNYRIDGE PL, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | 23 | PN, V |
| R363 | 8 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 24 | PN, V |
| R364 | 27 LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | 25 | 24 | 22 | 16 | - |
| R365 | 89 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 21 | - |
| R366 | 1756A PITTWATER RD, BAYVIEW | Residential | NCA01 | 34 | 33 | 31 | 22 | - |
| R367 | 9 JENDI AV, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | 23 | PN, V |
| R368 | 7A LOQUAT VALLEY RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 31 | PN, V |
| R369 | 1752 PITTWATER RD, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | 33 | PN, V |
| R370 | 2 PINDARI PL, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 24 | - |

*Predicted construction noise levels: OOHW Period 2 (Night)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R371 | 8A KARA CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 23 | - |
| R372 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 45 | 44 | 42 | 43 | - |
| R373 | 1849 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 29 | - |
| R374 | 1 THE ESPLANADE , MONA VALE | Residential | NCA01 | **45** | **44** | **42** | **40** | PN, V |
| R375 | 39 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **38** | PN, V |
| R376 | 15 REDNAL ST, MONA VALE | Residential | NCA01 | **38** | **37** | 35 | 32 | PN |
| R377 | 11 REDNAL ST, MONA VALE | Residential | NCA01 | 34 | 33 | 31 | 28 | - |
| R378 | 14 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 32 | - |
| R379 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **45** | PN, V |
| R380 | 8 KARA CR, BAYVIEW | Residential | NCA01 | **36** | 35 | 33 | 31 | PN |
| R381 | 13 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | **39** | PN, V |
| R382 | 2 REDNAL ST, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | **38** | PN, V |
| R383 | 22 BAYVIEW PL, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **37** | PN, V |
| R384 | 8 KARA CR, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 31 | PN |
| R385 | 6 KARA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 35 | PN, V |
| R386 | 10 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 29 | - |
| R387 | 5 GERROA AV, BAYVIEW | Residential | NCA01 | 33 | 32 | 30 | 29 | - |
| R388 | 7 UTINGU PL, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 21 | - |
| R389 | 126 WATERVIEW ST, MONA VALE | Residential | NCA01 | **42** | **41** | **39** | **36** | PN, V |
| R390 | 22 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 26 | 25 | 23 | 22 | - |
| R391 | 25 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **41** | PN, V |
| R392 | 10 GERROA AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **41** | PN, V |
| R393 | 1859 PITTWATER RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 35 | PN |
| R394 | 17 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 29 | 28 | 26 | 26 | - |
| R395 | 12A KAMILAROI RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **39** | PN, V |
| R396 | 19 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **40** | PN, V |
| R397 | 4 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **39** | PN, V |
| R398 | 2A THE ESPLANADE , MONA VALE | Commercial | NCA01 | 42 | 41 | 39 | 38 | - |
| R399 | 20 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 35 | PN |
| R400 | 7 KARA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **43** | PN, V |
| R401 | 10 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | 35 | PN |
| R402 | 3 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **39** | **38** | **36** | 34 | PN |
| R403 | 1865 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 32 | - |
| R404 | 13 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **43** | PN, V |
| R405 | 27 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **41** | PN, V |
| R406 | 1871 PITTWATER RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | **37** | PN |
| R407 | 1831A PITTWATER RD, BAYVIEW | Residential | NCA01 | 27 | 26 | 24 | 23 | - |
| R408 | 4 REDNAL ST, MONA VALE | Residential | NCA01 | **45** | **44** | **42** | **38** | PN, V |
| R409 | 27A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **41** | PN, V |
| R410 | 8 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 30 | 29 | 27 | 26 | - |
| R411 | 7 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **39** | **38** | **36** | 35 | PN |
| R412 | 6 BEAUMONT CR, BAYVIEW | Residential | NCA01 | 28 | 27 | 25 | 23 | - |
| R413 | 17 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **40** | PN |
| R414 | 29A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **38** | PN, V |
| R415 | 1845 PITTWATER RD, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 30 | - |
| R416 | 27A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **43** | PN, V |
| R417 | 14 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **40** | PN, V |
| R418 | 27B ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **40** | PN, V |
| R419 | 6 KARA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **39** | PN, V |
| R420 | 1839 PITTWATER RD, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 28 | - |
| R421 | 3 KARA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **38** | PN, V |
| R422 | 12 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **42** | **41** | **39** | **39** | PN, V |
| R423 | 27 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **41** | PN, V |
| R424 | 11 HALESMITH RD, MONA VALE | Residential | NCA01 | **46** | **45** | **43** | **40** | PN, V |
| R425 | 1857 PITTWATER RD, BAYVIEW | Residential | NCA01 | **37** | **36** | 34 | 32 | PN |
| R426 | 1861 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 45 | 44 | 42 | 43 | - |
| R427 | 126 WATERVIEW ST, MONA VALE | Residential | NCA01 | **43** | **42** | **40** | **39** | PN, V |
| R428 | 8 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | 35 | 34 | 32 | 32 | - |

*Predicted construction noise levels: OOHW Period 2 (Night)*

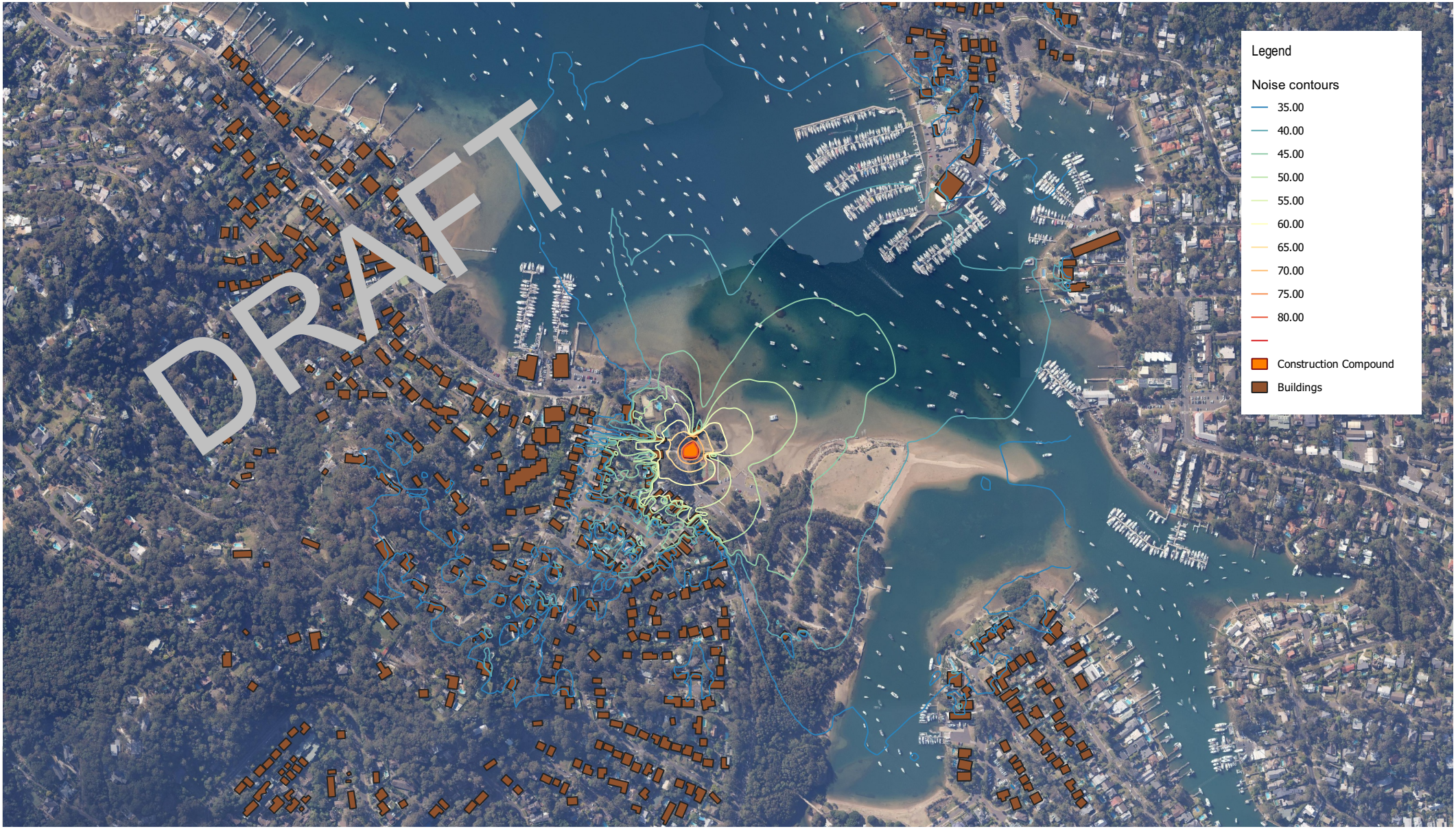
| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| Residential: Noticeable Clearly audible Moderately intrusive Highly intrusive **Bold** Highly noise affected<br>Non-residential: Exceeds noise management level | | | | | | | | |
| R429 | 10 PRINCES ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **39** | PN, V |
| R430 | 1712 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 62 | 61 | 59 | 31 | - |
| R431 | 14 MITALA ST, NEWPORT | Commercial | NCA01 | 48 | 47 | 45 | 36 | - |
| R432 | 5 FERMOY AV, BAYVIEW | Residential | NCA01 | **54** | **53** | **51** | **49** | PN, V, SN, RP, DR |
| R433 | 14 MITALA ST, NEWPORT | Commercial | NCA01 | 49 | 48 | 46 | 39 | - |
| R434 | 26-28 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **42** | PN, V |
| R435 | 118 IRRUBEL RD, NEWPORT | Residential | NCA01 | **45** | **44** | **42** | **36** | PN, V |
| R436 | 63A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **37** | PN, V |
| R437 | 12 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | **39** | PN, V |
| R438 | 39 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **38** | PN, V |
| R439 | 63 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 34 | PN, V |
| R440 | 24 FERMOY AV, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | **36** | PN, V |
| R441 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **45** | PN, V |
| R442 | 30 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **44** | **43** | **41** | **44** | PN, V |
| R443 | 79 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **37** | PN, V, SN, RP, DR |
| R444 | 7 FERMOY AV, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **47** | PN, V |
| R445 | 1714 PITTWATER RD, BAYVIEW | Commercial | NCA01 | 56 | 55 | 53 | 31 | - |
| R446 | 1935B PITTWATER RD, BAYVIEW | Residential | NCA01 | **53** | **52** | **50** | 31 | PN, V, SN, RP, DR |
| R447 | 2 MITALA ST, NEWPORT | Residential | NCA01 | **43** | **42** | **40** | 33 | PN, V |
| R448 | 1903 PITTWATER RD, BAYVIEW | Residential | NCA01 | **68** | **67** | **65** | **65** | PN, V, SN, AA, RP, DR |
| R449 | 6 FERMOY AV, BAYVIEW | Residential | NCA01 | **57** | **56** | **54** | **40** | PN, V, SN, RP, DR |
| R450 | 11 MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **38** | PN, V |
| R451 | 1678 PITTWATER RD, BAYVIEW | Passive recreation | NCA01 | 56 | 55 | 53 | 72 | N |
| R452 | 7 MITALA ST, NEWPORT | Residential | NCA01 | **45** | **44** | **42** | 34 | PN, V |
| R453 | 14 ROCHES AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **44** | PN, V |
| R454 | 1678 PITTWATER RD, BAYVIEW | Active recreation | NCA01 | 82 | 81 | 79 | 71 | N |
| R455 | 1933 PITTWATER RD, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 28 | PN, V |
| R456 | 1953 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 28 | PN, V |
| R457 | 77 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **52** | **51** | **49** | **37** | PN, V, SN, RP, DR |
| R458 | 1897 PITTWATER RD, BAYVIEW | Residential | NCA01 | **59** | **58** | **56** | **63** | PN, V, SN, AA, RP, DR |
| R459 | 1A FERMOY AV, BAYVIEW | Residential | NCA01 | **61** | **60** | **58** | **53** | PN, V, SN, AA, RP, DR |
| R460 | 71 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | **36** | PN, V, SN, RP, DR |
| R461 | 140 IRRUBEL RD, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **36** | PN, V |
| R463 | 79 IRRUBEL RD, NEWPORT | Residential | NCA01 | **44** | **43** | **41** | 32 | PN, V |
| R464 | 1935A PITTWATER RD, BAYVIEW | Residential | NCA01 | **51** | **50** | **48** | 27 | PN, V, SN, RP, DR |
| R465 | 1871 PITTWATER RD, BAYVIEW | Residential | NCA01 | **40** | **39** | **37** | **37** | PN |
| R466 | 1957 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | 28 | PN, V |
| R467 | 2 FERMOY AV, BAYVIEW | Residential | NCA01 | **65** | **64** | **62** | 34 | PN, V, SN, AA, RP, DR |
| R468 | 4A MITALA ST, NEWPORT | Residential | NCA01 | **48** | **47** | **45** | **37** | PN, V |
| R469 | 1901C PITTWATER RD, BAYVIEW | Residential | NCA01 | **61** | **60** | **58** | **57** | PN, V, SN, AA, RP, DR |
| R470 | 24 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **43** | PN, V |
| R471 | 3 FERMOY AV, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | **55** | PN, V, SN, RP, DR |
| R472 | 2 MITALA ST, NEWPORT | Residential | NCA01 | **47** | **46** | **44** | 33 | PN, V |
| R473 | 29A ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | **38** | PN, V |
| R474 | 4 CRYSTAL ST, NEWPORT | Residential | NCA01 | **40** | **39** | **37** | 29 | PN |
| R475 | 2 FERMOY AV, BAYVIEW | Residential | NCA01 | **60** | **59** | **57** | 35 | PN, V, SN, RP, DR |
| R476 | 40 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **43** | **42** | **40** | 29 | PN, V |
| R477 | 4 MITALA ST, NEWPORT | Residential | NCA01 | **47** | **46** | **44** | 34 | PN, V |
| R478 | 40 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 33 | PN, V |
| R479 | 37 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **47** | **46** | **44** | 35 | PN, V |
| R480 | 136 IRRUBEL RD, NEWPORT | Residential | NCA01 | **42** | **41** | **39** | 33 | PN, V |
| R481 | 11 FERMOY AV, BAYVIEW | Residential | NCA01 | **49** | **48** | **46** | **46** | PN, V |
| R482 | 1907 PITTWATER RD, BAYVIEW | Residential | NCA01 | **70** | **69** | **67** | **49** | PN, V, SN, AA, RP, DR |
| R483 | 16 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | **37** | PN, V |
| R484 | 12 MITALA ST, NEWPORT | Residential | NCA01 | **50** | **49** | **47** | **39** | PN, V |
| R485 | 1879 PITTWATER RD, BAYVIEW | Residential | NCA01 | **48** | **47** | **45** | **45** | PN, V |
| R486 | 10 FERMOY AV, BAYVIEW | Residential | NCA01 | **50** | **49** | **47** | 35 | PN, V |
| R487 | 1754B PITTWATER RD, BAYVIEW | Residential | NCA01 | **45** | **44** | **42** | 32 | PN, V |

*Predicted construction noise levels: OOHW Period 2 (Night)*

| Receiver ID | Address | Receiver Type | NCA | CS01 | CS02 | CS03 | CS04 | Additional management measures |
|---|---|---|---|---|---|---|---|---|
| **Residential:** **Noticeable** **Clearly audible** **Moderately intrusive** **Highly intrusive** **Bold** **Highly noise affected** **Non-residential:** **Exceeds noise management level** | | | | | | | | |
| R489 | 22 ALEXANDRA CR, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **42** | PN, V |
| R490 | 8 KAMILAROI RD, BAYVIEW | Residential | NCA01 | **41** | **40** | **38** | **36** | PN, V |
| R491 | 11 KING EDWARD AV, BAYVIEW | Residential | NCA01 | **46** | **45** | **43** | **42** | PN, V |
| R492 | 7 GERROA AV, BAYVIEW | Residential | NCA01 | 32 | 31 | 29 | 28 | - |

# Appendix C

## Predicted noise contour maps




Paper Size ISO A4

0 100 200 m

**Northern Beaches Council**
**Bayview Sea**
**Wall Design**

## Construction Compound (CC) noise contours

Project No. **12542425**
Revision No. **A**
Date. **29/09/22**

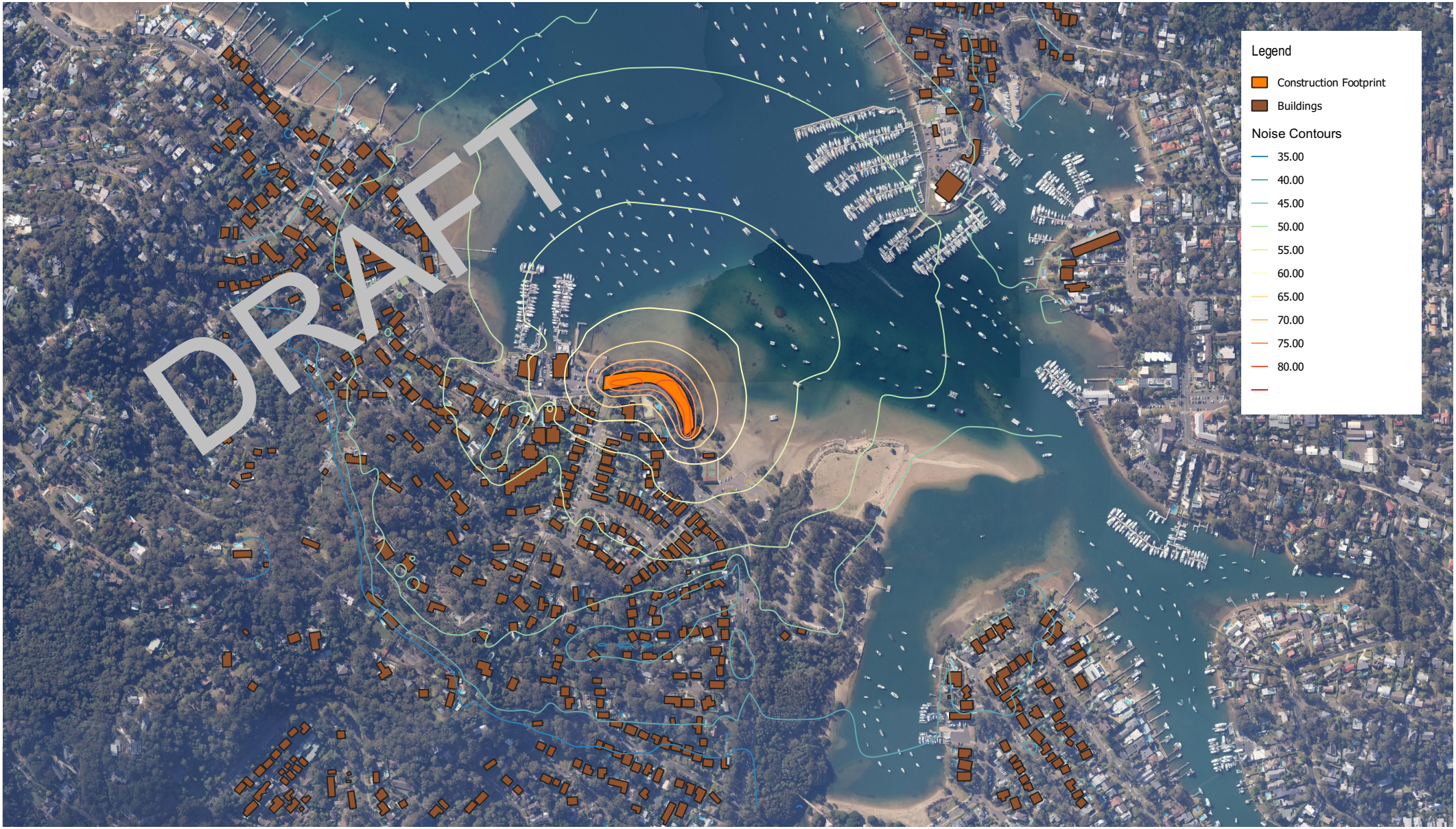
**Appendix C**

Document Path:

Print Date:

Data Source:

Created By: Christopher Doyle




Paper Size ISO A4

0 100 200 m

**Northern Beaches Council**
**Bayview Sea**
**Wall Design**

## Construction Scenario 1 (CS1) noise contours

Project No. **12542425**
Revision No. **A**
Date. **29/09/22**

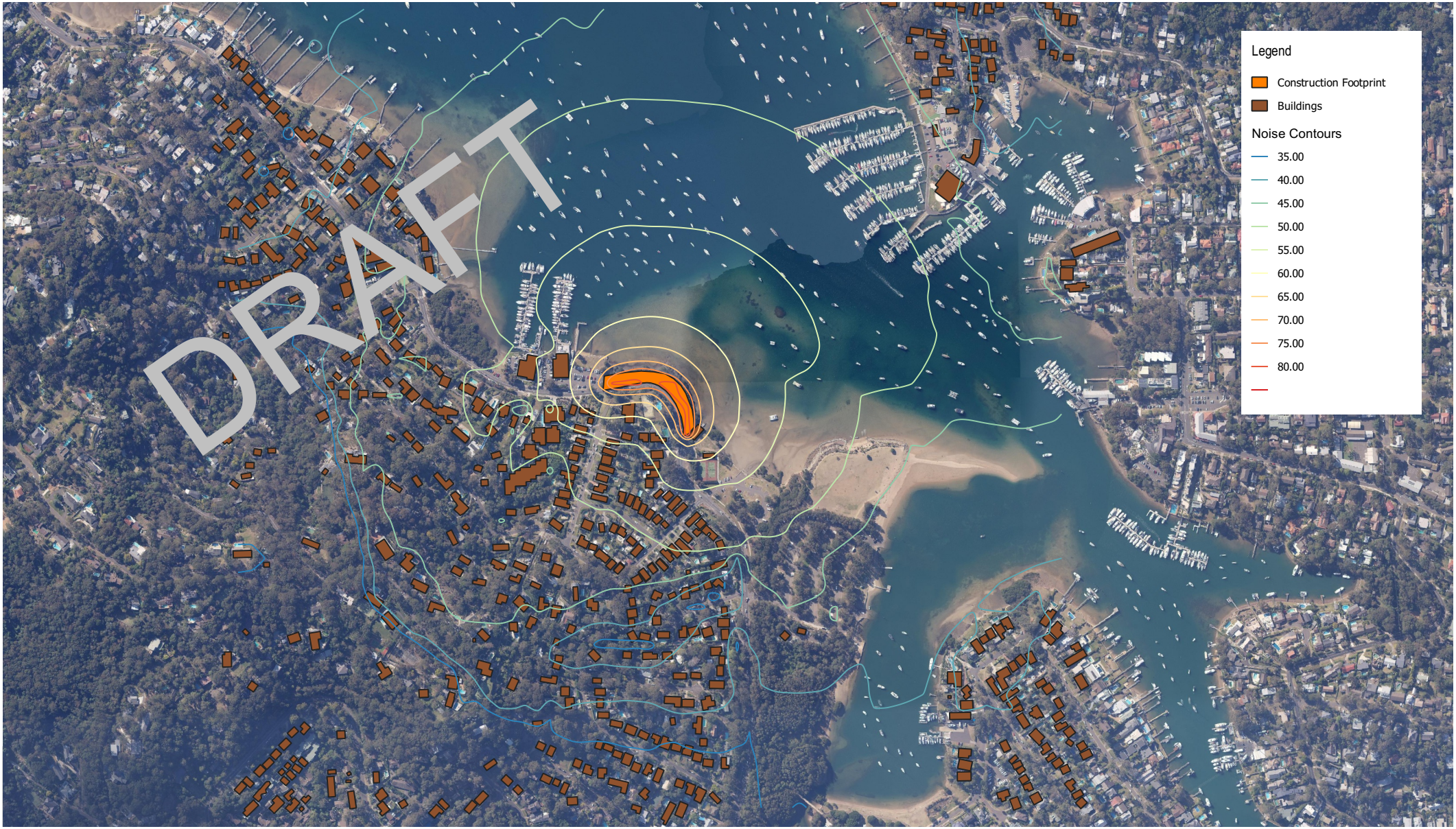
**Appendix C**

Document Path:

Print Date:

Data Source:

Created By: Christopher Doyle




Paper Size ISO A4

0 100 200 m

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## Construction Scenario 2 (CS2) noise contours

Project No. **12542425**
Revision No. **A**
Date. **29/09/22**

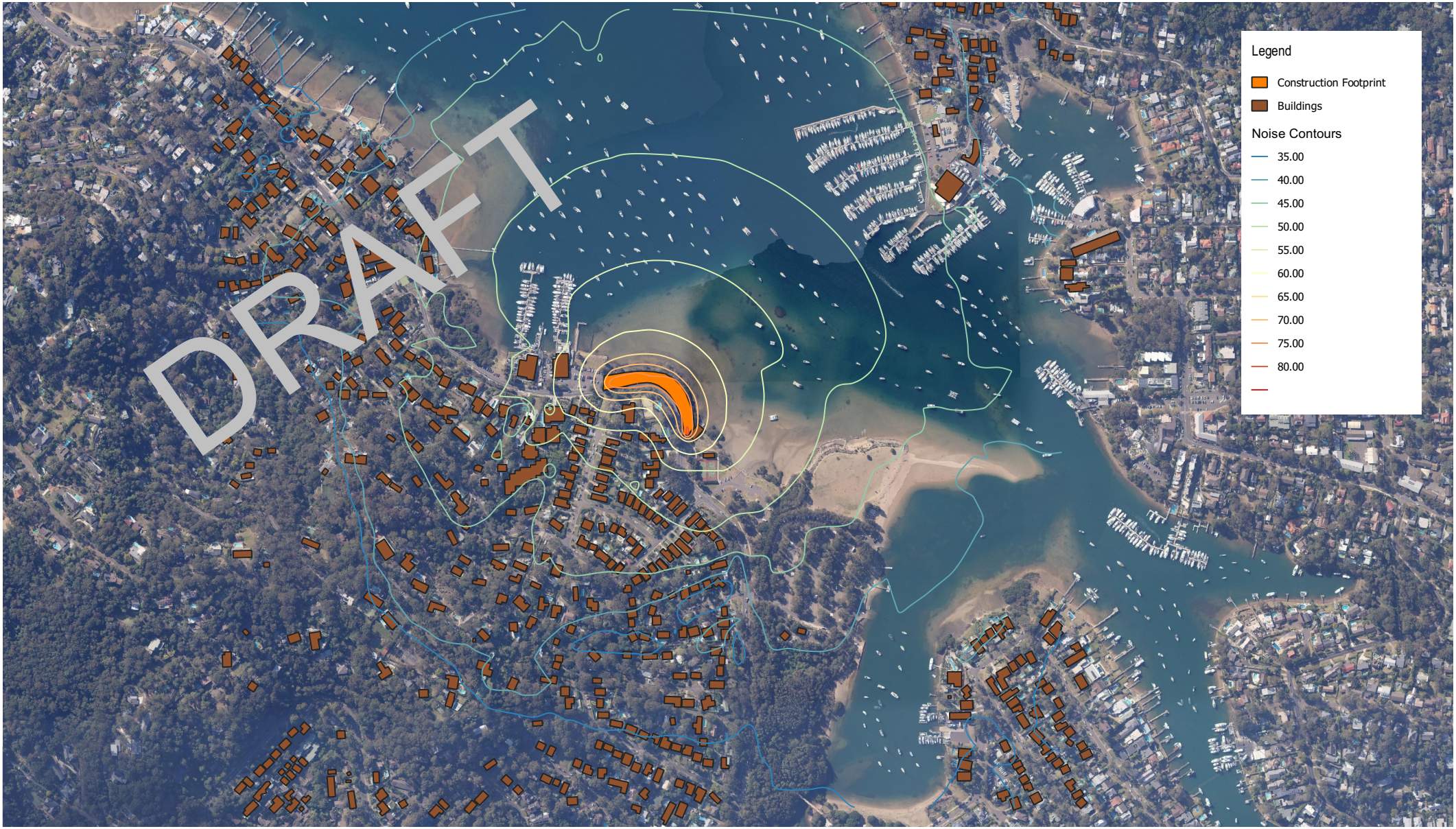
**Appendix C**

Document Path:

Print Date:

Data Source:

Created By: Christopher Doyle




Paper Size ISO A4

0 100 200 m

**Northern Beaches Council**
**Bayview Sea**
**Wall Design**

## Construction Scenario 3 (CS3) noise contours

Project No. **12542425**
Revision No. **A**
Date. **29/09/22**

**Appendix C**

Document Path:

Print Date:

Data Source:

Created By: Christopher Doyle

ghd.com

→ The Power of Commitment

# Appendix D

## EPBC Act Protected Matters Search Tool Results

Australian Government
Department of Agriculture, Water and the Environment

# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 12-Jul-2022

# Summary

## Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

| | |
|---|---|
| World Heritage Properties: | None |
| National Heritage Places: | 1 |
| Wetlands of International Importance (Ramsar | None |
| Great Barrier Reef Marine Park: | None |
| Commonwealth Marine Area: | None |
| Listed Threatened Ecological Communities: | 8 |
| Listed Threatened Species: | 97 |
| Listed Migratory Species: | 62 |

## Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

| | |
|---|---|
| Commonwealth Lands: | 9 |
| Commonwealth Heritage Places: | None |
| Listed Marine Species: | 80 |
| Whales and Other Cetaceans: | 14 |
| Critical Habitats: | None |
| Commonwealth Reserves Terrestrial: | None |
| Australian Marine Parks: | None |
| Habitat Critical to the Survival of Marine Turtles: | None |

## Extra Information

This part of the report provides information that may also be relevant to the area you have

| | |
|---|---|
| State and Territory Reserves: | 1 |
| Regional Forest Agreements: | None |
| Nationally Important Wetlands: | None |
| EPBC Act Referrals: | 4 |
| Key Ecological Features (Marine): | None |
| Biologically Important Areas: | 4 |
| Bioregional Assessments: | 1 |
| Geological and Bioregional Assessments: | None |

# Details

## Matters of National Environmental Significance

### National Heritage Places [ Resource Information ]

| Name | State | Legal Status | Buffer Status |
|---|---|---|---|
| Natural | | | |
| Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves | NSW | Listed place | In buffer area only |

### Listed Threatened Ecological Communities [ Resource Information ]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

| Community Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community | Endangered | Community likely to occur within area | In feature area |
| Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland | Endangered | Community known to occur within area | In feature area |
| Coastal Upland Swamps in the Sydney Basin Bioregion | Endangered | Community likely to occur within area | In feature area |
| Eastern Suburbs Banksia Scrub of the Sydney Region | Critically Endangered | Community may occur within area | In feature area |
| Littoral Rainforest and Coastal Vine Thickets of Eastern Australia | Critically Endangered | Community likely to occur within area | In buffer area only |
| Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion | Endangered | Community likely to occur within area | In feature area |
| River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria | Critically Endangered | Community likely to occur within area | In feature area |
| Subtropical and Temperate Coastal Saltmarsh | Vulnerable | Community likely to occur within area | In buffer area only |

