Appendix A - Consideration of section 171 factors and matters of national environmental significance and Commonwealth land

Section 171 Factors

In addition to the requirements of the Guideline for Division 5.1 assessments (DPE, 2022) and the Roads and Related Facilities EIS Guideline (DUAP, 1996), the following factors listed in section 171 of the NSW *Environmental Planning and Assessment Regulation 2021*, have also been considered to assess the likely impacts of the proposal on the natural and built environments.

Factor	Impact
Any environmental impact on a community? During construction, there would be construction related noise and visual impacts to surrounding receivers and impacts to traffic, transport and access. Impacts would be minimised through implementing the safeguards and management measures identified in section 7 of this REF. Operation of the proposal would have improved visual amenity and community engagement.	Moderate, short-term
Any transformation of a locality? The landscape character would be altered due to the reduction in prominent built form and the revealing of low scale attractive elements including Manly Pavilion. The would provide a positive change to the area. The changes would be visible nearby the proposal but undiscernible from a distance.	Positive, long-term
Any environmental impact on the ecosystems of the locality? The assessment of biodiversity indicates potential impacts to biodiversity would not be significant. Impacts to biodiversity would be minimised through implementing the safeguards and management measures identified in chapter 7 of this REF.	Minor, short-term
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? There would be temporary aesthetic impacts during construction of the proposal, including elevated noise levels, reduced visual amenity and restricted access. No long-term reduction to these environmental qualities and values are anticipated.	Moderate, short-term
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 may cause temporary impacts on heritage listed items which would be minimised through implementing the safeguards and management measures identified in chapter 7 of this REF. However, in the long term there would be a major positive impact on the historic views to and from the Manly Pavilion and other heritage items would be reinstated.	Minor, short-term Positive, long-term
Any impact on the habitat of protected animals, within the meaning of the *Biodiversity Conservation Act 2016*. The assessment of biodiversity indicates potential impacts to biodiversity would not be significant. Impacts to biodiversity would be minimised through implementing the safeguards and management measures identified in section 7 of this REF.	Minor, short-term
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 is unlikely to endanger any species of animal, plant or other form of life, whether living on land, in water or in the air provided the safeguards and management measures identified in section 7 of this REF are implemented.	Nil
Any long-term effects on the environment? The proposal would result in a moderate impact on the landscape character and a low to high visual impact depending on the location of the viewer and distance to the proposal.	Moderate, long-term

Factor	Impact
The proposal would provide a variety of social benefits to the local community including enhanced public waterfront access, improved scenic value and community engagement. No other long term negative effects on the environment are anticipated.	Positive, long-term
Any degradation of the quality of the environment? The proposal would result in localised soil /beach disturbance during earthworks associated with site compound and haul road construction. This may lead to erosion and sedimentation, potentially impacting to water quality. Impacts would be minor with implementation of the safeguards and management measures identified in section 7 of this REF.	Minor, short-term
Any risk to the safety of the environment? Construction related activities pose potential risks to the safety of the environment through spills/leaks of fuel, oil or other chemicals. Risks would be minor with implementation of the safeguards and management measures identified in section 7 of this REF.	Minor, short-term
Any reduction in the range of beneficial uses of the environment? Following construction, the proposal would not reduce the range of beneficial uses of the environment; on the contrary it would facilitate accessibility to the area.	Nil
Any pollution of the environment? Construction related activities may result in pollution of the environment through air and noise emission, and temporary increase in suspended sediments. Impacts would be minor with the implementation of the safeguards and management measures identified in section 7 of this REF.	Minor short-term
Any environmental problems associated with the disposal of waste? All wastes generated by the proposal would be disposed of at an off-site facility licensed to receiver such waste. Therefore, there would not be significant environmental problems associated with waste disposal.	Nil
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? All resources required by the proposal are readily available and are not likely to become in short supply.	Nil
Any cumulative environmental effect with other existing or likely future activities? There is potential for cumulative impacts associated with other projects in the area as outlined in section 6.13 of this REF.	Minor short-term
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The proposal would not have any significant impacts on coastal processes.	Nil
Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1 The proposal aligns with the local strategic planning statements, regional strategic plans or district strategic plans, as described in section 2.1.4.	N/A
Other relevant environmental factors In considering the potential impacts of this proposal all relevant environmental factors have been considered in section 6 of this REF.	N/A

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal should be referred to the Australian DCCEEW.

A referral is not required for proposed actions that may affect nationally-listed threatened species, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
Any impact on a World Heritage property? There are no items within or in the immediate vicinity of the proposal area listed on the World Heritage List.	Nil
Any impact on a National Heritage place? There are no items within or in the immediate vicinity of the proposal area listed on the National Heritage List.	Nil
Any impact on a wetland of international importance? There are no nationally important wetlands or Ramsar Wetlands in the proposal area or in the wider study locality.	Nil
Any impact on a listed threatened species or communities? Three species listed under the EBPC Act were considered to have a moderate to high likelihood of occurrence in the biodiversity study area. The biodiversity assessment (refer section 6.1) concluded that the proposal is not likely to significantly impact threatened species, populations, ecological communities or migratory species, in the framework of the EPBC Act. A referral to the Australian Government DCCEEW was deemed not required for biodiversity matters.	Minor short-term negative
Any impacts on listed migratory species? All listed migratory species under the EPBC Act were considered to have no or a low likelihood occurrence in the biodiversity study area, based on the absence of suitable habitat and high levels of disturbance from pedestrians and pets in the area. Therefore, impacts to migratory species as a result of the proposal are considered unlikely.	Nil
Any impact on a Commonwealth marine area? The proposal area is not within or in the vicinity of a Commonwealth marine area.	Nil
Does the proposal involve a nuclear action (including uranium mining)? The proposal would not involve a nuclear action.	Nil
Additionally, any impact (direct or indirect) on the environment of Commonwealth land? The proposal does not impact any Commonwealth land.	Nil

Appendix B - Statutory consultation checklists

Transport and Infrastructure SEPP

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	TI SEPP Section
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No		Section 2.111
Bus Depots	Does the project propose a bus depot?	No		Section 2.111
Permanent road maintenance 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 2.111

Development within the Coastal Zone

Development type	Description	Yes / No	If 'yes' consult with	TI SEPP 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 that land?	No		Section 2.14

Note: See interactive map at ***Planning Portal NSW spatial viewer - find a property***. 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

Development type	Potential impact	Yes / No	If 'yes' consult with	TI SEPP Section
Stormwater	Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council?	No		Section 2.10
Traffic	Are the works 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
Sewerage system	Will the works 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
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a *substantial* volume of water?	No		Section 2.10
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council	Yes	Northern Beaches Council	Section 2.10

Development type	Potential impact	Yes / No	If 'yes' consult with	TI SEPP Section
	management or control? If so, will this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?			
Road & footpath excavation	Will the works involve more than *minor* or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes	Northern Beaches Council	Section 2.10

Local heritage items

Development type	Potential impact	Yes / No	If 'yes' consult with	TI SEPP Section
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 works? 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	Northern Beaches Council	Section 2.11

Flood liable land

Development type	Potential impact	Yes / No	If 'yes' consult with	TI SEPP Section
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent?	No		Section 2.12
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance?	Yes	State Emergency Services (SES)	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

Development type	Potential impact	Yes / No	If 'yes' consult with	TI SEPP Section
National parks and reserves	Are the works 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		Section2.15
National parks and reserves	Are the works on land in Zone C1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No		Section 2.15
Navigable waters	Do the works include a fixed or floating structure in or over navigable waters?	No		Section 2.15

Development type	Potential impact	Yes / No	If 'yes' consult with	TI SEPP Section
Artificial light	Would the works 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
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in section 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	No		Section 2.15
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No		Section 2.15
Willandra Lakes Region	Development on, or reasonably likely to have an impact on, a part of the Willandra Lakes Region World Heritage Property?	No		Section 2.15
Western City operational area	Development within a Western City operational area specified in the *Western Parkland City Authority Act 2018*, Schedule 2 with a capital investment value of $30 million or more?	No		Section 2.15
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No		Section 2.16

Appendix C - Biodiversity Impact Assessment

Manly Sea Life Upgrade

Biodiversity Assessment Report

Transport for NSW

Manly Sea Life Upgrade

Biodiversity Assessment Report

Transport for NSW | 27 April 2023

Prepared by Stantec Australia Pty Ltd for BESIX Watpac on behalf of Transport for NSW

Document controls

Approval and authorisation

Title	Manly Cove West (Manly Sea Life) Biodiversity Assessment Report
Accepted on behalf of Transport for NSW by:	
Signed:	
Dated:	

Title	
Accepted on behalf of BESIX Watpac by:	
Signed:	
Dated:	

Document status

Document status	Date	Prepared by	Reviewed by
Rev A	03/02/2022	Jake Ludlow	Kate Reeds
Rev B	27/03/2023	Jake Ludlow	Kate Reeds

Executive summary

Transport for NSW (Transport) is proposing to demolish the former Manly Sea Life building to seabed level and extend the boardwalk adjacent to Manly Pavilion at Manly, NSW (the proposal). The proposal would involve a number of land-side and water-side activities including the demolition of the former Manly Sea Life building and associated timber jetty and construction of a 100 metre long boardwalk. Construction of the proposal may be staged, so work impacts on the operation of the Manly Pavilion, the Manly Art Gallery and Museum and other businesses, are minimised. The demolition method, design and staging have also been developed to reduce impacts to the environment including noise, seagrass, Little Penguins (*Eudyptula minor*) and heritage. The demolition method has been altered from a cofferdam to a wet method to minimise impacts to seagrass and local marine life.

This Biodiversity Assessment Report (BAR) describes the existing environment within the biodiversity study area and identifies potential impacts to biodiversity as a result of construction and operation of the proposal. The biodiversity assessment was informed by a review of existing information and data in the biodiversity study area and the study locality, as well as a field investigations of the marine environment, conducted in February 2022, March 2022 and November 2022.

The proposal is located within the Northern Beaches Council Local Government Area (LGA). The proposal is located at the western end of Manly Cove and is currently unused and has remained vacant since the closure of the Manly Sea Life Sanctuary in 2018.

The biodiversity study area is located on a highly modified, urban foreshore which is fringed by commercial buildings (Manly Pavilion and Manly Waterworks) as well as the existing Sea Life building and timber jetty. The land-side component of the biodiversity study area is comprised of landscaped gardens with planted trees and grassed areas, and is generally used for recreational purposes. No remnant terrestrial vegetation or native Plant Community Type (PCTs) occur within the biodiversity study area.

The marine component of the biodiversity study area contains a variety of subtidal habitats. A significant feature of this is large patches of seagrasses (including *Zostera muelleri* subsp. *capricorni*, *Halophila* sp. and *Posidonia australis*) distributed throughout the biodiversity study area. Another feature of the subtidal environment includes subtidal rocky reef which runs along the foreshore of Federation Point consisting of boulders and crevices with areas of macroalgae, mainly kelp (*Ecklonia radiata*). The biodiversity study area also contains artificial habitats including existing timber jetty piles, subtidal seawall and the western portion of Manly Cove tidal pool which are colonised by encrusting invertebrates and macroalgae. A large portion of the subtidal biodiversity study area consists of unvegetated soft sediment. No other marine vegetation such as mangrove or saltmarshes were recorded.

The habitat in the biodiversity study area provides potential habitat for 12 threatened fauna species (both terrestrial and marine) and two endangered populations. These included:

Six microbats:

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) listed as vulnerable under the *Biodiversity Conservation Act 2016* (BC Act)
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*) listed as vulnerable under the BC Act
- Little Bent-winged Bat (*Miniopterus australis*) listed as vulnerable under the BC Act.
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) listed as vulnerable under the BC Act
- Southern Myotis (*Myotis macropus*) listed as vulnerable under the BC Act

- Greater Broad-nosed Bat (*Scoteanax rueppellii*) listed as vulnerable under the BC Act.

One mammal:

- Grey-headed Flying Fox (*Pteropus poliocephalus*) listed as vulnerable under the BC Act and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Two fish:

- White's Seahorse (*Hippocampus whitei*) listed as endangered under the *Fisheries Management Act 1994* (FM Act) and EPBC Act
- Black Rockcod (*Epinephelus daemelii*) listed as endangered under the FM Act and vulnerable under the EPBC Act.

Two endangered populations:

- Little Penguin (*Eudyptula minor*) in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline).
- *Posidonia australis* seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie listed as endangered under the FM Act.

Two marine mammals:

- New Zealand Fur Seal (*Arctocephalus forsteri*) listed as vulnerable under the BC Act
- Australian Fur Seal (*Arctocephalus pusillus*) listed as vulnerable under the BC Act.

One marine invertebrate:

- Cauliflower Soft Coral (*Dendronephthya australis*) listed as endangered under the FM Act and EPBC Act.

Although there are records of Grey-headed Flying Fox and Australian/New Zealand Fur Seals occurring within the biodiversity study area, direct impacts to these animals were considered unlikely, given the limited amount of suitable habitat and (in terms of the seals), their infrequent sightings in the biodiversity study area.

The proposal would require removal and / or relocation of eight native Bangalow Palms (*Archontophoenix cunninghamiana*) and temporarily disturb a small area of landscaped grass to facilitate the compound area. The removal/relocation of this vegetation is a small proportion relative to the available foraging resources in the wider study locality and is unlikely to have a measurable impact on overall habitat availability. If the Bangalow Palms are permanently removed, they would be be replaced in accordance with the Tree and Hollow Replacement guidelines under the Transport *Biodiversity Policy* (TfNSW, 2022). Furthermore, the majority of vegetation to be cleared is associated with the establishment of the compound area, thus, following decommissioning of the compound area (i.e. completion of construction), this area would be restored and made good. Potential risks of the spread/introduction of weeds and diseases and the potential for erosion and sediment mobilisation during construction activities would be managed in accordance with the relevant Transport guidelines.

As microbats could potentially occur within the un-used Manly Sea Life building and existing timber jetty, pre-clearance surveys would be undertaken prior to removal, so that if

individuals are present they can be collected and relocated to nearby suitable habitat according to a Microbat Management Plan (if required).

The proposal would not require large-scale disturbance of the seabed or nor would it have direct impacts to beds of the endangered seagrass *Posidonia australis*. Removal of the existing timber jetty structure (including piles) and subtidal seawall would impact about 500 square metres of subtidal rocky reef communities (Type 2 Key Fish Habitat (KFH)), 35 square metres of seagrass (Type 1 KFH) and 143 square metres of un-vegetated soft sediment (Type 3 KFH).

To support the new boardwalk, 16 steel piles would be installed by a barge mounted piling rig into the subtidal habitat east of the existing walkway near Manly Pavilion. Thirteen steel piles would be driven into subtidal rocky reef (Type 2 KFH), and three within medium density Halophila and low density Zostera seagrass (Type 1 KFH). This would result in the loss of 61 square metres of subtidal rocky reef (Type 2 KFH) and 19 square metres of seagrass (Type 1 KFH). During the operational phase of the proposal, around 211 square metres of subtidal rocky reef (Type 2 KFH) and about 97 square metres of seagrass (Type 1 KFH) would be shaded by the boardwalk. However, the removal of the existing timber jetty and Sea Life building would effectively become unshaded soft sediment, whereby seagrasses may recolonise the area over time if conditions are suitable.

Under Section 199 of the FM Act, consultation with NSW Department of Primary Industries (DPI) (Fisheries) is required for any dredging and reclamation works. 'Dredging' under the *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013) is classified as disturbance of the seabed/streambed. In this case, this refers to removal of structures and piling. Under Section 205 of the FM Act, a permit to 'harm' marine vegetation is required for this purpose and would therefore need to be obtained prior to construction.