### Listed Threatened Species [ Resource Information ]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| BIRD | | | |
| Anthochaera phrygia<br>Regent Honeyeater [82338] | Critically Endangered | Species or species habitat known to occur within area | In feature area |
| Botaurus poiciloptilus<br>Australasian Bittern [1001] | Endangered | Species or species habitat known to occur within area | In feature area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat likely to occur within area | In feature area |
| Callocephalon fimbriatum<br>Gang-gang Cockatoo [768] | Endangered | Species or species habitat known to occur within area | In feature area |
| Charadrius leschenaultii<br>Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Dasyornis brachypterus<br>Eastern Bristlebird [533] | Endangered | Species or species habitat may occur within area | In feature area |
| Diomedea antipodensis<br>Antipodean Albatross [64458] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Diomedea antipodensis gibsoni<br>Gibson's Albatross [82270] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Diomedea epomophora<br>Southern Royal Albatross [89221] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Diomedea exulans<br>Wandering Albatross [89223] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Diomedea sanfordi<br>Northern Royal Albatross [64456] | Endangered | Species or species habitat may occur within area | In feature area |
| Erythrotriorchis radiatus<br>Red Goshawk [942] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Falco hypoleucos<br>Grey Falcon [929] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Fregetta grallaria grallaria<br>White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Grantiella picta<br>Painted Honeyeater [470] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Hirundapus caudacutus<br>White-throated Needletail [682] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Lathamus discolor<br>Swift Parrot [744] | Critically Endangered | Species or species habitat known to occur within area | In buffer area only |
| Limosa lapponica baueri<br>Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area | In feature area |
| Macronectes halli<br>Northern Giant Petrel [1061] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Numenius madagascariensis<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area | In feature area |
| Pachyptila turtur subantarctica<br>Fairy Prion (southern) [64445] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Phoebetria fusca<br>Sooty Albatross [1075] | Vulnerable | Species or species habitat may occur within area | In buffer area only |
| Pterodroma leucoptera leucoptera<br>Gould's Petrel, Australian Gould's Petrel [26033] | Endangered | Species or species habitat may occur within area | In feature area |
| Pterodroma neglecta neglecta<br>Kermadec Petrel (western) [64450] | Vulnerable | Foraging, feeding or related behaviour may occur within area | In feature area |
| Pycnoptilus floccosus<br>Pilotbird [525] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Rostratula australis<br>Australian Painted Snipe [77037] | Endangered | Species or species habitat known to occur within area | In feature area |
| Sternula nereis nereis<br>Australian Fairy Tern [82950] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche bulleri<br>Buller's Albatross, Pacific Albatross [64460] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Thalassarche bulleri platei<br>Northern Buller's Albatross, Pacific Albatross [82273] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Thalassarche carteri<br>Indian Yellow-nosed Albatross [64464] | Vulnerable | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Thalassarche cauta<br>Shy Albatross [89224] | Endangered | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche eremita<br>Chatham Albatross [64457] | Endangered | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Thalassarche melanophris<br>Black-browed Albatross [66472] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche salvini<br>Salvin's Albatross [64463] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche steadi<br>White-capped Albatross [64462] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| FISH | | | |
| Epinephelus daemelii<br>Black Rockcod, Black Cod, Saddled Rockcod [68449] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Hippocampus whitei<br>White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Macquaria australasica<br>Macquarie Perch [66632] | Endangered | Species or species habitat may occur within area | In feature area |
| Prototroctes maraena<br>Australian Grayling [26179] | Vulnerable | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Seriolella brama](#)<br>Blue Warehou [69374] | Conservation Dependent | Species or species habitat known to occur within area | In feature area |
| [Thunnus maccoyii](#)<br>Southern Bluefin Tuna [69402] | Conservation Dependent | Species or species habitat likely to occur within area | In feature area |
| **FROG** | | | |
| [Heleioporus australiacus](#)<br>Giant Burrowing Frog [1973] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| [Litoria aurea](#)<br>Green and Golden Bell Frog [1870] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Mixophyes balbus](#)<br>Stuttering Frog, Southern Barred Frog (in Victoria) [1942] | Vulnerable | Species or species habitat may occur within area | In feature area |
| **MAMMAL** | | | |
| [Balaenoptera musculus](#)<br>Blue Whale [36] | Endangered | Species or species habitat may occur within area | In feature area |
| [Chalinolobus dwyeri](#)<br>Large-eared Pied Bat, Large Pied Bat [183] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| [Dasyurus maculatus maculatus (SE mainland population)](#)<br>Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184] | Endangered | Species or species habitat known to occur within area | In feature area |
| [Eubalaena australis](#)<br>Southern Right Whale [40] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Isoodon obesulus obesulus](#)<br>Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Petauroides volans](#)<br>Greater Glider (southern and central) [254] | Endangered | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Petaurus australis australis | | | |
| Yellow-bellied Glider (south-eastern) [87600] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Petrogale penicillata | | | |
| Brush-tailed Rock-wallaby [225] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) | | | |
| Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104] | Endangered | Species or species habitat known to occur within area | In feature area |
| Potorous tridactylus tridactylus | | | |
| Long-nosed Potoroo (northern) [66645] | Vulnerable | Species or species habitat likely to occur within area | In buffer area only |
| Pseudomys novaehollandiae | | | |
| New Holland Mouse, Pookila [96] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Pteropus poliocephalus | | | |
| Grey-headed Flying-fox [186] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| OTHER | | | |
| Dendronephthya australis | | | |
| Cauliflower Soft Coral [90325] | Endangered | Species or species habitat may occur within area | In feature area |
| PLANT | | | |
| Acacia bynoeana | | | |
| Bynoe's Wattle, Tiny Wattle [8575] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Acacia terminalis subsp. terminalis MS | | | |
| Sunshine Wattle (Sydney region) [88882] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Asterolasia elegans | | | |
| [56780] | Endangered | Species or species habitat known to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Caladenia tessellata<br>Thick-lipped Spider-orchid, Daddy Long-legs [2119] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Cryptostylis hunteriana<br>Leafless Tongue-orchid [19533] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Cynanchum elegans<br>White-flowered Wax Plant [12533] | Endangered | Species or species habitat likely to occur within area | In buffer area only |
| Darwinia biflora<br>[14619] | Vulnerable | Species or species habitat may occur within area | In buffer area only |
| Eucalyptus camfieldii<br>Camfield's Stringybark [15460] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Genoplesium baueri<br>Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Grevillea caleyi<br>Caley's Grevillea [9683] | Critically Endangered | Species or species habitat likely to occur within area | In buffer area only |
| Haloragodendron lucasii<br>Hal [6480] | Endangered | Species or species habitat may occur within area | In buffer area only |
| Kunzea rupestris<br>[8798] | Vulnerable | Species or species habitat likely to occur within area | In buffer area only |
| Lasiopetalum joyceae<br>[20311] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Melaleuca biconvexa<br>Biconvex Paperbark [5583] | Vulnerable | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Melaleuca deanei<br>Deane's Melaleuca [5818] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Persicaria elatior<br>Knotweed, Tall Knotweed [5831] | Vulnerable | Species or species habitat may occur within area | In buffer area only |
| Persoonia hirsuta<br>Hairy Geebung, Hairy Persoonia [19006] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Pimelea curviflora var. curviflora<br>[4182] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Prostanthera densa<br>Villous Mintbush [12233] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Prostanthera junonis<br>Somersby Mintbush [64960] | Endangered | Species or species habitat may occur within area | In feature area |
| Rhizanthella slateri<br>Eastern Underground Orchid [11768] | Endangered | Species or species habitat may occur within area | In feature area |
| Rhodamnia rubescens<br>Scrub Turpentine, Brown Malletwood [15763] | Critically Endangered | Species or species habitat known to occur within area | In feature area |
| Rhodomyrtus psidioides<br>Native Guava [19162] | Critically Endangered | Species or species habitat likely to occur within area | In feature area |
| Syzygium paniculatum<br>Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Thesium australe<br>Austral Toadflax, Toadflax [15202] | Vulnerable | Species or species habitat may occur within area | In feature area |
| REPTILE | | | |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area | In feature area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Hoplocephalus bungaroides<br>Broad-headed Snake [1182] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| SHARK | | | |
| Carcharias taurus (east coast population)<br>Grey Nurse Shark (east coast population) [68751] | Critically Endangered | Species or species habitat likely to occur within area | In feature area |
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Galeorhinus galeus<br>School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453] | Conservation Dependent | Species or species habitat may occur within area | In buffer area only |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Sphyrna lewini](#)<br>Scalloped Hammerhead [85267] | Conservation Dependent | Species or species habitat likely to occur within area | In feature area |
| SNAIL | | | |
| [Meridolum maryae](#)<br>Maroubra Woodland Snail, Maroubra Land Snail [89884] | Endangered | Species or species habitat known to occur within area | In feature area |

## Listed Migratory Species [ Resource Information ]

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Migratory Marine Birds | | | |
| [Anous stolidus](#)<br>Common Noddy [825] | | Species or species habitat likely to occur within area | In feature area |
| [Apus pacificus](#)<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area | In feature area |
| [Ardenna carneipes](#)<br>Flesh-footed Shearwater, Fleshy-footed Shearwater [82404] | | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| [Ardenna grisea](#)<br>Sooty Shearwater [82651] | | Species or species habitat likely to occur within area | In feature area |
| [Calonectris leucomelas](#)<br>Streaked Shearwater [1077] | | Species or species habitat known to occur within area | In feature area |
| [Diomedea antipodensis](#)<br>Antipodean Albatross [64458] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| [Diomedea epomophora](#)<br>Southern Royal Albatross [89221] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Diomedea exulans<br>Wandering Albatross [89223] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Diomedea sanfordi<br>Northern Royal Albatross [64456] | Endangered | Species or species habitat may occur within area | In feature area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area | In feature area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area | In feature area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area | In feature area |
| Macronectes halli<br>Northern Giant Petrel [1061] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Phaethon lepturus<br>White-tailed Tropicbird [1014] | | Species or species habitat may occur within area | In feature area |
| Phoebetria fusca<br>Sooty Albatross [1075] | Vulnerable | Species or species habitat may occur within area | In buffer area only |
| Sternula albifrons<br>Little Tern [82849] | | Species or species habitat may occur within area | In feature area |
| Thalassarche bulleri<br>Buller's Albatross, Pacific Albatross [64460] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Thalassarche carteri<br>Indian Yellow-nosed Albatross [64464] | Vulnerable | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Thalassarche cauta<br>Shy Albatross [89224] | Endangered | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche eremita<br>Chatham Albatross [64457] | Endangered | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Thalassarche melanophris<br>Black-browed Albatross [66472] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche salvini<br>Salvin's Albatross [64463] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche steadi<br>White-capped Albatross [64462] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Migratory Marine Species | | | |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat may occur within area | In feature area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Species or species habitat may occur within area | In feature area |
| Caperea marginata<br>Pygmy Right Whale [39] | | Foraging, feeding or related behaviour may occur within area | In feature area |
| Carcharhinus longimanus<br>Oceanic Whitetip Shark [84108] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Carcharodon carcharias<br>White Shark, Great White Shark [64470] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area | In feature area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Dugong dugon<br>Dugong [28] | | Species or species habitat may occur within area | In feature area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Eubalaena australis as Balaena glacialis australis<br>Southern Right Whale [40] | Endangered | Species or species habitat likely to occur within area | In feature area |
| Lagenorhynchus obscurus<br>Dusky Dolphin [43] | | Species or species habitat may occur within area | In feature area |
| Lamna nasus<br>Porbeagle, Mackerel Shark [83288] | | Species or species habitat likely to occur within area | In feature area |
| Megaptera novaeangliae<br>Humpback Whale [38] | | Species or species habitat known to occur within area | In feature area |
| Mobula alfredi as Manta alfredi<br>Reef Manta Ray, Coastal Manta Ray [90033] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Mobula birostris as Manta birostris<br>Giant Manta Ray [90034] | | Species or species habitat may occur within area | In feature area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Orcinus orca<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area | In buffer area only |
| Rhincodon typus<br>Whale Shark [66680] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Sousa sahulensis as Sousa chinensis<br>Australian Humpback Dolphin [87942] | | Species or species habitat likely to occur within area | In feature area |
| **Migratory Terrestrial Species** | | | |
| Cuculus optatus<br>Oriental Cuckoo, Horsfield's Cuckoo [86651] | | Species or species habitat may occur within area | In feature area |
| Hirundapus caudacutus<br>White-throated Needletail [682] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Species or species habitat known to occur within area | In feature area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat likely to occur within area | In feature area |
| Myiagra cyanoleuca<br>Satin Flycatcher [612] | | Species or species habitat known to occur within area | In feature area |
| Rhipidura rufifrons<br>Rufous Fantail [592] | | Species or species habitat known to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Symposiachrus trivirgatus as Monarcha trivirgatus](#)<br>Spectacled Monarch [83946] | | Species or species habitat may occur within area | In feature area |
| **Migratory Wetlands Species** | | | |
| [Actitis hypoleucos](#)<br>Common Sandpiper [59309] | | Species or species habitat likely to occur within area | In feature area |
| [Calidris acuminata](#)<br>Sharp-tailed Sandpiper [874] | | Species or species habitat likely to occur within area | In feature area |
| [Calidris canutus](#)<br>Red Knot, Knot [855] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Calidris ferruginea](#)<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat likely to occur within area | In feature area |
| [Calidris melanotos](#)<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area | In feature area |
| [Charadrius leschenaultii](#)<br>Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| [Gallinago hardwickii](#)<br>Latham's Snipe, Japanese Snipe [863] | | Species or species habitat known to occur within area | In feature area |
| [Limosa lapponica](#)<br>Bar-tailed Godwit [844] | | Species or species habitat known to occur within area | In feature area |
| [Numenius madagascariensis](#)<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area | In feature area |
| [Pandion haliaetus](#)<br>Osprey [952] | | Species or species habitat known to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Tringa nebularia | | | |
| Common Greenshank, Greenshank [832] | | Species or species habitat likely to occur within area | In feature area |

## Other Matters Protected by the EPBC Act

### Commonwealth Lands [ Resource Information ]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

| Commonwealth Land Name | State | Buffer Status |
|---|---|---|
| Communications, Information Technology and the Arts - Australian Postal Corporation | | |
| Commonwealth Land - Australian Postal Commission [13239] | NSW | In buffer area only |
| Commonwealth Land - Australian Postal Corporation [16525] | NSW | In buffer area only |
| Communications, Information Technology and the Arts - Telstra Corporation Limited | | |
| Commonwealth Land - Australian Telecommunications Commission [13241] | NSW | In buffer area only |
| Commonwealth Land - Australian Telecommunications Commission [13240] | NSW | In buffer area only |
| Defence | | |
| Commonwealth Land - Defence Service Homes Corporation [13220] | NSW | In buffer area only |
| Defence - PITTWATER DIVING ANNEX (forms part of "RAN Torpedo Range") [10027] | NSW | In buffer area only |
| Defence - PITTWATER DIVING ANNEX (forms part of "RAN Torpedo Range") [10028] | NSW | In buffer area only |
| Defence - PITTWATER DIVING ANNEX (forms part of "RAN Torpedo Range") [10026] | NSW | In buffer area only |
| Defence - Defence Housing Authority | | |
| Commonwealth Land - Defence Housing Authority [13238] | NSW | In buffer area only |

### Listed Marine Species [ Resource Information ]

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Bird | | | |
| Actitis hypoleucos | | | |
| Common Sandpiper [59309] | | Species or species habitat likely to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Anous stolidus<br>Common Noddy [825] | | Species or species habitat likely to occur within area | In feature area |
| Apus pacificus<br>Fork-tailed Swift [678] | | Species or species habitat likely to occur within area overfly marine area | In feature area |
| Ardenna carneipes as Puffinus carneipes<br>Flesh-footed Shearwater, Fleshy-footed Shearwater [82404] | | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Ardenna grisea as Puffinus griseus<br>Sooty Shearwater [82651] | | Species or species habitat likely to occur within area | In feature area |
| Bubulcus ibis as Ardea ibis<br>Cattle Egret [66521] | | Species or species habitat may occur within area overfly marine area | In feature area |
| Calidris acuminata<br>Sharp-tailed Sandpiper [874] | | Species or species habitat likely to occur within area | In feature area |
| Calidris canutus<br>Red Knot, Knot [855] | Endangered | Species or species habitat likely to occur within area overfly marine area | In feature area |
| Calidris ferruginea<br>Curlew Sandpiper [856] | Critically Endangered | Species or species habitat likely to occur within area overfly marine area | In feature area |
| Calidris melanotos<br>Pectoral Sandpiper [858] | | Species or species habitat may occur within area overfly marine area | In feature area |
| Calonectris leucomelas<br>Streaked Shearwater [1077] | | Species or species habitat known to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Charadrius leschenaultii<br>Greater Sand Plover, Large Sand Plover [877] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Diomedea antipodensis<br>Antipodean Albatross [64458] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Diomedea antipodensis gibsoni as Diomedea gibsoni<br>Gibson's Albatross [82270] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Diomedea epomophora<br>Southern Royal Albatross [89221] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Diomedea exulans<br>Wandering Albatross [89223] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Diomedea sanfordi<br>Northern Royal Albatross [64456] | Endangered | Species or species habitat may occur within area | In feature area |
| Fregata ariel<br>Lesser Frigatebird, Least Frigatebird [1012] | | Species or species habitat likely to occur within area | In feature area |
| Fregata minor<br>Great Frigatebird, Greater Frigatebird [1013] | | Species or species habitat may occur within area | In feature area |
| Gallinago hardwickii<br>Latham's Snipe, Japanese Snipe [863] | | Species or species habitat known to occur within area overfly marine area | In feature area |
| Haliaeetus leucogaster<br>White-bellied Sea-Eagle [943] | | Species or species habitat known to occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Hirundapus caudacutus<br>White-throated Needletail [682] | Vulnerable | Species or species habitat known to occur within area overfly marine area | In feature area |
| Lathamus discolor<br>Swift Parrot [744] | Critically Endangered | Species or species habitat known to occur within area overfly marine area | In buffer area only |
| Limosa lapponica<br>Bar-tailed Godwit [844] | | Species or species habitat known to occur within area | In feature area |
| Macronectes giganteus<br>Southern Giant-Petrel, Southern Giant Petrel [1060] | Endangered | Species or species habitat may occur within area | In feature area |
| Macronectes halli<br>Northern Giant Petrel [1061] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Merops ornatus<br>Rainbow Bee-eater [670] | | Species or species habitat may occur within area overfly marine area | In feature area |
| Monarcha melanopsis<br>Black-faced Monarch [609] | | Species or species habitat known to occur within area overfly marine area | In feature area |
| Motacilla flava<br>Yellow Wagtail [644] | | Species or species habitat likely to occur within area overfly marine area | In feature area |
| Myiagra cyanoleuca<br>Satin Flycatcher [612] | | Species or species habitat known to occur within area overfly marine area | In feature area |
| Neophema chrysostoma<br>Blue-winged Parrot [726] | | Species or species habitat likely to occur within area overfly marine area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Numenius madagascariensis](#)<br>Eastern Curlew, Far Eastern Curlew [847] | Critically Endangered | Species or species habitat known to occur within area | In feature area |
| [Pachyptila turtur](#)<br>Fairy Prion [1066] | | Species or species habitat known to occur within area | In feature area |
| [Pandion haliaetus](#)<br>Osprey [952] | | Species or species habitat known to occur within area | In feature area |
| [Phaethon lepturus](#)<br>White-tailed Tropicbird [1014] | | Species or species habitat may occur within area | In feature area |
| [Phoebetria fusca](#)<br>Sooty Albatross [1075] | Vulnerable | Species or species habitat may occur within area | In buffer area only |
| [Rhipidura rufifrons](#)<br>Rufous Fantail [592] | | Species or species habitat known to occur within area overfly marine area | In feature area |
| [Rostratula australis as Rostratula benghalensis (sensu lato)](#)<br>Australian Painted Snipe [77037] | Endangered | Species or species habitat known to occur within area overfly marine area | In feature area |
| [Sternula albifrons as Sterna albifrons](#)<br>Little Tern [82849] | | Species or species habitat may occur within area | In feature area |
| [Symposiachrus trivirgatus as Monarcha trivirgatus](#)<br>Spectacled Monarch [83946] | | Species or species habitat may occur within area overfly marine area | In feature area |
| [Thalassarche bulleri](#)<br>Buller's Albatross, Pacific Albatross [64460] | Vulnerable | Species or species habitat may occur within area | In feature area |
| [Thalassarche bulleri platei as Thalassarche sp. nov.](#)<br>Northern Buller's Albatross, Pacific Albatross [82273] | Vulnerable | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Thalassarche carteri<br>Indian Yellow-nosed Albatross [64464] | Vulnerable | Species or species habitat likely to occur within area | In feature area |
| Thalassarche cauta<br>Shy Albatross [89224] | Endangered | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche eremita<br>Chatham Albatross [64457] | Endangered | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche impavida<br>Campbell Albatross, Campbell Black-browed Albatross [64459] | Vulnerable | Species or species habitat may occur within area | In feature area |
| Thalassarche melanophris<br>Black-browed Albatross [66472] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche salvini<br>Salvin's Albatross [64463] | Vulnerable | Foraging, feeding or related behaviour likely to occur within area | In feature area |
| Thalassarche steadi<br>White-capped Albatross [64462] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Tringa nebularia<br>Common Greenshank, Greenshank [832] | | Species or species habitat likely to occur within area overfly marine area | In feature area |
| Fish | | | |
| Acentronura tentaculata<br>Shortpouch Pygmy Pipehorse [66187] | | Species or species habitat may occur within area | In feature area |
| Festucalex cinctus<br>Girdled Pipefish [66214] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| [Filicampus tigris](#)<br>Tiger Pipefish [66217] | | Species or species habitat may occur within area | In feature area |
| [Heraldia nocturna](#)<br>Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227] | | Species or species habitat may occur within area | In feature area |
| [Hippichthys penicillus](#)<br>Beady Pipefish, Steep-nosed Pipefish [66231] | | Species or species habitat may occur within area | In feature area |
| [Hippocampus abdominalis](#)<br>Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233] | | Species or species habitat may occur within area | In feature area |
| [Hippocampus whitei](#)<br>White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Histiogamphelus briggsii](#)<br>Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242] | | Species or species habitat may occur within area | In feature area |
| [Lissocampus runa](#)<br>Javelin Pipefish [66251] | | Species or species habitat may occur within area | In feature area |
| [Maroubra perserrata](#)<br>Sawtooth Pipefish [66252] | | Species or species habitat may occur within area | In feature area |
| [Notiocampus ruber](#)<br>Red Pipefish [66265] | | Species or species habitat may occur within area | In feature area |
| [Phyllopteryx taeniolatus](#)<br>Common Seadragon, Weedy Seadragon [66268] | | Species or species habitat may occur within area | In feature area |
| [Solegnathus spinosissimus](#)<br>Spiny Pipehorse, Australian Spiny Pipehorse [66275] | | Species or species habitat may occur within area | In feature area |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Solenostomus cyanopterus<br>Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183] | | Species or species habitat may occur within area | In feature area |
| Solenostomus paradoxus<br>Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184] | | Species or species habitat may occur within area | In feature area |
| Stigmatopora argus<br>Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276] | | Species or species habitat may occur within area | In feature area |
| Stigmatopora nigra<br>Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277] | | Species or species habitat may occur within area | In feature area |
| Syngnathoides biaculeatus<br>Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279] | | Species or species habitat may occur within area | In feature area |
| Trachyrhamphus bicoarctatus<br>Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280] | | Species or species habitat may occur within area | In feature area |
| Urocampus carinirostris<br>Hairy Pipefish [66282] | | Species or species habitat may occur within area | In feature area |
| Vanacampus margaritifer<br>Mother-of-pearl Pipefish [66283] | | Species or species habitat may occur within area | In feature area |
| **Mammal** | | | |
| Arctocephalus forsteri<br>Long-nosed Fur-seal, New Zealand Fur-seal [20] | | Species or species habitat may occur within area | In feature area |
| Arctocephalus pusillus<br>Australian Fur-seal, Australo-African Fur-seal [21] | | Species or species habitat may occur within area | In feature area |
| Dugong dugon<br>Dugong [28] | | Species or species habitat may occur within area | In feature area |
| **Reptile** | | | |

| Scientific Name | Threatened Category | Presence Text | Buffer Status |
|---|---|---|---|
| Caretta caretta<br>Loggerhead Turtle [1763] | Endangered | Species or species habitat known to occur within area | In feature area |
| Chelonia mydas<br>Green Turtle [1765] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Dermochelys coriacea<br>Leatherback Turtle, Leathery Turtle, Luth [1768] | Endangered | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Eretmochelys imbricata<br>Hawksbill Turtle [1766] | Vulnerable | Species or species habitat known to occur within area | In feature area |
| Natator depressus<br>Flatback Turtle [59257] | Vulnerable | Foraging, feeding or related behaviour known to occur within area | In feature area |
| Pelamis platurus<br>Yellow-bellied Seasnake [1091] | | Species or species habitat may occur within area | In feature area |

| Whales and Other Cetaceans | | | [ Resource Information ] |
|---|---|---|---|
| Current Scientific Name | Status | Type of Presence | Buffer Status |
| Mammal | | | |
| Balaenoptera acutorostrata<br>Minke Whale [33] | | Species or species habitat may occur within area | In buffer area only |
| Balaenoptera edeni<br>Bryde's Whale [35] | | Species or species habitat may occur within area | In feature area |
| Balaenoptera musculus<br>Blue Whale [36] | Endangered | Species or species habitat may occur within area | In feature area |
| Caperea marginata<br>Pygmy Right Whale [39] | | Foraging, feeding or related behaviour may occur within area | In feature area |

| Current Scientific Name | Status | Type of Presence | Buffer Status |
| --- | --- | --- | --- |
| [Delphinus delphis](#)<br>Common Dolphin, Short-beaked Common Dolphin [60] | | Species or species habitat may occur within area | In feature area |
| [Eubalaena australis](#)<br>Southern Right Whale [40] | Endangered | Species or species habitat likely to occur within area | In feature area |
| [Grampus griseus](#)<br>Risso's Dolphin, Grampus [64] | | Species or species habitat may occur within area | In buffer area only |
| [Lagenorhynchus obscurus](#)<br>Dusky Dolphin [43] | | Species or species habitat may occur within area | In feature area |
| [Megaptera novaeangliae](#)<br>Humpback Whale [38] | | Species or species habitat known to occur within area | In feature area |
| [Orcinus orca](#)<br>Killer Whale, Orca [46] | | Species or species habitat may occur within area | In buffer area only |
| [Sousa sahulensis as Sousa chinensis](#)<br>Australian Humpback Dolphin [87942] | | Species or species habitat likely to occur within area | In feature area |
| [Stenella attenuata](#)<br>Spotted Dolphin, Pantropical Spotted Dolphin [51] | | Species or species habitat may occur within area | In feature area |
| [Tursiops aduncus](#)<br>Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418] | | Species or species habitat likely to occur within area | In feature area |
| [Tursiops truncatus s. str.](#)<br>Bottlenose Dolphin [68417] | | Species or species habitat may occur within area | In feature area |

# Extra Information

## State and Territory Reserves [ Resource Information ]

| Protected Area Name | Reserve Type | State | Buffer Status |
|---|---|---|---|
| Ku-ring-gai Chase | National Park | NSW | In buffer area only |

## EPBC Act Referrals [ Resource Information ]

| Title of referral | Reference | Referral Outcome | Assessment Status | Buffer Status |
|---|---|---|---|---|
| **Not controlled action** | | | | |
| Construction of a high-capacity fibre optic submarine cable | 2006/2914 | Not Controlled Action | Completed | In feature area |
| Demolition of Ablutions Block, Snapper Island, NSW | 2018/8303 | Not Controlled Action | Completed | In feature area |
| Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia | 2015/7522 | Not Controlled Action | Completed | In feature area |
| **Referral decision** | | | | |
| Breeding program for Grey Nurse Sharks | 2007/3245 | Referral Decision | Completed | In feature area |

## Biologically Important Areas

| Scientific Name | Behaviour | Presence | Buffer Status |
|---|---|---|---|
| **Dolphins** | | | |
| Tursiops aduncus | | | |
| Indo-Pacific/Spotted Bottlenose Dolphin [68418] | Breeding | Likely to occur | In feature area |
| **Seabirds** | | | |
| Ardenna pacifica | | | |
| Wedge-tailed Shearwater [84292] | Foraging | Likely to occur | In feature area |
| **Sharks** | | | |
| Carcharias taurus | | | |
| Grey Nurse Shark [64469] | Foraging | Known to occur | In feature area |
| **Whales** | | | |
| Megaptera novaeangliae | | | |
| Humpback Whale [38] | Foraging | Known to occur | In buffer area only |

## Bioregional Assessments

| SubRegion | BioRegion | Website | Buffer Status |
|---|---|---|---|
| Sydney | Sydney Basin | BA website | In feature area |

# Caveat

## 1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

## 2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

## 3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

## 4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

# Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.



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# Appendix E

## AHIMS Extensive search results

# AHIMS Web Services (AWS)

## Extensive search - Site list report

Your Ref/PO Number : 12542425

Client Service ID : 703116

| SiteID | SiteName | Datum | Zone | Easting | Northing | Context | Site Status ** | SiteFeatures | SiteTypes | Reports |
|---|---|---|---|---|---|---|---|---|---|---|
| 45-6-1566 | Bayview; | AGD | 56 | 342349 | 6274142 | Open site | Valid | Shell : -, Artefact : - | Midden | 417 |
| | **Contact** | **Recorders** | ASRSYS | | | | | **Permits** | | |
| 45-6-2689 | 1927 Pittwater Rd Midden 2 | AGD | 56 | 342066 | 6274034 | Open site | Valid | Shell : -, Artefact : - | | |
| | **Contact** | **Recorders** | Jim Wheeler | | | | | **Permits** | 1991 | |
| 45-6-2789 | 1927 Pittwater Rd - PAD | AGD | 56 | 342078 | 6273986 | Open site | Valid | Potential Archaeological Deposit (PAD) : 1 | | |
| | **Contact** T Russell | **Recorders** | Jim Wheeler | | | | | **Permits** | | |
| 45-6-2688 | 1927 Pittwater Rd Midden 1 | AGD | 56 | 342118 | 6274082 | Open site | Destroyed | Shell : -, Artefact : - | | |
| | **Contact** | **Recorders** | Jim Wheeler | | | | | **Permits** | 1991,2062,2371 | |

**** Site Status**

**Valid** - The site has been recorded and accepted onto the system as valid

**Destroyed** - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

**Partially Destroyed** - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

**Not a site** - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

**Report generated by AHIMS Web Service on 26/07/2022 for Anthea Mihalatos for the following area at Lot : 30, DP:DP7254, Section : - with a Buffer of 200 meters.. Number of Aboriginal sites and Aboriginal objects found is 4**

# Appendix F

## Preliminary Environmental Investigation

# Preliminary Environmental Investigation

## Shared Pathway from Bayview Baths to Tennis Courts

59919083

Prepared for

Northern Beaches Council

21 May 2019

Cardno

## Contact Information

**Cardno (NSW/ACT) Pty Ltd**
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## Document Information

| | |
|---|---|
| Prepared for | Northern Beaches Council |
| Project Name | Shared Pathway from Bayview Baths to Tennis Courts |
| File Reference | 59919083 R001 Rev2 Bayview PEI.docx |
| Job Reference | 59919083 |
| Date | 21 May 2019 |
| Version Number | Rev 2 |

Author(s):

Dan McCallum
Environmental Scientist

Effective Date 21/05/2019

Approved By:

Belinda Crichton
Principal Environmental Scientist

Date Approved 21/05/2019

## Document History

| Version | Effective Date | Description of Revision | Prepared by | Reviewed by |
|---|---|---|---|---|
| V01 | 15/03/2019 | Draft for Internal Review | Dan McCallum | Belinda Crichton |
| Rev0 | 26/03/2019 | Draft for Client Review | Dan McCallum | Belinda Crichton |
| Rev1 | 10/04/2019 | Draft for Client Review | Belinda Crichton | Kevin Roberts |
| Rev 2 | 21/05/2019 | Final addressing client comments | Belinda Crichton | Belinda Crichton |

# Executive Summary

Northern Beaches Council (Council) has committed to investigating the feasibility of two options for a shared pedestrian/cycle pathway (shared pathway) between Bayview Tennis Courts and the Bayview Baths at Bayview on the southern foreshores of Pittwater. The proposed two options being considered are:

- Option 1 - widen and upgrade the existing footpath which runs parallel to Pittwater Road for approximately 130m; and
- Option 2 - construct a boardwalk which extends into the waters of Pittwater, outside the majority of the mangrove zone, and is approximately 250m in length.