Offsets for the residual loss of subtidal rocky reef, seagrass should be considered in accordance with the *Biodiversity Policy* (TfNSW, 2022), *Policy and guidelines for fish habitat conservation and management* Update 2013 (NSW DPI, 2013) and in consultation with NSW DPI (Fisheries).

Sediment mobilisation from piling and other water-side construction activities and vessel wash and scour were also identified as potential proposal impacts. However, the biodiversity study area is likely to be frequently exposed to elevated levels of sediment, associated with rainfall and sea conditions. Thus, with the appropriate controls set out in the Marine Ecology Management Plan (MEMP), a slight, temporary increase in these impacts is not expected to substantially impact marine biodiversity.

Caulerpa taxifolia (Caulerpa) was observed within the biodiversity study area and movements of vessels, plant and equipment could further spread Caulerpa (and potentially other marine pests) within Manly Cove and to other unaffected estuaries. Controls would therefore be in place to ensure all equipment in contact with the water is properly cleaned and checked prior to and upon completion of construction so these risks are avoided.

The proposal is unlikely to have a measurable impact on any threatened species or populations with a likelihood of occurrence within the biodiversity study area. Disturbances to potential habitat are expected to be mostly temporary and constitute only a small proportion of available habitat in the locality. The proposal is not expected to fragment or isolate threatened species populations or substantially impact any species' lifecycle, provided that the mitigation measures and controls outlined in this assessment are implemented as part of the Construction Environmental Management Plan (CEMP). In particular, mitigation measures are proposed to survey for Black Rockcod and White Seahorses prior to construction to minimise the risk of harm. The specific process and timing of this would be advised by NSW DPI (Fisheries) and outlined in a Syngnathid Management Plan (SMP) incorporated into the MEMP. Noise reduction options will also be implemented as part of the MEMP to attenuate the underwater noise produced during piling to acceptable levels, with this level guided by NSW DPI (Fisheries) consultation.

Species Impact Statements (SIS) or EPBC referral were not considered to be required as part of this assessment.

Considering the above and assuming recommended mitigation measures are implemented, the proposal is unlikely to significantly impact on biodiversity within the biodiversity study area.

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Appendix A Species recorded

Appendix B Habitat assessment table

Appendix C Assessments of significance

Glossary

Definitions	
Beach reclamation area	Refers to a portion of Manly Cove beach used for material handling and load out, an area of about 841 square metres (refer Figure 1-2).
Biodiversity Assessment Method	The Biodiversity Assessment Method (BAM) is established under section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.
Biodiversity Assessment Report	This report, which assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.
Biodiversity offsets	The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (DPIE 2020)
Biodiversity study area	Refers to the assessment area comprised of the marine and terrestrial components, and area of about 3.6 hectares and presented in Figure 1-3. The marine portion was defined in a previous survey done by Cardno (now Stantec) on 17 February 2022 (refer Figure 1-3).
Calculator or BAM-C	Biodiversity Assessment Method Calculator – a tool that applies the BAM to calculate the number and type of credits required to offset the impacts of development on biodiversity or credits generated at a biodiversity stewardship site.
Compound area	The temporary facilities required for construction, including for example an office and amenities compound, construction compound, materials handling and load out area. The compound area would likely be in the vicinity of the Manly Art Gallery and Museum and on a reclaimed section of Manly Cove Beach, an area of about 95 square metres. These areas are shown on Figure 1-2.
Construction footprint	The area to be directly impacted by the proposal during construction activities (see definition for subject land).
Construction haul road	Refers to the road used to facilitate the construction work and area of about 277 square metres (refer Figure 1-2).
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Demolition area	Refers to the locations of existing infrastructure to be demolished which includes most of the former Sea Life building (some structural elements retained underneath the new boardwalk), timber jetty and support piles. The demolition area is about 0.2 hectares and is shown in Figure 1-1.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat, and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation) (DPIE 2020)
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component.
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the development footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (DPIE 2020).

Definitions	
Local population	Local population: the population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions: • The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area. • The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. • The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time or return year to year. (OEH 2018)
MNES	A matter of national environmental significance (MNES) protected by a provision of Part 3 of the EPBC Act
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (DPIE 2020).
Mitigation	Action to reduce the severity of an impact.
Mitigation measure	Any measure that facilitates the safe movement of wildlife and/or prevents wildlife mortality or injury.
Native vegetation	(a) trees (including any sapling or shrub or any scrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland. A plant is native to New South Wales if it was established in New South Wales before European settlement (BC Act).
Operational footprint	The area that will be subject to ongoing operational impacts from the proposal. This includes the road, surrounding safety verges and infrastructure, fauna connectivity structures and maintenance access tracks and compounds.
Population	A group of organisms, all of the same species, occupying a particular area (DPIE 2020).
Proposal	Refers to the Manly Sea Life upgrade as described in Section 1.2
Proposal area	The area around the proposal footprint required for construction including the maritime works area, compound area and material handling and load out area. The total area is about 1.2 hectares and is shown in Figure 1-2.
Proposal footprint	The area directly impacted by proposed work, including the removal of structures and installation of new structures.
Study locality	Refers to an area within ten kilometres of the proposal area (for the purpose of the background research) (refer Figure 1-4).
Target species	A species has been identified within the study area or is considered to have a moderate to high likelihood of occurrence and may be impacted by the proposal.

Abbreviations

AASS	Actual Acid Sulfate Soils/sediments
AOBV	Area of Outstanding Biodiversity Value
AoS	Assessment of Significance
ASS	Acid Sulfate Soils/sediments
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
BC Act	NSW Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BoM	Bureau of Meteorology
CEMP	Construction Environmental Plan
DCCEW	Department of Climate Change, Energy, the Environment and Water (formerly Commonwealth Department of Agriculture, Water and the Environment, DAWE)
DoE	Commonwealth Department of the Environment (former)
DPIE	NSW Department of Planning, Industry and Environment
DPI	NSW Department of Primary Industries
DSAPT	Disability Standards for Accessible Public Transport 2002
EAC	East Australian Current
EES	Environment, Energy and Science group (in DPIE)
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (Federal)
FM Act	NSW Fisheries Management Act 1994
GDE	Groundwater Dependent Ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
IMP	Introduced Marine Pest
KFH	Key Fish Habitat
LGA	Local Government Area
MEMP	Marine Ecology Management Plan
MMP	Microbat Management Plan
MNES	Matters of National Environmental Significance
MWA	Marine Works Area
NPWS	National Parks and Wildlife Service
OCP	Organochlorine Pesticides
OEH	NSW Office of Environment and Heritage (former)
PAH	Polycyclic Aromatic Hydrocarbons
PASS	Potential Acid Sulfate Soils/sediments
PCT	Plant Community Type
PMST	Protected Matters Search Tool
POMS	Pacific Oyster Mortality Syndrome
PSI	Preliminary Site Investigation
PTS	Permanent Threshold Shift
REF	Review of Environmental Factors
ROV	Remotely Operated Vehicle
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
SMP	Syngnathid Management Plan
TBT	Tributyltin
TEC	Threatened Ecological Community
TTS	Temporary Threshold Shift
WQO	Water Quality Objectives

1 Introduction

1.1 Proposal identification

Transport for NSW (Transport) proposes to demolish the former Manly Sea Life building to seabed level and extend the boardwalk in front of Manly Pavilion (the proposal).

The proposal is located within the Local Government Area (LGA) of Northern Beaches Council. The Manly Sea Life building is located on the western foreshore of Manly Cove and can be accessed from the Fairlight Walk footpath or Commonwealth Parade near Federation Point, Manly. The Manly Sea Life Sanctuary was officially closed on 29 January 2018 and has remained vacant since closing.

1.2 The proposal

Key features of the proposal would include:

- demolition of the former Manly Sea Life building down to seabed level
- retention of some former Manly Sea Life structural elements underneath the new proposed boardwalk
- demolition of the timber jetty, including supporting piles
- construction of a new 100 metre long pile-supported boardwalk that runs adjacent to Manly Pavilion, that allows sufficient space for walking and a dwell area with seating
- construction of new stairs and access ramp to the beach
- safety features on the boardwalk including handrails, tactile indicators, ladders into the water, and emergency life buoys.

Figure 1-1 shows the key features of the proposal.

Construction of the proposal shall be staged to ensure that work impacting the operation of the Manly Pavilion and other businesses are minimised. A detailed project description and work methodology is presented in Section 3 of the Review of Environmental Factors (REF) (Stantec, 2023a). For safety reasons, piling works may be undertaken outside standard working hours (i.e. during night or early morning) when the water is calm and the harbour is least busy. It is anticipated that the construction works would take approximately 12 months, depending on weather, maritime and staging requirements.

The demolition method, design and staging have also been developed to reduce impacts to the environment including noise, seagrass, Little Penguins and heritage. The demolition method has been altered from a cofferdam to a wet method to minimise impacts to seagrass and local marine life.

FAIRLIGHT STREET

COMMONWEALTH PARADE

WEST ESPLANADE

MANLY ART GALLERY AND MUSEUM

FAIRLIGHT WALK

FORMER MANLY SEA LIFE

MANLY WATERWORKS

MANLY PAVILION

N

Steps to beach

Dwell area

Access ramp to beach

Walkway

Viewing platform

Key Features

Manly, NSW

Project Code: 304500787-GS-002
Drawn By: TB, Checked By: SM
Rev: 06
Date: 2023-01-25
Figure No: 1-1

Stantec

Legend

- Bored pile
- Concrete column
- Driven pile
- Existing infrastructure to be removed (demolition area)
- New boardwalk infrastructure

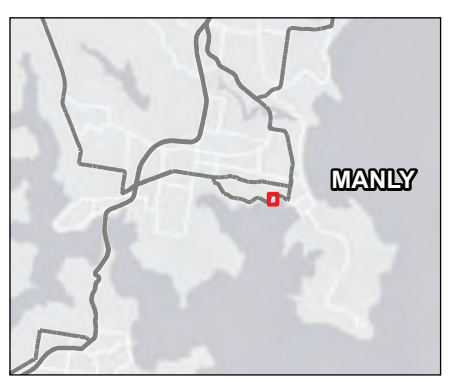
Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by MetroMap (December, 2022)

NOT FOR CONSTRUCTION

0 10 20 30 Metres

Scale at A3: 1:600



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1.3 Legislative context

An REF is prepared to satisfy 'Transport duties under s.5.5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) 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 in making decisions on the likely significance of any environmental impacts. This biodiversity assessment report forms part of the REF being prepared for the proposal, and assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.

Part 7 of the *Biodiversity Conservation Act 2016* (BC Act) and Part 7A of the *Fisheries Management Act 1994* (FM Act) require that the significance of the impact on threatened species and endangered ecological communities or their habitats is assessed using a five-part test at Section 7.3 of the BC Act. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in accordance with the Environment Agency Head's requirements or a Biodiversity Development Assessment Report (BDAR) must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM).

Significance of impacts on nationally listed threatened species, ecological communities and migratory species are to be assessed in accordance with the *Matters of National Environmental Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999* (DoE, 2013). If significant impacts are considered likely, then the action is deemed a controlled action and a referral is required.



Proposal Areas

Manly, NSW

Project Code: 304500787-GS-003
Drawn By: TB, Checked By: AC
Rev: 06
Date: 2023-01-25
Figure No: 1-2

Stantec

Legend

- Proposal area
- Existing infrastructure to be removed (demolition area)
- Cadastre
- Material handling and load out area (beach reclamation area)
- Construction haul road
- Compound area
- New boardwalk infrastructure

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by MetroMap (December, 2022)
2. Cadastre supplied by NSW SS (2022)

NOT FOR CONSTRUCTION

0 10 20 30 Metres

Scale at A3: 1:600



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Biodiversity Study Area

Manly, NSW

Project Code: 304500787-GS-006
Drawn By: TB, Checked By: AS
Rev: 01
Date: 2023-01-25
Figure No: 1-3

Legend

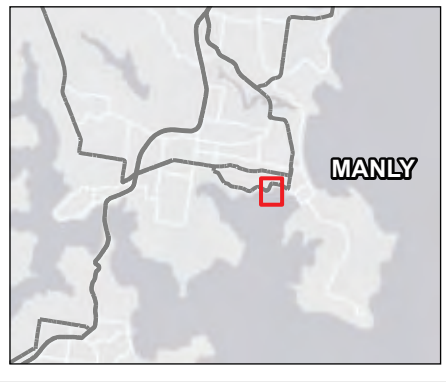
- Biodiversity Study Area
- Proposal Area
- Cadastre

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by MetroMap (December, 2022)
2. Cadastre supplied by NSW SS (2022)

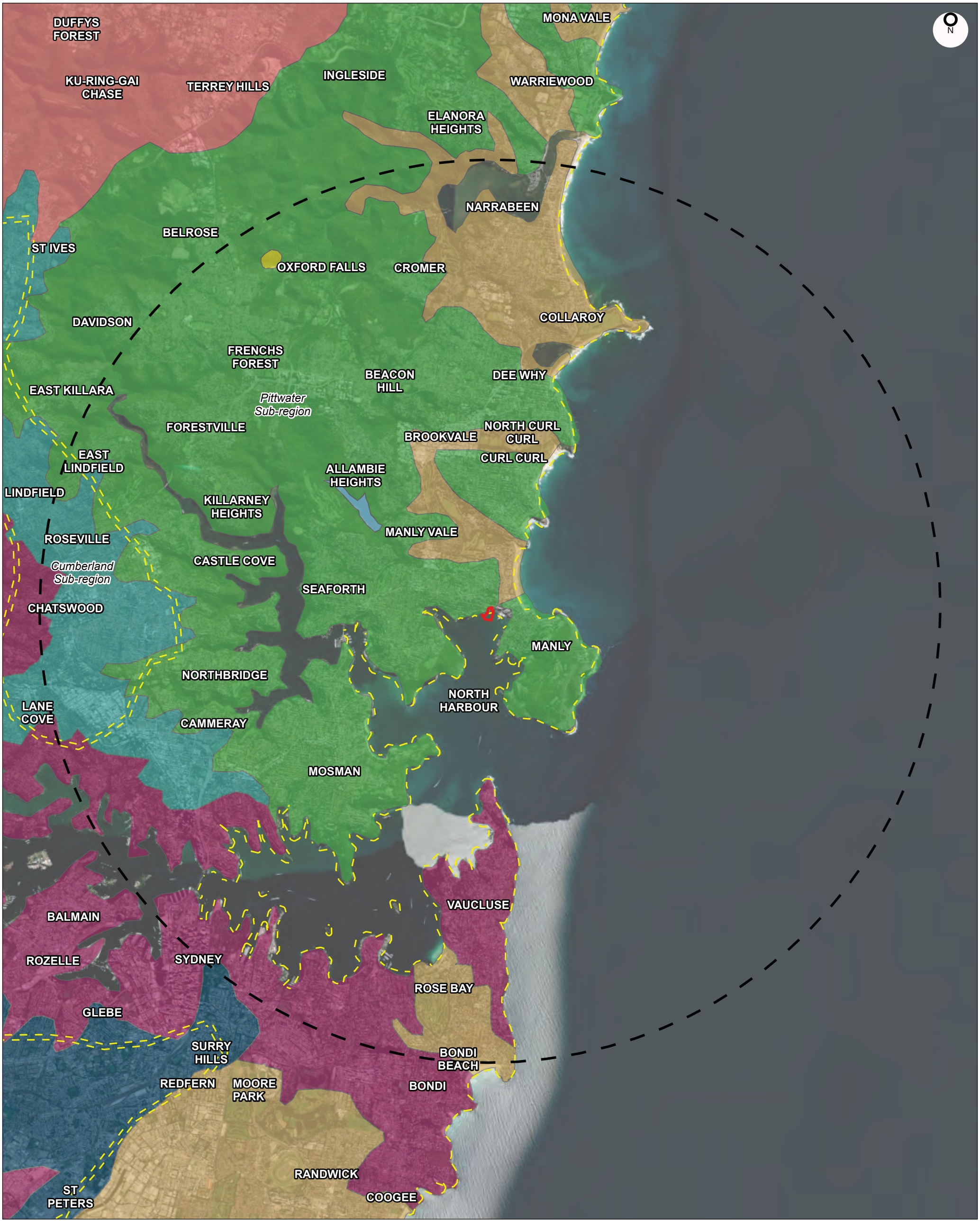
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Scale at A3: 1:1,500



Stantec

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Study Locality

Manly, NSW

Project Code: 304500787-GS-007
Drawn By: TB, Checked By: AS
Rev: 01
Date: 2023-01-25
Figure No: 1-4

Stantec

Legend

- Biodiversity Study Area
- Study Locality (10km)
- IBRA7 Subregions

Mitchell Landscape

- Ashfield Plains
- Belrose Coastal Slopes
- Hornsby Plateau
- Pennant Hills Ridges
- Port Jackson Basin
- Sydney - Newcastle Barriers and Beaches
- Sydney Basin Diatremes
- Estuary/Water Added

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by Esri and third party suppliers
2. Mitchell Landscape supplied by DPE (2019)
3. IBRA7 Subregions supplied by DCCEEW

0 1,000 2,000 3,000 Metres

Scale at A3: 1:80,000



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2 Methodology

2.1 Personnel

This BAR was prepared by the following personnel:

- Jake Ludlow (BSc) – Ecologist
- Kate Reeds (BSc, MSc) – Principal Ecologist.