This Preliminary Environmental Investigation (PEI) has been prepared to identify potential environmental issues and risk for the two options for the project. In particular, a Biodiversity Assessment was undertaken to determine the feasibility of each option in relation and marine and ecological impacts.

### Need for the Proposal

The existing footpath and road embankment along Pittwater Road within the Study Area, is supported by a sandstone seawall that ranges from 0.5m to 1.6m in height. The wall is in varying stages of disrepair and failure, with some areas where the wall has completely failed. The north-eastern apex of Pittwater Road alignment displays the greatest extent of seawall failure. Fill material has become exposed that has undergone erosion resulting in regression of the embankment to within approximately 2.5m from the edge of the road. It is in this area that the greatest lateral movement of the pavements can be observed with up to 170mm movement of the pavement to the north-east. Movement of the pavements is considered to be the result of the failure of the sea wall. The condition of the existing seawall is described in detail in JK Geotechnics (2018).

### Proposal Objectives

The objectives of the shared pedestrian/bicycle pathway between Bayview Tennis Courts and the Bayview Baths at Bayview are to:

- Upgrade the current dilapidated footpath that runs parallel to Pittwater Road; and
- Provide pedestrians and cyclists with a safe pathway from Bayview Tennis Courts and the Bayview Baths.

### Environmental Issues and Recommendations

The main environmental issues associated with both options include:

- Biodiversity: Clearing of vegetation and habitat including;
  - *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, listed as Threatened Ecological Community(TEC) under the BC Act;
  - Removal of marine vegetation (mangroves);
  - Removal of intertidal rocky shore habitat;
  - Removal of sub-tidal soft sediment habitat (Option 2).
- Heritage: Potential impacts to a locally listed heritage item (Sea Scout Hall) at the eastern extent of the Study Area (Option 2) and the *Araucaria* street trees which are located at the western extent of the Study Area (Option 1); and
- Acid sulfate soils: The Study Area is within areas mapped as Class 1, 2 and 5 acid sulfate soils. Construction works may disturb these soils that could allow for the mobilisation of heavy metals and acid into Pittwater Estuary (Option 2).

It is recommended that further environmental assessment are completed during the concept design stage of the project.

# Table of Contents



# Appendices

# Tables



# Figures

# Abbreviations

| | |
|---|---|
| AHIMS | Aboriginal Heritage Information Management System |
| BC Act | *Biodiversity Conservation Act 2016* |
| BOM | Bureau of Meteorology |
| CAMBA | China-Australia Migratory Bird Agreement |
| Cardno | Cardno (NSW/ACT) Pty Ltd |
| CBD | Central Business District |
| Coastal Management SEPP | *State Environmental Planning Policy (Coastal Management) 2018* |
| Council | Northern Beaches Council |
| dB | Decibel. A scale used in sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure |
| dB(A) | A value used for 'A-weighted' sound pressure levels. 'A' frequency weighted is an adjustment made to sound-level measurement to approximate the response of the human ear |
| DoEE | Australian Government Department of Environment and Energy |
| DOI | NSW Department of Industry |
| DP&E | NSW Department of Planning and Environment |
| DPI | NSW Department of Primary Industries |
| EPA | NSW Environment Protection Authority |
| EP&A Act | *Environmental Planning and Assessment Act 1979* |
| EP&A Regulation | *Environmental Planning and Assessment Regulation 2000* |
| EPBC Act | *Environmental Protection and Biodiversity Conservation Act 1999* |
| EPL | Environmental Protection License |
| ESD | Ecologically Sustainable Development |
| FM Act | *NSW Fisheries Management Act 1994* |
| ICNG | *Interim Construction Noise Guideline* |
| ISEPP | *State Environmental Planning Policy (Infrastructure) 2007* |
| JAMBA | Japan-Australia Migratory Bird Agreement |
| KFH | Key Fish Habitat |
| LGA | Local Government Area |
| MHWM | Mean High Water Mark |
| NES | National Environmental Significance. Matters of NES are listed under the EPBC Act |
| OEH | NSW Office of Environment and Heritage |
| PCT | Plant Community Types |
| PEI | Preliminary Environmental Investigation |
| Pittwater LEP | *Pittwater Local Environmental Plan 2014* |
| PMST | DoEE's Protected Matters Search Tool |
| REF | Review of Environmental Factors |
| Roads and Maritime | Roads and Maritime Services |
| ROKAMBA | Republic of Korea-Australia Migratory Bird Agreement |

| | |
|---|---|
| SEE | Statement of Environmental Effects |
| SEPP | State Environmental Planning Policy |
| Study Area | An area encompassing the option footprints as outlined in Figure 1-1. |
| Study Locality | The area within 5km of the Study Area |
| TEC | Threatened Ecological Community |
| TLB | Taylor Lauder Bersten |
| ToS | Test of Significance |

# 1 Introduction

## 1.1 Proposal Overview

Northern Beaches Council (Council) has committed to investigating the feasibility of two options for a shared pedestrian/cycle pathway (shared pathway) between Bayview Tennis Courts and the Bayview Baths at Bayview on the southern foreshores of Pittwater. The proposed two options being considered are:

- Option 1 - widen and upgrade the existing footpath which runs parallel to Pittwater Road for approximately 130m; and
- Option 2 - construct a boardwalk which extends into the waters of Pittwater, outside the majority of the mangrove zone, and is approximately 250m in length.

Refer to Figure 1-1 for the regional location of the Study Area.

## 1.2 Background

Pittwater is a significant natural asset within the Northern Beaches Council Local Government Area (LGA) and is approximately 30km from the Sydney Central Business District (CBD). The Study Area lies on the southern foreshores of Pittwater Estuary in the suburb of Bayview.

The existing footpath which runs parallel to Pittwater Road, runs along the toe of a hill that protrudes into the estuary. From Bayview Sea Scouts Pittwater Road runs in a north-south direction before turning approximately 90 degrees and running in an east-west direction to Bayview Baths, approximately 200m in distance.

Within the estuary there are a number of valuable estuarine habitats including mangroves, coastal saltmarshes, intertidal mud flats, beaches and rocky shorelines. Pittwater also has great significance to the traditional Aboriginal owners and custodians of this land. Pittwater has a number of uses including recreation, tourism and local business.

A geotechnical investigation was undertaken by JK Geotechnics (2018) to provide geotechnical information on subsurface conditions along the Bayview foreshore, extending from the Bayview Sea Scouts to the Bayview Baths. The report provided comments and recommendations on retention, earthworks, footing design and pavement design for Option 1 and comments and recommendations for Option 2. Taylor Lauder Bersten (TLB) was then engaged to provide structural designs of the two options as shown in Appendix A (TLB, 2018).

## 1.3 Purpose of the Report

The purpose of this Preliminary Environmental Investigation (PEI) is to:

- Identify potential environmental issues and risk for the project;
- Undertake a Biodiversity Assessment to determine the feasibility of each option in relation and marine and ecological impacts;
- Provide recommendations to inform options considerations, the design process and future detailed environmental assessment;
- Outline stakeholder consultation for the project;
- Identify relevant approval pathways and likely permits required for each option;
- Assist Council to integrate environmental, economic and social outcomes into decision making; and
- Assist Council to apply the principles of Ecologically Sustainable Development (ESD).


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# Site Location

## BAYVIEW SHARED PATHWAY PEI

**Legend**

- Watercourses
- Major Road (LPI, 2016)
- Study Area

**FIGURE 1-1**

**1:5,000 Scale at A3**

m
0 50 100 150 200

Cardno

Map Produced by NSW/ACT (WNE)
Date: 2019-03-15 | Project:59919082
Coordinate System: GDA 1994 MGA Zone 56
Map: 59919083-GS-004-BayviewPEI_Reg&Vic 01.mxd 01
Imagery supplied by Nearmap April 2018

# 2 Proposed Works

## 2.1 Project Description

There are currently two options for the area of investigation as outlined in Figure 2-1. The options sketch for the two options are shown in Appendix A.

### 2.1.1 Option 1

Option 1 involves widening and upgrading the existing footpath (approximately 130m in length) which runs parallel to Pittwater Road. The retaining wall which supports both the footpath and the road embankment is in varying stages of disrepair/failure and requires remediation.

Key features of Option 1 include (TLB, 2018):

- Demolition of the existing footpath;
- Installation of sheet piles from either the roadway or tracking equipment between existing footpath and mangroves;
- Remove marine sands between sheet piles and existing retaining wall if required, whilst maintaining integrity of existing retaining wall;
- Place geofabric and backfill (e.g. crushed concrete) between existing retaining wall and sheet piles and compact as required;
- Place sandstone boulders facing the sheet piles; and
- Pour new footpath slab, with a minimum width of 3.5m; and
- Installation of a balustrade to improve safety.

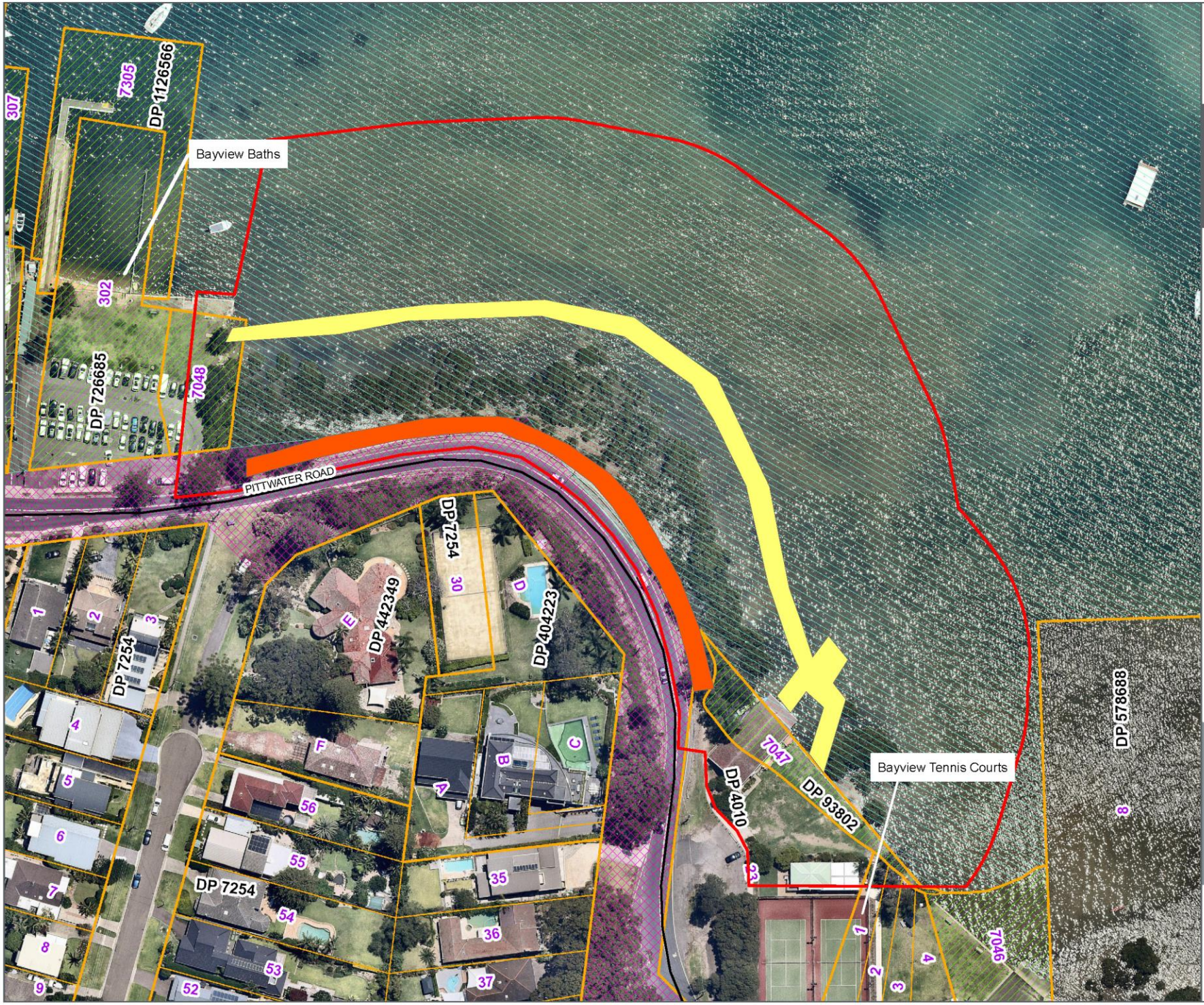
### 2.1.2 Option 2

Option 2 involves the construction of a boardwalk which extends into the waters of Pittwater and is approximately 250m in length.

Key features of Option 2 include (TLB, 2018):

- Installation of timber piles by excavator tracking on sand, assuming the sand can support the equipment ;
- Integration of Sea scout launch ramp into the structure;
- Install timber decking surface (or alternate mesh decking) at a width of approximately 3.5m;
- Possibility that the boardwalk would need to be designed for vessel impact; and
- 30-year design life.

It is noted that the existing footpath is in a current state of disrepair and would require remediation even if Option 2 was selected.

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# Project Options

**BAYVIEW SHARED PATHWAY PEI**

## Legend

- Major Road (LPI, 2016)

**Project Options**

- Option 1
- Option 2
- Study
- Lot

**Crown Land**

- Crown Parcel
- Crown Road
- Crown Waterway

**FIGURE 2-1**

**1:1,000 Scale at A3**

m
0 10 20 30 40

N

Cardno

Map Produced by NSW/ACT (WNE)
Date: 2019-03-14 | Project:59919082
Coordinate System: GDA 1994 MGA Zone 56
Map: 59919083-GS-006-BayviewPEI_ProjedOptions 01.mxd 01
Imagery supplied by Nearmap April 2018

## 2.2 Land Description and Tenure for Proposed Works

The proposed works would be carried out on the land identified in Table 2-1 and shown on Figure 2-1.

Table 2-1 Land Tenure and Proposed Works

| Lot | DP Number | Owner | Description |
|---|---|---|---|
| - | - | Crown Land | Pittwater Estuary. Crown Land extends below the Mean High Water Mark (MHWM). |
| - | - | Crown Land (Northern Beaches Council is the Roads Authority) | Pittwater Road |
| 7047 | 93802 | Crown Land (under the care and control of Northern Beaches Council) | The north-eastern portion of the Sea Scout Hall and the portion of the recreational area that fronts onto the water. |
| 7048 | 93802 | Crown Land (under the care and control of Northern Beaches Council) | The western portion of the car park for the marina carpark and foreshore. |
| 23 | 4010 | Northern Beaches Council | Recreational area, tennis courts clubhouse, majority of the tennis courts and the south-western end of the Sea Scout Hall. |

## 2.3 Need for the Proposal

The existing footpath and road embankment along Pittwater Road within the Study Area, is supported by a sandstone seawall that ranges from 0.5m to 1.6m in height. The wall is in varying stages of disrepair and failure, with some areas where the wall has completely failed. The north-eastern apex of Pittwater Road alignment displays the greatest extent of seawall failure. Fill material has become exposed that has undergone erosion resulting in regression of the embankment to within approximately 2.5m from the edge of the road. It is in this area that the greatest lateral movement of the pavements can be observed with up to 170mm movement of the pavement to the north-east. Movement of the pavements is considered to be the result of the failure of the sea wall. The condition of the existing seawall is described in detail in JK Geotechnics (2018).

The Bayview-Church Point Residents association has lobbied Council to investigate the possibility of installation of a shared path boardwalk (Option 2) from the Bayview Tennis Courts to the Bayview baths citing that the existing footpath held safety concerns due to the narrowness, no railing, subsidence, seawall erosion, restricted disabled accessibility, and closeness to vehicular traffic.

Council has committed to investigating the feasibility of both options. This PEI, including the biodiversity assessment, will be used by Council to select a preferred option.

## 2.4 Proposal Objectives

The objectives of the shared pedestrian/bicycle pathway between Bayview Tennis Courts and the Bayview Baths at Bayview are to:

- Upgrade the current dilapidated footpath that runs parallel to Pittwater Road; and
- Provide pedestrians and cyclists with a safe pathway from Bayview Tennis Courts and the Bayview Baths.

# 3 Statutory and Planning Framework

## 3.1 Commonwealth Legislation

### 3.1.1 Environmental Protection and Biodiversity Conservation Act 1999

*The Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Australian Government's key piece of environmental legislation, focusing on matters of National Environmental Significance (NES), with States and Territories having responsibility for matters of State and local significance.

Approval is required from the Commonwealth Minister for the Environment and Energy for any controlled action that may result in a significant impact on matters of NES.

A search of the EPBC Act database, using the Department of Environment and Energy's (DoEE) Protected Matters Search Tool (PMST), was carried out on 14 February 2019 (refer Appendix B). The nine matters of NES protected under the EPBC Act are shown in Table 3-1 which also identifies the potential for occurrence within 1km of the proposed works.

Table 3-1 Potential Impacts of Matters of NES (DoEE, 2019)

| Matters of NES | Potentially Occurring |
|---|---|
| World heritage properties | None |
| National heritage places | None |
| Wetlands of international importance (listed under the Ramsar Convention) | None |
| Great Barrier Reef Marine Park | None |
| Commonwealth marine areas | None |
| Listed Threatened ecological communities | 3 |
| Listed Threatened species | 68 |
| Listed Migratory species (protected under international agreements such as the Bonn Convention, JAMBA, CAMBA, AND ROKAMBA[1]) | 55 |

As indicated in Table 3-1, three threatened ecological communities (*Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community*, *Coastal Upland Swamps in the Sydney Basin Bioregion*, and *Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion*), 68 listed threatened species and 55 migratory species have the potential to be located within 1km of the proposed works.

The Plant Community Type (PCT) *Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion* (PCTID 1234) was found along the top of the existing revetment wall. This PCT was found to be commensurate with the Threatened Ecological Community (TEC) *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, listed as endangered under the NSW BC Act. This PCT/TEC was restricted to the narrow strip between the mangrove corridor and the existing footpath. Thus, due to the small patch sizes of this PCT, it did not meet the minimum condition thresholds for its listing as *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland Ecological Community* (endangered) under the Commonwealth EPBC Act.

Based on the outcomes of the investigations summarised in Section 5.1 the proposed works are unlikely to have a significant impact on NES and therefore referral under the EPBC Act is not required.

[1]Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)

## 3.2 NSW Legislation and Approval

### 3.2.1 State Environmental Planning Policy (Infrastructure) 2007

The S*tate Environmental Planning Policy (Infrastructure) 2007* (ISEPP) aims to facilitate the effective delivery of infrastructure across the state.

Division 17 of the ISEPP provides provisions relating to roads and traffic. Under Clause 94, development for the purpose of a road (or road infrastructure facilities) may be carried out by or on behalf of a public authority without consent on any land regardless of local zoning provisions.

Division 25, Clause 129 of the ISEPP permits development on any land for the purposes of waterway or foreshore management activities to be carried out by or on behalf of a public authority without consent. In the ISEPP, the definition of waterway and foreshore management activities includes coastal management works.

As such development consent for Option 1 is not required due to the provisions of ISEPP and Option 1 could be assessed under Division 5.1 of the EP&A Act and would be determined by Northern Beaches Council.

Division 1, Part 2 of the ISEPP identifies the requirement for consultation with local council or other government agencies prior to the commencement of some forms of development. The consultation that would be required for Option 1 during preparation of the REF is detailed in Section 4.1.

### 3.2.2 Environmental Planning and Assessment Act 1979

Development in NSW falls under the provisions of the EP&A Act and subordinate legislation. The EP&A Act includes provisions to ensure that the potential environmental impacts of a development or activity are assessed and considered in the decision-making process. Assessment and approvals may be carried out under different divisions of the EP&A Act depending on the type of proposal, and the scale and nature of impacts of the proposal. The proposed options (Options 1 and 2) may have different approval pathways because of this.

As Option 1 would fall under the provisions of the ISEPP (refer Section 3.2.1) and would be carried out by Council, it could be assessed under Division 5.1 of the EP&A Act. Projects assessed under Division 5.1 require preparation of a Review of Environmental Factors (REF) which would be determined by Council. Development consent under Division 4.1 of the EP&A Act would not be required due to the provisions of the ISEPP

However, Option 2 would require development consent under Division 4.1 of the EP&A Act as the provisions of ISEPP do not apply. Submission of a development application (DA) to Council would be supported by an environmental assessment in the form of an Statement of Environmental Effects (SEE). The consent authority for the proposed works would be the Local Planning Panel.

### 3.2.3 State Environmental Planning Policy (Coastal Management) 2018

The State *Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP), which aims to promote an integrated and coordinated approach to land use planning in the coastal zone in a manner consistent with the objectives of the *Coastal Management Act 2016*.

Under the Coastal Management SEPP, the Study Area is mapped as a 'Coastal Environment Area' (Clause 13) and a 'Coastal Use Area' (Clause 14) as shown on Figure 3-1. Clauses 13 and 14 identify a number of matters that are to be taken into account by Council when determining a proposal on land in these mapped zones. These have been listed in Table 3-2 along with comments on how they relate to the proposed works. These matters would be considered further in the environmental assessment of the preferred option.

The proposed work area is not mapped as 'Coastal Wetlands' or 'Proximity to Coastal Wetlands' under the Coastal Management SEPP so development consent is not required. The proposed works are not anticipated to have a significant impact on the 'Coastal Wetlands' to the east and west of the Study Area.

Table 3-2 Coastal Management SEPP Clauses 13 and 14 Matters for Consideration

| Matter | Relevance to Proposal |
|---|---|
| 13 (1)(a) The integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment is maintained | Disturbance of acid sulfate soils has the potential to impact on the surrounding waterways and biota. |
| 13 (1)(b) Coastal environmental values and natural coastal processes are not adversely impacted | The proposal would not have any long term adverse impacts on the coastal environmental values or natural processes. |

| Matter | Relevance to Proposal |
|---|---|
| 13 (1)(c) the water quality of the marine estate (within the meaning of the *Marine Estate Management Act 2014*). | There would be no long term adverse impacts to the water quality of the marine estate through the proposed works. |
| 13 (1)(d) Marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms | There would be no long term adverse impacts to marine and native vegetation, fauna and habitats as a result of the proposed works. |
| 13 (1)(e) Existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability | The proposal would have short term impacts on access to the foreshore and public open spaces during demolition and/or construction works.<br>Upon completion, access would be improved for the public with an increase in safety and amenity as well as improved access for persons with a disability. |
| 13 (1)(f) Aboriginal cultural heritage, practices and places | There are no identified Aboriginal sites at, or near the Study Area. |
| 13 (1)(g) Use of the surf zone | Not relevant to the proposal. |
| 14 (1)(a)(i) Existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability should be maintained | The proposal would have short term impacts on access to the foreshore during demolition and construction works.<br>Upon completion, access would be improved for the public with increase in safety and amenity as well as improved access for persons with a disability. |
| 14 (1)(a)(ii) Overshadowing, wind funnelling and the loss of views from public places to foreshores | Visual amenity would be impacted during the short term during construction works. Minor visual impacts may result with the removal of vegetation and the addition of a boardwalk extending into Pittwater Estuary (Option 2). |
| 14 (1)(a)(iii)The visual amenity and scenic qualities of the coast, including coastal headlands is not to be adversely impacted | |
| 14 (1)(a)(iv) Aboriginal cultural heritage, practices, and places are to be maintained | There are no identified Aboriginal sites at, or near the Study Area. |
| 14 (1)(a)(v) Cultural and built environment heritage would not be adversely impacted | The current footprint of Option 2 has the boardwalk intersecting the boat ramp of the Sea Scout Hall which is locally listed. |

### 3.2.4 Sydney Regional Environmental Plan No. 20 – Hawkesbury - Nepean River (No 2 -1997)

The aim of the *Sydney Regional Environmental Plan No. 20 Hawkesbury – Nepean River (No 2 – 1997)* is to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.

According to Clause 4 of the REP:

1) The general planning considerations set out in clause 5, and the specific planning policies and related recommended strategies set out in clause 6 which are applicable to the proposed development, must be taken into consideration:

   (a) by a consent authority determining an application for consent to the carrying out of development on land to which this plan applies, and

   (b) by a person, company, public authority or a company State owned corporation proposing to carry out development which does not require development consent.

2) Those considerations, policies and strategies should be taken into consideration in the preparation of each environmental planning instrument and development control plan that applies to land to which this plan applies.

The environmental assessment for the preferred option will need to consider the general planning consideration, specific planning policies and recommended strategies under Part 2 of the REP.

### 3.2.5 Pittwater Local Environment Plan 2014

The Study Area is located within the Northern Beaches LGA and governed by the *Pittwater Local Environmental Plan 2014* (Pittwater LEP). Under the Pittwater LEP, the two proposed footprints are comprised of the following zones (refer Figure 3-1):

- E2 Environmental Conservation;
- E4 Environmental Living;
- RE1 Public recreation; and
- R2 Low Density Residential.

The objectives and the permissibility of development within these zones are listed in Table 3-3.

The ISEPP overrides the provisions of the Pittwater LEP and development consent for Option 1 under Division 4.1 of the EP&A Act is not required.

Option 2, under the Pittwater LEP land zoning (E2 and RE1), could be classed as development with consent based on the following definitions of development:

***community facility*** *means a building or place:*
*(a) owned or controlled by a public authority or non-profit community organisation, and*

*(b) used for the physical, social, cultural or intellectual development or welfare of the community,*

*but does not include an educational establishment, hospital, retail premises, place of public worship or residential accommodation.*

***environmental facility*** *means a building or place that provides for the recreational use or scientific study of natural systems, and includes walking tracks, seating, shelters, board walks, observation decks, bird hides or the like, and associated display structures.*

***recreation area*** *means a place used for outdoor recreation that is normally open to the public, and includes:*
*(a) a children's playground, or*

*(b) an area used for community sporting activities, or*

*(c) a public park, reserve or garden or the like,*

*and any ancillary buildings, but does not include a recreation facility (indoor), recreation facility (major) or recreation facility (outdoor).*

***water recreation structure*** *means a structure used primarily for recreational purposes that has a direct structural connection between the shore and the waterway, and may include a pier, wharf, jetty or boat launching ramp.*

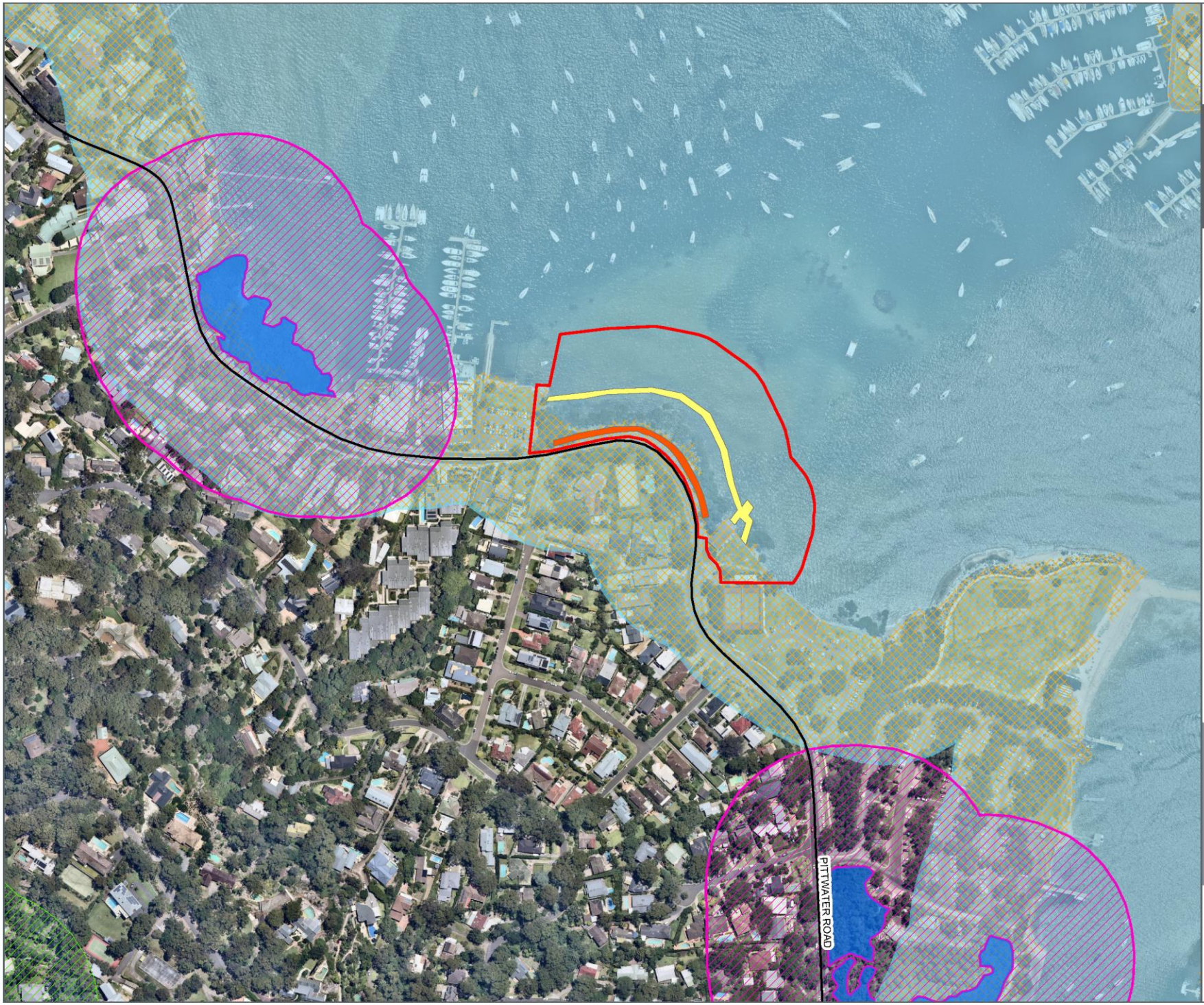
Option 2 may be carried out by Northern Beaches Council, a public authority, as development with consent under Division 4.1 of the EP&A Act.

Furthermore, in accordance with Clause 5.7 (2) of the Pittwater LEP, *Development consent is required to carry out development on any land below the mean high water mark of any body of water subject to tidal influence (including the bed of any such water)*.

Table 3-3 Pittwater LEP 2014 land use zonings

| Zone | Objectives of the Zone | Permitted without consent | Permitted with consent | Prohibited | Relevant Option |
|---|---|---|---|---|---|
| E2 Environmental Conservation | ▪ To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.<br>▪ To prevent development that could destroy, damage or otherwise have an adverse effect on those values.<br>▪ To ensure the continued viability of ecological communities and threatened species.<br>▪ To protect, manage, restore and enhance the ecology, hydrology and scenic values of riparian corridors and waterways, groundwater resources, biodiversity corridors, areas of remnant native vegetation and dependent ecosystems. | Environmental protection works | **Environmental facilities**; Oyster aquaculture **Recreation areas**; Roads | Business premises; Hotel or motel accommodation; Industries; Multi dwelling housing; Pond-based aquaculture; Recreation facilities (major); Residential flat buildings; Restricted premises; Retail premises; Seniors housing; Service stations; Tank-based aquaculture; Warehouse or distribution centres; Any other development not specified in item 2 or 3 | Option 1<br>Option 2 |
| E4 Environmental Living | ▪ To provide for low-impact residential development in areas with special ecological, scientific or aesthetic values.<br>▪ To ensure that residential development does not have an adverse effect on those values.<br>▪ To provide for residential development of a low density and scale integrated with the landform and landscape.<br>▪ To encourage development that retains and enhances riparian and foreshore vegetation and wildlife corridors. | Home businesses; Home occupations | Bed and breakfast accommodation; Boat sheds; Building identification signs; Business identification signs; Centre-based child care facilities; Community facilities; Dwelling houses; Environmental protection works; Group homes; Health consulting rooms; Home-based child care; Home industries; Jetties; Oyster aquaculture; Places of public worship; Pond-based aquaculture; Respite day care centres; Roads; Secondary dwellings; Tank-based aquaculture; Water recreation structures | Industries; Service stations; Warehouse or distribution centres; Any other development not specified in item 2 or 3 | Option 1 |
| RE1 Public Recreation | ▪ To enable land to be used for public open space or recreational purposes.<br>▪ To provide a range of recreational settings and activities and compatible land uses. | Building identification signs; Environmental protection works; Horticulture; Markets; Roads | Aquaculture; Centre-based child care facilities; **Community facilities**; **Environmental facilities**; Information and education facilities; Kiosks; Public administration buildings; | Any development not specified in item 2 or 3 | Option 1<br>Option 2 |

| Zone | Objectives of the Zone | Permitted without consent | Permitted with consent | Prohibited | Relevant Option |
|---|---|---|---|---|---|
| | ▪ To protect and enhance the natural environment for recreational purposes.<br>▪ To allow development that does not substantially diminish public use of, or access to, public open space resources.<br>▪ To provide passive and active public open space resources, and ancillary development, to meet the needs of the community. | | **Recreation areas;** Recreation facilities (indoor); Recreation facilities (outdoor); Respite day care centres; Restaurants or cafes; Signage; Take away food and drink premises; **Water recreation structures** | | |
| R2<br>Low Density Residential | ▪ To provide for the housing needs of the community within a low density residential environment.<br>▪ To enable other land uses that provide facilities or services to meet the day to day needs of residents.<br>▪ To provide for a limited range of other land uses of a low intensity and scale, compatible with surrounding land uses. | Home businesses; Home occupations | Bed and breakfast accommodation; Boarding houses; Boat sheds; Building identification signs; Business identification signs; Centre-based child care facilities; Community facilities; Dual occupancies; Dwelling houses; Environmental protection works; Exhibition homes; Group homes; Health consulting rooms; Home-based child care; Home industries; Jetties; Oyster aquaculture; Places of public worship; Pond-based aquaculture; Respite day care centres; Roads; Secondary dwellings; Tank-based aquaculture; Veterinary hospitals; Water recreation structures | Any development not specified in item 2 or 3 | Option 1 |

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# Coastal Management SEPP 2018

## BAYVIEW SHARED PATHWAY PEI

**Legend**

- Major Road (LPI, 2016)

**Project Options**

- Option 1
- Option 2
- Study Area
- Coastal Wetlands
- Proximity Area for Coastal Wetlands
- Coastal Use Area
- Coastal Environmental Area
- Littoral Rainforest
- Proximity Area for Littoral Rainforests

**FIGURE 3-1**

**1:3,000 Scale at A3**

m
0 25 50 75 100

Cardno

Map Produced by NSW/ACT (WNE)
Date: 2019-03-20 | Project:59919082
Coordinate System: GDA 1994 MGA Zone 56
Map: 59919083-GS-009-BayviewPEI_CoastalSEPP 01.mxd 01
Imagery supplied by Nearmap April 2018


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# Land Use Zoning

## BAYVIEW SHARED PATHWAY PEI

### Legend

Major Road (LPI, 2016)

**Project Options**

- Option 1
- Option 2
- Study

**Land Use Zoning**

- E2, Environmental Conservation
- E4, Environmental Living
- IN4, Working Waterfront
- R2, Low Density Residential
- RE1, Public Recreation
- W1, Natural Waterways
- W2, Recreational Waterways

FIGURE 3-2

1:1,000 Scale at A3

m
0 10 20 30 40

N

Cardno

Map Produced by NSW/ACT (WNE)
Date: 2019-03-13 | Project:59919082
Coordinate System: GDA 1994 MGA Zone 56
Map: 59919083-GS-007-BayviewPEI_Zoning 01.mxd 01
Imagery supplied by Nearmap April 2018

#### *3.2.5.2 Other Relevant NSW Legislation*

A summary of other legislation and possible permits and approvals required are provided in Table 3-4..

Table 3-4 Summary of Legislation and Required Permits and Approvals

| State Legislation | Approval Authority | Relevance to Proposal | Required Permits and Approvals |
|---|---|---|---|
| *EP&A Act*<br>*EP&A Regulation* | Northern Beaches Council /Local Planning Panel/ | For Option 1, the works require determination under Division 5.1 of this Act.<br>For Option 2, the works require development consent under Division 4.1 of this Act. | For Option 1, the works would require preparation of an REF. and would be determined by Northern Beaches Council.<br>For Option 2, the works would require preparation of an SEE, and would be approved by the Local Planning Panel. |
| *Coastal Management Act 2016* | Office of the Environment and Heritage (OEH)<br>Northern Beaches Council | The objects of the Act are to manage the coastal environment of New South Wales in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic wellbeing of the people of the State. | The proposed works are considered consistent with the objectives of the CM Act. |
| *Contaminated Land Management Act 1997* | Environment Protection Authority (EPA) | Must report to EPA if contaminated land is encountered during the works that meets the duty to report contamination requirements under Section 60 of this Act | None, unless contaminated land is encountered during works. |
| *Heritage Act 1977* | OEH (NSW Heritage Office) | Relates to non-Aboriginal artifacts and/or sites (older than 50 years) if uncovered during the works. | None.<br>There are no items listed on the State Heritage Register in the Study Area. |
| *National Parks and Wildlife Act 1974* | OEH | Relates to disturbance or destruction of any Aboriginal objects or places and removal of identified native species, populations or ecological communities. | None.<br>The closest Aboriginal cultural heritage site is approximately 115 m from Study Area . Refer to Section 5.2 for further information.<br>Should any Aboriginal object be detected during construction, a Section 90 consent would need to be obtained if the object named cannot be avoided. |
| *Biodiversity Conservation Act 2016* | OEH | The purpose of this Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. | None.<br>The proposed works are not anticipated to have a significant impact on threatened species, populations or ecological communities identified in the vicinity of the Study Area. |

| State Legislation | Approval Authority | Relevance to Proposal | Required Permits and Approvals |
|---|---|---|---|
| *Biosecurity Act 2015* | OEH | The object of this Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers | None. However, Council is responsible for removal and proper disposal of any noxious weeds encountered. |
| *Protection of the Environment Operations Act 1997*<br>*Protection of the Environment Operations (Waste) Regulation 2005* | EPA | Relates to noise, air and water pollution and waste management for activities that may cause water pollution.<br>Scheduled activities as listed under Schedule 1 of the Act require an Environmental Protection License (EPL) from the EPA, unless clauses in Schedule 1 specify otherwise. | None.<br>Waste generated by the project which requires offsite disposal, must be classified in accordance with the NSW EPA *Waste Classification Guidelines* (EPA, 2014). Proposed works do not require an EPL from the EPA. |
| *Roads Act 1993* | Appropriate Roads Authority | Consent of the appropriate roads authority must be received in the event that there is a need to close, or conduct works on or over a public road. | None.<br>Council is the Roads Authority for Pittwater Road. |
| *Waste Avoidance and Resource Recovery Act 2001* | EPA | The works would use resources and generate waste, and as such needs to consider the Resource Management Hierarchy (Avoidance, Recovery, Disposal) in the Act | None.<br>However, as the proposed activity would generate waste it is required to consider the waste management hierarchy referred to in this Act. |
| *Water Management Act 2000*<br>*Water Management (General) Regulation 2004* | Department of Industry (DOI) (Natural Resources Access Regulator)(NRAR) | A controlled activity approval is required under the Act to undertake any controlled activities (which include the removal of material by way of extraction) in, on or under waterfront land, where waterfront land includes the bed of the coastal waters and any land up to 40m inland form the mean high water mark of the coastal waters. | None.<br>The proposed works are located on waterfront land, however, councils are exempt and do not require a controlled activity approval to carry out works in, on or under waterfront land. |
| *Fisheries Management Act 1994*<br>*Fisheries Management (General) Regulation 2010* | DPI (Fisheries) | Certain marine and estuarine species are listed as vulnerable under the Act and protected under the Regulation.<br>Permits are required under the following sections of the Act to undertake the activities specified:<br>▪ Section 201: Carrying out of dredging and reclamation works;<br>▪ Section 205: Works that harm marine vegetation (i.e. mangroves, seagrass); and<br>▪ Section 219: Works that block the passage of fish. | For Option 1 - Part 7 permit under Section 205 required for the removal of mangroves and under Section 200 for removal of intertidal rocky shore.<br>For Option 2 - Part 7 permit, under Section 205 required for the removal of mangroves and under Section 200 for removal of sub-tidal soft sediment and intertidal rocky shore. |
| *Crown Lands Management Act 2016* | DOI (Crown Lands) | The objects of this Act are to provide for the ownership, use and management of the Crown Land of New South Wales, to provide clarity concerning the law applicable to Crown Land, to require environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown Land, to provide for the | Landowner consent and/or a license may be required from DOI (Crown Lands) to undertake the works. |

| State Legislation | Approval Authority | Relevance to Proposal | Required Permits and Approvals |
|---|---|---|---|
| | | consistent, efficient, fair and transparent management of Crown Land for the benefit of the people of New South Wales, and to provide for the management of Crown Land having regard to the principles of Crown Land management. | |

# 4 Stakeholder and Community Engagement

## 4.1 Option 1

Part 2 of the ISEPP identifies situations where consultation needs to be undertaken by public authorities with local council or other government agencies prior to the commencement of some forms of development. These consultation requirements are applicable to Option 1 which would fall under the provisions of ISEPP.

Clauses 13 to 16 of the ISEPP require public authorities to consult with local council where the development has impacts on council related infrastructure or services, impacts on local heritage, impacts on flood liable land, or certain land within the coastal zone. As Council is the proponent for the proposed works, Clauses 13 to 15 do not apply with respect to the development. The consultation triggers for public authorities other than with local council under Clause 16 of the ISEPP have been reviewed for Option 1 in Table 4-1.

Table 4-1 ISEPP Consultation Requirements for Option 1

| Consultation Trigger | Application to Proposal |
|---|---|
| Clause 15AA<br>Consultation with State Emergency Service – development with impacts on flood liable land. | The proposed works are not located on flood liable land. |
| Clause 16(2)(a)<br>Development adjacent to land reserved under the *National Parks and Wildlife Act 1974* | The Study Area is not located adjacent to reserved land under the *National Parks and Wildlife Act 1974* |
| Clause 16(2)(b)<br>Development on land in Zone E1 National Parks and Nature Reserves or in a land use zone that is equivalent to that zone | The Study Area is not located on land in Zone E1 National Parks and Nature Reserves or in a land use zone that is equivalent to that zone |
| Clause 16(2)(c)<br>Development adjacent to an aquatic reserve or a marine park declared under the *Marine Estate Management Act 2014* | The Study Area is not located adjacent to an aquatic reserve or a marine park declared under the *Marine Estate Management Act 1997* |
| Clause 16(2)(d)<br>Development in the foreshore area within the meaning of the *Sydney Harbour Foreshore Authority Act 1998* | The Study Area is not located in the foreshore area as defined by the *Sydney Harbour Foreshore Authority Act 1998* |
| Clause 16(2)(e)<br>Development comprising a fixed or floating structure in or over navigable waters | Option 1 is not development comprising a fixed or floating structure in or over navigable waters.. |
| Clause 16(2)(f)<br>Development for the purposes of an educational establishment, health services facility, correctional centre or group home, or for residential purposes, in an area that is bush fire prone land | The works do not involve any of the named purposes. |
| Clause 16(2)(g)<br>Development that may increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map | The works do not occur on land that is within the dark sky region. |
| Clause 16 (2)(h)<br>Development on defence communications facility buffer land within the meaning of clause 5.15 of the Standard Instrument | The works do not occur on or near defence communications facility buffer land. |
| Clause 16 (2)(i)<br>Development on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961* | The works do not occur in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961.* |

For Option 1, based on Table 4-1 there would be no specific requirements for Council to consult with other public authorities under the ISEPP.

Consultation with DPI (Fisheries) and DOI (Crown Lands) is recommended should Option 1 be selected as the preferred option.

## 4.2 Option 2

Consultation with DPI (Fisheries), DOI (Crown Lands) and Roads and Maritime is recommended should Option 2 be selected as the preferred option.

## 4.3 Consultation during Options Assessment

Council will undertake community consultation during the options assessment to inform selection of the preferred option. During detailed design and preparation of the Environmental Assessment, for the preferred option, the community will be kept informed and updated on the progress of the project.

# 5 Environmental Issues

## 5.1 Biodiversity

### 5.1.1 Existing Environment

A detailed biodiversity assessment was undertaken to support this PEI, this involved a desktop review of the Study Area, a marine field survey, a terrestrial field survey and a report detailing the findings. The report is contained within Appendix C. A summary of the report is provided in the following sections.

#### *5.1.1.1 Desktop Review*

*Terrestrial Vegetation*

Based on a review of The Native Vegetation of the Sydney Metropolitan Area – Version 3.1 VIS_ID 4489 (OEH, 2016) two Plant Community Types (PCT) were mapped in the Study Area;

- Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion (PCT Identification (PCTID) 920); and
- Seagrass meadows of the estuaries and lagoons of the New South Wales coast (PCTID 1913).

*Marine Vegetation*

A review of the Mapping of habitats of NSW estuaries (Creese, et al., 2009) revealed five marine vegetation communities mapped to occur within the Study Locality (5km around the Study Area). These and the associated areas within the Study Locality are detailed in Table 5-1. These generally occur as corridors fringing the Pittwater Estuary shorelines, including around Scotland Island. However, larger, extensive patches of these communities were mapped in Careel Bay, approximately 6km north of the Study Area.

Table 5-1 Marine Vegetation and Habitat Mapped within the Study Locality (source: Creese et al., 2009)

| Broad marine vegetation and habitat type | Marine vegetation communities | Area within the Study Locality (ha) |
|---|---|---|
| Mangroves | Mangrove | 14.5 |
| Seagrass | Posidonia | 24.4 |
| Seagrass | Posidonia/Zostera | 4.3 |
| Seagrass | Zostera | 18.4 |
| Saltmarsh | Saltmarsh | 2.7 |

Of these marine vegetation communities, two are mapped to occur within the Study Area. These are mangrove and Zostera. Mangrove is mapped in the intertidal areas of the Study Area while Zostera is mapped to occur along the north-eastern fringe of the Study Area (refer Figure 5-1).

*Threatened or Protected Ecological Communities*

A review of the NSW OEH BioNet database, The Native Vegetation of the Sydney Metropolitan Area – Version 3.1 VIS_ID 4489 (OEH, 2016), the NSW DPI Threatened Species Lists website and the DoEE PMST revealed 13 Threatened Ecological Community (TECs) and one protected (FM Act) vegetation community with potential to occur within the Study Locality.

*Threatened Species and Endangered Populations*

A review of the NSW OEH BioNet database, NSW DPI Threatened Species Lists website and DoEE PMST revealed 104 threatened species with potential to occur within the Study Locality. All 104 species with potential to occur within the Study Locality were considered unlikely to occur or have a low likelihood of occurring in the Study Area. This is due to the lack of suitable or optimal habitat for these species. Some of these species have potential to transit (fly/swim) through, but are unlikely to persist in the Study Area. These transient species also have a large habitat range and the Study Area would only constitute suboptimal foraging habitat for these species. Details of the database search and likelihood of occurrence criteria are contained in Appendix C.


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# Mapped Vegetation and Habitat

NORTHERN BEACHES COUNCIL LGA

**Legend**

- Biodiversity Assessment Study Area
- Mangrove (Creese et al., 2009)
- Zostera (Creese et al., 2009)
- Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion (NSW OEH, 2016d)

**FIGURE 5-1**

N

**1:2,250 Scale at A4**

Metres

0 25 50

Cardno

Map Produced by NSW/ACT (Water & Environment)
Date: 2019-03-12
Coordinate System: GDA 1994 MGA Zone 56
Project: 59919083
Map: 59919083_GS_002_EcologyVegMapping.mxd 01
Aerial imagery supplied by nearmap (2019)

*Migratory Species*

The NSW OEH BioNet and the PMST indicated 27 migratory species have either been previously recorded or are predicted to occur within the Study Area. All 27 migratory species were unlikely to occur or had a low likelihood of occurrence within the Study Area. Some of these species have potential to transit (fly/swim) through, but are unlikely to persist in the Study Area. These transient species also have a large habitat range and the Study Area would only constitute suboptimal foraging habitat for these species. Details of the database search and likelihood of occurrence criteria are contained in Appendix C.

*Protected Species*

A review of the NSW DPI Protected Fish Species website and DoEE PMST and application of the likelihood of occurrence criteria indicated that nine species were considered to have a moderate likelihood of occurrence in the Study Area. These were all syngnathids (Family: Syngnathidae). These species have potential to occur in the seagrass meadows and macroalgae beds within the Study Area. However, the habitat available to these species within the Study Area were considered suboptimal and only forms a small portion of that available within their respective distributions and significant impacts to populations of these species are unlikely.

### *5.1.1.2 Field Survey*

*Terrestrial Vegetation and Habitat*

Three terrestrial vegetation types were recorded within the Study Area. One type formed part of a remnant vegetation community (a PCT) and a TEC identified from the desktop review. Table 5-2 outlines the vegetation types documented within the Study Area and their approximate extents (ha).

Table 5-2 Terrestrial Vegetation Types within the Study Area

| Vegetation type | Formation (NSW OEH, 2019) | Class (NSW OEH, 2019) | Plant Community Type | ID | TEC | BC Act Status* | Approximate area (ha) |
|---|---|---|---|---|---|---|---|
| Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion | KF_CH9 Forested Wetlands | Coastal Floodplain Wetlands | Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion | 1234 | Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion | E | 0.11 |
| Native/exotic landscape planting | - | - | - | - | - | - | 0.03 |
| Exotic verge/park | - | - | - | - | - | - | 0.13 |

*E = Endangered

Figure 5-2 illustrates the distribution and extent of these vegetation types within the Study Area.

Swamp Oak forest comprised the highest value native terrestrial vegetation in the Study Area and was limited to a thin riparian strip between intertidal mangroves and the existing footpath. This community was characterised by a dominance of mature canopy species swamp oak (*Casuarina glauca*) with a minor occurrence of bangalay (*Eucalyptus botryoides*) in the eastern portion. This vegetation is considered to be of moderate condition, with a well-established canopy throughout but a cleared and mixed exotic/native understory. It is considered to conform to the TEC of *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, which is listed as endangered under the BC Act, based on the following key characteristics:

- Located on an estuarine fringe;
- Canopy dominated by *Casuarina glauca*; and
- Presence of understory species, predominately *Commeliana cyanea.*

Due to the small patch sizes of this PCT, it did not meet the minimum condition thresholds for its listing as *Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland Ecological Community* (endangered) under the EPBC Act.

Fauna habitats such as hollow-bearing trees or large woody debris were not observed within the Study Area, however the vegetation types present would provide habitats for a range of native fauna. Mature native riparian vegetation can provide seed and nectar foraging, roosting and nesting resources for native arboreal birds and mammals. Gaps within the retaining wall were observed to be used by fauna for refuge.

Three priority weeds were identified during in the Study Area during the field survey; African boxthorn (*Lycium ferocissimum*), Climbing asparagus (*Asparagus africanus*) and Ground asparagus (*Asparagus aethipicus*).

*Marine Vegetation and Habitat*

The intertidal areas of the Study Area were bound by the existing reataining wall, and were mostly colonised by a contiguous corridor of grey mangroves (*Avicennia marina*) (Figure 5-2 and Table 5-3). Succession was evident with a number of seedlings observed in the understorey. Most of the understorey within the mangrove corridor was comprised of bare soft sediment and rocky debris. However, a strip seaward of the mangrove canopy had a moderately dense cover of mangrove pneumatophore. Some sparse (low relief) rocky reef habitat, snags (woody debris) and crab burrows also occur here. The existing retaining wall was considered as intertidal rocky shore habitat.

The subtidal areas were characterised by an expansive shallow, sandflat which extends from the mangrove corridor to the northern edge of the Study Area (Figure 5-2 and Table 5-3). This area is mostly bare soft sediment however, small rocky debris were observed scattered across this area. Macro-algae colonised these hard surfaces.

Seagrass meadows were observed along the north-eastern and eastern sections of the Study Area (Figure 5-2 and Table 5-3). These meadows mostly comprised of low-medium density Halophila. Up to five blades of Zostera was observed within a Halophila patch but nowhere else. The marine pest alga, Caulerpa (*Caulerpa taxifolia*), occurred in low densities in these meadows.

Table 5-3 Marine Vegetation and Habitat Recorded within the Study Area

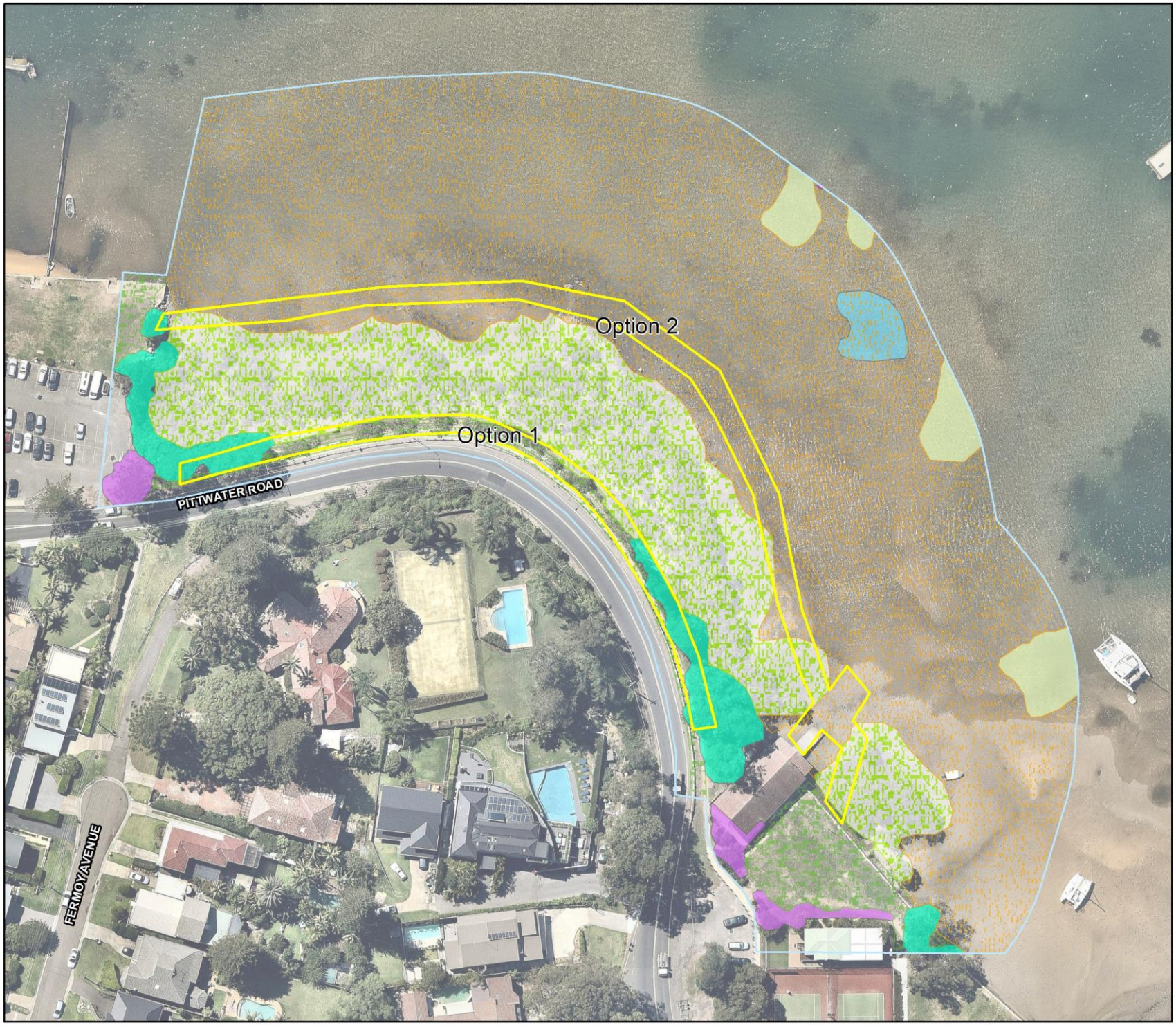
| Marine vegetation and habitat | Density | Key Fish Habitat Type | Area within the Study Area (ha) |
|---|---|---|---|
| Mangroves | 40% canopy cover | Type 2 – moderately sensitive KFH | 0.54 |
| Subtidal soft sediment habitat | - | Type 3 – minimally sensitive KFH | 1.63 |
| Halophila | Low-medium | Type 1 – highly sensitive KFH | 0.07 |
| Halophila and Zostera | Halophila – low-medium<br>Zostera - low | Type 1 – highly sensitive KFH | 0.02 |

The intertidal and subtidal areas of the Study Area are considered as Key Fish Habitat (KFH) and a Class 1 waterway as it occurs in an estuary. The Types of KFH within the Study Area based on marine vegetation and habitat features are oultined in Table 5-3. All three Types of KFH occur within the Study Area. In addition to those outlined in Table 5-3, the intertidal rocky shore areas along the existing retaining wall were considered KFH albeit no infauna sampling was undertaken as part of the field survey.

*Marine Fauna*

Sessile and mobile marine fauna have potential to take residence or transit through the Study Area. The intertidal rocky shore areas, including snags and the piles under the boat shed, were mostly colonised by Sydney rock oysters (*Saccostrea glomerata*) and the gastropod *Austrocochlea* sp. and limpet *Patelloida* sp..

Mobile fauna recorded during the field survey included common stingaree (*Trygonoptera testacea*), juvenile flathead (Family: Platycephalidae), toadfish (*Tetractenos* sp.), sand whiting (*Sillago ciliata*), sea mullet (*Mugil cephalus*) and blue swimmer crab (*Portunus armatus*). The seagrass meadows to the north of the Study Area and the mangroves within the Study Area have potential to provide nursery habitat for juvenile fish. The field survey was undertaken an incoming tide where the water level within the Study Area was relatively low thus, affecting the detection of fish and elasmobranchs. Other mobile marine fish and elasmobranchs, not observed during the field survey, have potential to forage in the Study Area as water levels increase with the tide. These include, but are not limited to, those that are recreationally targeted.

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# Vegetation and Habitat In Alignment Options

NORTHERN BEACHES COUNCIL LGA

**Legend**

- Biodiversity Assessm... Study Area
- C. taxifolia
- Grey Mangroves (including pneumato...
- Halophila and C. taxifolia
- Halophila, Zostera and C. taxifolia
- Soft sediment
- Exotic Verge/Park
- Native/Ex... Landscape Planting
- Swamp Oak Swamp Forest Fringing Estuaries, Sydney Basin Bioregion and South East Corner Bioregion (PCTID 1234)

N

**1:1,250 Scale at A4**

**FIGURE 5-2**

Cardno

Map Produced by NSW/ACT (Water & Environment)
Date: 2019-03-12
Coordinate System: GDA 1994 MGA Zone 56
Project: 59919083
Map: 59919083_GS_005_EcologyImpacts.mxd 01
Aerial imagery supplied by nearmap (2019)

*Threatened, Migratory and Protected Species and Endangered Populations*

No threatened flora species or populations were detected during the field survey and none are considered likely to occur based on the habitat characteristics of the Study Area. The threatened flora species identified in the NSW OEH BioNet database search were associated with the PCTs not identified in the Study Area. The small size of the Study Area allowed for a thorough survey for species identified in the desktop study as species with potential to occur.

The mangrove vegetation is considered to provide suitable refuge habitat for threatened shore/wading birds such as the Australian bittern (*Botaurus poiciloptilus*), listed as endangered under the BC Act and EPBC Act, and the black bittern (*Ixobrychus flavicollis*), listed as vulnerable under the BC Act. There was minimal open intertidal sand/mud flat habitat suitable for a number of other threatened/migratory shore/wading birds albeit some may forage in the pneumatophore corridor during low tide. However, this habitat is not considered to be of high quality for these species due to the small size, relatively open canopy (for the bitterns), the close proximity to an off leash dog beach and urbanised landscape.

### 5.1.2 Potential Issues

A preliminary impact assessment has been undertaken based on general activities associated with construction activities in foreshore areas restricted to the option footprints to help determine the feasibility of the options. It is noted that these potential impacts would be refined following design development and refinement.

The summary of the potential impacts of both options are outlined in Table 5-4 and discussed in detail in the following sections.