2.2 Background research

A review of information and database searches were completed in September 2022 to gain an understanding of biodiversity values within the study locality. Reviewed sources included:

- Soil Landscapes of the Sydney 1:100, 000 Sheet (Chapman & Murphy, 1989)
- eSPADE (v2.2):
    - Acid sulfate risk mapping
    - Soil landscapes
- SEED Portal (Sharing and Enabling Environmental Data):
    - NSW OEH Mitchell Landscapes database v3.1 (2011)
    - NSW State Vegetation Type Map (C1.1.M1.1) (NSW DPE, 2022)
    - IBRA regions and bio-regions
- NSW Department of Planning, Industry and Environment – Environment, Energy and Science (DPIE-EES) Vegetation Classification
- NSW BioNet
- NSW DPIE-EES Threatened Biodiversity Data Collection (TBDC)
- NSW Department of Primary Industries (NSW DPI) Fish Communities and Threatened Species Distribution of NSW (NSW DPI, 2016)
- NSW DPI Threatened species lists
- NSW DPI Listed Protected Fish Species
- NSW DPI Spatial Data Portal. Estuarine Macrophytes (NSW DPI, 2022a).
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) formerly Commonwealth Department of Agriculture, Water and the Environment Protected Matters Search Tool (PMST)
- Atlas of Living Australia
- National System for the Prevention and Management of Marine Pest Incursions
- National Introduced Marine Pest Information System (NIMPIS, 2022)
- Previous marine vegetation surveys undertaken in the area by Cardno (now Stantec) in 2021 and 2022 (Cardno, 2022; Cardno now Stantec, 2022).

Contemporary aerial imagery from Nearmap was used to identify potential vegetation and habitat to assist in the creation of presumptive maps.

Sensitive ecological sites were identified through searches of the following:

- Regional Conservation Plans prepared by the former NSW OEH

- Areas of Outstanding Biodiversity Value (AOBV) (formerly Critical Habitat) register
- Important habitat to threatened species as mapped for the BAM (accessed through the Biodiversity Offsets and Agreement Management System (BOAMS))
- NSW DPI Critical Habitat register
- NSW DPI Key Fish Habitat (KFH) maps (NSW DPI, 2022b)
- Commonwealth DCCEEW Register of Critical Habitat
- Bureau of Meteorology's (BoM's) Groundwater Dependent Ecosystems (GDEs) Atlas
- DCCEEW Directory of Important Wetlands Australia
- *State Environmental Planning Policy (Resilience and Hazards) 2021*
- *State Environmental Planning Policy (Biodiversity Conservation) 2021*
- Locations of NSW marine parks and reserves available from NSW DPI, Marine Parks website.

This report considers all coastal marine/estuarine and terrestrial species and ecological communities. Riverine and oceanic species and ecological communities have been excluded from this report as no habitat occurs in or near the biodiversity study area. Diadromous species (fish that migrate between fresh and salt water) have been included.

As the biodiversity study area is located within coastal waters (within three nautical mile limit seaward of the state/territorial sea baseline), matters in Commonwealth waters have not been considered in this report.

2.3 Habitat assessment

A habitat assessment was completed to assess the likelihood of occurrence of each threatened or migratory species, population or ecological community identified to potentially occur within the study locality. The likelihood of occurrence criteria is detailed in Table 2-1.

Species are considered 'likely to occur' (i.e. have a moderate to high likelihood of occurrence) where:

- The geographic distribution of the species is known or predicted to include the Interim Biogeographic Regionalisation for Australia (IBRA) subregion in which the proposal is located, and
- The biodiversity study area contains habitat features or components associated with the species, or
- Past or current surveys undertaken in the biodiversity study area indicate the species is present.

A test of significance (under the BC Act or FM Act) and/or an assessment of significance (under the EPBC Act; collectively known as Assessments of Significance (AoSs)) for species considered 'likely to occur' by the habitat assessment has been completed unless otherwise discussed in Section 3.12.

Table 2-1: Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the biodiversity study area during the current survey.
High	It is highly likely that a species inhabits the biodiversity study area and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods), has been recorded recently (within 20 years) in the locality (ten kilometres) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the biodiversity study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the biodiversity study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the biodiversity study area opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods) on habitat within the biodiversity study area, or habitat is in a modified or degraded state.
Low	It is unlikely that the species inhabits the biodiversity study area and has not been recorded recently in the study locality (ten kilometres). It may be an occasional visitor, but habitat similar to the biodiversity study area is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods) on available habitat. Specific habitat is not present in the biodiversity study area.
None	Suitable habitat is absent from the biodiversity study area.

2.4 Field surveys

Field surveys of the marine areas within the biodiversity study area were completed on 17 February 2022. The aims of the survey were to ground-truth the results of the background research and habitat assessment, with particular consideration given to species of conservation concern likely to occur such as White's Seahorse, Black Rockcod and Little Penguin. Targeted marine fauna surveys are discussed in Section 2.4.5.

Presumptive vegetation and habitat maps based on the results of the background research were developed to facilitate the field surveys. The maps were created for the biodiversity study area using ArcGIS 10.8 from an orthorectified aerial Nearmap imagery captured on 8 August 2021. Potential vegetation and habitat were outlined on a preliminary map layer via on-screen digitising at a scale of no more than 1:800 to demarcate boundaries as polygons determined from imagery and from existing vegetation and habitat mapping (NSW DPI, 2022a).

Presumptive map data were loaded onto a tablet connected to a GPS receiver (for added accuracy) and field survey data collected on the tablet.

2.4.1 Weather and sea conditions

The weather and sea conditions during the aquatic field survey and targeted fauna surveys are summarised in Table 2-2.

Table 2-2: Weather and sea conditions during the field surveys (Source: BoM, 2022a; WillyWeather 2022)

Date	Temperature range (°C)	Rainfall (mm)	Wind direction (9am/3pm)	Max wind speed (km/h)	High tide (m)	Low tide (m)
17/02/2022	20.3-31.7	0	N/NNE	54	09:44am (1.81 m) 10:14pm (1.43 m)	03:16am (0.48 m) 4:15 (0.33 m)
24/11/2022	16.7-21.5	0	W/WSW	30	09:02am (1.91 m) 9:36pm (1.45 m)	02:30am (0.38 m) 3:38pm (0.25 m)
10/03/2022	17.4-21.7	0	SW/SSE	52	02:20am (1.48 m) 2:52pm (1.13 m)	09:08am (0.72 m) 8:28pm (0.78 m)

2.4.2 Vegetation and fauna surveys

The terrestrial portion of the biodiversity study area included a small portion of the highly modified foreshore of West Esplanade Park, Manly Cove. Vegetation within the biodiversity study area comprised of landscaped grasses with planted native/exotic vegetation. Due to the lack of remnant vegetation categorisation of Plant Community Type (PCT) identified from background research, Threatened Ecological Community (TEC) commensuration checks were not required.

2.4.3 Targeted flora surveys

Background research did not indicate the presence of remnant terrestrial vegetation, therefore no targeted threatened flora surveys were considered necessary.

2.4.4 Aquatic habitat survey

Fieldwork was carried out from a five-metre survey vessel using a combination of an underwater Remotely Operated Vehicle (ROV) and/or bathyscope on 17 February 2022 for GHD Group Pty Ltd (GHD). The intertidal areas were inundated at the time of survey and the landward extent limited by a sandstone escarpment and existing foreshore infrastructure. Thus, all areas below high tide were surveyed from the vessel. The extent of the biodiversity study area for the aquatic field survey is indicated in Figure 1-3.

The vessel navigated to areas of potential marine vegetation and habitat areas to verify, describe and classify the presumptive map into categories below.

Seagrasses, where detected, were classified as follows:

- Species:
    - Posidonia (*Posidonia australis*)
    - Zostera (*Zostera muelleri* subsp. *capricorni*)
    - Halophila (*Halophila* spp.).

Estimates of seagrass density were made by ranking each observation point using three categories for each of three species known to occur in the biodiversity study area as per King and Barclay (1986):

- Density:
    - High (greater than 50 per cent cover) (i.e. Pos-3)
    - Medium (between 15 and 50 per cent cover, inclusive) (i.e. Pos-2)
    - Low (less than 15 per cent cover) (i.e. Pos-1).

The complexity of reef habitat was also classified, given complexity is considered a reasonable indicator of the potential for an area of reef to be habitat for threatened species such as Black Rockcod (*Epinephelus daemelii*). Habitat complexity was categorised as:

- High (greater than one-metre-high relief complex habitat associated with natural, unmodified shoreline, includes consolidated or boulder reef with/without macroalgae)
- Medium (0.5 to one metre medium relief complex habitat associated with natural or modified shoreline, includes consolidated or boulder reef with/without macroalgae)
- Low (less than 0.5 metres low relief reef with/without macroalgae).

2.4.5 Targeted marine fauna surveys

Due to the presence of seagrass (in particular Posidonia) and artificial habitats (i.e. subtidal piles and Manly Cove tidal net) targeted surveys for the threatened White's Seahorse (*Hippocampus whitei*) (listed as endangered under the EPBC Act and FM Act) were undertaken via SCUBA on 24 November 2022. This included a detailed search of existing subtidal piles, areas containing threatened Posidonia seagrass and artificial netting and piles associated with the Manly Cove tidal net.

In conjunction with the White's Seahorse targeted SCUBA survey, an additional survey for the Black Rockcod (listed as vulnerable under the EPBC Act and endangered under the FM Act) was undertaken in the areas of medium and high relief rocky reef along Federation Point within the biodiversity study area.

Targeted surveys for the Little Penguin (*Eudyptula minor*) were carried out at dusk between 7:00 pm and 8:20 pm on 10 March 2022 and 5:00 pm and 6:30 pm on 24 November 2022. Four historical burrows were inspected with a spotlight (red light filter attached), two below/near the existing southern walkway and two within rock crevices of the Federation Point foreshore.

2.5 Data analyses and mapping

Following completion of the field survey, polygons drawn on the presumptive maps were refined and reclassified as per the field data collected using the same methods described above for creating presumptive maps. Where areas comprised more than one species (i.e. Zostera with an understorey of Halophila), these were differentiated by the most abundant species while co-occurring species present were also described.

2.6 Limitations

Survey efficacy is influenced by a range of factors. The aquatic survey was conducted in summer 2022 and the subtidal targeted surveys were conducted in spring 2022. For single surveys, limitations are generally due to a single, short duration survey that does not account

for seasonal or other temporal variation. The detection of certain species may be affected by:

- Seasonal migration (particularly migratory and transient species)
- Seasonal availability of food for fauna
- Weather conditions during the survey period (some species may go through cycles of activity related to specific weather conditions)
- Species lifecycle (cycles of activity related to breeding).

These potential limitations have been addressed by applying the precautionary principle in cases where the survey methodology may have given a false negative result (i.e. a species that could reasonably be expected to occur, based on previous records and available habitat, was not observed). All species (including threatened species) have been assessed on the basis of the presence of their habitat and the likely significance of that habitat to a viable local population. Furthermore, it should be noted due to the dynamic nature of marine environment, the marine vegetation and communities may have varied through time or seasonally changed since the aquatic survey was completed in February 2022.

3 Existing environment

3.1 Environmental setting

Sydney Harbour (the harbour) is of high aesthetic, ecological and socio-economic importance to Sydney. The harbour is a drowned valley, tidal estuary (Roy, et al., 2001; Sydney Institute of Marine Science, 2014) about 30 kilometres long and occupies about 5000 hectares (Birch, 2006). The foreshores are highly urbanised and the harbour has a large volume of commercial and private boating activities. The harbour is the final destination for runoff from about 50,000 hectares of catchment, of which at least 86 per cent is urbanised and/or industrialised since the 1800s (Birch, 2006). Reclamation and vegetation clearing have resulted in major alterations to ecological function, hydrology and physio-chemical attributes of the estuary (Birch, 2006). Despite these alterations the harbour has shown signs of recovery in more recent times (Johnston, et al., 2015).

The biodiversity study area lies within the Pittwater Subregion of the Sydney Basin Bioregion (NSW National Parks and Wildlife Service, 2003a) and partially within the Belrose Coastal Slopes landscape (Mitchell, 2002) (refer Figure 1-4). The Pittwater Subregion geology is characterised by Triassic Hawkesbury Sandstone within ridge capping's of Ashfield Shale. Exposed valleys are typified by Narrabeen sandstones with Quaternary coastal sands along the coast. Characteristic landforms of the Pittwater subregion include a Hornsby plateau of quartz sandstone with the occasional shale caps, small beach, dune and lagoon barrier systems with steep coastal cliffs and rock platforms.

The biodiversity study area is located within at the western extent of Manly Cove, north-west of the entrance to Sydney Harbour. The biodiversity study area includes a portion of Federation Point from the west and is within the Sydney Harbour Foreshores and Waterways Area and Sydney Metropolitan Catchment Management Area.

3.2 Coastal processes and hydrology

The poleward flowing East Australian Current (EAC) brings nutrient depleted waters to the entrance of the harbour and water at the entrance of the harbour is continually being renewed (Sydney Institute of Marine Science, 2014). Water circulation in drowned valley estuaries, such as Sydney Harbour, is dominated by tidal currents as opposed to wind stress (Roy, et al., 2001; Sydney Institute of Marine Science, 2014). Tides are predominately semi-diurnal, reverse every six hours but can vary considerably spatially and temporally. Tidal velocities can reach up to 0.25 metres per second in the lower estuary with the most distant branches of the upper estuary usually experiencing slower velocities, sometimes up to an order of magnitude less (Sydney Institute of Marine Science, 2014). In some areas of the estuary, tide-induced residual circulation forms a number of gyres at regions of complex geometry which may force the retention of biota or pollutants (Das, et al., 2000).

Three common wind patterns are known on the harbour. The strongest of the three originate from the south (southerlies) and occur about 17 per cent of the time. The most frequent of the three (about 22 per cent of the time) are north-easterlies while the least common of the three patterns are westerlies which usually occur during the winter months (Sydney Institute of Marine Science, 2014). Generally, the wave climates at Manly Cove are characterised by a combination of wind and boat waves (i.e. vessel traffic) and a mixture of swell that comes in through the harbour entrance (i.e. from the south-east).

3.3 Soil and sediment properties

The present-day harbour comprises five environmental/sedimentological units including:

- Harbour entrance (marine flood-tide delta sands)
- Lower estuary (sands); within biodiversity study area
- Central estuary (muddy sands)
- Upper estuary (muds)
- Off-channel bays (muds) (Birch, 2006).

The biodiversity study area lies within two alluvial/fluvial geological units (Qhb and Qhf) and is underlain by Hawkesbury Sandstone (Rh) which bounds Manly Cove to the north-west and south-east (Chapman & Murphy, 1989). These geological units are described as follows:

- Qhb: Coarse quartz sand with varying amounts of shell fragments
- Qhf: Medium to fine 'marine' sand
- Rh: Medium to coarse-grained quartz sandstone, very minor shale and laminite lenses.

The surrounding steep headlands and foreshores (i.e. Federation Point and North Head) are both naturally and artificially cut and include pockets of fringing native vegetation.

3.3.1 Acid sulfate soils/sediments

Acid sulfate soil/sediment (ASS) is the common name given to naturally occurring soils and sediments that contain iron sulfate (pyrite). Acid sulfate soils/sediments are defined as either:

- Actual ASS (AASS) - highly acidic soils or sediments with pH <4, or
- Potential ASS (PASS) - soils or sediments containing sulphuric material that have not been oxidised but have potential for oxidation to generate high acidity.

The northern and central portion of the biodiversity study area is located within a designation of 'Wa4' being Aeolian Sandplain (Stantec, 2023b). There is a low probability of ASS being encountered at depths greater than three metres below ground surface. The central portion of the site (Manly Cove Beach) is located within an area of no known occurrence of acid sulfate materials (Stantec, 2023b).

The marine portion of the biodiversity study area is situated within a designation of 'Em' being estuarine bottom sediments. A high probability of ASS is noted for these areas and environmental risk is present if bottom sediments are disturbed.

Under the *Manly Local Environment Plan 2013* (Manly LEP) the biodiversity study area is situated between Class 4 (i.e. ASS likely to be found beyond two metres of natural ground surface) and Class 5 (indicates ASS within 500 meters of either Class 1, 2, 3 or 4). The subtidal portion of the biodiversity study area has not been mapped under the Manly LEP.

Tetra Tech Coffey (2023a) was commissioned by BESIX Watpac to provide factual information regarding the contamination status of the soil and sediment at the site. Upon review of the report, potential ASS is present below the site due to the presence of Chromium Reducible Sulfur (Scr) (Stantec, 2023b).

3.3.2 Soil and sediment quality

Soils and sediments of Sydney Harbour are historically known to contain heavy metals, asbestos, hydrocarbons, polycyclic aromatic hydrocarbons (PAHs) and organochlorine pesticides (OCPs) (Birch, 2006). Some concentrations of heavy metals in sediments in Sydney Harbour have been documented to be the highest in Australia and internationally (Montoya, 2015). About 20 per cent of all copper, lead and zinc were found in four bays in the Parramatta estuary in the early 2000s: (1) Iron Cove; (2) Rozelle and Blackwattle Bays; (3) Homebush Bay; and (4) Hen and Chicken Bay. These bays are over 10 kilometres upstream of the biodiversity study area. Other areas where heavy metals have been detected in sediments are located in small, highly concentrated areas of upper parts of tributaries and bays but are usually low in concentrations.

As part of the Manly Wharf 3 upgrade, preliminary contamination sampling identified the presence of organometal, tributyltin (TBT) (GHD, 2021). TBT concentrations within a sample analysed from inside the Manly Wharf 3 berthing pocket (about 250 metres east of the biodiversity study area) exceeded the adopted *Australian and New Zealand Guidelines for fresh and marine water quality 2018* (ANZG, 2018) sediment toxicant values. TBT is rapidly absorbed by organic materials (i.e. algae) or adsorbed onto suspended particles in the water column (Burton et al., 2004). It is then readily incorporated into tissues of lower trophic organisms (i.e. filter feeders and zooplankton) and accumulated into higher trophic organisms through predation (Berge et al., 2004). TBT has also been linked to endocrine disruptive effects such as imposex in gastropods (male characteristics appearing in female organisms) (Smith, 1981).

Burning of waste, chemical manufacturing and certain industrial processes have also introduced dioxins into the sediments of Sydney Harbour (Montoya, 2015). Once in an aquatic environment, dioxins can absorb quickly to particulate organic matter before settling in bottom sediments. They are mostly resistant to biological and chemical breakdown in the aquatic or terrestrial environment hence, are persistent in estuarine sediments. Effects on biota include lethality, reproductive impairment, developmental abnormalities, endocrine/immune/neurological system dysfunctions and wasting syndrome (Montoya, 2015). Following detection of this substance in the late 1980s, total fin-fish bans were implemented in Homebush Bay in 1989 extending to a commercial fishing ban upstream of the Gladesville Bridge in 1990. Dioxin analysis was not included in the laboratory analysis undertaken by GHD, 2021 (Manly Wharf 3 upgrade) based on the significant distance between historical industrial areas (i.e. Parramatta River) where dioxins are known to be present.

Microplastics are tiny plastic fragments, fibres and granules (generally smaller than five millimetres in diameter) (Montoya, 2015). These can either be manufactured as microplastics or a result of breakdown of larger plastic debris. Microplastics in the water column can settle in the sediment following accumulation of microbial films, algae and invertebrates and/or the adherence to other particles. A large number of compounds in plastics can interfere with biologically important processes resulting in endocrine disruption and carcinogenesis. Furthermore, marine plastic debris has been found to accumulate waterborne pollutants up to 100 times greater than sediments (Browne, et al., 2013). The highest concentrations of microplastics in sediments have been recorded in Sydney Harbour and Middle Harbour with some areas containing an order of magnitude greater than other estuaries internationally (Montoya, 2015).

The Preliminary Site Investigation (PSI) undertaken by Stantec (Stantec, 2023b) identified areas of potential environmental concern including potential fill material in landscaped gardens, and the footprint of the Manly Sea Life building.

Tetra Tech Coffey (2023a) was commissioned by BESIX Watpac to provide factual information regarding the contamination status of the soil and sediment at the site. Contamination testing was undertaken on select sediment and soil samples. Stantec (2023b) undertook a comparison of tested soil and sediment concentration results to the applicable guidelines for current and future land-uses (NEPM, 2013 recreation/public open-space for soil and Australian and New Zealand Guidelines Default Guidelines Values (DGVs) for toxicants in sediment for sediments). Results were reported below the adopted criteria for all samples tested.

3.4 Water quality

Generally, water quality of Manly Cove is of a high standard, primarily due to the close proximity to the entrance of Sydney Harbour which results in steady tidal flushing. However, during large rain events and/or large swell events or a combination of both (i.e. East Coast Low pressure systems) Manly Cove can experience elevated turbidity and suspended sediments. Suspended sediments attenuate light penetration through the water column and thereby limit pelagic and benthic primary production (the process of converting light energy into biomass). As the suspended matter settles to the seabed it may also smother benthic organisms and affect the type of organisms and plants that can exist in this environment. Fluctuations in light and rates of sedimentation occur naturally in Sydney Harbour due to regular resuspension of particulate matter by the tidal currents, wind-driven mixing and runoff events. Any activities which involve seabed disturbance have the potential to increase sedimentation and turbidity beyond the natural range. Water quality can be impacted by stormwater run-off from the surrounding catchment and may not be suitable for swimming due to the presence of several potential sources of faecal contamination. Table 3-1 presents the indicative Water Quality Objectives (WQOs) trigger values for the biodiversity study area.

Table 3-1: Sydney Harbour lower estuary WQOs trigger values (NSW DPIE, 2006)

Analyte (units)	Sydney Harbour WQO trigger value (lower estuary)
pH (pH units)	7.0-8.5 (pH units)
Salinity (µS/cm)	125-2200 µS/cm
Dissolved oxygen (% saturation)	80-110%
Turbidity (NTU)	0.5-10 NTU
Total nitrogen (µg/L)	300 µg/L
Total phosphorous (µg/L)	30 µg/L
Chlorophyll-a (µg/L)	4 µg/L
Enterococci (colony forming units/100 mL) (primary contact)	>150 (CFU/100 mL)
Enterococci (colony forming units/100 mL) (secondary contact)	>1000 (CFU/100 mL)

3.5 Terrestrial vegetation

The biodiversity study area is located on a highly modified, urban foreshore which is fringed by commercial buildings (Manly Pavilion and Manly Waterworks) as well as the former Sea Life building. Public amenities and Manly Art Gallery and Museum are located within the northern portion of the biodiversity study area. Residential and commercial buildings are

located nearby, separated by West Esplanade Street, Manly. The biodiversity study area does not contain remnant vegetation or riparian vegetation, remnant vegetation in the study locality is generally associated with nearby National Parks (i.e. North Head and Dobroyd Head). The landward portion of the biodiversity study area is predominantly paved and used as a walkway. One garden bed was observed at the northern portion of Manly Sea Life building close to stairs, of which these contained eight native planted Bangalow Palms (*Archontophoenix cunninghamiana*) (refer Plate 1). This garden bed would be removed or relocated as part of the proposal.

Numerous potted exotic plants (i.e. succulents, palms etc.) were observed on the pathway used as decorative features for Manly Pavilion. Native and exotic trees/palms and shrubs were observed within the landscaped garden beds and grassed area in proximity to Manly Art Gallery and Museum, all of which were likely to have been planted (refer Plate 2). Some of the species observed included the Canary Island Palm (*Phoenix canariensis*), Norfolk Island Pine (*Araucaria heterophylla*), Moreton Bay Fig Tree (*Ficus macrophylla*), *Xanthorrhoea* sp., *Lomandra* sp. and Pigface (*Carpobrotus glaucescens*) (refer Plate 3). Terrestrial vegetation mapped within the biodiversity study area is presented in Figure 3-1. A full list of terrestrial species recorded during the survey are presented in Appendix A and estimated areal coverage of vegetation in the biodiversity study area is presented in Table 3-2.

Table 3-2: Areas of terrestrial vegetation and habitat in the biodiversity study area

Terrestrial vegetation	Area in biodiversity study area (m^2)
Landscaped garden and park	915
Planted tree(s)	416



Plate 1: Landscaped garden bed containing eight Bangalow Palms which would be removed or relocated as part of the proposal



Plate 2: Landscaped garden bed and grassed area containing Canary Island Palm, Grass Tree, *Lomandra* sp. and Pigface near the Manly Art Gallery and Museum. Footpath and public outdoor seating visible



Plate 3: Grassed area with planted trees (Canary Island Palm, Norfolk Island Pine and Moreton Bay Fig)



Terrestrial Vegetation in the Biodiversity Study Area

Manly, NSW

Project Code: 304500787-GS-012
Drawn By: TB, Checked By: AC
Rev: 01
Date: 2023-01-25
Figure No: 3-1

Legend

- Biodiversity Study Area
- Compound area

Terrestrial Vegetation

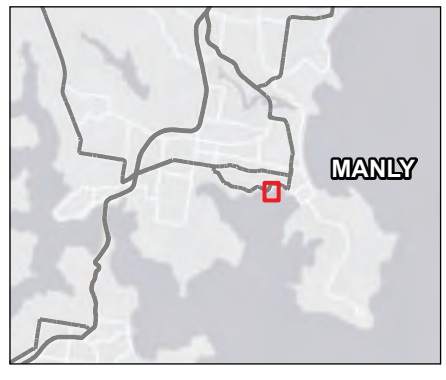
- Landscaped Garden and Park
- Planted Tree

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by MetroMap (December, 2022)
2. Terrestrial Vegetation supplied by Stantec (2023)

0 15 30 45
Metres

Scale at A3: 1:1,000



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3.6 Terrestrial fauna and habitat

Although the terrestrial vegetation was limited within the biodiversity study area, the biodiversity study area would still provide potential habitat for a number of species. Trees may provide potential foraging habitat for birds and arboreal and aerial mammals, particularly when in bloom/fruiting such as the Moreton Bay Fig which the Grey-headed Flying Fox may feed from. Numerous Moreton Bay Fig Trees were observed within the fragmented vegetation corridor west of the Manly Art Gallery and Museum building outside of the biodiversity study area. Birds and arboreal mammals may also roost in mature trees although the level of disturbance and lighting may deter roosting and foraging at night. The trees can also provide breeding habitat for birds common to urban areas.

Disturbance-tolerant birds may forage in the vegetated areas and the majority of the biodiversity study area is considered foraging habitat for microchiropteran bats (microbats). Microbats may also roost in the crevices of the existing Manly Sea Life building and timber jetty, although this would be suboptimal given the proximity to water.

Local and vagrant seabirds may use the foreshores and existing timber jetty structures as perching or foraging areas. The volume of pedestrian and vessel traffic in Manly Cove is likely to be a deterrent for species that are not adapted to anthropogenic disturbance. Dogs are not permitted on the sandflats east of the building, however, many are walked on-leash along the footpath along the shoreline.

A list of fauna species recorded during the survey is provided in Appendix A.

3.7 Priority weeds

No priority weeds listed under the *Biosecurity Act 2015* for the Greater Sydney region were recorded in the biodiversity study area during the survey.

3.8 Marine vegetation and habitat

All marine vegetation (seagrass, macroalgae, mangroves and saltmarsh) is protected under the FM Act. The FM Act protects marine vegetation from ‘harm’ in the form of gathering, cutting, pulling up, destroying, poisoning, digging up, removing, injuring or preventing light from reaching vegetation or any part of it. A permit under Section 205 of the FM Act is required to harm marine vegetation.

Estuarine macrophyte mapping (NSW DPI, 2022a) indicates there are six marine vegetation communities that occur within the study locality (refer Figure 3-2):

- Posidonia
- Posidonia/Zostera
- Zostera
- Halophila
- Mangrove
- Saltmarsh.

Seagrasses are the most extensive marine vegetation communities within the study locality and generally occur within embayment’s of the harbour (refer Table 3-3). No mangroves or saltmarsh are mapped within the biodiversity study area, however, communities have been mapped in the study locality. The nearest community of mangroves is associated with Manly Lagoon, about 1.8 kilometres north of the biodiversity study area and the closest community

of saltmarsh is located about 6.5 kilometres north of the biodiversity study area at Dee Why Lagoon. The biodiversity study area is mapped as KFH and is estuarine thus, is considered a Class 1 waterway - Major KFH (NSW DPI, 2013; NSW DPI, 2022b).