Table 5-4 Summary of Potential Impacts

| Impact pathway | Potential impacts | |
|---|---|---|
| | Option 1 | Option 2 |
| Vegetation clearing: Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion (PCTID 1234, *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* TEC) | 0.03 ha cleared (27% of the total within the Study Area)<br>Significant impact on TEC not considered likely. However, removal of TEC would include mature trees and foraging habitat resources (mistletoes) | <0.01 ha cleared (0.7% of the total within the Study Area)<br>Ecologically acceptable |
| Vegetation clearing: Native/exotic landscape planting | No clearing | No clearing |
| Vegetation clearing: Exotic verge/park | 0.03 ha cleared (22% of the total within the Study Area) | No clearing |
| Marine vegetation/habitat removal: mangroves | Up to 0.01 ha removed (up to 1.9% of the total within the Study Area)<br>Requires a Part 7 Permit under Section 205 of the FM Act | Up to 0.02 ha removed (up to 3.7% of the total within the Study Area)<br>Requires a Part 7 Permit under Section 205 of the FM Act |
| Marine vegetation/habitat removal: subtidal soft sediment habitat | None removed | Up to 0.11 ha impacted albeit direct impacts restricted to the location of the piles<br>Proportionally small mortality of infauna albeit creation of habitat for macroalgae, invertebrates and fish<br>Requires a Part 7 Permit under Section 200 of the FM Act |
| Marine vegetation/habitat removal: *Halophila* | None removed | None removed |
| Marine vegetation/habitat removal: *Halophila* and *Zostera* | None removed | None removed |
| Marine vegetation/habitat removal: Intertidal rocky shore | Removal of intertidal rocky shore habitat (i.e. revetment wall)<br>Habitat would be reinstated and recruitment of existing community is | Minimal removal of intertidal rocky shore habitat<br>Habitat would be reinstated and additional habitat would be created |

| Impact pathway | Potential impacts | |
|---|---|---|
| | Option 1 | Option 2 |
| | likely to occur following construction completion<br>Requires a Part 7 Permit under Section 200 of the FM Act | (e.g. on piles) and recruitment of existing community is likely to occur following construction completion<br>Requires a Part 7 Permit under Section 200 of the FM Act |
| Obstruction of fish passage | Unlikely | Unlikely |
| Noise and vibration | Potential temporary impact | Potential temporary impact |
| Significant impacts to threatened, migratory and protected species and endangered populations | Unlikely | Unlikely |
| Trigger a Key Threatening Process | Unlikely | Unlikely |
| Significant impacts to wetlands, conservation and other important areas | Unlikely | Unlikely |

#### *5.1.2.2 Terrestrial Vegetation*

Both options would require unavoidable removal of Swamp Oak forest which has been identified as a TEC.

Option 1 would require the removal of approximately 0.03ha of the TEC (approximately 27% of the total within the Study Area). Based on the assessment of the impact, through a five-part Test of Significance (ToS) under the BC Act, the impact is not considered to be significant to the local occurrence of this TEC within the Study Area. Thus a Species Impact Statement (SIS) or entry into the Biodiversity Offset Scheme (BOS) would not be required to proceed with this option. Details of the ToS are provided in Appendix C.

Option 2 would require clearing of <0.01 ha of the TEC which constitutes approximately 0.7% of the local occurrence within the Study Area. Impacts resulting from the construction of the boardwalk are considered to be ecologically acceptable.

#### *5.1.2.3 Terrestrial Fauna and Habitat*

The two options would have different impacts on the existing terrestrial native fauna habitat.

Option 2 would have limited impacts on terrestrial habitat, with a small portion of Swamp Oak forest (TEC) requiring removal at the western end of the proposed boardwalk. This would result in a small reduction of potential foraging, roosting and sheltering habitat however this vegetation is not considered to contain significant fauna habitat resources present elsewhere in the Study Area. The boardwalk would be situated in the intertidal foraging habitat for native/shore wading birds.

Option 1 would cause impacts on terrestrial fauna habitat including removal of the Swamp Oak forest (TEC). Several mature swamp oak trees containing mistletoes (nectar resources) would be removed as well as disturbance of the existing retaining wall habitat. The retaining wall is considered unlikely to support microbat roosts or shelter for threatened terrestrial mammals.

#### *5.1.2.4 Marine Vegetation and Habitat*

Both options would impact on marine vegetation and habitat. For Option 1, the current design of the shared pathway involves widening the existing footpath, which would require the removal of 0.01ha (approximately 1.9% of the total within the Study Area) of mangroves along the southern, landward edge of the mangrove corridor. Assuming localised processes remain similar to existing conditions, this removal is unlikely to place the mangrove corridor within the Study Area at risk of degradation, fragmentation or further loss.

For Option 2, the alignment coincides with the mangrove corridor (at the western and eastern ends) and would remove up to 0.02ha of mangroves (approximately 3.7% of the total within the Study Area). Assuming the boardwalk would be elevated off the seabed and the only points of contact would be from the piles, the net impact would be less than the 0.02ha indicated. Option 2 is located within potential seagrass habitat, and Halophila and Zostera meadows are known to exhibit temporal variation.

All marine vegetation could be susceptible to indirect impacts during the construction of both options. The disturbance of fill materials at the current footpath location and potential disturbance of acid sulfate soils during construction could result in the mobilisation of contaminants.

The majority of the intertidal rocky shore habitat would be lost following construction of Option 1. The eastern and western ends of the intertidal rocky shore would be impacted by Option 2.

Option 2 would require the permanent removal of subtidal soft sediment habitat at the location of the piles. Permanent removal of subtidal soft sediment habitat is not considered to affect the ecological functionality of the Study Area and the greater region. Following construction, the boardwalk would shade the area, however no marine vegetation is likely to be impacted other than macroalgae if it occurs in the footprint. The installation of the piles for the proposed boardwalk is likely to provide positive impacts in the area, providing marine habitat.

#### *5.1.2.5 Marine Fauna*

Piling works and vessel activities associated with Option 2 (e.g. transiting and anchoring) have potential to disturb mobile aquatic fauna within the estuary by generating additional noise and vibrations. For both options, water quality impacts on fauna can occur through poor construction practices and piling. This would manifest in sediment and contaminant mobilisation.

### 5.1.3 Recommendations

The following recommendations are made in relation to biodiversity:

- Design development and refinement to reduce the area of vegetation clearing (both options);
- Undertake coastal processes study prior to finalising the detailed design and review biodiversity impacts for consistency (both options);
- A Part 7 Permit, under Section 205 of the FM Act would be required to harm marine vegetation (both options);
- A Part 7 Permit, under Section 200 of the FM Act would be required for piling activities associated with Option 2 and the removal of the intertidal rocky shore habitat (both options);
- All retained trees with Tree Protection Zones (TPZs) falling within the disturbance corridor are to be managed in accordance with AS 4970-2009 Protection of Trees on Development Sites (both options);
- Considerations to the *Environmentally Friendly Seawalls: A Guide to Improving the Environmental Value of Seawalls and Seawall-lined Foreshores in Estuaries* (OEH, 2009) where possible, including (Option 1):
  - Use of materials with increased roughness and texture to facilitate colonisation of marine vegetation and fauna;
  - Create cavities that retain water at low tide and provide refuge for marine fauna;
  - Use boulders of various sizes and shapes;
  - Utilising natural building materials;
  - Gentle slopes are preferred with some benches and steps; and
  - Incorporate native riparian vegetation landward.
- Option 2 - Spacing of piles between the mangrove stems in some of these areas would allow for the alignment to be strategically positioned to avoid/minimise mangrove clearing; and
- Option 2 - given the temporal variation in seagrass meadows, a pre-clearance survey and monitoring during construction is recommended to ensure that the alignment would not directly impact Halophila and Zostera meadows.

## 5.2 Heritage

### 5.2.1 Existing Environment

#### *5.2.1.1 Aboriginal Heritage*

As part of the preparation of this PEI, a search of the Aboriginal Heritage Information Management System (AHIMS) was undertaken on 18 February 2019 to identify any Aboriginal heritage items of significance in the vicinity of the Study Area (refer Appendix D).

The search identified seven Aboriginal heritage items within a 1km of the Study Area as shown on Figure 5-3. The closest site was identified approximately 115m south-east of the Study Area and is presented in Table 5-5.

Table 5-5 Aboriginal heritage items in the vicinity of the proposed work area

| AHIMS No. | Site Name | Site Type | Location with Relation to Study Area |
|---|---|---|---|
| 45-6-1566 | Bayview | Midden | 115 m south-east from the southern extent |

#### *5.2.1.2 Non-Aboriginal Heritage*

As part of the preparation of this PEI, the Australian Heritage Database and the State Heritage Inventory were searched on 14 and 15 February 2019 to identify any items of heritage significance that may occur near the Study Area. The Australian Heritage Database contains listings for the World Heritage List, National Heritage List, and the Register of the National Estate (non-statutory archive). The State Heritage Inventory contains listings for the State Heritage Register and the Section 170 NSW State Agency Heritage Register. No items of national or state significance were listed in the vicinity of the Study Area.

Results from a search of the Pittwater LEP are presented in Table 5-6 and Appendix D. The current design of the boardwalk intersects the boat ramp that extends from the locally heritage-listed Sea Scout Hall.

Table 5-6 Non-Aboriginal heritage items in the vicinity of the proposed work area

| Item | Location | Listing | Location in Relation to Option 1 | Location in Relation to Option 2 |
|---|---|---|---|---|
| Sea Scout Hall | 1672 and 1678 Pittwater Road (grounds of Bayview Park). Lot 23 DP4010, Lot 7047 DP93802, | Pittwater LEP (Heritage Item SHI no 2270406) | Approximately 10m south | Within the proposed project footprint |
| Street trees - *Araucaria* species | Pittwater Road and Fermoy Avenue (within road reserve) | Pittwater LEP (Heritage Item SHI no 2270029) | Approximately 10m south | Approximately 40m south |
| Sandstone Retaining Wall | Pittwater Road and Fermoy Avenue (within road reserve at junction of roads) | Pittwater LEP (Archaeological Site ASHI no 2270057) | Approximately 30m south | Approximately 60m south |

In addition to Table 5-6, there are also two *Araucaria* species located approximately 10m west of the Option 1 footprint on the northern side of Pittwater Road (refer Figure 5-3). Whilst the Pittwater LEP mapping does not include these two trees in any listing it is believed they may be either part of Heritage Item SHI no 2270029, or may in fact be part of SHI no. 2270046 (Street Trees – 1 Bunya Pine and 2 Norfolk Island Pines). The primary address of SHI no. 2270046 is listed as adjacent to 1710 and 1712 Pittwater Road, Bayview however there are no *Araucaria* species at this location.

### 5.2.2 Potential Issues

#### *5.2.2.1 Aboriginal Heritage*

The midden is approximately 110m to the south-west to the area of investigation, and is unlikely to be impacted by the proposed works.

There is a risk that unidentified Aboriginal sites or places may be encountered during demolition and construction works. The site would have been disturbed considerably during the construction of Pittwater Road and the current footpath, so it is considered that the potential for Aboriginal archaeology is unlikely.

#### *5.2.2.2 Non-Aboriginal Heritage*

The Sea Scout Hall is a one-storey timber structure and is located at the southern point of Option 2 (boardwalk). The structure is supported on concrete piers and has a timber boat ramp providing access to Pittwater.

The current alignment of Option 2 intersects the boat ramp that extends from the Sea Scout Hall and as such the construction and operation of the boardwalk has potential to directly impact the heritage item and has the potential to restrict access of the sea scouts sailing crafts and canoes to Pittwater. In addition the works may have a visual impact to the heritage value of the building.

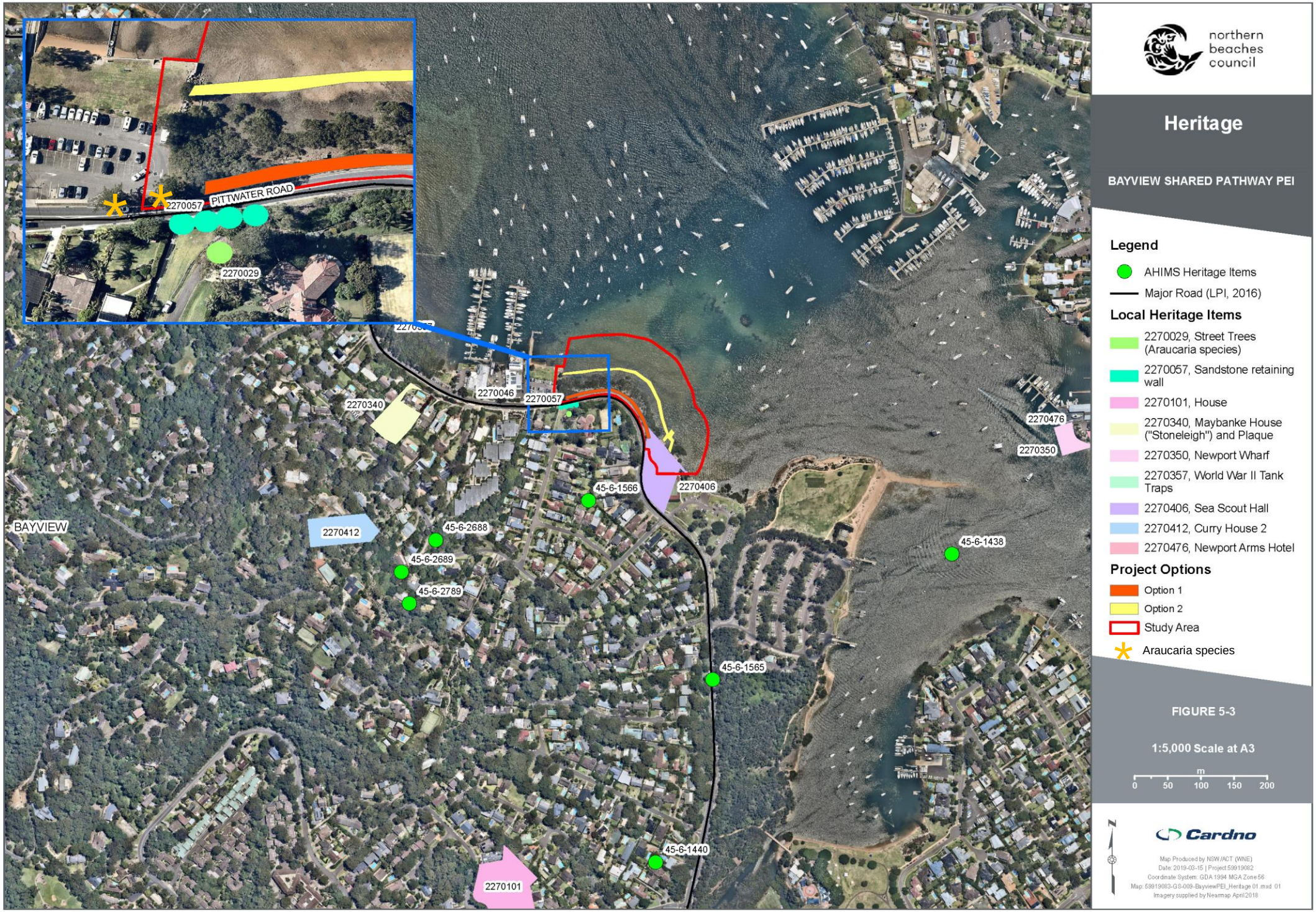
The unlisted street trees, of the genus *Araucaria* are conifers within the road reserve that borders the western boundary of Option 1 (refer Figure 5-3). Based on the current alignment of Option 1 significant impacts to these trees are not anticipated however consideration of impacts such as encroachment into the Tree Protection Zone, changes in hydrology and trimming of the trees should be considered.

The sandstone retaining wall is located on the embankment on the southern side of Pittwater Road. The wall is directly across the road from the northern portion of Option 1 and would not be directly impacted by the proposed work.

### 5.2.3 Recommendations

The following recommendations are made in relation to heritage:

- Option 2 - Investigate design options to limit the impact to the locally listed Sea Scout Hall (and boat ramp) during construction and operation;
- Option 2 – Undertake a Statement of Heritage Impact (SoHI) for the locally listed Sea Scout Hall;
- Option 2 – Consultation with the Sea Scout Hall about access requirements and construction timing; and
- Option 1 – Consideration of impacts to the Araucaria species (located approximately 10m from the western extent of Option 1) such as encroachment into the Tree Protection Zone, changes in hydrology and trimming of the trees. The potential heritage value of these trees should also be considered.

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# Heritage

## BAYVIEW SHARED PATHWAY PEI

### Legend

- AHIMS Heritage Items
- Major Road (LPI, 2016)

### Local Heritage Items

- 2270029, Street Trees (Araucaria species)
- 2270057, Sandstone retaining wall
- 2270101, House
- 2270340, Maybanke House ("Stoneleigh") and Plaque
- 2270350, Newport Wharf
- 2270357, World War II Tank Traps
- 2270406, Sea Scout Hall
- 2270412, Curry House 2
- 2270476, Newport Arms Hotel

### Project Options

- Option 1
- Option 2
- Study Area
- Araucaria species

**FIGURE 5-3**

**1:5,000 Scale at A3**

m
0 50 100 150 200

Cardno

Map Produced by NSW/ACT (WNE)
Date: 2019-03-15 | Project:59919082
Coordinate System: GDA 1994 MGA Zone 56
Map: 59919083-GS-009-BayviewPEI_Heritage 01.mxd 01
Imagery supplied by Nearmap April 2018

## 5.3 Geology and Soils

### 5.3.1 Existing Environment

#### *5.3.1.1 Landform, Geology and Soils*

The Study Area lies on the southern foreshores of the Pittwater Estuary in the suburb of Bayview. The site is located in an area dominated by broad sandstone ridgelines with steep creek lined gullies feeding into the estuary. The site runs along the toe of a hill that protrudes into Pittwater. To construct Pittwater Road it appears that cuts have been formed on the western side of the road and some fill has been placed on the eastern side (JK Geotechnics, 2018). The general topography of the area is shown on Figure 5-4.

The 1:100,000 geological map of Sydney (Geological Survey of NSW, Geological Series Sheet 9130) indicates that the Study Area is underlain by interbedded laminite, shale and sandstone of the Narrabeen Group.

The Soil Landscape mapping identify the footprint of Option 1 as disturbed terrain (refer Figure 5-4). Some fill material may have been used during the construction of the existing footpath that runs parallel to Pittwater Road.

#### *5.3.1.2 Contamination*

The EPA online contaminated land record was searched on 14 February 2019 to determine whether any notices had been issued under the *Contaminated Land Management Act 1997* in the vicinity of the Study Area. Records were not identified within or surrounding the proposed works. The register for contaminated land notified to the EPA was also searched, however sites were not identified within or surrounding the proposed works. However, it is noted that sediments in estuaries, especially in urbanised estuaries such as the Pittwater Estuary, can accumulate contaminants.

#### *5.3.1.3 Acid Sulfate Soils*

Acid sulfate soils (ASS) have been classified based on the likelihood of the acid sulfate soils being present particular areas and at certain depths. There are five classifications as shown in Table 5-7.

Table 5-7 Acid Sulfate Soil Classification

| Class | Description |
|---|---|
| Class 1 | Acid sulfate soils in a class 1 area are likely to be found on and below the natural ground surface. Any works will trigger the requirement for assessment and may require management. |
| Class 2 | Acid sulfate soils in a class 2 area are likely to be found below the natural ground surface. Any works beneath the natural ground surface, or works which are likely to lower the water table, will trigger the requirement for assessment and may require management. |
| Class 3 | Acid sulfate soils in a class 3 area are likely to be found beyond 1 metre below the natural ground surface. Any works that extend beyond 1 metre below the natural ground surface, or works which are likely to lower the water table beyond 1 metre below the natural ground surface, will trigger the requirement for assessment and may require management. |
| Class 4 | Acid sulfate soils in a class 4 area are likely to be found beyond 2 metres below the natural ground surface. Any works that extend beyond 2 metres below the natural ground surface, or works which are likely to lower the water table beyond 2 metres below the natural ground surface, will trigger the requirement for assessment and may require management. |
| Class 5 | Acid sulfate soils are not typically found in Class 5 areas. Works within 500 metres of adjacent class 1,2,3 or 4 land that are below 5 metres AHD and by which the water table is likely to be lowered below 1 metre AHD on adjacent class 1, 2, 3 or 4 land will trigger the requirement for assessment and may require management. |

There is a high probability of ASS in the sediments of Pittwater Estuary. Acid sulfate soils within the Study Area, as mapped by the Pittwater LEP, are as follows (refer Figure 5-5):

- Class 1 – waters within Pittwater Estuary;
- Class 2 – at the eastern extent of the Study Area in proximity to the Bayview Tennis Courts; and
- Class 5 – Pittwater Road and parts of the retaining wall.

### 5.3.2 Potential Impacts

#### *5.3.2.1 Landform, Geology and Soils*

Both options would require the disturbance of soils and sediments (earthworks), presenting a potential impact to the estuary through erosion and sedimentation.

#### *5.3.2.2 Contamination*

As fill materials are present in the existing footpath that runs parallel to Pittwater Road, there is a possibility that elevated concentrations of contaminants could be present. However as sheet piles are proposed for this option the risk of contaminants leaching into the surrounding soils, nearby vegetation and waterways is not considered significant.

The risk of contaminated sediments associated with Option 2 are not considered likely.

#### *5.3.2.3 Acid Sulfate Soils*

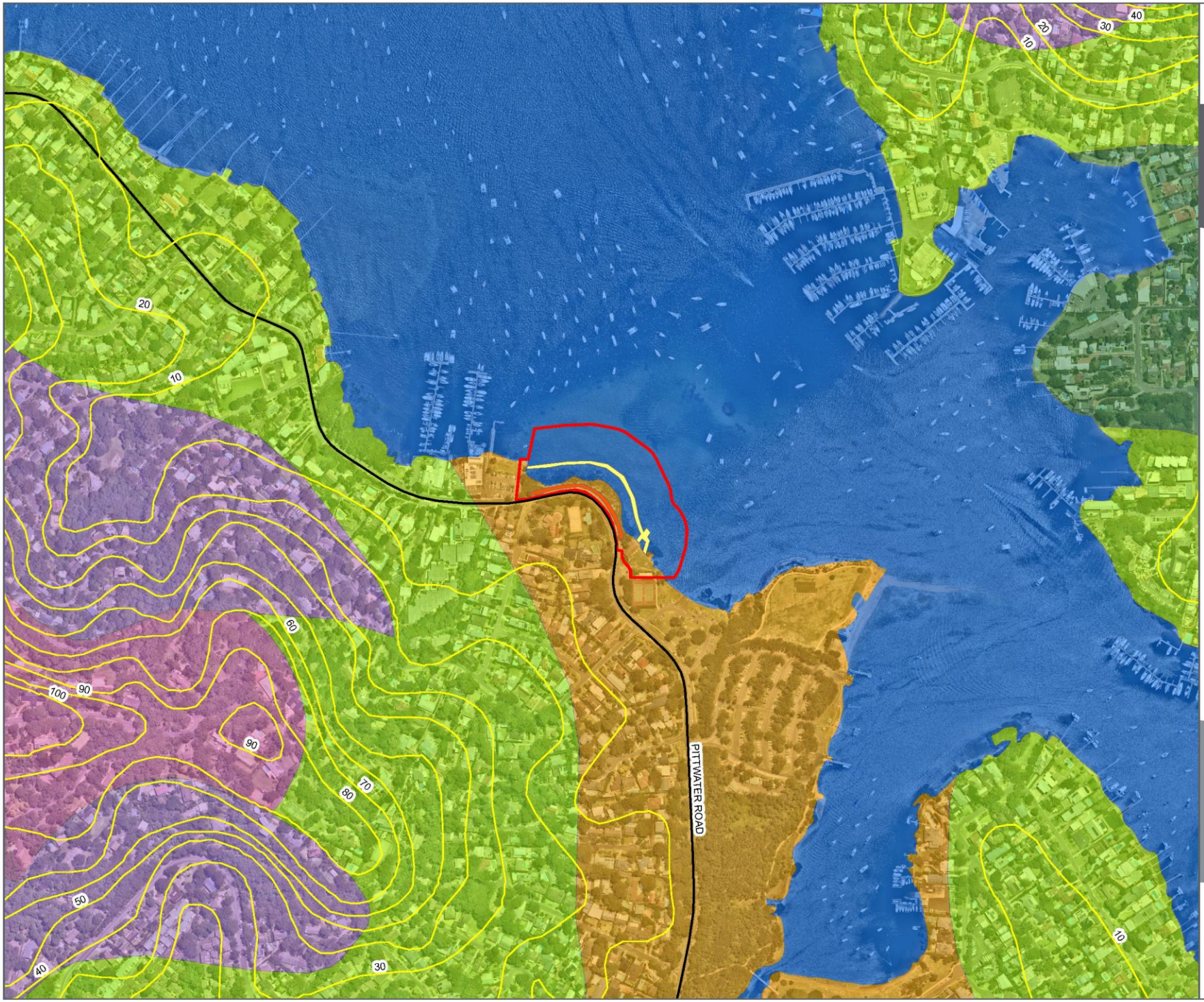
When potential ASS or ASS are exposed to air through drainage or excavation, iron sulphides of soils react with oxygen and water to produce iron compounds and sulphuric acid. This acid can release other substances, including heavy metals, from the soil and into the surrounding environment and waterways. If this occurs the surrounding water can become toxic, potentially killing vegetation and aquatic life. Furthermore, the disturbance of ASS can lead to the corrosion of concrete, iron, steel and some aluminium alloys.

There is the potential for ASS to be disturbed during construction of Option 2.

### 5.3.3 Recommendations

The following recommendations are made in relation to geology and soils:

- Develop of a soil and water management plan (both options);
- Undertake further geological investigations as outlined in JK Geotechnics (2018) to confirm the depth to sandstone bedrock (both options); and
- Undertake ASS testing and if necessary, prepare an ASS management plan (Option 1).

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# Topography and Soil Landscapes

## BAYVIEW SHARED PATHWAY PEI

### Legend

Contours (10m)

Major Road (LPI, 2016)

### Project Options

Option 1

Option 2

Study

### Soil Landscapes

AEnp, NEWPORT

COha, HAWKESBURY

COwn, WATAGAN

DTxx, DISTURBED TERRAIN

ERer, ERINA

ERgy, GYMEA

Water

FIGURE 5-4

1:5,000 Scale at A3

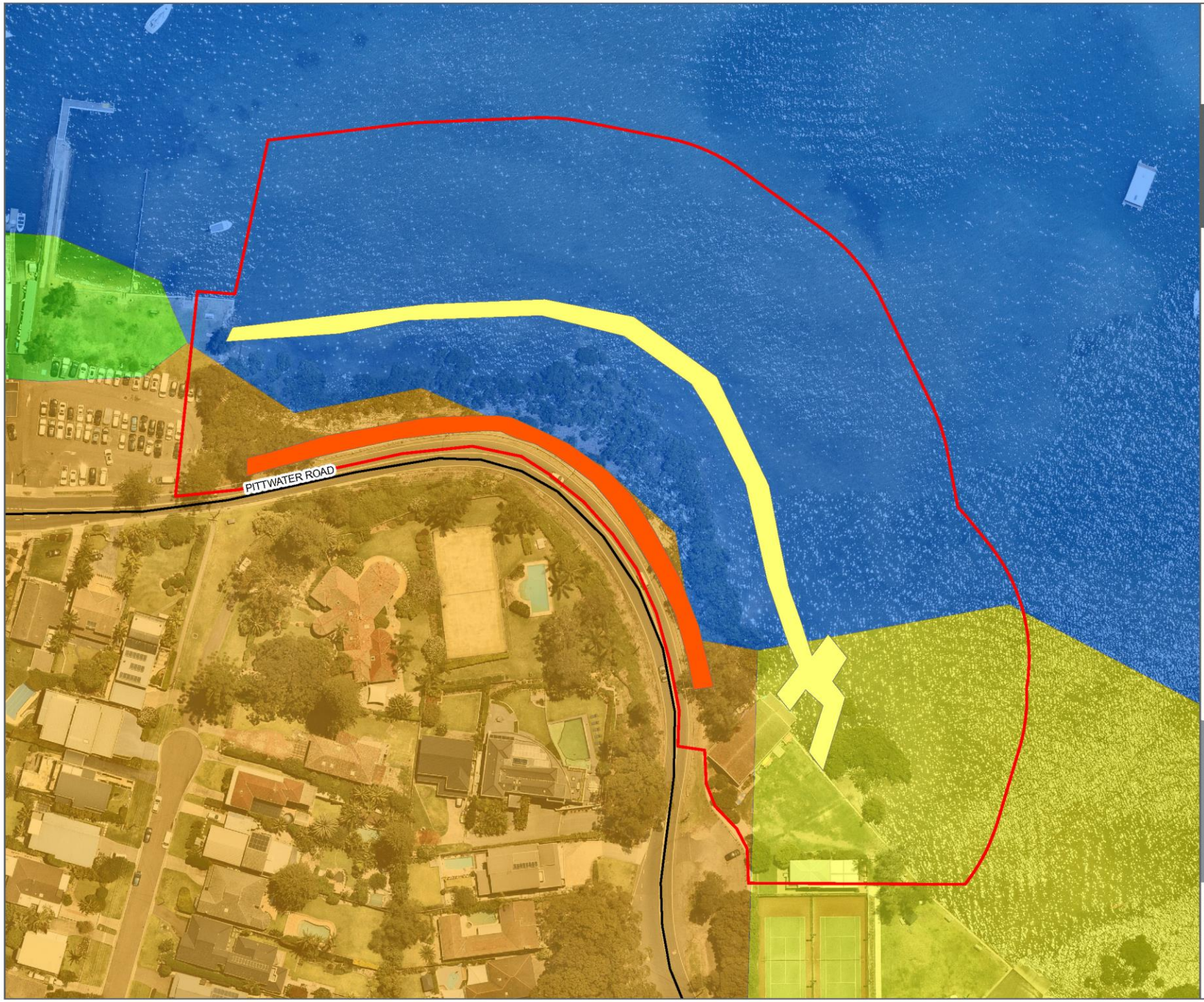
m

0 50 100 150 200

N

Cardno

Map Produced by NSW/ACT (WNE)
Date: 2019-03-14 | Project:59919082
Coordinate System: GDA 1994 MGA Zone 56
Map: 59919083-GS-010-BayviewPEI_Landscapes 01.mxd 01
Imagery supplied by Nearmap April 2018




northern beaches council

# Acid Sulphate Soils

## BAYVIEW SHARED PATHWAY PEI

**Legend**

- Major Road (LPI, 2016)

**Project Options**

- Option 1
- Option 2
- Study

**Acid Sulphate Soils**

- Class 1
- Class 2
- Class 3
- Class 5

**FIGURE 5-5**

**1:1,000 Scale at A3**

m
0 10 20 30 40

Cardno

Map Produced by NSW/ACT (WINE)
Date: 2019-03-13 | Project:59919082
Coordinate System: GDA 1994 MGA Zone 56
Map: 59919083-GS-014-BayviewPEI_ASS 01.mxd 01
Imagery supplied by Nearmap April 2018

## 5.4 Water Quality and Coastal Processes

### 5.4.1 Existing Environment

#### *5.4.1.1 Surface Water*

Pittwater Estuary is a drowned river valley approximately 10km long, 1km wide and 22m deep, that discharges into the Hawkesbury River at Broken Bay. Broken Bay is a major estuarine junction that also receives water from Brisbane Water from the north and the Hawkesbury-Nepean River from the west. Pittwater Estuary drains a catchment area of 5,100ha, approximately 28.5% of which is urbanised and the remainder bushland (Lawson Treloar Pty Ltd, 2003). The Estuary has a tidal range of approximately 1m with the influence of astronomical tides greatest at the northern end and wind-driven circulation of greater importance at the southern end (Lawson Treloar Pty Ltd, 2003). Water levels are also influenced by flood discharges from the Hawkesbury-Nepean River (Lawson Treloar Pty Ltd, 2003).