Table 3-3: Marine vegetation and habitat mapped within the study locality (NSW DPI, 2022a)

Broad marine vegetation and habitat type	Marine vegetation community	Area within the study locality (ha)	Proximity and bearing of the closest occurrence to the biodiversity study area
Seagrass	Posidonia	~0.6	Within biodiversity study area
Seagrass	Posidonia/Zostera	~7.9	Within biodiversity study area
Seagrass	Zostera	~59.6	Within biodiversity study area
Seagrass	Halophila	~1.4	Within biodiversity study area
Mangrove	Mangrove	~14.2	~1.8 kilometre north
Saltmarsh	Saltmarsh	~8.3	~6.5 kilometre north

DUFFYS FOREST
MONA VALE
KU-RING-GAI CHASE
TERREY HILLS
INGLESIDE
WARRIEWOOD
ELANORA HEIGHTS
NARRABEEN
BELROSE
ST IVES
OXFORD FALLS
CROMER
DAVIDSON
COLLAROY
FRENCHS FOREST
BEACON HILL
DEE WHY
EAST KILLARA
FORESTVILLE
BROOKVALE
NORTH CURL CURL
CURL CURL
EAST LINDFIELD
ALLAMBIE HEIGHTS
LINDFIELD
KILLARNEY HEIGHTS
MANLY VALE
ROSEVILLE
CASTLE COVE
SEAFORTH
CHATSWOOD
MANLY
NORTHBRIDGE
NORTH HARBOUR
LANE COVE
CAMMERAY
MOSMAN
VAUCLUSE
BALMAIN
ROZELLE
SYDNEY
ROSE BAY
GLEBE
SURRY HILLS
BONDI BEACH
REDFERN
MOORE PARK
BONDI
RANDWICK
ST PETERS
COOGEE

N

FAIRLIGHT STREET
WEST ESPLANADE
THE CRESCENT
COMMONWEALTH PARADE
FAIRLIGHT WALK

Marine Vegetation in the Study Locality

Manly, NSW

Project Code: 304500787-GS-008
Drawn By: TB, Checked By: AS
Rev: 01
Date: 2023-01-25
Figure No: 3-2

Stantec

Legend

- Biodiversity Study Area
- Study Locality (10km)

Marine Vegetation

- Halophila
- Mangrove
- Posidonia
- Posidonia/Zostera
- Saltmarsh
- Zostera

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Imagery supplied by MetroMap (June, 2022) and Esri
2. Marine Vegetation supplied by DPI (2022)

0 1,000 2,000 3,000 Metres

Scale at A3: 1:80,000



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Results of the aquatic field survey conducted on 17 February 2022 found the biodiversity study area was comprised of a mosaic of seagrass, high/medium/low subtidal and intertidal rocky reef with macroalga (mainly kelp, *Ecklonia radiata*), unvegetated soft sediment and artificial structures (i.e. subtidal/intertidal timber piles and structures). It should be noted due to the dynamic nature of marine environments, the marine vegetation and communities may have varied through time or seasonally changed since the survey was completed. The subtidal and intertidal habitats surveyed on 17 February 2022 within the biodiversity study area are described below and presented in Figure 3-3 and Table 3-4.

The foreshore intertidal area of Manly Cove included sandy beach and sands below the seawall near the footpath (refer Plate 4). The intertidal habitat otherwise included the upper portions of the timber and concrete wharf pylons and concrete seawall which were heavily encrusted by Sydney Rock Oysters (*Saccostrea glomerata*) and Variable Barnacle (*Amphibalanus variegatus*) (refer Plate 5). The seawall also contained clusters of intertidal tube worms (*Galeolaria caespitosa*) and gastropds (refer Plate 6).



Plate 4: Sandy beach habitat within the biodiversity study area.



Plate 5: Typical intertidal communities and condition of vertical concrete wharf piles in the biodiversity study area



Plate 6: Typical intertidal communities and condition of Manly Sea Life seawall in the biodiversity study area

About 0.9 hectares of seagrass was recorded subtidally within the biodiversity study area and contained three species: Posidonia, Zostera and Halophila.

The most numerically abundant species was Halophila, which was generally observed in all patches, varying in density. Medium density Halophila and low density Zostera was observed growing beneath the wharf piles. Posidonia was the least common species, with one small, mono-specific, fragmented patch occurring within the tidal pool to the south of the existing Manly Sea Life building. Posidonia was also observed co-occurring with other seagrasses in five patches (refer Plate 7), the largest of those being to the west of the tidal pool occurring with medium density Zostera and Halophila. The invasive marine alga *Caulerpa taxifolia* (Caulerpa) was observed within the biodiversity study area, often co-occurring with other seagrasses. Approximate areas of dominant seagrasses are presented in Table 3-4.



Plate 7: Posidonia co-occurring with Zostera and Halophila

High to medium relief rocky reef consisting of large boulders with scattered sparse/dense macroalgae was recorded at the south-western extent of the biodiversity study area along Federation Point. Low relief rocky reef and rubble was observed with scattered sparse/dense macroalgae east of Manly Pavilion (refer Plate 8).



Plate 8: Typical low relief rocky reef with macroalgae east of the existing boardwalk

The lower western portion of the Manly Sea Life concrete seawall was colonised by macroalga, mainly kelp. Subtidal sections of the timber jetty piles were heavily encrusted with a thick layer of marine growth consisting of various ascidians (mainly *Pyura stolonifera*), dense clusters of brown algae (*E. radiata* and *Padina* sp.) and red coralline algae (*Corallina* sp.). Rocky reef and macroalgae communities present on subtidal piles are considered Type 2 - moderately sensitive KFH. Vertical macroalgae coverage was difficult to ascertain on individual piles, however, most contained a dense cluster towards the base of the pile (refer Plate 9). As a conservative estimate, macroalga made up about one third of the piles surface area.



Plate 9: Subtidal timber jetty pile (Type 2 - KFH)

The upper subtidal section of the Manly Sea Life building seawall was densely colonised with Cunjevoi (*Pyura stolonifera*) which then transitioned to a band of dense *E. radiata* (Type 2 KFH) down to the seabed (refer Plate 10). The band of macroalgae was observed along most of the seawall and was about 1-1.5 metres wide. Other common species observed along the seawall were brown algae (*Padina* sp.) and red filamentous algae (refer Plate 12). Rocky reef and macroalgae communities present on the seawall are considered Type 2 - moderately sensitive KFH.



Plate 10: Representative subtidal assemblage on the Manly Sea Life seawall (eastern side)

A large part of the biodiversity study area consisted of subtidal unvegetated soft sediment habitat (about 1.8 hectares) which is classed as a Type 3 KFH. This was mostly comprised of bare sand and shell grit in the deeper areas (refer Table 3-4). No visible epifauna (i.e. fauna that lives on the surface of the seafloor) was observed during this survey, however, sediment bioturbation indicated the presence of burrowing infauna (refer Plate 11).

Soft sediment areas provide habitat for benthic infaunal assemblages which generally consist of burrowing organisms, such as polychaete worms, amphipod crustaceans, bivalve and gastropod molluscs and other worm-like phyla such as nemerteans and nematodes (which are often abundant). These animals are usually found within the upper 30 centimetres of the sediment. As well as being a source of food for organisms higher up the food web, such as fish, large invertebrates and shorebirds, they also drive nutrient cycling through reworking of the sediments (bioturbation), altering physical and chemical processes, excreting nutrient-rich wastes and feeding on phytoplankton (Pennifold & David, 2001). The activity of benthic assemblages in nearshore sediments is linked to pelagic processes and thus influences nutrient exchange processes between coastal and offshore systems (Eyre & Ferguson, 2005; Connell & Gillanders, 2007). Little information is known in regard to the specific infauna associated with the biodiversity study area however, the macrofauna communities associated with seagrass meadows generally have greater density, biomass and diversity of benthic infauna (Rodil et al. 2021).



Plate 11: Representative soft sediment habitat (Type 3 - KFH) with bioturbation holes

The amount of marine growth on the Manly Cove tidal pool netting varied considerably among locations and depth around the perimeter of the tidal pool. In general, the upper intertidal section of netting was mostly bare, with occasional fragments of brown and red filamentous algae either growing or entangled on the nets. The subtidal portion of the netting was most heavily colonised by macroalgae and ascidians in areas where the netting was adjacent to pilings (refer Plates 12 and 13). Seagrass was observed growing through the tidal net, with dead seagrass (wrack) accumulated at the base. An unidentified pipefish was observed attached to a strand of *Sargassum* sp. (no photograph).



Plate 12: Manly Cove tidal pool netting (western side)



Plate 13: Medium density Halophila growing through the southern portion of the tidal net, tidal net colonised by brown filamentous algae, *Padina* sp.

Habitat on existing piles is considered Type 2 - Moderately sensitive KFH as it meets the description of estuarine rocky reefs and macroalgae were observed on these structures (NSW DPI, 2013). Intertidal and subtidal soft sediment areas are considered Type 3 - Minimally sensitive KFH as these areas were characterised by unstable or unvegetated sand. All seagrass meadows are considered Type 1 - Highly sensitive KFH attributed to the presence of Posidonia, Zostera and Halophila in areas larger than five square metres. KFH types within the biodiversity study area are summarised in Figure 3-4.

Table 3-4: Areas of marine vegetation and habitat in the biodiversity study area

Marine vegetation and habitat	Area in biodiversity study area (m^2)
Seagrass - Type 1 KFH	Dominant species of seagrass (horizontal area): Posidonia: 2 Posidonia/Zostera/Halophila*: 1,080 Zostera: 443 Zostera/Halophila*: 4,705 Halophila: 4,705 Collectively: 9,041
Rocky reef containing macroalgae - Type 2 KFH	3,381
Intertidal rocky reef	93
Subtidal rocky reef communities (piles and seawall) - Type 2 KFH	260 (vertical area on piles**) 240 (vertical area on seawall)
Subtidal soft sediment - Type 3 KFH	18,525

*Indicates co-occurring species of similar densities; **Estimated marine vegetation on vertical piles calculated as about one-third of the length of the subtidal portion.

The marine vegetation and habitat within the biodiversity study area is characteristic of many nearshore areas in the harbour. Subtidal and intertidal artificial structures of the existing wharf provide habitat for a number of local and transient fish and other mobile species. The intertidal sand flats can provide habitat for foraging shorebirds. These may include several threatened and migratory species known to occur in Sydney Harbour (refer Sections 3.12 and 3.18). No threatened or migratory species were observed during the field survey, however, fish species frequently observed in the harbour were recorded. These included Yellowfin Bream (*Acanthopagrus australis*), Eastern Hulafish (*Trachinops taeniatus*) and Fanbelly Leatherjackets (*Monacanthus chinensis*).

The list of marine fauna species recorded during the field survey is provided in Appendix A.



Indicative Locations of Benthic Marine Habitat in the Biodiversity Study Area

Manly, NSW

Project Code: 304500787-GS-013
Drawn By: TB, Checked By: AC
Rev: 01
Date: 2023-01-25
Figure No: 3-3

Stantec

Legend

- Biodiversity Study Area

Marine Habitat

- Boulders
- High/medium relief rocky reef with macroalgae
- Intertidal rocky reef
- Low relief rocky reef with macroalgae
- Soft Sediment

Dominant Species of Seagrass

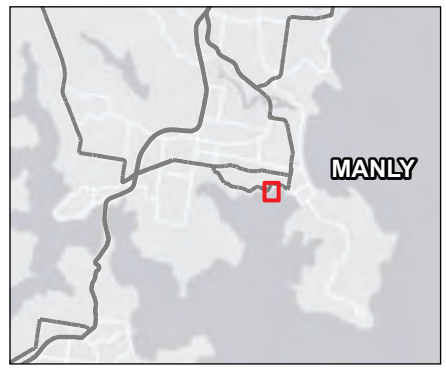
- Halophila
- Posidonia
- Posidonia/Zostera/Halophila
- Zostera
- Zostera/Halophila
- Posidonia Present

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by MetroMap (December, 2022)
2. Marine Habitat and Dominant Species of Seagrass supplied by Stantec (2022)

0 10 20 30 40 50 Metres

Scale at A3: 1:1,000



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Key Fish Habitat in the Biodiversity Study Area

Manly, NSW

Project Code: 304500787-GS-014
Drawn By: TB, Checked By: AC
Rev: 01
Date: 2023-01-24
Figure No: 3-4

Legend

- Biodiversity Study Area

Key Fish Habitat

- Type 1
- Type 2
- Type 3

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by MetroMap (December, 2022)
2. Key Fish Habitat supplied by Stantec (2022)

0 10 20 30 40 50 Metres

Scale at A3: 1:1,000



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3.9 Marine pests and diseases

In NSW, Introduced Marine Pests (IMPs) of concern are listed under Schedule 2 of the NSW *Biosecurity Act 2015* as a 'prohibited matter' and under Schedule 1, Part 2 of the NSW *Biosecurity Regulation 2017* as a 'notifiable matter'. A search of the National Introduced Marine Pest Information System (NIMPIS) (NIMPIS, 2022) and the NSW DPI Aquatic Pest Distribution (DPI, 2022c) identified the species in Table 3-5 as known to occur in proximity to the biodiversity study area.

Table 3-5: Marine and aquatic pest species known to occur within Sydney Harbour (NIMPIS, 2022, NSW DPI, 2022c)

Source: NIMPIS, 2022	**Source: NSW DPI, 2022c**
Common name/species	**Common name/species and disease**
Colonial Ascidian (*Botrylloides leachii*)	Pacific Oyster (*Crassostrea gigas*)
Solitary Ascidian (*Styela plicata*)	Eastern Gambusia (*Gambusia holbrooki*)
Acorn Barnacle (*Megabalanus rosa*)	**Caulerpa (*Caulerpa taxifolia*)**
East Asian Bivalve (*Theora lubrica*)	Pacific Oyster Mortality Syndrome (POMS)
Bugula neritina	
Bugulina flabellate	
Lace Coral (*Schizoporella unicornis*)	
Plumularia setacea	
Speckled Pill Bug (*Cirolana harfordi*)	
Cirolanid Isopod (*Eurylana arcuate*)	
Sponge Isopod (*Paracerceis sculpta*)	
Marine Pill Bug (*Sphaeroma walker*)	
Caulerpa filiformis	
Fanworm (*Euchone limnicola*)	
Fouling Serpulid (*Hydroides elegans*)	
Japanese Polydorid (*Pseudopolydora paucibranchiata*)	

Key: **Bold** indicates observed within the biodiversity study area.

Like a great number of other estuaries and waterways, Sydney Harbour is at risk of infestation from the marine pest Caulerpa (*Caulerpa taxifolia*) (NSW DPI, 2022d). Caulerpa is known to spread via fishing and boating activities as well as natural hydrology and was observed during the field survey often co-occurring with seagrasses in the biodiversity study area. Caulerpa is a fast-growing marine alga native to tropical Australia and the South Pacific (NSW DPI, 2022d). This species is known to alter the physical and chemical environment and can outcompete native seagrasses and seaweeds, forming dense mats. As it can propagate from fragments, it is known to easily spread via fishing and boating activities.

3.10 Threatened ecological communities

No remnant vegetation or PCTs occur within the biodiversity study area, however numerous TECs have been mapped within the study locality. Seagrass meadows (PCT ID 1913), extent shown in Figure 3-2 were observed in the biodiversity study area and contained the threatened *Posidonia australis*. PCTs with associated TECs within the study locality are presented in Table 3-6 and shown on Figure 3-5.