Water quality in Pittwater Estuary is typical of moderately developed estuaries. This means that the same pressures on water quality in urbanised estuaries apply to Pittwater including:

- Runoff, stormwater, industrial and wastewater overflows;
- Waterway usage and development; and
- Heavy metal contamination.

The Beachwatch State of the Beaches (OEH, 2018) provides a summary of the water quality at Pittwater. The report indicates that microbial water quality at the beach is suitable for swimming most of the time, but is susceptible to pollution following rain and during dry weather conditions. Bayview Baths are subject to low levels of flushing, which means that following storm water events the water can take longer than other beaches in the area to recover.

An existing sewer runs roughly parallel along the seaward-side of the existing retaining wall. Culverts are present along the retaining wall, allowing for storm water to drain from Pittwater Road and the surrounding areas into the estuary.

#### *5.4.1.2 Groundwater*

A search of NSW Office of Water Groundwater map did not identify any groundwater bores within 500m of the Study Area. Due to the tidal nature of the proposed Study Area, the water levels vary from above surface levels at high tide to some depth below the surface (JK Geotechnics, 2018).

### 5.4.2 Potential Issues

#### *5.4.2.1 Surface Water*

Impacts on hydrology and water quality associated with the proposed works have the potential to occur during construction. A reduction in water quality and flow could affect local and regional sensitive environments in the vicinity of the Study Area. If ASS are excavated or drained during the proposed works, sulfuric acid and heavy metals could be released into the surrounding surface water. This could impact the health of biota existing in and around Pittwater Estuary.

During construction, machinery would be in operation within (or in close proximity) to Pittwater Estuary. Spills and/or leaks could occur along the area of proposed works.

#### *5.4.2.2 Groundwater*

As the Study Area is located within a tidal zone and sands overlie the bedrock, groundwater would be a construction constraint. Due to the tidal nature of the area, there would be limited time each day when construction could be undertaken, particularly for Option 2.

### 5.4.3 Recommendations

The following recommendations are made in relation to water quality and coastal processes:

- Consideration of the need for temporary diversion of the stormwater network during construction (Option 1);
- Consideration of construction methodologies that would decrease the risk to water quality including reduced project footprints, undertaking works from land where possible and appropriate equipment selection; and

> Consideration of groundwater constraints during development of construction methodology (Option 1).

## 5.5 Traffic and Access

### 5.5.1 Existing Environment

Pittwater Road is a main arterial road providing a link along the Northern Beaches between Brookvale and Mona Vale. On a local scale Pittwater Road generally follows the foreshore of the Pittwater Estuary from Mona Vale through the suburb of Bayview. Local residential streets in the vicinity of the Study Area include Fermoy Avenue, Roches Avenue, King Edward Avenue, Roches Avenue and Alexandra Crescent. Traffic along the Mona Vale to Bayview stretch of Pittwater Road is primarily local traffic and does not carry high traffic volumes. There is a bus route travels along Pittwater Road, and in parts is a shared bicycle path.

A parking area is located to the west of the Study Area providing parking to access Gibson Marina, Bayview Baths, passive recreational areas and the foreshore. To the east of the Study Area is a large carpark providing parking to access the Bayview Tennis Courts, passive recreational areas, the foreshore and Rowland Reserve. A third, small carpark is located in front of the Sea Scouts Hall.

Pedestrian access is available along Pittwater Road in the vicinity of the Study Area and access to the foreshore at certain locations. There is boat ramp on the foreshore within the eastern carpark.

### 5.5.2 Potential Issues

There would be a minor increase in traffic volumes along Pittwater Road during construction as a result of construction personnel driving to the site and through the delivery of equipment and resources. There is the potential that Pittwater Road may need to be closed for short durations and/or overnight.

Both options would have the potential for access impacts to patrons of Gibson Marina, Bayview Baths, users of the tennis courts, waterways and recreation areas.

For Option 1, there would be a temporary impact to pedestrians during construction as the existing footpath would need to be closed. Alternative routes/detours would need to be provided. It is noted this impact in inevitable as remediation works on the existing footpath need to be undertaken regardless of the option selected.

For Option 2, access to the Sea Scout Hall may be impacted during construction and operation of the boardwalk. Public access would likely be restricted during construction, which would prevent water vessels (sailing crafts and canoes) being launched. The design of the boardwalk is yet to be finalised however integration of the boardwalk and sea scout hall (including boat ramp) would be necessary to ensure long term access to the Estuary.

The completed works would provide a benefit to the community through improved access: with either an upgraded footpath parallel to Pittwater Road or an additional footpath to the north over the water. The completed works would provide an alternative to cyclists that currently ride along Pittwater Road.

### 5.5.3 Recommendations

The following recommendations are made in relation to traffic and access:

> Locate compound/stockpile sites and implement construction methodology that would minimise impacts and access disruptions to public areas (Bayview Baths, Bayview Tennis Courts, passive recreational areas, the foreshore and Rowland Reserve) and Gibson Marina;

> Option 1 - Consideration of alternative pedestrian access routes/detours for users of the existing footpath along Pittwater Road;

> Option 2 - Consider design options that would enable the Sea Scouts Hall (and boat ramp) continual access to the Pittwater Estuary during construction and operation;

> Option 2 - Consultation with community, stakeholders and the Roads and Maritime Services; and

> The preferred option design should incorporate appropriate infrastructure provision that would improve pedestrian and cycle safety and connectivity.

## 5.6 Noise and Vibration

### 5.6.1 Existing Environment

#### *5.6.1.1 Noise*

The proposed works are situated within an area zoned E2 - Environmental Conservation and potentially RE1 – Public Recreation. The surrounding area comprises R2 - Low Density Residential, E4 – Environmental Living, IN4 – Working Waterfront, W1 – Natural Waterways and W2 – Recreational Waterways. The background noise levels in the Study Locality are influenced primarily by traffic on Pittwater Road, vessel activity on the waterways, the marina, surrounding cafes and recreational users along the foreshore.

The identified noise sensitive receivers in vicinity of the Study Area include:

- Residential properties along Pittwater Road, Fermoy Avenue and King Edward Avenue;
- Commercial businesses at Gibson Marina; and
- Active and passive recreational areas including Bayview Baths, Sea Scouts Hall, Bayview Tennis Courts, Rowland Reserve.

#### *5.6.1.2 Vibration*

Existing vibration within the study area would be a result of heavy vehicle movements along Pittwater Road, although this is not expected to be a frequent occurrence.

Vibration sensitive receivers in the Study Area would include those identified as sensitive to noise. In addition, buildings and infrastructure can be impacted by vibration. Sensitive buildings would include residential premises and heritage features. The heritage listed sandstone retaining wall (located on the southern side of Pittwater Road, near Fermoy Avenue) may be vibration sensitive given its age and present condition (cracks, collapsing).

### 5.6.2 Potential Issues

#### *5.6.2.1 Noise*

Construction noise would likely have an impact on identified nearby sensitive receivers. However, it is noted that construction is not likely to involve continuous noise for the entire construction period, and is over a short period of time.

The operational phase of the project would not have an adverse impact on noise levels in the area. The noise levels would likely be similar to the current noise levels in the area.

#### *5.6.2.2 Vibration*

Vibration has the potential to cause human disturbance, affect buildings contents and/or cause structural damage. Human receptors and buildings (including the heritage listed sandstone retaining wall) would require consideration during options assessment and when considering construction methodology.

### 5.6.3 Recommendations

The following recommendations are made in relation to noise and vibration:

- A detailed assessment of construction noise and vibration impacts should be prepared as part of the detailed environmental assessment; and
- Consideration of various construction methods and staging should be considered during design development to minimise noise and vibration impacts.

## 5.7 Socio-economic and Land Use

### 5.7.1 Existing Environment

The 2016 census found that the Northern Beaches LGA had a population of approximately 3,620 people, based on the place of usual residence (ABS, 2016).

The Study Area and surrounds are zoned for environmental, residential and public recreation purposes under the Pittwater LEP. The Study Area is surrounded by a number of recreational areas including Bayview

Baths, Bayview Tennis Courts, passive recreational areas, the foreshore and Rowland Reserve. Gibson Marina, including a café and other businesses, lies on the western extent of the Study Area.

### 5.7.2 Potential Issues

The proposed works may have impacts on recreational users of the area and patrons of the cafés and business at Gibson Marina during construction through amenity impacts, changed access arrangements and parking restrictions.

If Option 2 is selected, an upgrade would still be required on the current footpath due to its dilapidated state, which is an additional cost to Council. Both the existing footbath and boardwalk would require ongoing maintenance.

### 5.7.3 Recommendations

The following recommendations are made in relation to socio-economic and land use:

> Consultation with the residents and local businesses including regular project updates once the preferred option is selected and throughout the project; and

> Consider the capital and maintenance costs of both option, including the need to remediate the existing footpath.

## 5.8 Visual Amenity

### 5.8.1 Existing Environment

A site walkover was conducted to understand the visual character of the Study Area. The area surveyed was the existing footpath running parallel to Pittwater Road, the surrounding recreational areas, businesses and the waterway.

The Study Area generally comprised low density residential buildings on the southern side of Pittwater Road, stands of native vegetation and mangroves, recreational areas and commercial areas at the northern and southern extent of the Study Area. The waters of Pittwater Estuary are to the north of the Study Area with a picturesque vista of the water, boats, marinas and bushland in the background. Due to the proximity to water and coastal wetlands, the area is considered to be of high scenic quality.

### 5.8.2 Potential Issues

During construction and operational phases of both options, visual amenity would be impacted. Loss of the vegetation along Pittwater Road and within the mangrove corridor has the potential to reduce the visual amenity of the Study Area. Whilst Option 2 would introduce a new element to the visual landscape, it would also provide a vantage point for the public to view the Pittwater Estuary including the boats, marina, mangroves and the estuary itself. To enable the long term access of the Sea Scouts water vessels to the Estuary it is likely that the boardwalk would need to be raised significantly (to avoid obstruction of the boat ramp) which would have an impact on the visual amenity of the area.

### 5.8.3 Recommendations

The following recommendations are made in relation to visual amenity:

> Vegetation clearing should be minimised during the detailed design phases of the project; and

> Option 2 – design of the boardwalk should be sympathetic to the existing visual landscape of the area.

## 5.9 Climate and Air Quality

### 5.9.1 Existing Environment

The closest Bureau of Meteorology (BOM) weather station to the proposed site is the Terrey Hills weather station (site number 066059), approximately 7.1km south-west of the proposed site. Mean daily maximum temperature ranges from 22.8 °C in January to 12.0 °C in July. Average yearly rainfall is 1,089.9mm, with the highest mean rainfall occurring in June (BOM, 2019).

Air quality in the region can often exceed guideline values for suspended fine particles (10 year mean of 30 exceedances per year) and occasionally exceed guideline values for ozone (10 year mean of 1.8 exceedances per year) (BOM, 2019). The primary sources of air pollution in the area are exhaust fumes from motor vehicles, increased use of private vehicles, and increased traffic congestion, smoke from bushfires,

use of wood fires in winter and industrial land use (SHOROC, 2010). The main sources of air pollution surrounding the proposed works would be vehicle emissions from vehicles travelling on Pittwater Road and surrounding roads.

Sensitive air quality receivers near the Study Locality include residents and users of public open space as outlined in Section 5.6.

### 5.9.2 Potential Issues

There are sensitive receivers in the Study Locality that may be impacted by air quality impacts from the proposed works. Air quality impacts from the works may include increased emissions from heavy vehicles and dust generation from fill and upgrade works.

There would be no risk of the works affecting the climate of the region.

### 5.9.3 Recommendations

The following recommendations are made in relation to climate and air quality:

- Consider opportunities to limit dust generation and vehicle emissions during construction; and
- An air quality impact assessment should be prepared during detailed environmental assessment.

# 6 Conclusion

Council has committed to investigating the feasibility of two options for a shared pedestrian/cycle pathway (shared pathway) between Bayview Tennis Courts and the Bayview Baths at Bayview on the southern foreshores of Pittwater. The proposed two options being considered are:

- Option 1 - widen and upgrade the existing footpath which runs parallel to Pittwater Road for approximately 130m; and
- Option 2 - construct a boardwalk which extends into the waters of Pittwater, outside the majority of the mangrove zone, and is approximately 250m in length.

This PEI has been prepared to identify potential environmental issues and risk for the two options for the project. In particular, a Biodiversity Assessment was undertaken to determine the feasibility of each option in relation and marine and ecological impacts.

## 6.1 Summary of Environmental Issues and Recommendations

### 6.1.1 Potential Issues and Approvals

Potential environmental issues and approvals for the two proposed options have been identified in Table 6-1.

Table 6-1 Summary of Potential Issues

| | | Option 1 | Option 2 |
|---|---|---|---|
| **1** | **Description** | Upgrade of existing path adjacent to Pittwater Road to a shared pathway supported by a continuous retaining wall constructed of sheet piles | New timber boardwalk supported by timber or concrete piles within Pittwater and outside of the existing mangroves. |
| **2** | **Approximate length** | 130m | 250m |
| **3** | **Width** | 3.5m | 3.5m |
| **4** | **Total design and construct cost (ex GST)*** | $566,000 | $1,048,000 |
| **5** | **Lighting Required** | No – use existing utilities | Yes – but has not been included in cost |
| **6** | **Threatened species affected by the proposal** | | |
| 6.1 | Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions | Yes (0.03ha) | Yes (0.04ha) |
| 6.2 | Mangroves (including pneumatophore) | Yes (0.01ha) | Yes (up to 0.02ha) |
| 6.3 | Seagrass meadows (*Posidonia australis*) | No | No |
| 6.4 | Seagrass meadows (*Zostera muelleri subsp.. capricorni*) | No | No |
| 6.5 | Seagrass meadows (*Halophila spp*.) | No | No |
| 6.6 | Marine vegetation (subtidal soft sediment) | No | Yes (up to 0.11ha) |
| 6.7 | Marine vegetation (intertidal rocky shore) | Removal of intertidal rocky shore habitat (i.e. revetment wall) | Removal of intertidal rocky shore habitat (i.e eastern and western ends of the boardwalk) |
| 6.8 | Saltmarsh | No | No |
| 6.9 | Vegetation (exotic verge/park) | Yes (0.03ha) | No |
| 6.10 | Vegetation (native/exotic landscape planting) | No | No |
| 6.11 | Impact based on above encroachment | Significant impact not considered likely | Significant impact not considered likely |

| | | Option 1 | Option 2 |
|---|---|---|---|
| **7** | **Approvals required from Council** | | |
| 7.1 | *Environmental Planning and Assessment Act 1979* | Assessed under Division 5.1 (REF) | Assessed under Division 4.1 - DA (SEE) |
| 7.2 | *Roads Act 1993* | Council is the Roads Authority | Council is the Roads Authority |
| 7.3 | Pittwater LEP | Zoned E2, E4, RE1 and R2 | Zoned E2 and RE1 |
| **8** | **Approvals required from OEH** | | |
| 8.1 | *Coastal Management Act 2016* | Project is consistent with objectives of the Act | Project is consistent with objectives of the Act |
| 8.2 | *Heritage Act 1977* | Satisfied - there are no items listed on the State Heritage Register likely to be impacted | Satisfied - there are no items listed on the State Heritage Register likely to be impacted |
| 8.3 | *National Parks and Wildlife Act 1974* (disturbance to aboriginal objects) | Satisfied - there are no known aboriginal heritage items likely to be affected | Satisfied - there are no known aboriginal heritage items likely to be affected |
| 8.4 | *Biodiversity Conservation Act 2016* (impact on threatened species, populations or ecological communities) | Satisfied - significant impact not considered likely | Satisfied - significant impact not considered likely |
| 8.5 | *Biosecurity Act 2015* (biosecurity risks) | Satisfied - no risk encountered | Satisfied - no risk encountered |
| **9** | **Approvals required from the EPA** | | |
| 9.1 | *Protection of the Environment Operations Act 1997* (air, noise and water pollution) | Satisfied - minimal affectation only during construction | Satisfied - minimal affectation only during construction |
| 9.2 | *Protection of the Environment Operations (Waste) Regulation 2005* (waste generated) | Satisfied – minimal waste expected to be generated and would be classified in accordance with EPA guidelines for offsite disposal | Satisfied – minimal waste expected to be generated and would be classified in accordance with EPA guidelines for offsite disposal |
| 9.3 | *Contaminated Land Management Act 1997* | Satisfied - no contaminants likely to be encountered | Satisfied - no contaminants likely to be encountered |
| 9.4 | *Waste Avoidance and Resource Recovery Act 2001* | Satisfied - minimal waste expected to be generated and would be managed with consideration of the waste management hierarchy. | Satisfied - minimal waste expected to be generated and would be managed with consideration of the waste management hierarchy. |
| **10** | **Approvals required from the DPI (Fisheries)** | | |
| 10.1 | *Fisheries Management Act 1994*<br>*Fisheries Management (General) Regulation 2010* | Part 7 permit under Section 205 required for the removal of mangroves and under Section 200 for removal of intertidal rocky shore. | Part 7 permit, under Section 200 required for the removal of mangroves and under Section 200 for removal of sub-tidal soft sediment and intertidal rocky shore. |
| **11** | **Approvals required from the DOI (Crown Lands) and DOI (NRAR)** | | |
| 11.1 | *Crown Lands Management Act 2016* | Landowner consent/license required | Landowner consent/license required |
| 11.2 | *Water Management Act 2000*<br>*Water Management (General) Regulation 2004* | Satisfied - Council is exempt | Satisfied - Council is exempt |
| **12** | **Stakeholder approvals/consultation recommended** | Yes, DPI (Fisheries) and DOI (Crown Lands) | Yes, DPI (Fisheries), DOI (Crown Lands) and Roads and Maritime |

| | | Option 1 | Option 2 |
|---|---|---|---|
| **13** | **Other stakeholders affected (e.g. Sea Scouts)** | No | Yes, Statement of Heritage Impact (SoHI) for the locally listed Sea Scout Hall to be undertaken |
| **14** | **Acid Sulphate Soils action required** | No management required | Assessment and management required |
| **15** | **Other considerations** | Potential impacts to *Araucaria* species | Visual impact of the boardwalk |

*Source: Council (2019)

### 6.1.2 Recommendations

Council will need to prepare an Environmental Assessment, in the form of an REF or SEE, once the preferred option has been determined. In addition to the standard considerations on an environmental assessment a summary of the recommendations is provided in Table 6-2.

Table 6-2 Summary of Recommendations

| Issue Category | Recommendation |
|---|---|
| Biodiversity | > Design development and refinement to reduce the area of native vegetation clearing (both options);<br>> Undertake coastal processes study prior to finalising the detailed design and review biodiversity impacts for consistency (both options);<br>> A Part 7 Permit, under Section 205 of the FM Act would be required to harm marine vegetation (both options);<br>> A Part 7 Permit, under Section 200 of the FM Act would be required for piling activities associated with Option 2 and the removal of the intertidal rocky shore habitat (both options);<br>> All retained trees with Tree Protection Zones (TPZs) falling within the disturbance corridor are to be managed in accordance with AS 4970-2009 Protection of Trees on Development Sites (both options);<br>> Considerations to the NSW Department of Environment and Climate Change (DECC) *Environmentally Friendly Seawalls: A Guide to Improving the Environmental Value of Seawalls and Seawall-lined Foreshores in Estuaries* (DECC, 2009) where possible, including (Option 1):<br>– Use of materials with increased roughness and texture to facilitate colonisation of marine vegetation and fauna;<br>– Create cavities that retain water at low tide and provide refuge for marine fauna;<br>– Use boulders of various sizes and shapes;<br>– Utilising natural building materials;<br>– Gentle slopes are preferred with some benches and steps; and<br>– Incorporate native riparian vegetation landward.<br>> Option 2 - Spacing of piles between the mangrove stems in some of these areas would allow for the alignment to be strategically positioned to avoid/minimise mangrove clearing; and<br>> Option 2 - given the temporal variation in seagrass meadows, a pre-clearance survey and monitoring during construction is recommended to ensure that the alignment would not directly impact Halophila and Zostera meadows. |
| Heritage | > Option 2 - Investigate design options to limit the impact to the locally listed Sea Scout Hall (and boat ramp) during construction and operation;<br>> Option 2 – Undertake a Statement of Heritage Impact (SoHI) for the locally listed Sea Scout Hall;<br>> Option 2 – Consultation with the Sea Scout Hall about access requirements and construction timing; and |

| Issue Category | Recommendation |
|---|---|
| | > Option 1 – Consideration of impacts to the Araucaria species (located approximately 10m from the western extent of Option 1) such as encroachment into the Tree Protection Zone, changes in hydrology and trimming of the trees. The potential heritage value of these trees should also be considered. |
| Geology and Soils | > Develop of a soil and water management plan (both options);<br>> Undertake further geological investigations as outlined in JK Geotechnics (2018) to confirm the depth to sandstone bedrock (both options); and<br>> Undertake ASS testing and if necessary, prepare an ASS management plan (Option 1). |
| Water Quality and Coastal Processes | > Consideration of the need for temporary diversion of the stormwater drain network during construction (Option 1);<br>> Consideration of construction methodologies that would decrease the risk to water quality including reduced project footprints, undertaking works from land where possible and appropriate equipment selection; and<br>> Consideration of groundwater constraints during development of construction methodology (Option 1). |
| Traffic and Access | > Locate compound/stockpile sites and implement construction methodology that would minimise impacts and access disruptions to public areas (Bayview Baths, Bayview Tennis Courts, passive recreational areas, the foreshore and Rowland Reserve) and Gibson Marina;<br>> Option 1 - Consideration of alternative pedestrian access routes/detours for users of the existing footpath along Pittwater Road;<br>> Option 2 - Consider design options that would enable the Sea Scouts Hall (and boat ramp) continual access to the Pittwater Estuary during construction and operation;<br>> Option 2 - Consultation with community, stakeholders and the Roads and Maritime Services; and<br>> The preferred option design should incorporate appropriate infrastructure provision that would improve pedestrian and cycle safety and connectivity. |
| Noise and Vibration | > A detailed assessment of construction noise and vibration impacts should be prepared as part of the detailed environmental assessment; and<br>> Consideration of various construction methods and staging should be considered during design development to minimise noise and vibration impacts. |
| Socio-economic and land use | > Consultation with the residents and local businesses including regular project updates once the preferred option is selected and throughout the project; and<br>> Consider the capital and maintenance costs of both option, including the need to remediate the existing footpath. |
| Visual amenity | > Vegetation clearing should be minimised during the detailed design phases of the project; and<br>> Option 2 – design of the boardwalk should be sympathetic to the existing visual landscape of the area. |
| Climate and Air Quality | > Consider opportunities to limit dust generation and vehicle emissions during construction; and<br>> An air quality impact assessment should be prepared during detailed environmental assessment. |

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APPENDIX

# A

## OPTIONS SKETCH

# APPENDIX B

## PMST RESULTS

# APPENDIX

# C

## BIODIVERISTY ASSESSMENT REPORT

APPENDIX

# D

## HERITAGE DATABASE RESULTS

# Appendix G

## Geotechnical Report

# REPORT

# TO
# NORTHERN BEACHES COUNCIL

# ON
# GEOTECHNICAL INVESTIGATION

# FOR
# PROPOSED FOOTPATH ROUTES

# AT
# BAYVIEW TENNIS CLUB TO BAYVIEW BATHS

**21 November 2018**
**Ref: 31838SYrpt**


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Date: 21 November 2018
Report No: 31838SYrpt
Revision No: 0

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## 1 INTRODUCTION

This report presents the results of a geotechnical investigation for two alternative footpath routes along the Bayview foreshore extending from the Bayview Sea Scouts to the Bayview Baths. A site location plan is presented as Figure 1. The investigation was commissioned by Mr Thomas Lau of Northern Beaches Council and was completed in accordance with our proposal (Ref: P47943SY Bayview, dated 28 August 2018).

The existing footpath that runs along the Bayview foreshore between the Bayview Sea Scouts and Bayview Baths is narrow and requires widening. Two alternative have been proposed. These are:

- Option 1 - Widen and upgrade the existing footpath such that it has a minimum width of 2.5m or
- Option 2 - Construct a new boardwalk that runs out beyond the mangroves over Pittwater and extends from the park to the south of Bayview Sea Scouts to Bayview Baths.

The purpose of the investigation was to obtain geotechnical information on subsurface conditions at the test locations. Based on this we have provided comments and recommendations on retention, earthworks, footing design and pavement design for Option 1 and comments and recommendations for footing design for Option 2.

## 2 INVESTIGATION PROCEDURE

Due to the proposed route locations all investigation had to be completed at low tide and consequently testing was carried out on 19 to 20 September 2018. The investigation comprised:

- the drilling of 4 hand augered boreholes (BH1, BH2, BH3 and BH5) to depths ranging from 0.45m (BH1) to 1.5m (BH2) and
- the completion of fourteen Dynamic Cone Penetration (DCP1 to DCP14) tests to depths between 0.7m (DCP1) and 5.0m (DCP8).

The boreholes were drilled to identify the materials present while the DCP tests were completed to determine the relative density of the soils and probe the depth to sandstone bedrock. It should be noted that while it is generally inferred that the depth of refusal indicates the depth to bedrock premature refusal may occur on obstructions in the fill, tree roots or other hard layers within the soil

profile. The degree of compaction of the fill and the relative density/strength of the natural soils were interpreted from the DCP test results.

The test locations, as indicated on the attached Test Location Plan (Figure 2) were set out using taped measurements from existing surface features.

Groundwater measurements were made in all boreholes during and on completion of drilling. No longer term groundwater measurements were made.

Our engineering geologist, Mr Bo Jonak, was present full time on site during the fieldwork and set out the test locations, nominated sampling and testing, logged the subsurface profile and recorded the DCP test results. The borehole logs and DCP test results are attached to this report together with a glossary of the logging terms and symbols used.

## 3 RESULTS OF INVESTIGATION

### 3.1 Site Description

The site is located on the southern shore of Pittwater in an area dominated by broad sandstone ridgelines with steep creek lined gullies feeding into Pittwater. The site runs along the toe of a hill that protrudes into Pittwater. To construct the road it appears that cuts have been formed on the western side of the road and some fill has been placed on the eastern side. From the Bayview Sea Scouts the road runs in a north-south direction before turning approximately 90$^{o}$ and running in an east-west direction to Bayview Baths, a total distance of about 200m. On the Pittwater side of the road, outside the crash barrier, there is a concrete paved footpath.

A sandstone block seawall that ranges in height from about 0.5m to 1.6m supports the footpath and road embankment. The wall is in varying stages of disrepair/failure, with some areas where the wall has completely failed. Sections of the current pavement show signs of movement both laterally and vertically with these areas predominantly associated with failure of the seawall. The most north-eastern point of the site at the apex of the road alignment shows the greatest extent of seawall failure. Here the sandstone wall has almost completely failed and exposes fill. Erosion of fill has resulted in regression of the embankment to within approximately 2.5m from the edge of the road. It is in this area that the greatest lateral movement of the pavements can be observed with up to about 170mm movement of the pavement to the north-east.

A sewer that appears to be concrete encased runs roughly parallel to but beyond the seawall, further out into Pittwater. The Bayview Sea Scouts Hall is located in the reserve at the southern end of the existing footpath and is a single storey clad timber framed structure that is supported on concrete piers and has a timber boat ramp providing access to Pittwater. At the western end of the footpath is the reserve associated with Bayview Baths that is supported by a sandstone block seawall that ranges in height up to about 2.5m and appears in good condition. Pittwater Road runs along the inside of the footpath and has an asphaltic concrete pavement that generally appears in good condition.

### 3.2 Subsurface Conditions

The 1:100,000 geological map of Sydney (Geological Survey of NSW, Geological Series Sheet 9130) indicates that the site is underlain by interbedded laminite, shale and sandstone of the Narrabeen Group. In general a relatively thin fill layer was encountered that overlay sands that in turn overlay sandstone bedrock. The more pertinent details of the subsurface conditions encountered are provided below. For a more detailed description of materials encountered at a particular location reference should be made to the attached borehole logs and DCP test results. A summary of the subsurface conditions is presented below:

***Fill***

Fill comprising silty sands and sandy gravel was encountered in BH's 2, 3 and 4 and extended to depths ranging from 0.3m to 0.5m. BH4 refused at 0.5m within the fill. The fill was typically assessed to be poorly compacted.

***Soils***

Sandy sands were encountered in BH's 1 to 3 from the surface or immediately below the fill and comprised a mix of sands and silty sands that were of very loose to loose relative density. In BH2 a sandy clay was encountered below the sands and was assessed to be of stiff strength and overlay sandstone bedrock.

***Sandstone***

Sandstone bedrock was inferred at depths ranging from 0.59m to 1.4m at DCP1 to 6. Although it is possible that premature refusal of the DCP tests may have occurred, the inferred depths are relatively consistent and as such it is our opinion that these inferred depths are likely to be representative of the actual depth to bedrock. At DCP 7 to 14 the refusal depths ranged from 0.3m to 5.0m. Although not inconceivable, we think it unlikely that the depth to rock will range to this

extent along the route alignment of Option 2 and believe that where the DCP has refused at shallow depth that this is unlikely to represent the depth to bedrock.

***Groundwater***

Due to the tidal nature of both route alignments the water levels vary from above the surface levels at which the tests were completed to some depth below the surface.

## 4 COMMENTS AND RECOMMENDATIONS

The comments and recommendations provided below provide design advice for each of the proposed routes. Irrespective of which route is selected, the existing retaining wall supporting the footpath and road embankment requires remediation as long term erosion of the bank will, at some point threaten the stability of the road itself.

### 4.1 Option 1 – Widen Existing Footpath

Should Option 1 be adopted there will not only be the opportunity to widen the footpath to the required width but also to remediate the existing retaining wall which is in a state of failure.

#### 4.1.1 Retention

The existing seawall requires remediating. It is anticipated that this would be completed by constructing a new retaining wall further out to sea and the backfilling between the existing wall and new wall to widen the pavement.

For the design of new walls we recommend that a triangular earth pressure distribution and an active lateral earth pressure, $k_a$, of 0.35 be adopted. A bulk unit weight of 20kN/m$^3$ should also be used. In addition, all appropriate hydrostatic pressures and surcharge loads should be added to the above pressures. Due to the potential for scour, we recommend that all passive support in front of the wall be ignored with the exception of that part of the wall that extends into the underlying natural clays or sandstone bedrock.

Due to the tidal nature of the area, care must be taken that while the wall is free draining that internal erosion of the embankment does not occur as a result of the loss of finer particles. In this regard we recommend that a durable granular backfill, such as a single sized washed igneous gravel or recycled building material be used. Geofabric should also be used as a separation medium

between the finer backfill material and the single sized washed gravel. Consideration must be given to the long term performance of the geofabric, particularly with regards to its permeability.

### 4.1.2 Footing Design

Due to the risk of scour undermining the wall we recommend that all footings be uniformly founded on the underlying clay or sandstone bedrock. It appears that clay may not be present over the full length of the wall and in this regard, unless the wall is flexible and can undergo differential movement we recommend that the wall be uniformly founded on the underlying sandstone bedrock. Where footings are founded on sandstone bedrock of at least very low strength they may be designed for an allowable bearing pressure of 600kPa.

As the site is located in a tidal area and sands overlie the bedrock, groundwater will be a construction constraint that will need to be worked around. In this regard consideration will need to be given to the best construction method for this site, whether that be using temporary shoring with dewatering and a strip footing progressively excavated and poured during accessible hours or whether a piled solution be adopted. Should a piled solution be adopted it is anticipated that bored piers constructed inside driven temporary liners or driven piles will be the most suitable means of construction. Due to the relatively shallow depth to bedrock screw piles are not considered suitable for this site.

Prior to pouring concrete we recommend that all footings be free from all loose and softened materials and inspected by a geotechnical engineer to confirm that the design bearing pressures are achieved. Should water pond in the base of footings the bedrock will soften and no longer be suitable for the design ABP's. Where this occurs the footing excavations must first be pumped dry and then re-excavated to remove all loose and softened materials.

As an existing sewer runs on the seaward side of the existing seawall care must be taken that the proposed new wall alignment does not conflict with the sewer.

Although the DCP test results generally indicate fairly uniform depths to bedrock along this proposed route alignment, should this option be adopted we recommend that further investigation be completed to confirm the depths to bedrock.

### 4.1.3 Earthworks

Construction of the new retaining wall and footpath will require the completion of earthworks. The completion of earthworks in limited space, such as behind retaining walls is difficult to successfully complete and consequently, the earthworks techniques adopted will depend on the space between the back of the existing wall and the existing embankment, which is expected to be constrained by the alignment of the sewer. Where adequate space exists for the adoption of conventional compaction equipment such as small rollers it is anticipated that engineered fill will be placed behind the wall with a granular drainage medium placed immediately behind the wall. Where space does not allow for the use of rollers engineered fill is difficult to place successfully and in this instance it is generally better to backfill the void using a single sized durable gravel such as a 10mm or 20mm igneous gravel or recycled building material that requires only nominal compaction. Irrespective of whether gravel is used to fill the void between the back of the new wall and the existing embankment or it just forms part of the free draining medium at the back of the wall it must be wrapped in geofabric to prevent finer material from washing into it our being eroded from the embankment as tides vary and wave impacts occur.

Where engineered fill is placed (ie where used to extend the embankment out into Pittwater) or is used to raise existing levels or prior to the placement of pavements we recommend that the following subgrade preparation be completed:

- Proof roll the subgrade a minimum of five passes using a five tonne roller in the presence of an experienced geotechnician or geotechnical engineer. The purpose of proof rolling is to increase the near-surface density of the soils and to identify any soft or unstable zones,
- Should soft or unstable be encountered further advice on remediation of these areas will be provided by this office at that time.

Engineered fill may comprise a ripped sandstone that is free from all organic or otherwise deleterious materials. The material should be placed in loose layer thicknesses of no greater than 200mm with a maximum particle size of 75mm. Due to the likely limited size of equipment used to compact the backfill, it possible that loose layer thicknesses will need to be reduced in order to achieve the required density ratio. Where this is the case maximum particle sizes should be limited to no greater than about one third the size of the loose layer thickness. All engineered fill must be compacted to between 98% and 102% of Standard Maximum Dry Density (SMDD) and within +/- 2% of Standard Optimum Moisture Content (SOMC).

Earthworks testing should be completed at a frequency of 1 test/500m$^2$/layer. For the backfilling of confined spaces such as service trenches, temporary batters etc the frequency of testing should be 1 test/50m$^2$/2 layers. A minimum of Level 2 earthworks control should be adopted for this site although where movement sensitive structures are to be supported on engineered fill this should be increased to Level 1 earthworks testing in accordance with AS3798-2007. The Geotechnical Inspection and Testing Authority (GITA) should be engaged directly by the end client and not the earthworks contractor. The guidelines set out in AS3798 should be adopted on this site.

### 4.1.4 Pavements

As pavements will be only trafficked by people and bicycles and not vehicles it is not necessary for a subbase layer to be adopted in the design of rigid (concrete) pavements. Flexible (asphaltic concrete) pavements should have a base course layer of at least 100mm thickness of crushed rock to RTA QA specification 3051 (1994) unbound base material (or equivalent good quality and durable fine crushed rock), which is compacted to at least 100% of SMDD. Concrete pavements should be designed with an effective shear transmission at all joints by way of either doweled or keyed joints.

## 4.2 Option 2 – Boardwalk Running Out Over Pittwater

Should Option 2 be adopted the boardwalk will run in front of the existing Bayview Sea Scouts club house and boat ramp and will restrict their access to Pittwater. The boardwalk will be supported on piles and in this regard the piles will need to be installed by some mechanical process. Due to the tidal nature in which the boardwalk will be installed machinery will not be able to be supported on barges and all machinery will need to access the site from the boat ramp at Bayview Tennis Courts. This is likely to limit the hours during which piling operations can be completed.

Due to the sandy nature of the soils and the high groundwater table driven piles or steel tube piles appear most suited to this site. Where piles are founded on the underlying sandstone bedrock they may be designed for an ABP of 600kPa. As the boardwalk would have to be designed to withstand impact from boats it is unlikely that screw piles would provide the required lateral strength.

The DCP test results refused at variable depths along the proposed route alignment. Considering the topography, this suggests that at some locations premature refusal may have occurred on harder bands within the soils, rather than on bedrock itself. Consequently, we recommend that should this route be considered that further investigation be completed to confirm the depths to bedrock unless the piling system can be readily adapted for variations that are found to occur.

### 4.3 Further Geotechnical Input

The following is a summary of the further geotechnical input which is required and which has been detailed in the preceding sections of this report:

- Irrespective of which option is adopted further investigation should be completed to confirm the depth to sandstone bedrock.
- Prior to the placement of engineered fill or pavements the subgrade should be proof rolled in the presence of an experienced engineer of engineering geologist such that any unstable areas may be identified and appropriate remedial measures initiated.
- Density tests to confirm that engineered fill has been compacted to the required SMDD and within +/-2% of SOMC.

## 5 GENERAL COMMENTS

The recommendations presented in this report include specific issues to be addressed during the construction phase of the project. As an example, special treatment of soft spots may be required as a result of their discovery during proof-rolling, etc. In the event that any of the construction phase recommendations presented in this report are not implemented, the general recommendations may become inapplicable and JK Geotechnics accept no responsibility whatsoever for the performance of the structure where recommendations are not implemented in full and properly tested, inspected and documented.

The long term successful performance of pavements would be dependent on the satisfactory completion of the earthworks. In order to achieve this, the quality assurance program should not be limited to routine compaction density testing only. Other critical factors associated with the earthworks may include subgrade preparation, selection of fill materials, control of moisture content and drainage, etc. The satisfactory control and assessment of these items may require judgment from an experienced engineer. Such judgment often cannot be made by a technician who may not have formal engineering qualifications and experience. In order to identify potential problems, we recommend that a pre-construction meeting be held so that all parties involved understand the earthworks requirements and potential difficulties. This meeting should clearly define the lines of communication and responsibility.

The subsurface conditions between the completed boreholes may be found to be different (or may be interpreted to be different) from those expected. Variation can also occur with groundwater

conditions, especially after climatic changes. If such differences appear to exist, we recommend that you immediately contact this office.

This report provides advice on geotechnical aspects for the proposed civil and structural design. As part of the documentation stage of this project, Contract Documents and Specifications may be prepared based on our report. However, there may be design features we are not aware of or have not commented on for a variety of reasons. The designers should satisfy themselves that all the necessary advice has been obtained. If required, we could be commissioned to review the geotechnical aspects of contract documents to confirm the intent of our recommendations has been correctly implemented.

A waste classification will need to be assigned to any soil excavated from the site prior to offsite disposal. Subject to the appropriate testing, material can be classified as Virgin Excavated Natural Material (VENM), General Solid, Restricted Solid or Hazardous Waste. Analysis takes seven to 10 working days to complete, therefore, an adequate allowance should be included in the construction program unless testing is completed prior to construction. If contamination is encountered, then substantial further testing (and associated delays) should be expected. We strongly recommend that this issue is addressed prior to the commencement of excavation on site.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. If there is any change in the proposed development described in this report then all recommendations should be reviewed. Copyright in this report is the property of JK Geotechnics. We have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report. The report shall not be reproduced except in full.

**JK Geotechnics**
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

# BOREHOLE LOG

**Borehole No.** 1
1/1

**Client:** NORTHERN BEACHES COUNCIL
**Project:** PROPOSED FOOTPATH ROUTES
**Location:** PITTWATER ROAD, BAYVIEW, NSW

**Job No.** 31838SY **Method:** HAND AUGER **R.L. Surface:** N/A
**Date:** 20/9/18 **Datum:**
**Logged/Checked by:** J.B.J./W.T.

| Groundwater Record | SAMPLES ES | SAMPLES U50 | SAMPLES DB | SAMPLES DS | Field Tests | Depth (m) | Graphic Log | Unified Classification | DESCRIPTION | Moisture Condition/ Weathering | Strength/ Rel. Density | Hand Penetrometer Readings (kPa.) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ▶ | | | | | REFER TO DCP TEST RESULTS | 0 | | SP | SAND: fine to medium grained, light brown, glass fragments. | M | L | | MARINE |
| | | | | | | | | SM | Silty SAND: fine to medium grained, light grey, trace of shell fragments, clay, high plasticity light grey bands. | | | | BOREHOLE COLLAPSING AT 0.3m DEPTH |
| | | | | | | 0.5 | | | END OF BOREHOLE AT 0.45m | | | | RED BROWN SANDY CLAY ON AUGER TEETH |
| | | | | | | 1 | | | | | | | |
| | | | | | | 1.5 | | | | | | | |
| | | | | | | 2 | | | | | | | |
| | | | | | | 2.5 | | | | | | | |
| | | | | | | 3 | | | | | | | |
| | | | | | | 3.5 | | | | | | | |

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# BOREHOLE LOG

**Borehole No.** 2
1/1

**Client:** NORTHERN BEACHES COUNCIL
**Project:** PROPOSED FOOTPATH ROUTES
**Location:** PITTWATER ROAD, BAYVIEW, NSW

**Job No.** 31838SY **Method:** HAND AUGER **R.L. Surface:** N/A
**Date:** 20/9/18 **Datum:**
**Logged/Checked by:** J.B.J./W.T.

| Groundwater Record | SAMPLES ES | SAMPLES U50 | SAMPLES DB | SAMPLES DS | Field Tests | Depth (m) | Graphic Log | Unified Classification | DESCRIPTION | Moisture Condition/ Weathering | Strength/ Rel. Density | Hand Penetrometer Readings (kPa.) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ■ | REFER TO DCP TEST RESULTS | 0 | | | FILL: Sand, fine to medium grained, light brown, with medium to coarse grained sandstone gravel. | M | | | APPEARS POORLY COMPACTED |
| | | | | | | | | | FILL: Gravelly sand, fine to medium grained, grey, trace of medium grained igneous gravel, clay and glass fragments. | | | | |
| ▶ | | | | | | | | SM | | W | L | | MARINE |
| | | | | | | 0.5 | | | Silty SAND: fine to medium grained, grey, with roots and root fibres. | | | | |
| | | | | | | | | SP | SAND: fine to medium grained, grey. | | | | |
| | | | | ■ | | | | CH | Sandy CLAY: high plasticity, light grey. | w>PL | St | | |
| | | | | | | 1 | | | | | | | |
| | | | | | | 1.5 | | | END OF BOREHOLE AT 1.5m | | | | HAND AUGER REFUSAL ON INFERRED BEDROCK |
| | | | | | | 2 | | | | | | | |
| | | | | | | 2.5 | | | | | | | |
| | | | | | | 3 | | | | | | | |
| | | | | | | 3.5 | | | | | | | |

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# BOREHOLE LOG

**Borehole No.** 3
1/1

**Client:** NORTHERN BEACHES COUNCIL
**Project:** PROPOSED FOOTPATH ROUTES
**Location:** PITTWATER ROAD, BAYVIEW, NSW

**Job No.** 31838SY **Method:** HAND AUGER **R.L. Surface:** N/A
**Date:** 19/9/18 **Datum:**
**Logged/Checked by:** J.B.J./W.T.

| Groundwater Record | SAMPLES ES | SAMPLES U50 | SAMPLES DB | SAMPLES DS | Field Tests | Depth (m) | Graphic Log | Unified Classification | DESCRIPTION | Moisture Condition/ Weathering | Strength/ Rel. Density | Hand Penetrometer Readings (kPa.) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | REFER TO DCP TEST RESULTS | 0 | | | FILL: Sand, fine grained, light brown, with roots and shell fragments. | M | | | APPEARS POORLY COMPACTED |
| | | | | | | | | | FILL: Sandy clay, high plasticity, dark grey, with roots and root fibres, trace of shell fragments, igneous, ironstone and quartz gravel and glass. | w.PL | | | |
| ▶ | | | | | | 0.5 | | SM | Silty SAND: fine to medium grained, light grey, trace of roots and root fibres. | W | VL | | MARINE |
| | | | | | | | | | END OF BOREHOLE AT 0.75m | | | | WATER CAUSING COLLAPSE OF BOREHOLE |
| | | | | | | 1 | | | | | | | |
| | | | | | | 1.5 | | | | | | | |
| | | | | | | 2 | | | | | | | |
| | | | | | | 2.5 | | | | | | | |
| | | | | | | 3 | | | | | | | |
| | | | | | | 3.5 | | | | | | | |

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# BOREHOLE LOG

**Borehole No.** 4
1/1

**Client:** NORTHERN BEACHES COUNCIL
**Project:** PROPOSED FOOTPATH ROUTES
**Location:** PITTWATER ROAD, BAYVIEW, NSW

**Job No.** 31838SY **Method:** HAND AUGER **R.L. Surface:** N/A
**Date:** 19/9/18 **Datum:**
**Logged/Checked by:** J.B.J./W.T.

| Groundwater Record | SAMPLES ES | SAMPLES U50 | SAMPLES DB | SAMPLES DS | Field Tests | Depth (m) | Graphic Log | Unified Classification | DESCRIPTION | Moisture Condition/ Weathering | Strength/ Rel. Density | Hand Penetrometer Readings (kPa.) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ■ | REFER TO DCP TEST RESULTS | 0 | | | FILL: Sand, fine grained, light brown, with root fibres, sandstone gravel and shell fragments. | M | | | APPEARS POORLY COMPACTED |
| | | | | ■ | | | | | FILL: Silty sand, fine to medium grained, dark grey, with root fibres, trace of clay fines and sandstone gravel. | | | | APPEARS WELL COMPACTED |
| | | | | ■ | | 0.5 | | | FILL: Silty clayey sand, fine to medium grained, dark grey, with clay nodules, medium to coarse grained igneous and sandstone gravel, trace of roots and ash. | w>PL | | | |
| | | | | | | | | | FILL: Sandy clay, medium to high plasticity, dark grey, trace of sandstone gravel and root fibres. | | | | |
| | | | | | | 1 | | | END OF BOREHOLE AT 0.5m | | | | |
| | | | | | | 1.5 | | | | | | | |
| | | | | | | 2 | | | | | | | |
| | | | | | | 2.5 | | | | | | | |
| | | | | | | 3 | | | | | | | |
| | | | | | | 3.5 | | | | | | | |

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

# DYNAMIC CONE PENETRATION TEST RESULTS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Client: | NORTHERN BEACHES COUNCIL | | | | | | |
| Project: | PROPOSED FOOTPATH ROUTES | | | | | | |
| Location: | PITTWATER ROAD, BAYVIEW, NSW | | | | | | |
| Job No. | 31838SY | | | Hammer Weight & Drop: 9kg/510mm | | | |
| Date: | 20-9-18 | | | Rod Diameter: 16mm | | | |
| Tested By: | J.B.J. | | | Point Diameter: 20mm | | | |
| Test Location | **1** | **2** | **3** | Test Location | **1** | **2** | **3** |
| Surface RL | | | | Surface RL | | | |
| Depth (mm) | Blows per 100mm Penetration | | | Depth (mm) | Blows per 100mm Penetration | | |
| 0 - 100 | 2 | 3 | 1 | 3000-3100 | | | |
| 100 - 200 | 3 | 2 | 1 | 3100-3200 | | | |
| 200 - 300 | 3 | 2 | 3 | 3200-3300 | | | |
| 300 - 400 | 3 | 1 | 1 | 3300-3400 | | | |
| 400 - 500 | 6 | 1 | 2 | 3400-3500 | | | |
| 500 - 600 | 1 | 2 | 3 | 3500-3600 | | | |
| 600 - 700 | 6 | 12 | 1 | 3600-3700 | | | |
| 700 - 800 | REFUSAL | 3 | 1 | 3700-3800 | | | |
| 800 - 900 | | 2 | 1 | 3800-3900 | | | |
| 900 - 1000 | | 3 | 2 | 3900-4000 | | | |
| 1000 - 1100 | | 6 | 15 | 4000-4100 | | | |
| 1100 - 1200 | | 7 | END | 4100-4200 | | | |
| 1200 - 1300 | | 11 | | 4200-4300 | | | |
| 1300 - 1400 | | 10 | | 4300-4400 | | | |
| 1400 - 1500 | | REFUSAL | | 4400-4500 | | | |
| 1500 - 1600 | | | | 4500-4600 | | | |
| 1600 - 1700 | | | | 4600-4700 | | | |
| 1700 - 1800 | | | | 4700-4800 | | | |
| 1800 - 1900 | | | | 4800-4900 | | | |
| 1900 - 2000 | | | | 4900-5000 | | | |
| 2000 - 2100 | | | | 5000-5100 | | | |
| 2100 - 2200 | | | | 5100-5200 | | | |
| 2200 - 2300 | | | | 5200-5300 | | | |
| 2300 - 2400 | | | | 5300-5400 | | | |
| 2400 - 2500 | | | | 5400-5500 | | | |
| 2500 - 2600 | | | | 5500-5600 | | | |
| 2600 - 2700 | | | | 5600-5700 | | | |
| 2700 - 2800 | | | | 5700-5800 | | | |
| 2800 - 2900 | | | | 5800-5900 | | | |
| 2900 - 3000 | | | | 5900-6000 | | | |

Remarks:
1. The procedure used for this test is described in AS1289.6.3.2-1997 (R2013)
2. Usually 8 blows per 20mm is taken as refusal
3. Datum of levels is AHD

# JK Geotechnics

GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

# DYNAMIC CONE PENETRATION TEST RESULTS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Client: | NORTHERN BEACHES COUNCIL | | | | | | |
| Project: | PROPOSED FOOTPATH ROUTES | | | | | | |
| Location: | PITTWATER ROAD, BAYVIEW, NSW | | | | | | |
| Job No. | 31838SY | | | Hammer Weight & Drop: 9kg/510mm | | | |
| Date: | 20-9-18 | | | Rod Diameter: 16mm | | | |
| Tested By: | J.B.J. | | | Point Diameter: 20mm | | | |
| Test Location | **4** | **5** | **6** | Test Location | **4** | **5** | **6** |
| Surface RL | | | | Surface RL | | | |
| Depth (mm) | Blows per 100mm Penetration | | | Depth (mm) | Blows per 100mm Penetration | | |
| 0 - 100 | 1 | 1 | 2 | 3000-3100 | | | |
| 100 - 200 | 1 | 2 | 2 | 3100-3200 | | | |
| 200 - 300 | 2 | 4 | 1 | 3200-3300 | | | |
| 300 - 400 | 7 | 6 | 4 | 3300-3400 | | | |
| 400 - 500 | 7 | 2 | 8 | 3400-3500 | | | |
| 500 - 600 | 11 | 16/90mm | 8 | 3500-3600 | | | |
| 600 - 700 | 14/80mm | REFUSAL | 9 | 3600-3700 | | | |
| 700 - 800 | REFUSAL | | 10 | 3700-3800 | | | |
| 800 - 900 | | | 10/20mm | 3800-3900 | | | |
| 900 - 1000 | | | REFUSAL | 3900-4000 | | | |
| 1000 - 1100 | | | | 4000-4100 | | | |
| 1100 - 1200 | | | | 4100-4200 | | | |
| 1200 - 1300 | | | | 4200-4300 | | | |
| 1300 - 1400 | | | | 4300-4400 | | | |
| 1400 - 1500 | | | | 4400-4500 | | | |
| 1500 - 1600 | | | | 4500-4600 | | | |
| 1600 - 1700 | | | | 4600-4700 | | | |
| 1700 - 1800 | | | | 4700-4800 | | | |
| 1800 - 1900 | | | | 4800-4900 | | | |
| 1900 - 2000 | | | | 4900-5000 | | | |
| 2000 - 2100 | | | | 5000-5100 | | | |
| 2100 - 2200 | | | | 5100-5200 | | | |
| 2200 - 2300 | | | | 5200-5300 | | | |
| 2300 - 2400 | | | | 5300-5400 | | | |
| 2400 - 2500 | | | | 5400-5500 | | | |
| 2500 - 2600 | | | | 5500-5600 | | | |
| 2600 - 2700 | | | | 5600-5700 | | | |
| 2700 - 2800 | | | | 5700-5800 | | | |
| 2800 - 2900 | | | | 5800-5900 | | | |
| 2900 - 3000 | | | | 5900-6000 | | | |

Remarks:
1. The procedure used for this test is described in AS1289.6.3.2-1997 (R2013)
2. Usually 8 blows per 20mm is taken as refusal
3. Datum of levels is AHD

# JK Geotechnics

GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

# DYNAMIC CONE PENETRATION TEST RESULTS

| | | | |
|---|---|---|---|
| Client: | NORTHERN BEACHES COUNCIL | | |
| Project: | PROPOSED FOOTPATH ROUTES | | |
| Location: | PITTWATER ROAD, BAYVIEW, NSW | | |
| Job No. | 31838SY | Hammer Weight & Drop: | 9kg/510mm |
| Date: | 20-9-18 | Rod Diameter: | 16mm |
| Tested By: | J.B.J. | Point Diameter: | 20mm |

| Test Location | 7 | 8 | 9 | Test Location | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|
| Surface RL | | | | Surface RL | | | |
| Depth (mm) | Blows per 100mm Penetration | | | Depth (mm) | Blows per 100mm Penetration | | |
| 0 - 100 | 6 | SUNK | | 3000-3100 | | 1 | SUNK |
| 100 - 200 | 8 | | | 3100-3200 | | 2 | |
| 200 - 300 | 8 | | | 3200-3300 | | 2 | |
| 300 - 400 | 7 | 4 | | 3300-3400 | | 1 | |
| 400 - 500 | 7 | 3 | | 3400-3500 | | 1 | |
| 500 - 600 | 1 | 1 | | 3500-3600 | | 1 | |
| 600 - 700 | | 3 | | 3600-3700 | | 1 | |
| 700 - 800 | | 1 | | 3700-3800 | | 1 | |
| 800 - 900 | | 1 | | 3800-3900 | | 1 | |
| 900 - 1000 | 3 | 3 | | 3900-4000 | | 3 | |
| 1000 - 1100 | 6 | 1 | | 4000-4100 | | 4 | |
| 1100 - 1200 | 6 | | | 4100-4200 | | 4 | |
| 1200 - 1300 | 5 | 2 | | 4200-4300 | | 4 | |
| 1300 - 1400 | 4 | 1 | | 4300-4400 | | 5 | |
| 1400 - 1500 | 4 | | | 4400-4500 | | 6 | |
| 1500 - 1600 | 5 | 1 | | 4500-4600 | | 6 | |
| 1600 - 1700 | 4 | 1 | | 4600-4700 | | 6 | 2 |
| 1700 - 1800 | 4 | | | 4700-4800 | | 6 | 4/90mm |
| 1800 - 1900 | 4 | | | 4800-4900 | | 6 | REFUSAL |
| 1900 - 2000 | 3 | 1 | | 4900-5000 | | 6 | |
| 2000 - 2100 | 5 | 1 | | 5000-5100 | | END | |
| 2100 - 2200 | 5 | 1 | | 5100-5200 | | | |
| 2200 - 2300 | 6 | | | 5200-5300 | | | |
| 2300 - 2400 | 10 | 1 | | 5300-5400 | | | |
| 2400 - 2500 | 10 | | | 5400-5500 | | | |
| 2500 - 2600 | END | 1 | | 5500-5600 | | | |
| 2600 - 2700 | | | | 5600-5700 | | | |
| 2700 - 2800 | | 1 | | 5700-5800 | | | |
| 2800 - 2900 | | | | 5800-5900 | | | |
| 2900 - 3000 | | | | 5900-6000 | | | |

Remarks:
1. The procedure used for this test is described in AS1289.6.3.2-1997 (R2013)
2. Usually 8 blows per 20mm is taken as refusal
3. Datum of levels is AHD

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| Client: | NORTHERN BEACHES COUNCIL | | | | | | |
| Project: | PROPOSED FOOTPATH ROUTES | | | | | | |
| Location: | PITTWATER ROAD, BAYVIEW, NSW | | | | | | |
| Job No. | 31838SY | | | Hammer Weight & Drop: 9kg/510mm | | | |
| Date: | 20-9-18 | | | Rod Diameter: 16mm | | | |
| Tested By: | J.B.J. | | | Point Diameter: 20mm | | | |
| Test Location | **10** | **11** | **12** | Test Location | **10** | **11** | **12** |
| Surface RL | | | | Surface RL | | | |
| Depth (mm) | Blows per 100mm Penetration | | | Depth (mm) | Blows per 100mm Penetration | | |
| 0 - 100 | SUNK | 3 | SUNK | 3000-3100 | | | |
| 100 - 200 | ↓ | 3 | 2 | 3100-3200 | | | |
| 200 - 300 | ↓ | 3 | 3 | 3200-3300 | | | |
| 300 - 400 | 1 | 3 | 3 | 3300-3400 | | | |
| 400 - 500 | 1 | 12 | 4 | 3400-3500 | | | |
| 500 - 600 | 2 | 15/90mm | 5 | 3500-3600 | | | |
| 600 - 700 | 1 | REFUSAL | 5 | 3600-3700 | | | |
| 700 - 800 | 10 | | 6 | 3700-3800 | | | |
| 800 - 900 | ↓ | | 4 | 3800-3900 | | | |
| 900 - 1000 | ↓ | | 6 | 3900-4000 | | | |
| 1000 - 1100 | ↓ | | 7 | 4000-4100 | | | |
| 1100 - 1200 | 5 | | 6 | 4100-4200 | | | |
| 1200 - 1300 | 6 | | 6 | 4200-4300 | | | |
| 1300 - 1400 | 10 | | 7 | 4300-4400 | | | |
| 1400 - 1500 | 6 | | 8 | 4400-4500 | | | |
| 1500 - 1600 | REFUSAL | | 12 | 4500-4600 | | | |
| 1600 - 1700 | | | 14 | 4600-4700 | | | |
| 1700 - 1800 | | | 10/20mm | 4700-4800 | | | |
| 1800 - 1900 | | | REFUSAL | 4800-4900 | | | |
| 1900 - 2000 | | | | 4900-5000 | | | |
| 2000 - 2100 | | | | 5000-5100 | | | |
| 2100 - 2200 | | | | 5100-5200 | | | |
| 2200 - 2300 | | | | 5200-5300 | | | |
| 2300 - 2400 | | | | 5300-5400 | | | |
| 2400 - 2500 | | | | 5400-5500 | | | |
| 2500 - 2600 | | | | 5500-5600 | | | |
| 2600 - 2700 | | | | 5600-5700 | | | |
| 2700 - 2800 | | | | 5700-5800 | | | |
| 2800 - 2900 | | | | 5800-5900 | | | |
| 2900 - 3000 | | | | 5900-6000 | | | |

Remarks:
1. The procedure used for this test is described in AS1289.6.3.2-1997 (R2013)
2. Usually 8 blows per 20mm is taken as refusal
3. Datum of levels is AHD

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| Date: | 20-9-18 | Rod Diameter: | 16mm |
| Tested By: | J.B.J. | Point Diameter: | 20mm |

| Test Location | 13 | 14 | | Test Location | 13 | 14 | |
|---|---|---|---|---|---|---|---|
| Surface RL | | | | Surface RL | | | |
| Depth (mm) | Blows per 100mm Penetration | | | Depth (mm) | Blows per 100mm Penetration | | |
| 0 - 100 | 3 | | | 3000-3100 | | | |
| 100 - 200 | 4 | | | 3100-3200 | | | |
| 200 - 300 | 3/10mm | 4 | | 3200-3300 | | | |
| 300 - 400 | REFUSAL | | | 3300-3400 | | | |
| 400 - 500 | | | | 3400-3500 | | | |
| 500 - 600 | | 2 | | 3500-3600 | | | |
| 600 - 700 | | 2 | | 3600-3700 | | | |
| 700 - 800 | | 1 | | 3700-3800 | | | |
| 800 - 900 | | | | 3800-3900 | | | |
| 900 - 1000 | | 1 | | 3900-4000 | | | |
| 1000 - 1100 | | | | 4000-4100 | | | |
| 1100 - 1200 | | 3 | | 4100-4200 | | | |
| 1200 - 1300 | | 2 | | 4200-4300 | | | |
| 1300 - 1400 | | 4 | | 4300-4400 | | | |
| 1400 - 1500 | | 4 | | 4400-4500 | | | |
| 1500 - 1600 | | 6 | | 4500-4600 | | | |
| 1600 - 1700 | | 9 | | 4600-4700 | | | |
| 1700 - 1800 | | 4 | | 4700-4800 | | | |
| 1800 - 1900 | | 8 | | 4800-4900 | | | |
| 1900 - 2000 | | 15 | | 4900-5000 | | | |
| 2000 - 2100 | | 12 | | 5000-5100 | | | |
| 2100 - 2200 | | 10/10mm | | 5100-5200 | | | |
| 2200 - 2300 | | REFUSAL | | 5200-5300 | | | |
| 2300 - 2400 | | | | 5300-5400 | | | |
| 2400 - 2500 | | | | 5400-5500 | | | |
| 2500 - 2600 | | | | 5500-5600 | | | |
| 2600 - 2700 | | | | 5600-5700 | | | |
| 2700 - 2800 | | | | 5700-5800 | | | |
| 2800 - 2900 | | | | 5800-5900 | | | |
| 2900 - 3000 | | | | 5900-6000 | | | |

Remarks:
1. The procedure used for this test is described in AS1289.6.3.2-1997 (R2013)
2. Usually 8 blows per 20mm is taken as refusal
3. Datum of levels is AHD


AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
AERIAL IMAGE ©: 2015 GOOGLE INC.

This plan should be read in conjunction with the JK Geotechnics report.

Title: **SITE LOCATION PLAN**

Location: PITTWATER ROAD
BAYVIEW, NSW

Report No: 31838SY

Figure No: 1

JK **Geotechnics**

PLOT DATE: 22/11/2018 4:44:01 PM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\31000'S\31838 BAYVIEW\CAD\31838.DWG


AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM, 14 SEP 2018.

LEGEND

- BOREHOLE AND DCP TEST
- DCP TEST

0 10 20 30 40 50
SCALE 1:1000 @A3 METRES

This plan should be read in conjunction with the JK Geotechnics report.