Table 3-6: PCTs with associated TECs mapped within the study locality and their proximity to the biodiversity study area

PCT and ID	Associated TECs BC Act/FM Act*	 EPBC Act	Area in locality (ha)	Proximity and bearing of the closest occurrence to the biodiversity study area
Sydney Coastal Lilly Pilly-Palm Gallery Rainforest (PCT ID 3039) / Sydney Coastal Foreshores Gully Rainforest (PCT ID 3040) / Sydney Enriched Sandstone Moist Forest (PCT ID 3176) (BC Act only)	Hygrocybeae Community of Lane Cove Bushland Park in the Sydney Basin Bioregion (critically endangered) / Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (endangered)	Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (critically endangered)	~24 / ~15 / ~37	1.1 km, south-west (PCT ID 3040)
Blue Gum High Forest (PCT ID 3136)	Blue Gum High Forest in the Sydney Basin Bioregion (critically endangered) / Hygrocybeae Community of Lane Cove Bushland Park in the Sydney Basin Bioregion (critically endangered)	-	~73	~3.2 km, south
Hunter Coast Lowland Spotted Gum Moist Forest (PCT ID 3234)	Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion (endangered)	-	~5	~8.2 km, north

PCT and ID	Associated TECs BC Act/FM Act*	 EPBC Act	Area in locality (ha)	Proximity and bearing of the closest occurrence to the biodiversity study area
Sydney Coastal Shale-Sandstone Forest (PCT ID 3259)	Duffys Forest Ecological Community in the Sydney Basin Bioregion (endangered)	-	~62	~5.7 km, north-west
Sydney Turpentine Ironbark Forest (PCT ID 3262)	Sydney Turpentine-Ironbark Forest in the Sydney Basin Bioregion (critically endangered)	Turpentine-Ironbark Forest of the Sydney Basin Bioregion (critically endangered)	~6	~8.5 km, north-west
Central Headland Grassland (PCT ID 3407)	Themeda grassland on seacliffs and coastal headlands in the NSW North Coast, Sydney Basin and South East Corner Bioregions (endangered)	-	~1	~6.5 km, north-west
Coastal Sands Littoral Scrub-Forest (PCT ID 3546)	Bangalay Sand Forest of the Sydney Basin and South East Corner bioregions (endangered) / Kurnell Dune Forest in the Sutherland Shire and City of Rockdale (endangered)	Littoral Rainforest and Coastal Vine Thickets of Eastern Australia (critically endangered)	~6	~1.1 km, west
Sydney Coastal Sandstone Bloodwood Shrub Forest (PCT ID 3593)	Duffys Forest Ecological Community in the Sydney Basin Bioregion (endangered)	-	~211	~1.7 km, south-west

PCT and ID	Associated TECs BC Act/FM Act*	 EPBC Act	Area in locality (ha)	Proximity and bearing of the closest occurrence to the biodiversity study area
Southern Sandplain Heath (PCT ID 3805) / Sydney Coastal Sand Mantle Heath (PCT ID 3806)	Eastern Suburbs Banksia Scrub in the Sydney Basin Bioregion (critically endangered)	Eastern Suburbs Banksia Scrub of the Sydney Region (critically endangered)	~82 / ~8	~1.4 km, south-east (PCT ID 3806)
Sydney Coastal Sand Swamp Scrub (PCT ID 3922)	Sydney Freshwater Wetlands in the Sydney Basin Bioregion (endangered)	-	~8	~1.6 km, south-east
Sydney Coastal Upland Swamp Heath (PCT ID 3924)	Coastal Upland Swamp in the Sydney Basin Bioregion (endangered)	Coastal Upland Swamps in the Sydney Basin Bioregion (endangered)	~33	~1.4 km, south
Estuarine Reedland (PCT ID 3963)	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (endangered)	Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community (endangered)	~3	~1.5 km, north
Sydney Creekflat Wetland (PCT ID 3972)	Sydney Freshwater Wetlands in the Sydney Basin Bioregion (endangered)	-	~5	~6.3, north

PCT and ID	Associated TECs BC Act/FM Act*	 EPBC Act	Area in locality (ha)	Proximity and bearing of the closest occurrence to the biodiversity study area
Coastal Floodplain Swamp Paperbark Scrub (PCT ID 3985)	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (endangered) / Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion (endangered)	Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community (endangered)	~0.4	~9.1, north
Coastal Sands Swamp Mahogany Rush Forest (PCT ID 3986) / Northern Estuarine Paperbark Sedge Forest (PCT ID 4000) / Northern Paperbark-Swamp Mahogany Saw-sedge Forest (PCT ID 4006)	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (endangered)	-	~10 / ~0.3 / ~9	~5.3 km, north (PCT ID 3986)
Coastal Alluvial Bangalay Forest (PCT ID 4019)	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (endangered)	-	~46	~6.3 km, north

PCT and ID	Associated TECs BC Act/FM Act*	 EPBC Act	Area in locality (ha)	Proximity and bearing of the closest occurrence to the biodiversity study area
Estuarine Swamp Oak-Mangrove Forest (PCT ID 4027) / Estuarine Swamp Oak Twig-rush Forest (PCT ID 4028)	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (endangered)	River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria (critically endangered)	~3	~1.4 km, north
Southern Estuarine Swamp Paperbark Creekflat Scrub (PCT ID 4056) / Sydney Creekflat Swamp Mahogany-Paperbark Forest (PCT ID 4057)	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (endangered)	-	~3 / 3	~6.1 km, north
Paspalum vaginatum-Samphire Saltmarsh (PCT ID 4095) / Prickly Couch-Sea Rush Saltmarsh (PCT ID 4096)	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (endangered)	Subtropical and Temperate Coastal Saltmarsh (endangered)	~0.1 / ~1	~9 km, north-west

PCT and ID	Associated TECs BC Act/FM Act*	 EPBC Act	Area in locality (ha)	Proximity and bearing of the closest occurrence to the biodiversity study area
Samphire Saltmarsh (PCT ID 4097)	Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (endangered) / The Shorebird Community occurring on the relict tidal delta sands at Taren Point (endangered)	Subtropical and Temperate Coastal Saltmarsh (endangered)	~1	~9.8 km, north
Seagrass meadows (PCT 1913)*	*Posidonia australis* seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie (endangered population)	*Posidonia australis* Seagrass Meadows of the Manning-Hawkesbury Ecoregion (endangered)	~70	PCT in biodiversity study area (FM Act)

*Marine vegetation discussed in Section 3.8

DUFFYS FOREST
MONA VALE
KU-RING-GAI CHASE
TERREY HILLS
INGLESIDE
WARRIEWOOD
ELANORA HEIGHTS
NARRABEEN
BELROSE
ST IVES
OXFORD FALLS
CROMER
DAVIDSON
COLLAROY
FRENCHS FOREST
BEACON HILL
DEE WHY
EAST KILLARA
FORESTVILLE
BROOKVALE
NORTH CURL CURL
CURL CURL
EAST LINDFIELD
ALLAMBIE HEIGHTS
LINDFIELD
KILLARNEY HEIGHTS
MANLY VALE
ROSEVILLE
CASTLE COVE
SEAFORTH
CHATSWOOD
MANLY
NORTHBRIDGE
NORTH HARBOUR
LANE COVE
CAMMERAY
MOSMAN
VAUCLUSE
BALMAIN
ROZELLE
SYDNEY
ROSE BAY
GLEBE
SURRY HILLS
BONDI BEACH
REDFERN
MOORE PARK
BONDI
RANDWICK
ST PETERS
COOGEE

N

SYDNEY ROAD
PITTWATER ROAD
LAUDERDALE AVENUE
COMMONWEALTH PARADE
WEST ESPLANADE
BELGRAVE STREET

Note: No PCT associated with TEC within the biodiversity study area

PCTs Associated with TECs in the Study Locality

Manly, NSW

Project Code: 304500787-GS-016
Drawn By: TB, Checked By: AS
Rev: 01
Date: 2023-01-25
Figure No: 3-5

Stantec

Legend

- Biodiversity Study Area
- Study Locality (10km)

PCT ID

3039, 3040, 3136, 3176, 3234, 3259, 3262, 3407, 3546, 3581, 3593, 3805, 3806, 3922, 3924, 3963, 3972, 3985, 3986, 4000, 4006, 4019, 4027, 4028, 4056, 4057, 4095, 4096, 4097

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by Esri and third party suppliers
2. SVTM Plant Community Type supplied by DPE (2022)

0 1,000 2,000 3,000 Metres

Scale at A3: 1:80,000

MANLY

This document has been prepared based on information provided by others as cited in the data sources. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Threatened Posidonia seagrass was observed within the biodiversity study area, which could form part of the *Posidonia australis* Seagrass Meadows of the Manning-Hawkesbury Ecoregion TEC. TECs listed under the EPBC Act are identified by key diagnostic characteristics and condition thresholds. These characteristics and conditions assist in identifying endangered ecological communities (EECs) and determining whether the EPBC Act is likely to apply to the community (DEE, 2018). The condition thresholds assist in distinguishing different meadows of different quality with consideration to various degrees of disturbance and degradation. Condition classes and thresholds provide guidance for when a patch of a TEC retains sufficient conservation values to be considered as a Matter of National Environmental Significance (MNES), as defined under the EPBC Act. This means that the referral, assessment and compliance provisions of the EPBC Act are focussed on the most valuable areas of the TEC.

Table 3-7 details the assessment of the occurrence of Posidonia TEC within the biodiversity study area. Posidonia does not comprise greater than 50 percent coverage of the observed meadows and therefore was not considered to meet the condition thresholds for this to be considered part of the EPBC listed endangered population. Therefore, assessment under the EPBC Act for this endangered population is not required for the proposal.

Table 3-7: Key diagnostic characteristics and condition thresholds for *Posidonia australis* seagrass meadows of the Manning-Hawkesbury ecoregion TEC (source: DEE, 2018)

Key diagnostic characteristics	Condition thresholds for small (≥0.01-1 ha) meadows	
	Threshold level	**Occurrence within study area**
• Occurring within the Manning Shelf and Hawkesbury Shelf bioregions from Wallis Lake (32°S) to Port Hacking (34°S); • Occurs in shallow subtidal coastal waters (<10 m) in locations with protection from high wave energy, typically permanently open estuaries; • Consists of seagrass meadows ≥0.01 km^2 (1 ha) and dominated (i.e. >50% of total seagrass cover) by *P. australis*; and • Occurs on sand or silty-mud substrate.	Cover: • >50% Posidonia cover of total meadow area	Posidonia were observed in the biodiversity study area was considered to be less than 50% cover and was co-occurring with other seagrass species.
	Shoot density: • 100 shoots/m^2	Within the occurrence, shoot density was estimated to be less than 100 shoots/m^2

Posidonia australis seagrass in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie of the Sydney and Central Coast Region of NSW present within the biodiversity study area is an endangered population under the FM Act. Consequently, an AoS under the FM Act was conducted and is summarised in Section 4.8 and presented in Appendix C.

3.11 Groundwater dependent ecosystems

There are no aquatic or terrestrial GDEs in the biodiversity study area (BoM, 2022b). The closest mapped GDE is associated with Manly Lagoon, about 1.9 kilometres north of the biodiversity study area.

3.12 Threatened species and populations

A review of the DPIE-EES BioNet database, NSW DPI threatened species list and the DCCEEW PMST revealed 155 threatened species including two endangered populations with potential to occur within the study locality (refer Table 3-8). Those with records in the study locality are indicated in Figure 3-6. Of the 155 threatened species, four were amphibians, 41 were flora, two were invertebrates, 69 were birds, four were fish/Syngnathids, 26 were mammals, six were reptiles and three were sharks. Migratory species listed under the EPBC Act are discussed in Section 3.18.

An assessment of the likelihood of occurrence of all threatened species and populations based on the available habitat within the biodiversity study area, was carried out to determine the potential for these species to occur there. Some of these habitats were not considered optimal/suitable due to the size, condition, level of disturbance and the widespread occurrence of similar habitat in the study locality. These species were considered an occasional visitor but are not dependent on the resources available in the biodiversity study area. This was a consideration of the likelihood of occurrence assessment.

The likelihood of occurrence assessment found the majority of the threatened species were either unlikely to occur or have a low likelihood of occurrence in the biodiversity study area. However, due to the presence of suitable habitat in the biodiversity study area and/or known populations in the harbour, 12 species and two endangered populations were considered to have a moderate to high likelihood of occurrence. These include:

Six microbats:

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) listed as vulnerable under the BC Act
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*) listed as vulnerable under the BC Act
- Little Bent-winged Bat (*Miniopterus australis*) listed as vulnerable under the BC Act
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) listed as vulnerable under the BC Act
- Southern Myotis (*Myotis macropus*) listed as vulnerable under the BC Act
- Greater Broad-nosed Bat (*Scoteanax rueppellii*) listed as vulnerable under the BC Act.

One mammal:

- Grey-headed Flying Fox (*Pteropus poliocephalus*) listed as vulnerable under the BC Act and the EPBC Act.

Two fish:

- White's Seahorse (*Hippocampus whitei*) listed as endangered under the FM Act and EPBC Act
- Black Rockcod (*Epinephelus daemelii*) listed as endangered under the FM Act and vulnerable under the EPBC Act.

Two endangered populations:

- Little Penguin (*Eudyptula minor*) in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline).

- *Posidonia australis* seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie listed as endangered under the FM Act.

Two marine mammals:

- New Zealand Fur Seal (*Arctocephalus forsteri*) listed as vulnerable under the BC Act
- Australian Fur Seal (*Arctocephalus pusillus*) listed as vulnerable under the BC Act.

One marine invertebrate:

- Cauliflower Soft Coral (*Dendronephthya australis*) listed as endangered under the FM Act and EPBC Act.

White's Seahorse

White's Seahorse are endemic to the estuaries and coastal embayments between Hervey Bay in Queensland and Sussex Inlet in NSW (NSW DPI, 2022e). They are usually found in sponge gardens, seagrass meadows and soft corals, as well as artificial habitats such as swimming nets and jetty/wharf piles like those within the biodiversity study area. Resident populations of White's Seahorse have been reported in the harbour and at Manly Cove tidal pool (Sea Dragon Diving Co. pers. com., 2022), some of which attract recreational divers. Recent conservation efforts by Sea Life Sydney Aquarium in collaboration with NSW DPI and University of Technology, Sydney released individuals from a breeding program into Clifton Gardens at Mosman and in Manly. White's Seahorse was considered to have a high likelihood of occurrence in the biodiversity study area due to the presence of suitable habitat (i.e. artificial structures) and known populations in the harbour, however no individuals were recorded during the targeted survey. This does not mean that they do not occur, rather they are highly cryptic and can be difficult to detect. The proposal has potential to present a risk to this species due to the presence of preferred habitat, known populations in the harbour and Manly Cove tidal net and their limited mobility. Thus, AoSs under the FM Act and the EPBC Act have been prepared to inform the impact assessment (refer Appendix C) and summarised in Section 4.8.



Plate 15: White's Seahorse recordings at Manly Cove tidal pool (11 individuals in total) (Sea Dragon Diving Co. pers. com., 2022)

Black Rockcod

The Black Rockcod was considered to have a high likelihood of occurrence in the biodiversity study area due to the presence of suitable habitat and anecdotal evidence of sightings in the wider harbour. This species is known to occur in warm temperate to subtropical waters of the south-western Pacific Ocean (Aquaculture, Conservation and Marine Parks Unit, Port Stephens Fisheries Institute, 2012) and has been recorded along the east coast of Australia from southern Queensland to Kangaroo Island off South Australia and around Lord Howe and Norfolk Islands. The Black Rockcod distribution is centred around the NSW coast and adults are usually found in caves, gutters and beneath bommies on rocky reefs up to 50 metres in depth. Juveniles of this species prefer coastal rock pools while larger juveniles prefer rocky reefs in estuaries. This species has high site fidelity and is territorial. Significant habitat for the species has been identified, of which the intertidal rocky shore within the coastal depth zone between zero and 20 metres of the Hawkesbury Shelf is considered as significant. Although the biodiversity study area does not extend to the coastal areas of the Hawkesbury Shelf, the subtidal rocky reefs of the harbour and within the biodiversity study area have potential to provide habitat for larger juvenile Black Rockcod. As such, AoSs under the FM Act and the EPBC Act have been completed for the species (refer Appendix C) and summarised in Section 4.8.

Little Penguin

The endangered population of Little Penguins at the Manly Point Area is listed on the critical habitat register (now Area of Outstanding Biodiversity Value (AOBV) under the BC Act). The registered AOBV occurs within the study locality, about 650 metres south-east of the biodiversity study area. No individuals or evidence of nesting was observed during the targeted survey within the biodiversity study area. The Little Penguin population at Manly is the only known breeding population on the mainland of NSW (NSW NPWS, 2003b). Breeding occurs between May to February, however, the species is known to use burrows during other times of the year to rest and moult. Adult penguins usually forage around 10-30 kilometres from their nest with the adults' foraging range known to greatly reduce once young have hatched.

The escarpment at Federation Point is not listed under the AOBV, or as a potential habitat area, however, Little Penguins have historically been known to inhabit the escarpment and forage within the foreshore. Kristie King (Northern Beaches Council) was consulted in regard to any data indicating Little Penguin usage at the study area. Video footage of Little Penguins in the vicinity of the Manly Cove tidal pool was provided although this was from 2018. Erica Mahon (Department of Planning and Environment) was also consulted and provided historical breeding pair counts for Federation Point. Historical data indicated that there were up to five breeding pairs in 2009/2010 at Federation Point, with three recorded in the subsequent year (2010/2011) with some breeding pairs lost to a dog attack. No breeding pairs were recorded after these dates at Federation Point.

Stantec was supplied with the most recent Manly Little Penguin Recovery Program Monitoring Report 2020/21 (NSW NPWS and DPIE, 2021) which indicated a total of 23 breeding pairs, 60 eggs laid, 51 fledglings (penguin chicks six weeks old or more) and 29 active nests. No breeding activity was detected in the vicinity of Quarantine Station Boilerhouse (Quarantine Beach) and Australian Institute of Police Management (Collins Beach) which may have contributed to the lowest breeding count on record. Historically, predation by foxes and dogs is one of the main threats to the population with numerous killed in 2015. Predation of foxes were responsible for four direct deaths including one chick in the monitoring period.

Due to the location of the proposal near the listed AOBV and potential for proposal activities to impact the population and its habitat, an AoS under Part 7.3 of the BC Act has been completed for this endangered population to inform the assessment of impacts (refer Appendix C) and is summarised in Section 4.8.

Microbats

Six microbats were considered to have a moderate likelihood of occurrence in the biodiversity study area, although there is no known breeding habitat there. The existing Sea Life building and wharf structures have potential to provide roosting habitat and the entire biodiversity study area may provide foraging habitat for these six species, although suboptimal. While these species prefer to roost in caves or tree hollows, they are known to roost in man-made structures including in/under bridges/wharves and buildings. The Southern Myotis is known to forage over water and can be found roosting in small groups near water (NSW DPIE, 2020a). As these species are sedentary during the day, have potential to be disturbed during construction (during demolition and piling at night/early evenings) and are also difficult to detect, an AoS under the BC Act has been completed for this group of species (refer Appendix C) and summarised in Section 4.8.

Grey-headed Flying Fox

The Grey-headed Flying-fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 kilometres of a regular food source and are commonly found in gullies, close to water (i.e. lakes, rivers or coasts), in vegetation with a dense canopy. There are no roosting camps in or near the biodiversity study area, with the closest camp at the Burnt Bridge Deviation, Balgowlah, two kilometres north-west of the biodiversity study area. Individuals from this and other camps may forage on flowering and fruiting shrubs and trees in the biodiversity study area and surrounds. Given the very small amount of landscaped vegetation removed or relocated (eight trees), temporary disturbance of the proposal during daylight and night/early evenings (i.e. piling) and sufficient available habitat in the wider study locality, impacts to these species are unlikely. As such no AoS was completed for the species and it has not been considered further in this assessment.

Marine Mammals

The New Zealand and Australian Fur Seals are both known to have an affinity to rocky parts of islands such as Montague Island (about 290 kilometres south of the biodiversity study area), although individuals are often sighted far north of this, including in Sydney Harbour where they utilise intertidal rock platforms similar to those present in Manly Cove. Both species were considered to have a moderate likelihood of occurrence within the biodiversity study area where they might periodically forage in the rocky reef. The biodiversity study area does not, however, contain any known breeding habitat for the species. Given the species are transient, and a small proportion of suitable habitat will be impacted by the proposal which is wide-spread throughout the study locality, impacts to these species as a result of the proposal are unlikely. As such no AoSs were completed for these species. Mitigation measures to minimise potential indirect impacts (such as noise, vibration or vessel strikes) during construction, have however, been considered and are outlined in Section 5.

Cauliflower Soft Coral

The Cauliflower Soft Coral is a temperate soft coral species, endemic to eastern Australia. It is known to occur in abundance at Port Stephens and the Brisbane Water area of Hawksbury River, NSW. The Cauliflower Soft Coral has also been found in other NSW waters, including Sydney Harbour, Terrigal, Botany Bay and Jervis Bay. They are known to occur in estuarine environments at depths of around 1-15 metres and occasionally at depths of around 30 metres. They inhabit sandy seabed where there is high current flow. Given suitable sandy seabed was observed throughout the biodiversity study area, and the sedentary nature the species, the Cauliflower Soft Coral was considered to have a moderate likelihood of occurring within the biodiversity study area. However, no sightings were recorded in any survey, and suitable habitat is present in the study locality. As such no AoS was completed for the species and it has not been considered further in this assessment.

Table 3-8: Likelihood of occurrence summary of threatened species with potential to occur within the study locality

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Amphibians					
Heleioporus australiacus	Giant Burrowing Frog	V	V	(PMST) / 10 (BioNet)	None.
Litoria aurea	Green and Golden Bell Frog	E	V	(PMST)	None.
Mixophyes balbus	Stuttering Frog	E	V	(PMST)	None.
Pseudophryne australis	Red-crowned Toadlet	V	-	357 (BioNet)	None.
Flora					
Acacia bynoeana	Bynoe's Wattle	E	V	(PMST)	None.
Acacia pubescens	Downy Wattle	V	V	(PMST)	None.
Acacia terminalis subsp. terminalis	Sunshine Wattle	E	E	(PMST) / 466 (BioNet)	None.
Allocasuarina glareicola	-	E	E	(PMST)	None.
Allocasuarina portuensis	Nielsen Park She-oak	E	E	(PMST) / 64 (BioNet)	None.
Asterolasia elegans	-	E	E	(PMST)	None.
Caladenia tessellata	Thick-lipped Spider-orchid	E	V	(PMST)	None.
Callistemon linearifolius	Netted Bottle Brush	V	-	6 (BioNet)	None.
Chamaesyce psammogeton	Sand Spurge	E	-	7 (BioNet)	None.
Cryptostylis hunteriana	Leafless Tongue-Orchid	V	V	(PMST)	None.
Cynanchum elegans	White-flowered Wax Plant	E	E	(PMST)	None.
Darwinia biflora	-	V	V	(PMST)	None.
Deyeuxia appressa	-	E	E	(PMST)	None.
	Giant Spear Lily	V	-	1 (BioNet)	None.
Epacris purpurascens var. purpurascens	-	V	-	21 (BioNet)	None.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Eucalyptus camfieldii	Camfield's Stringybark	V	V	(PMST) / 50 (BioNet)	None.
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	5 (BioNet)	None.
Genoplesium baueri	Yellow Gnat-orchid	E	E	(PMST)	None.
	Caley's Grevillea	CE	CE	(PMST) / 76 (BioNet)	None.
Haloragodendron lucasii	Hal	E	E	(PMST)	None.
Hibbertia superans	-	E	-	1 (BioNet)	None.
Hygrocybe reesiae	-	V	-	2 (BioNet)	None.
Lasiopetalum joyceae	-	V	V	(PMST) / 1 (BioNet)	None.
Leptospermum deanei	Deane's Tea-Tree	V	V	(PMST)	None.
Macadamia integrifolia	Macadamia Nut	-	V	8 (BioNet)	None.
Melaleuca biconvexa	Biconvex Paperbark	V	V	(PMST) / 1 (BioNet)	None.
Melaleuca deanei	Deane's Melaleuca	V	V	(PMST)	None.
Microtis angusii	Angus's Onion Orchid	E	E	(PMST) / 9 (BioNet)	None.
Persicaria elatior	Tall Knotweed	V	V	(PMST)	None.
Persoonia hirsuta	Hairy Geebung	E	E	(PMST) / 13 (BioNet)	None.
Pimelea curviflora var. curviflora	-	V	V	(PMST) / 29 (BioNet)	None.
Pimelea spicata	Spiked Rice-flower	E	E	(PMST)	None.
Prostanthera densa	Villous Mintbush	V	V	(PMST) / 1 (BioNet)	None.
Prostanthera junonis	Somersby Mintbush	E	E	(PMST)	None.
Prostanthera marifolia	Seaforth Mintbush	CE	CE	(PMST) / 857 (BioNet)	None.
Rhizanthella slateri	Eastern Underground Orchid	V	E	(PMST)	None.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Rhodamnia rubescens	Scrub Turpentine	CE	CE	(PMST) / 2 (BioNet)	None.
Rhodomyrtus psidioides	Native Guava	CE	CE	(PMST)	None.
Syzygium paniculatum	Magenta Lilly Pilly	V	V	(PMST) / 124 (BioNet)	None.
Tetratheca glandulosa	-	V	-	78 (BioNet)	None.
Thesium australe	Austral Toadflax	V	V	(PMST)	None.
Invertebrates					
Dendronephthya australis	**Cauliflower Soft Coral**	**E***	**E**	**(PMST/DPI)**	**Moderate.**
Meridolum maryae	Maroubra Woodland Snail	E	-	(PMST)	None.
Birds					
Anthochaera phrygia	Regent Honeyeater	CE	CE	(PMST)	None.
Ardenna carneipes	Flesh-footed Shearwater	V	M, Ma	(PMST) / 1 (BioNet)	Low.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	2 (BioNet)	None.
Botaurus poiciloptilus	Australasian Bittern	E	E	(PMST) / 1 (BioNet)	Low.
Burhinus grallarius	Bush Stone-curlew	E	-	13 (BioNet)	Low.
Calidris alba	Sanderling	V	M, Ma	3 (BioNet)	Low.
Calidris canutus	Red Knot	E	CE, M, Ma	(PMST) / 2 (BioNet)	Low.
Calidris ferruginea	Curlew Sandpiper	E	CE, M, Ma	(PMST) / 3 (BioNet)	Low.
Calidris tenuirostris	Great Knot	V	CE, M, Ma	(PMST)	Low.
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	(PMST) / 1 (BioNet)	Low.
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	V	V	(PMST) / 66 (BioNet)	Low.
Charadrius leschenaultia	Greater Sand Plover		V, M, Ma	(PMST) / 2 (BioNet)	Low.
Charadrius mongolus	Lesser Sand Plover	V	E, M, Ma	(PMST) / 1 (BioNet)	Low.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	2 (BioNet)	None.
Daphoenositta chrysoptera	Varied Sittella	V	-	4 (BioNet)	None.
Dasyornis brachypterus	Eastern Bristlebird	E	E	(PMST)	None.
Diomedea antipodensis	Antipodean Albatross	V	V, M, Ma	(PMST)	None.
Diomedea antipodensis gibsoni	Gibson's Albatross	V	V	(PMST)	None.
Diomedea epomophora	Southern Royal Albatross	-	E, M, Ma	(PMST)	None.
Diomedea exulans	Wandering Albatross	E	E, M, Ma	(PMST) / 2 (BioNet)	None.
Diomedea sanfordi	Northern Royal Albatross	E	E, M, Ma	(PMST)	None.
Esacus magnirostris	Beach Stone-curlew	CE	Ma	1 (BioNet)	Low.
Eudyptula minor	**Little Penguin in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline)**	**EP**	**-**	**(PMST) / 27 (BioNet)**	**High.**
Erythrotriorchis radiatus	Red Goshawk	CE	V	(PMST)	Low.
Falco hypoleucos	Grey Falcon	E	-	(PMST)	None.
Fregetta grallaria	White-bellied Storm-petrel	V	V, Ma	(PMST)	Low.
Glossopsitta pusilla	Little Lorikeet	V	-	33 (BioNet)	Low.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Grantiella picta	Painted Honeyeater	V	V	(PMST)	None.
Haematopus fuliginosus	Sooty Oystercatcher	V	-	25 (BioNet)	Low.
Haematopus longirostris	Pied Oystercatcher	E	-	8 (BioNet)	Low.
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	Ma	(PMST) / 86 (BioNet)	Low.
Hieraaetus morphnoides	Little Eagle	V	-	4 (BioNet)	None.
Hirundapus caudacutus	White-throated Needletail	-	V, M, Ma	(PMST) / 22 (BioNet)	Low.
Ixobrychus flavicollis	Black Bittern	V	-	21 (BioNet)	Low.
Lathamus discolor	Swift Parrot	E	CE, Ma	(PMST) / 19 (BioNet)	None
Limosa lapponica baueri	Nunivak Bar-tailed Godwit	-	V	(PMST)	Low.
Limosa limosa	Black-tailed Godwit	V	M, Ma	(PMST)	Low.
Lophoictinia isura	Square-tailed Kite	V	-	7 (BioNet)	None.
Macronectes giganteus	Southern Giant Petrel	E	E, M, Ma	(PMST)	Low.
Macronectes halli	Northern Giant Petrel	V	V, M, Ma	(PMST)	Low.
Neophema pulchella	Turquoise Parrot	V	-	1 (BioNet)	None.
Ninox connivens	Barking Owl	V	-	7 (BioNet)	None.
Ninox strenua	Powerful Owl	V	-	1279 (BioNet)	None.
Numenius madagascariensis	Eastern Curlew	-	CE, M, Ma	(PMST) / 4 (BioNet)	Low.
Onychoprion fuscata	Sooty Tern	V	Ma	1 (BioNet)	Low.
Pachyptila turtur subantarctica	Fairy Prion (southern)	-	V	(PMST)	Low.
Pandion cristatus	Eastern Osprey	V	M, Ma	30 (BioNet)	Low.
Petroica boodang	Scarlet Robin	V	-	1 (BioNet)	None.
Phoebetria fusca	Sooty Albatross	V	M, Ma	(PMST)	None.
Pterodroma leucoptera	Gould's Petrel	V	E	(PMST)	Low.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Pterodroma neglecta	Kermadec Petrel (western)	V	V	(PMST)	Low.
Ptilinopus regina	Rose-crowned Fruit-Dove	V	-	2 (BioNet)	None.
Ptilinopus superbus	Superb Fruit-Dove	V	Ma	4 (BioNet)	None.
Pycnoptilus floccosus	Pilotbird	-	V	(PMST)	None.
Rostratula australis	Australian Painted Snipe	E	E, Ma	(PMST)	None.
Sternula albifrons	Little Tern	E	M, Ma	(PMST) / 5 BioNet)	Low.
Sternula nereis	Australian Fairy Tern	-	V	(PMST)	Low.
Thalassarche bulleri	Buller's Albatross	-	V, M, Ma	(PMST) / 1 (BioNet)	None.
Thalassarche bulleri platei	Northern Buller's Albatross	-	V, M, Ma	(PMST)	None.
Thalassarche carteri	Indian Yellow-nosed Albatross	-	V, M, Ma	(PMST)	None.
Thalassarche cauta	Shy Albatross	V	E, M, Ma	(PMST) / 5 (BioNet)	None.
Thalassarche eremita	Chatham Albatross	-	E, M, Ma	(PMST)	None.
Thalassarche impavida	Campbell Albatross	-	E, M, Ma	(PMST)	None.
Thalassarche melanophris	Black-browed Albatross	V	V, M, Ma	(PMST) / 13 (BioNet)	None.
Thalassarche salvini	Salvin's Albatross	-	V, M, Ma	(PMST)	None.
Thalassarche steadi	White-capped Albatross	-	V, M, Ma	(PMST)	None.
Thinornis cucullatus cucullatus	Eastern Hooded Plover	CE	V, Ma	1 (BioNet)	Low.
Tyto novaehollandiae	Masked Owl	V	-	2 (BioNet)	None.
Tyto tenebricosa	Sooty Owl	V	-	4 (BioNet)	None.
Fish and Syngnathids					
Epinephelus daemelii	**Black Rockcod**	**E***	**V**	**(PMST) / (DPI)**	**High.**