Title: **TEST LOCATION PLAN**

Location: PITTWATER ROAD
BAYVIEW, NSW

Report No: 31838SY

Figure No: 2

J K **Geotechnics**

PLOT DATE: 23/11/2018 5:05:57 PM DWG FILE: S:\6 GEOTECHNICAL\6F GEOTECHNICAL JOBS\31000'S\31838 BAYVIEW\CAD\31838.DWG

# REPORT EXPLANATION NOTES

## INTRODUCTION

These notes have been provided to amplify the geotechnical report in regard to classification methods, field procedures and certain matters relating to the Comments and Recommendations section. Not all notes are necessarily relevant to all reports.

The ground is a product of continuing natural and man-made processes and therefore exhibits a variety of characteristics and properties which vary from place to place and can change with time. Geotechnical engineering involves gathering and assimilating limited facts about these characteristics and properties in order to understand or predict the behaviour of the ground on a particular site under certain conditions. This report may contain such facts obtained by inspection, excavation, probing, sampling, testing or other means of investigation. If so, they are directly relevant only to the ground at the place where and time when the investigation was carried out.

## DESCRIPTION AND CLASSIFICATION METHODS

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726:2017 *'Geotechnical Site Investigations'*. In general, descriptions cover the following properties – soil or rock type, colour, structure, strength or density, and inclusions. Identification and classification of soil and rock involves judgement and the Company infers accuracy only to the extent that is common in current geotechnical practice.

Soil types are described according to the predominating particle size and behaviour as set out in the attached soil classification table qualified by the grading of other particles present (eg. sandy clay) as set out below:

| Soil Classification | Particle Size |
|---|---|
| Clay | < 0.002mm |
| Silt | 0.002 to 0.075mm |
| Sand | 0.075 to 2.36mm |
| Gravel | 2.36 to 63mm |
| Cobbles | 63 to 200mm |
| Boulders | > 200mm |

Non-cohesive soils are classified on the basis of relative density, generally from the results of Standard Penetration Test (SPT) as below:

| Relative Density | SPT 'N' Value (blows/300mm) |
|---|---|
| Very loose (VL) | < 4 |
| Loose (L) | 4 to 10 |
| Medium dense (MD) | 10 to 30 |
| Dense (D) | 30 to 50 |
| Very Dense (VD) | > 50 |

Cohesive soils are classified on the basis of strength (consistency) either by use of a hand penetrometer, vane shear, laboratory testing and/or tactile engineering examination. The strength terms are defined as follows.

| Classification | Unconfined Compressive Strength (kPa) | Indicative Undrained Shear Strength (kPa) |
|---|---|---|
| Very Soft (VS) | ≤ 25 | ≤ 12 |
| Soft (S) | > 25 and ≤ 50 | > 12 and ≤ 25 |
| Firm (F) | > 50 and ≤ 100 | > 25 and ≤ 50 |
| Stiff (St) | > 100 and ≤ 200 | > 50 and ≤ 100 |
| Very Stiff (VSt) | > 200 and ≤ 400 | > 100 and ≤ 200 |
| Hard (Hd) | > 400 | > 200 |
| Friable (Fr) | Strength not attainable – soil crumbles | |

Rock types are classified by their geological names, together with descriptive terms regarding weathering, strength, defects, etc. Where relevant, further information regarding rock classification is given in the text of the report. In the Sydney Basin, 'shale' is used to describe fissile mudstone, with a weakness parallel to bedding. Rocks with alternating inter-laminations of different grain size (eg. siltstone/claystone and siltstone/fine grained sandstone) is referred to as 'laminite'.

## SAMPLING

Sampling is carried out during drilling or from other excavations to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on plasticity, grain size, colour, moisture content, minor constituents and, depending upon the degree of disturbance, some information on strength and structure. Bulk samples are similar but of greater volume required for some test procedures.

Undisturbed samples are taken by pushing a thin-walled sample tube, usually 50mm diameter (known as a U50), into the soil and withdrawing it with a sample of the soil contained in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shrink-swell behaviour, strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling used are given on the attached logs.

## INVESTIGATION METHODS

The following is a brief summary of investigation methods currently adopted by the Company and some comments on their use and application. All methods except test pits, hand auger drilling and portable Dynamic Cone Penetrometers require the use of a mechanical rig which is commonly mounted on a truck chassis or track base.

**Test Pits:** These are normally excavated with a backhoe or a tracked excavator, allowing close examination of the insitu soils and 'weaker' bedrock if it is safe to descend into the pit. The depth of penetration is limited to about 3m for a backhoe and up to 6m for a large excavator. Limitations of test pits are the problems associated with disturbance and difficulty of reinstatement and the consequent effects on close-by structures. Care must be taken if construction is to be carried out near test pit locations to either properly recompact the backfill during construction or to design and construct the structure so as not to be adversely affected by poorly compacted backfill at the test pit location.

**Hand Auger Drilling:** A borehole of 50mm to 100mm diameter is advanced by manually operated equipment. Refusal of the hand auger can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

**Continuous Spiral Flight Augers:** The borehole is advanced using 75mm to 115mm diameter continuous spiral flight augers, which are withdrawn at intervals to allow sampling and insitu testing. This is a relatively economical means of drilling in clays and in sands above the water table. Samples are returned to the surface by the flights or may be collected after withdrawal of the auger flights, but they can be very disturbed and layers may become mixed. Information from the auger sampling (as distinct from specific sampling by SPTs or undisturbed samples) is of limited reliability due to mixing or softening of samples by groundwater, or uncertainties as to the original depth of the samples. Augering below the groundwater table is of even lesser reliability than augering above the water table.

**Rock Augering:** Use can be made of a Tungsten Carbide (TC) bit for auger drilling into rock to indicate rock quality and continuity by variation in drilling resistance and from examination of recovered rock cuttings. This method of investigation is quick and relatively inexpensive but provides only an indication of the likely rock strength and predicted values may be in error by a strength order. Where rock strengths may have a significant impact on construction feasibility or costs, then further investigation by means of cored boreholes may be warranted.

**Wash Boring:** The borehole is usually advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be assessed from the cuttings, together with some information from "feel" and rate of penetration.

**Mud Stabilised Drilling:** Either Wash Boring or Continuous Core Drilling can use drilling mud as a circulating fluid to stabilise the borehole. The term 'mud' encompasses a range of products ranging from bentonite to polymers. The mud tends to mask the cuttings and reliable identification is only possible from intermittent intact sampling (eg. from SPT and U50 samples) or from rock coring, etc.

**Continuous Core Drilling:** A continuous core sample is obtained using a diamond tipped core barrel. Provided full core recovery is achieved (which is not always possible in very low strength rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation. In rocks, NMLC or HQ triple tube core barrels, which give a core of about 50mm and 61mm diameter, respectively, is usually used with water flush. The length of core recovered is compared to the length drilled and any length not recovered is shown as NO CORE. The location of NO CORE recovery is determined on site by the supervising engineer; where the location is uncertain, the loss is placed at the bottom of the drill run.

**Standard Penetration Tests:** Standard Penetration Tests (SPT) are used mainly in non-cohesive soils, but can also be used in cohesive soils, as a means of indicating density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289.6.3.1–2004 (R2016) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – Standard Penetration Test (SPT)'*.

The test is carried out in a borehole by driving a 50mm diameter split sample tube with a tapered shoe, under the impact of a 63.5kg hammer with a free fall of 760mm. It is normal for the tube to be driven in three successive 150mm increments and the 'N' value is taken as the number of blows for the last 300mm. In dense sands, very hard clays or weak rock, the full 450mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form:

- In the case where full penetration is obtained with successive blow counts for each 150mm of, say, 4, 6 and 7 blows, as

  N = 13
  4, 6, 7

- In a case where the test is discontinued short of full penetration, say after 15 blows for the first 150mm and 30 blows for the next 40mm, as

  N > 30
  15, 30/40mm

The results of the test can be related empirically to the engineering properties of the soil.

A modification to the SPT is where the same driving system is used with a solid 60° tipped steel cone of the same diameter as the SPT hollow sampler. The solid cone can be continuously driven for some distance in soft clays or loose sands, or may be used where damage would otherwise occur to the SPT. The results of this Solid Cone Penetration Test (SCPT) are shown as '$N_c$' on the borehole logs, together with the number of blows per 150mm penetration.

**Cone Penetrometer Testing (CPT) and Interpretation:** The cone penetrometer is sometimes referred to as a Dutch Cone. The test is described in Australian Standard 1289.6.5.1–1999 (R2013) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Static Cone Penetration Resistance of a Soil – Field Test using a Mechanical and Electrical Cone or Friction-Cone Penetrometer'*.

In the tests, a 35mm or 44mm diameter rod with a conical tip is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with a hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the frictional resistance on a separate 134mm or 165mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are electrically connected by wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck. The CPT does not provide soil sample recovery.

As penetration occurs (at a rate of approximately 20mm per second), the information is output as incremental digital records every 10mm. The results given in this report have been plotted from the digital data.

The information provided on the charts comprise:

- Cone resistance – the actual end bearing force divided by the cross sectional area of the cone – expressed in MPa. There are two scales presented for the cone resistance. The lower scale has a range of 0 to 5MPa and the main scale has a range of 0 to 50MPa. For cone resistance values less than 5MPa, the plot will appear on both scales.
- Sleeve friction – the frictional force on the sleeve divided by the surface area – expressed in kPa.
- Friction ratio – the ratio of sleeve friction to cone resistance, expressed as a percentage.

  The ratios of the sleeve resistance to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1% to 2% are commonly encountered in sands and occasionally very soft clays, rising to 4% to 10% in stiff clays and peats. Soil descriptions based on cone resistance and friction ratios are only inferred and must not be considered as exact.

Correlations between CPT and SPT values can be developed for both sands and clays but may be site specific.

Interpretation of CPT values can be made to empirically derive modulus or compressibility values to allow calculation of foundation settlements.

Stratification can be inferred from the cone and friction traces and from experience and information from nearby boreholes etc. Where shown, this information is presented for general guidance, but must be regarded as interpretive. The test method provides a continuous profile of engineering properties but, where precise information on soil classification is required, direct drilling and sampling may be preferable.

There are limitations when using the CPT in that it may not penetrate obstructions within any fill, thick layers of hard clay and very dense sand, gravel and weathered bedrock. Normally a 'dummy' cone is pushed through fill to protect the equipment. No information is recorded by the 'dummy' probe.

**Flat Dilatometer Test:** The flat dilatometer (DMT), also known as the Marchetti Dilometer comprises a stainless steel blade having a flat, circular steel membrane mounted flush on one side.

The blade is connected to a control unit at ground surface by a pneumatic-electrical tube running through the insertion rods. A gas tank, connected to the control unit by a pneumatic cable, supplies the gas pressure required to expand the membrane. The control unit is equipped with a pressure regulator, pressure gauges, an audio-visual signal and vent valves.

The blade is advanced into the ground using our CPT rig or one of our drilling rigs, and can be driven into the ground using an SPT hammer. As soon as the blade is in place, the membrane is inflated, and the pressure required to lift the membrane (approximately 0.1mm) is recorded. The pressure then required to lift the centre of the membrane by an additional 1mm is recorded. The membrane is then deflated before pushing to the next depth increment, usually 200mm down. The pressure readings are corrected for membrane stiffness.

The DMT is used to measure material index ($I_D$), horizontal stress index ($K_D$), and dilatometer modulus ($E_D$). Using established correlations, the DMT results can also be used to assess the 'at rest' earth pressure coefficient ($K_o$), over-consolidation ratio (OCR), undrained shear strength ($C_u$), friction angle ($\phi$), coefficient of consolidation ($C_h$), coefficient of permeability ($K_h$), unit weight ($\gamma$), and vertical drained constrained modulus (M).

The seismic dilatometer (SDMT) is the combination of the DMT with an add-on seismic module for the measurement of shear wave velocity ($V_s$). Using established correlations, the SDMT results can also be used to assess the small strain modulus ($G_o$).

**Portable Dynamic Cone Penetrometers:** Portable Dynamic Cone Penetrometer (DCP) tests are carried out by driving a 16mm diameter rod with a 20mm diameter cone end with a 9kg hammer dropping 510mm. The test is described in Australian Standard 1289.6.3.2–1997 (R2013) *'Methods of Testing Soils for Engineering Purposes, Soil Strength and Consolidation Tests – Determination of the Penetration Resistance of a Soil – 9kg Dynamic Cone Penetrometer Test'*.

The results are used to assess the relative compaction of fill, the relative density of granular soils, and the strength of cohesive soils. Using established correlations, the DCP test results can also be used to assess California Bearing Ratio (CBR).

Refusal of the DCP can occur on a variety of materials such as obstructions within any fill, tree roots, hard clay, gravel or ironstone, cobbles and boulders, and does not necessarily indicate rock level.

**Vane Shear Test:** The vane shear test is used to measure the undrained shear strength ($C_u$) of typically very soft to firm fine grained cohesive soils. The vane shear is normally performed in the bottom of a borehole, but can be completed from surface level, the bottom and sides of test pits, and on recovered undisturbed tube samples (when using a hand vane).

The vane comprises four rectangular blades arranged in the form of a cross on the end of a thin rod, which is coupled to the bottom of a drill rod string when used in a borehole. The size of the vane is dependent on the strength of the fine grained cohesive soils; that is, larger vanes are normally used for very low strength soils. For borehole testing, the size of the vane can be limited by the size of the casing that is used.

For testing inside a borehole, a device is used at the top of the casing, which suspends the vane and rods so that they do not sink under self-weight into the 'soft' soils beyond the depth at which the test is to be carried out. A calibrated torque head is used to rotate the rods and vane and to measure the resistance of the vane to rotation.

With the vane in position, torque is applied to cause rotation of the vane at a constant rate. A rate of 6° per minute is the common rotation rate. Rotation is continued until the soil is sheared and the maximum torque has been recorded. This value is then used to calculate the undrained shear strength. The vane is then rotated rapidly a number of times and the operation repeated until a constant torque reading is obtained. This torque value is used to calculate the remoulded shear strength. Where appropriate, friction on the vane rods is measured and taken into account in the shear strength calculation.

## LOGS

The borehole or test pit logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on the frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will enable the most reliable assessment, but is not always practicable or possible to justify on economic grounds. In any case, the boreholes or test pits represent only a very small sample of the total subsurface conditions.

The terms and symbols used in preparation of the logs are defined in the following pages.

Interpretation of the information shown on the logs, and its application to design and construction, should therefore take into account the spacing of boreholes or test pits, the method of drilling or excavation, the frequency of sampling and testing and the possibility of other than 'straight line' variations between the boreholes or test pits. Subsurface conditions between boreholes or test pits may vary significantly from conditions encountered at the borehole or test pit locations.

## GROUNDWATER

Where groundwater levels are measured in boreholes, there are several potential problems:

- Although groundwater may be present, in low permeability soils it may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes and may not be the same at the time of construction.
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must be washed out of the hole or 'reverted' chemically if reliable water observations are to be made.

More reliable measurements can be made by installing standpipes which are read after the groundwater level has stabilised at intervals ranging from several days to perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from perched water tables or surface water.

## FILL

The presence of fill materials can often be determined only by the inclusion of foreign objects (eg. bricks, steel, etc) or by distinctly unusual colour, texture or fabric. Identification of the extent of fill materials will also depend on investigation methods and frequency. Where natural soils similar to those at the site are used for fill, it may be difficult with limited testing and sampling to reliably assess the extent of the fill.

The presence of fill materials is usually regarded with caution as the possible variation in density, strength and material type is much greater than with natural soil deposits. Consequently, there is an increased risk of adverse engineering characteristics or behaviour. If the volume and quality of fill is of importance to a project, then frequent test pit excavations are preferable to boreholes.

## LABORATORY TESTING

Laboratory testing is normally carried out in accordance with Australian Standard 1289 *'Methods of Testing Soils for Engineering Purposes'* or appropriate NSW Government Roads & Maritime Services (RMS) test methods. Details of the test procedure used are given on the individual report forms.

## ENGINEERING REPORTS

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building) the information and interpretation may not be relevant if the design proposal is changed (eg. to a twenty storey building). If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

Reasonable care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions – the potential for this will be partially dependent on borehole spacing and sampling frequency as well as investigation technique.
- Changes in policy or interpretation of policy by statutory authorities.
- The actions of persons or contractors responding to commercial pressures.
- Details of the development that the Company could not reasonably be expected to anticipate.

If these occur, the Company will be pleased to assist with investigation or advice to resolve any problems occurring.

**SITE ANOMALIES**

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

**REPRODUCTION OF INFORMATION FOR CONTRACTUAL PURPOSES**

Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.



**REVIEW OF DESIGN**

Where major civil or structural developments are proposed or where only a limited investigation has been completed or where the geotechnical conditions/constraints are quite complex, it is prudent to have a joint design review which involves an experienced geotechnical engineer/engineering geologist.

**SITE INSPECTION**

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related.

Requirements could range from:

i) a site visit to confirm that conditions exposed are no worse than those interpreted, to

ii) a visit to assist the contractor or other site personnel in identifying various soil/rock types and appropriate footing or pile founding depths, or

iii) full time engineering presence on site.

# SYMBOL LEGENDS

## SOIL


FILL


TOPSOIL


CLAY (CL, CI, CH)


SILT (ML, MH)


SAND (SP, SW)


GRAVEL (GP, GW)


SANDY CLAY (CL, CI, CH)


SILTY CLAY (CL, CI, CH)


CLAYEY SAND (SC)


SILTY SAND (SM)


GRAVELLY CLAY (CL, CI, CH)


CLAYEY GRAVEL (GC)


SANDY SILT (ML, MH)


PEAT AND HIGHLY ORGANIC SOILS (Pt)

## ROCK


CONGLOMERATE


SANDSTONE


SHALE/MUDSTONE


SILTSTONE


CLAYSTONE


COAL


LAMINITE


LIMESTONE


PHYLLITE, SCHIST


TUFF


GRANITE, GABBRO


DOLERITE, DIORITE


BASALT, ANDESITE


QUARTZITE

## OTHER MATERIALS


BRICKS OR PAVERS


CONCRETE


ASPHALTIC CONCRETE

# CLASSIFICATION OF COARSE AND FINE GRAINED SOILS

| Major Divisions | | Group Symbol | Typical Names | Field Classification of Sand and Gravel | Laboratory Classification | |
|---|---|---|---|---|---|---|
| Coarse grained soil (more than 65% of soil excluding oversize fraction is greater than 0.075mm) | GRAVEL (more than half of coarse fraction is larger than 2.36mm | GW | Gravel and gravel-sand mixtures, little or no fines | Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength | ≤ 5% fines | $C_u > 4$<br>$1 < C_c < 3$ |
| | | GP | Gravel and gravel-sand mixtures, little or no fines, uniform gravels | Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength | ≤ 5% fines | Fails to comply with above |
| | | GM | Gravel-silt mixtures and gravel-sand-silt mixtures | 'Dirty' materials with excess of non-plastic fines, zero to medium dry strength | ≥ 12% fines, fines are silty | Fines behave as silt |
| | | GC | Gravel-clay mixtures and gravel-sand-clay mixtures | 'Dirty' materials with excess of plastic fines, medium to high dry strength | ≥ 12% fines, fines are clayey | Fines behave as clay |
| | SAND (more than half of coarse fraction is smaller than 2.36mm) | SW | Sand and gravel-sand mixtures, little or no fines | Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength | ≤ 5% fines | $C_u > 6$<br>$1 < C_c < 3$ |
| | | SP | Sand and gravel-sand mixtures, little or no fines | Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength | ≤ 5% fines | Fails to comply with above |
| | | SM | Sand-silt mixtures | 'Dirty' materials with excess of non-plastic fines, zero to medium dry strength | ≥ 12% fines, fines are silty | N/A |
| | | SC | Sand-clay mixtures | 'Dirty' materials with excess of plastic fines, medium to high dry strength | ≥ 12% fines, fines are clayey | |

| Major Divisions | | Group Symbol | Typical Names | Field Classification of Silt and Clay | | | Laboratory Classification |
|---|---|---|---|---|---|---|---|
| | | | | Dry Strength | Dilatancy | Toughness | % < 0.075mm |
| ine grained soils (more than 35% of soil excluding oversize fraction is less than 0.075mm) | SILT and CLAY (low to medium plasticity) | ML | Inorganic silt and very fine sand, rock flour, silty or clayey fine sand or silt with low plasticity | None to low | Slow to rapid | Low | Below A line |
| | | CL, CI | Inorganic clay of low to medium plasticity, gravelly clay, sandy clay | Medium to high | None to slow | Medium | Above A line |
| | | OL | Organic silt | Low to medium | Slow | Low | Below A line |
| | SILT and CLAY (high plasticity) | MH | Inorganic silt | Low to medium | None to slow | Low to medium | Below A line |
| | | CH | Inorganic clay of high plasticity | High to very high | None | High | Above A line |
| | | OH | Organic clay of medium to high plasticity, organic silt | Medium to high | None to very slow | Low to medium | Below A line |
| | Highly organic soil | Pt | Peat, highly organic soil | – | – | – | – |

### Laboratory Classification Criteria

A well graded coarse grained soil is one for which the coefficient of uniformity $Cu > 4$ and the coefficient of curvature $1 < C_c < 3$. Otherwise, the soil is poorly graded. These coefficients are given by:

$$C_u = \frac{D_{60}}{D_{10}} \quad \text{and} \quad C_c = \frac{(D_{30})^2}{D_{10}\ D_{60}}$$

Where $D_{10}$, $D_{30}$ and $D_{60}$ are those grain sizes for which 10%, 30% and 60% of the soil grains, respectively, are smaller.

NOTES:

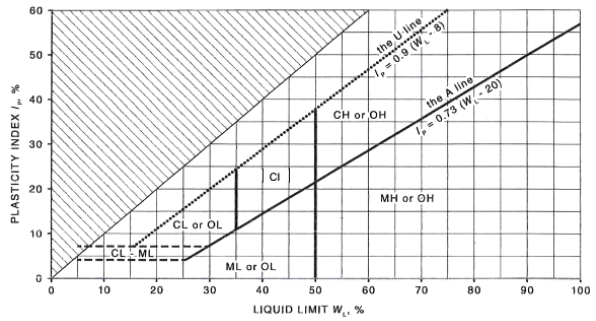
1 For a coarse grained soil with a fines content between 5% and 12%, the soil is given a dual classification comprising the two group symbols separated by a dash; for example, for a poorly graded gravel with between 5% and 12% silt fines, the classification is GP-GM.

2 Where the grading is determined from laboratory tests, it is defined by coefficients of curvature ($C_c$) and uniformity ($C_u$) derived from the particle size distribution curve.

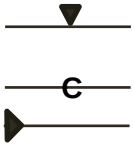
3 Clay soils with liquid limits > 35% and ≤ 50% may be classified as being of medium plasticity.

4 The U line on the Modified Casagrande Chart is an approximate upper bound for most natural soils.

### Modified Casagrande Chart for Classifying Silts and Clays according to their Behaviour



# LOG SYMBOLS

| Log Column | Symbol | Definition |
|---|---|---|
| Groundwater Record |  | Standing water level. Time delay following completion of drilling/excavation may be shown.<br>Extent of borehole/test pit collapse shortly after drilling/excavation.<br>Groundwater seepage into borehole or test pit noted during drilling or excavation. |
| Samples | ES<br>U50<br>DB<br>DS<br>ASB<br>ASS<br>SAL | Sample taken over depth indicated, for environmental analysis.<br>Undisturbed 50mm diameter tube sample taken over depth indicated.<br>Bulk disturbed sample taken over depth indicated.<br>Small disturbed bag sample taken over depth indicated.<br>Soil sample taken over depth indicated, for asbestos analysis.<br>Soil sample taken over depth indicated, for acid sulfate soil analysis.<br>Soil sample taken over depth indicated, for salinity analysis. |
| Field Tests | N = 17<br>4, 7, 10 | Standard Penetration Test (SPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration. 'Refusal' refers to apparent hammer refusal within the corresponding 150mm depth increment. |
| | $N_c$ = 5<br>7<br>3R | Solid Cone Penetration Test (SCPT) performed between depths indicated by lines. Individual figures show blows per 150mm penetration for 60° solid cone driven by SPT hammer. 'R' refers to apparent hammer refusal within the corresponding 150mm depth increment. |
| | VNS = 25<br>PID = 100 | Vane shear reading in kPa of undrained shear strength.<br>Photoionisation detector reading in ppm (soil sample headspace test). |
| Moisture Condition (Fine Grained Soils) | $w$ > PL<br>$w \approx$ PL<br>$w$ < PL<br>$w \approx$ LL<br>$w$ > LL | Moisture content estimated to be greater than plastic limit.<br>Moisture content estimated to be approximately equal to plastic limit.<br>Moisture content estimated to be less than plastic limit.<br>Moisture content estimated to be near liquid limit.<br>Moisture content estimated to be wet of liquid limit. |
| (Coarse Grained Soils) | D<br>M<br>W | DRY – runs freely through fingers.<br>MOIST – does not run freely but no free water visible on soil surface.<br>WET – free water visible on soil surface. |
| Strength (Consistency) Cohesive Soils | VS<br>S<br>F<br>St<br>VSt<br>Hd<br>Fr<br>( ) | VERY SOFT – unconfined compressive strength ≤ 25kPa.<br>SOFT – unconfined compressive strength > 25kPa and ≤ 50kPa.<br>FIRM – unconfined compressive strength > 50kPa and ≤ 100kPa.<br>STIFF – unconfined compressive strength > 100kPa and ≤ 200kPa.<br>VERY STIFF – unconfined compressive strength > 200kPa and ≤ 400kPa.<br>HARD – unconfined compressive strength > 400kPa.<br>FRIABLE – strength not attainable, soil crumbles.<br>Bracketed symbol indicates estimated consistency based on tactile examination or other assessment. |
| Density Index/ Relative Density (Cohesionless Soils) | VL<br>L<br>MD<br>D<br>VD<br>( ) | **Density Index ($I_D$) Range (%)** / **SPT 'N' Value Range (Blows/300mm)**<br>VERY LOOSE ≤ 15 — 0 – 4<br>LOOSE > 15 and ≤ 35 — 4 – 10<br>MEDIUM DENSE > 35 and ≤ 65 — 10 – 30<br>DENSE > 65 and ≤ 85 — 30 – 50<br>VERY DENSE > 85 — > 50<br>Bracketed symbol indicates estimated density based on ease of drilling or other assessment. |
| Hand Penetrometer Readings | 300<br>250 | Measures reading in kPa of unconfined compressive strength. Numbers indicate individual test results on representative undisturbed material unless noted otherwise. |

| Log Column | Symbol | Definition |
|---|---|---|
| Remarks | 'V' bit | Hardened steel 'V' shaped bit. |
| | 'TC' bit | Twin pronged tungsten carbide bit. |
| | $T_{60}$ | Penetration of auger string in mm under static load of rig applied by drill head hydraulics without rotation of augers. |
| | Soil Origin | The geological origin of the soil can generally be described as: |
| | | RESIDUAL – soil formed directly from insitu weathering of the underlying rock. No visible structure or fabric of the parent rock. |
| | | EXTREMELY WEATHERED – soil formed directly from insitu weathering of the underlying rock. Material is of soil strength but retains the structure and/or fabric of the parent rock. |
| | | ALLUVIAL – soil deposited by creeks and rivers. |
| | | ESTUARINE – soil deposited in coastal estuaries, including sediments caused by inflowing creeks and rivers, and tidal currents. |
| | | MARINE – soil deposited in a marine environment. |
| | | AEOLIAN – soil carried and deposited by wind. |
| | | COLLUVIAL – soil and rock debris transported downslope by gravity, with or without the assistance of flowing water. Colluvium is usually a thick deposit formed from a landslide. The description 'slopewash' is used for thinner surficial deposits. |
| | | LITTORAL – beach deposited soil. |

## Classification of Material Weathering

| Term | | Abbreviation | | Definition |
|---|---|---|---|---|
| Residual Soil | | RS | | Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported. |
| Extremely Weathered | | XW | | Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible. |
| Highly Weathered | Distinctly Weathered (Note 1) | HW | DW | The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores. |
| Moderately Weathered | | MW | | The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable, but shows little or no change of strength from fresh rock. |
| Slightly Weathered | | SW | | Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock. |
| Fresh | | FR | | Rock shows no sign of decomposition of individual minerals or colour changes. |

**NOTE 1:** The term 'Distinctly Weathered' is used where it is not practicable to distinguish between 'Highly Weathered' and 'Moderately Weathered' rock. 'Distinctly Weathered' is defined as follows: *'Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores'*. There is some change in rock strength.

## Rock Material Strength Classification

| Term | Abbreviation | Uniaxial Compressive Strength (MPa) | Guide to Strength | |
|---|---|---|---|---|
| | | | Point Load Strength Index $Is_{(50)}$ (MPa) | Field Assessment |
| Very Low Strength | VL | 0.6 to 2 | 0.03 to 0.1 | Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30mm thick can be broken by finger pressure. |
| Low Strength | L | 2 to 6 | 0.1 to 0.3 | Easily scored with a knife; indentations 1mm to 3mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150mm long by 50mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling. |
| Medium Strength | M | 6 to 20 | 0.3 to 1 | Scored with a knife; a piece of core 150mm long by 50mm diameter can be broken by hand with difficulty. |
| High Strength | H | 20 to 60 | 1 to 3 | A piece of core 150mm long by 50mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer. |
| Very High Strength | VH | 60 to 200 | 3 to 10 | Hand specimen breaks with pick after more than one blow; rock rings under hammer. |
| Extremely High Strength | EH | > 200 | > 10 | Specimen requires many blows with geological pick to break through intact material; rock rings under hammer. |

## Abbreviations Used in Defect Description

| Cored Borehole Log Column | | Symbol Abbreviation | Description |
|---|---|---|---|
| Point Load Strength Index | | • 0.6 | Axial point load strength index test result (MPa) |
| | | x 0.6 | Diametral point load strength index test result (MPa) |
| Defect Details | – Type | Be | Parting – bedding or cleavage |
| | | CS | Clay seam |
| | | Cr | Crushed/sheared seam or zone |
| | | J | Joint |
| | | Jh | Healed joint |
| | | Ji | Incipient joint |
| | | XWS | Extremely weathered seam |
| | – Orientation | Degrees | Defect orientation is measured relative to normal to the core axis (ie. relative to the horizontal for a vertical borehole) |
| | – Shape | P | Planar |
| | | C | Curved |
| | | Un | Undulating |
| | | St | Stepped |
| | | Ir | Irregular |
| | – Roughness | Vr | Very rough |
| | | R | Rough |
| | | S | Smooth |
| | | Po | Polished |
| | | Sl | Slickensided |
| | – Infill Material | Ca | Calcite |
| | | Cb | Carbonaceous |
| | | Clay | Clay |
| | | Fe | Iron |
| | | Qz | Quartz |
| | | Py | Pyrite |
| | – Coatings | Cn | Clean |
| | | Sn | Stained – no visible coating, surface is discoloured |
| | | Vn | Veneer – visible, too thin to measure, may be patchy |
| | | Ct | Coating ≤ 1mm thick |
| | | Filled | Coating > 1mm thick |
| | – Thickness | mm.t | Defect thickness measured in millimetres |

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