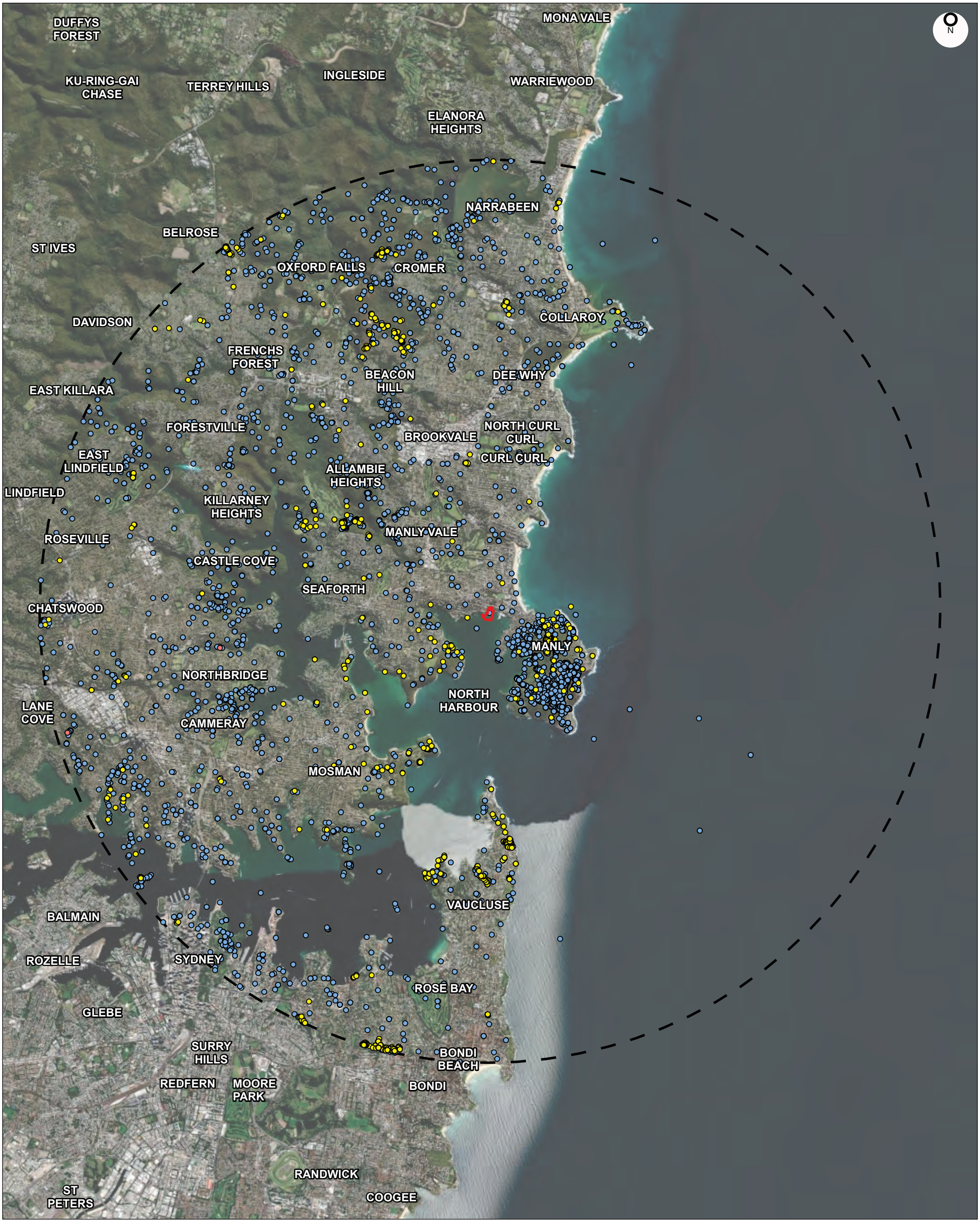
Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Hippocampus whitei	**White's Seahorse**	**E*, P***	**E, Ma**	**(PMST) / (DPI)**	**High.**
Macquaria australasica	Macquarie Perch	E	E	(PMST) / (DPI)	None.
Prototroctes maraena	Australian Grayling	E	V	(PMST) / (DPI)	Low.
Mammals					
Arctocephalus forsteri	**New Zealand Fur Seal**	**V**	**Ma**	**(PMST) / 1 (BioNet)**	**Moderate.**
Arctocephalus pusillus	**Australian Fur Seal**	**V**	**Ma**	**(PMST) / 4 (BioNet)**	**Moderate.**
Balaenoptera borealis	Sei Whale	-	V, M	(PMST)	Low.
Balaenoptera musculus	Blue Whale	E	E, M	(PMST)	Low.
Balaenoptera physalus	Fin Whale	-	V, M	(PMST)	Low.
Cercartetus nanus	Eastern Pygmy-possum	V	-	505 (BioNet)	None.
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	(PMST) / 337 (BioNet)	Low.
Dasyurus maculatus	Spot-tailed Quoll (southeastern mainland population)	V	V	(PMST) / 6 (BioNet)	None.
Dugong dugon	Dugong	E	M, Ma	(PMST)	Low.
Eubalaena australis	Southern Right Whale	E	E, M	(PMST) / 2 (BioNet)	Low.
Falsistrellus tasmaniensis	**Eastern False Pipistrelle**	**V**	**-**	**1 (BioNet)**	**Moderate.**
Isoodon obesulus	Southern Brown Bandicoot (eastern)	E	E	(PMST) / 5 (BioNet)	None.
Megaptera novaeangliae	Humpback Whale	V	V, M	(PMST)	Low.
Micronomus norfolkensis	**Eastern Coastal Free-tailed Bat**	**V**	**-**	**19 (BioNet)**	**Moderate.**
Myotis macropus	**Southern Myotis**	**V**	**-**	**107 (BioNet)**	**Moderate.**
Notamacropus parma	Parma Wallaby	V	-	(PMST)	None.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Petauroides volans	Greater Glider (southern and central)	-	E	(PMST)	None.
Petaurus australis australis	Yellow-bellied Glider (south-eastern)		V	(PMST)	None.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	(PMST)	None.
Perameles nasuta	Long-nosed Bandicoot (North Head population)	EP	-	4851 (BioNet)	Low.
Phascolarctos cinereus	Koala (combined populations of QLD, NSW and the ACT)	V	E	(PMST) / 4 (BioNet)	None.
Pseudomys novaehollandiae	New Holland Mouse	-	V	(PMST) / 2 (BioNet)	None.
Pteropus poliocephalus	**Grey-headed Flying-fox**	**V**	**V**	**(PMST) / 819 (BioNet)**	**High.**
Saccolaimus flaviventris	**Yellow-bellied Sheathtail-bat**	**V**	**-**	**8 (BioNet)**	**Moderate.**
Scoteanax rueppellii	**Greater Broad-nosed Bat**	**V**	**-**	**6 (BioNet)**	**Moderate.**
Vespadelus troughtoni	**Eastern Cave Bat**	**V**	**-**	**1 (BioNet)**	**Moderate.**
Reptiles					
Caretta caretta	Loggerhead Turtle	E	E, M, Ma	(PMST) / 6 (BioNet)	Low.
Chelonia mydas	Green Turtle	V	V, M, Ma	(PMST) / 8 (BioNet)	Low.
Dermochelys coriacea	Leatherback Turtle	E	E, M, Ma	(PMST) / 1 (BioNet)	Low.
Eretmochelys imbricata	Hawksbill Turtle	-	V, M, Ma	(PMST) / 1 (BioNet)	Low.
Hoplocephalus bungaroides	Broad-headed Snake	E	V	(PMST)	None.
Natator depressus	Flatback Turtle	-	V, M, Ma	(PMST)	Low.
Elasmobranchs					
Carcharias taurus	Grey Nurse Shark (east coast population)	CE*	CE	(PMST) / (DPI)	Low.

Scientific Name	Common Name	BC Act/FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Carcharodon carcharias	White Shark	V*	V, M	(PMST) / (DPI)	Low.
Rhincodon typus	Whale Shark	-	V, M	(PMST)	Low.

Key: EP = endangered population; CE = critically endangered; E = endangered; V = vulnerable; M = migratory (EPBC Act); Ma = marine (EPBC Act); P = protected (FM Act)

Moderate or high likelihood of occurrence species are in **bold**.



Threatened Species Records in the Study Locality

Manly, NSW

Project Code: 304500787-GS-009
Drawn By: TB, Checked By: AS
Rev: 01
Date: 2023-01-24
Figure No: 3-6

Stantec

Legend

- Biodiversity Study Area
- Study Locality (10km)

Threatened Species Records

- Fauna
- Flora
- Fungi

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by Esri and third party suppliers
2. Threatened Species Records supplied by BioNet (2022)

0 1,000 2,000 3,000 Metres

Scale at A3: 1:80,000



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3.13 Protected species

Some species of fish have been formally protected because they are naturally scarce or their numbers have been substantially reduced over recent decades. These species are protected to help prevent them becoming threatened in the future. Twenty-four fish protected under the FM Act have potential to occur within the study locality. Fishing and collecting of these species without a permit would incur a penalty in accordance with Section 19 of the FM Act. An assessment of the likelihood of occurrence of all FM Act protected species, in accordance with the criteria set out in Table 2-1, was carried out to determine the potential for these species to occur within the biodiversity study area (refer Appendix B). A summary of the likelihood of occurrence assessment is provided in Table 3-9.

The EPBC Act also provides for the protection of species. These are referred to as 'Marine' listed species. Their listing under the EPBC Act highlights the need for their conservation and management as protecting them from being killed, injured, taken, traded, kept or moved. Similar to the FM Act, all Syngnathids (Family: Syngnathidae) are listed as Marine under the EPBC Act. The PMST also identified/predicted the occurrence of eight bird species listed as Marine under the EPBC Act with potential to occur in the study locality. All of these species were considered to have a low likelihood of occurrence due to the high level of disturbance and wide occurrence of similar habitat in the study locality.

All Syngnathids were considered to have a high likelihood of occurrence in the biodiversity study area due to presence of suitable habitat and known records within habitats present within Manly Cove tidal pool (Sea Dragon Diving Co. pers. com., 2022). The majority of the remaining 20 species have an affinity to marine vegetation and habitat in estuaries (i.e. seagrass, macroalgae, rocky reef). These 20 species have a wide distribution and are not unique to the harbour or the habitat within the biodiversity study area.

A further four fish species were also considered to have a moderate or high likelihood of occurrence within the biodiversity study area, including:

- Elegant Wrasse (*Anampses elegans*)
- Estuary Cod (*Epinephelus coioides*)
- Queensland Groper (*Epinephelus lanceolatus*)
- Eastern Blue Devil (*Paraplesiops bleekeri*).

The subtidal areas of the biodiversity study area form potential habitat for all species above however, these subtidal habitat features are not unique to the biodiversity study area and are widespread throughout the harbour. Furthermore, given fish are highly mobile species it is likely that they will be encouraged to move away from unfavourable conditions during construction and seek refuge at other unaffected habitat in the study locality.

All marine vegetation, including seagrass, saltmarsh, mangroves and macroalgae, are protected under the FM Act. The biodiversity study area does not encompass saltmarsh or mangroves, however, seagrass (Type 1 KFH) and macroalgae (Type 2 KFH) were present (see Section 3.8). Seagrass and macroalgae are considered as marine vegetation and Division 4 of the FM Act protects marine vegetation from 'harm' in the form of gathering, cutting, pulling up, destroying, poisoning, digging up, removing, injuring, shading or otherwise harming any part of it.

Table 3-9: Likelihood of occurrence summary of protected species within the biodiversity study area

Scientific Name	Common Name	FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Birds					
Bubulcus ibis	Cattle Egret	-	Ma	(PMST)	None.
Charadrius ruficapillus	Red-capped Plover	-	Ma	(PMST)	Low.
Himantopus himantopus	Black-winged Stilt	-	Ma	(PMST)	Low.
Merops ornatus	Rainbow Bee-eater	-	Ma	(PMST)	None.
Neophema chrysostoma	Blue-winged Parrot	-	Ma	(PMST)	None.
Pachyptila turtur	Fairy Prion	-	Ma	(PMST)	Low.
Recurvirostra novaehollandiae	Red-necked Avocet	-	Ma	(PMST)	Low.
Stercorarius skua	Great Skua	-	Ma	(PMST)	Low.
Fish and Syngnathids					
Acentronura tentaculata	**Shortpouch Pygmy Pipehorse**	**P**	**Ma**	**(PMST)**	**High.**
Anampses elegans	**Elegant Wrasse**	**P**	**-**	**(PMST)**	**High.**
Epinephelus coioides	**Estuary Cod**	**P**	**-**	**(PMST)**	**High.**
Epinephelus lanceolatus	**Queensland Groper**	**P**	**-**	**(PMST)**	**Moderate.**
Festucalex cinctus	**Girdled Pipefish**	**P**	**Ma**	**(PMST)**	**High.**
Filicampus tigris	**Tiger Pipefish**	**P**		**(PMST)**	**High.**
Heraldia nocturna	**Upside-down Pipefish**	**P**		**(PMST)**	**High.**
Hippichthys penicillus	**Beady Pipefish**	**P**	**Ma**	**(PMST)**	**High.**
Hippocampus abdominalis	**Big-belly Seahorse**	**P**	**Ma**	**(PMST)**	**High.**
Histiogamphelus briggsii	**Crested Pipefish**	**P**	**Ma**	**(PMST)**	**High.**
Lissocampus runa	**Javelin Pipefish**	**P**	**Ma**	**(PMST)**	**High.**
Maroubra perserrata	**Sawtooth Pipefish**	**P**	**Ma**	**(PMST)**	**High.**

Scientific Name	Common Name	FM Act*	EPBC Act*	Number of records (source)	Likelihood of occurrence
Notiocampus ruber	**Red Pipefish**	**P**	**Ma**	**(PMST)**	**High.**
Paraplesiops bleekeri	**Eastern Blue Devil**	**P**	**-**	**(PMST)**	**High.**
Phyllopteryx taeniolatus	**Weedy Seadragon**	**P**	**Ma**	**(PMST)**	**High.**
Solegnathus spinosissimus	**Spiny Pipehorse**	**P**	**Ma**	**(PMST)**	**High.**
Solenostomus cyanopterus	**Robust Ghostpipefish**	**P**	**Ma**	**(PMST)**	**High.**
Solenostomus paradoxus	**Ornate Ghostpipefish**	**P**	**Ma**	**(PMST)**	**High.**
Stigmatopora argus	**Spotted Pipefish**	**P**	**Ma**	**(PMST)**	**High.**
Stigmatopora nigra	**Widebody Pipefish**	**P**	**Ma**	**(PMST)**	**High.**
Syngnathoides biaculeatus	**Double-end Pipehorse**	**P**	**Ma**	**(PMST)**	**High.**
Trachyrhamphus bicoarctatus	**Bentstick Pipefish**	**P**	**Ma**	**(PMST)**	**High.**
Urocampus carinirostris	**Hairy Pipefish**	**P**	**Ma**	**(PMST)**	**High.**
Vanacampus margaritifer	**Mother-of-pearl Pipefish**	**P**	**Ma**	**(PMST)**	**High.**
All Seahorses, Seadragons, Pipefish, Pipehorses, Ghostpipefish and Seamoths	**-**	**P**	**-**	**DPI**	**High.**
Reptile					
Pelamis platurus	Yellow-bellied Seasnake	-	Ma	(PMST)	Low.

*P = protected (FM Act); Ma = marine (EPBC Act); Moderate or high likelihood of occurrence species are in **bold**.

3.14 Commercial and recreational fishing

Drowned valley estuaries are the most productive of all estuary types in terms of commercial and recreational fishing (Roy, et al., 2001). In 1980-81, commercial fish catch was about 108 tonne, while the corresponding recreational fish catch was estimated as 165 tonne. Since then, prawn trawling has been phased out and because of elevated levels of dioxins in fish and crustaceans across Sydney Harbour, including Parramatta River and other connected tidal waterways, a ban was placed on commercial fishing in 2006. Recreational fishing in the harbour has not been banned, but fishers are urged to follow dietary advice on the levels of

consumption of seafood from Sydney Harbour, Parramatta River and other connected tidal waterways. Fishers can also continue to practise catch and release.

Around 62% of the fishing effort in Sydney Harbour (east of the harbour bridge) is estimated to be shore-based and 38% boat-based, with the largest proportion of catch taken by shore-based fishers (74% by number and 58% by weight of fish, crabs and cephalopods). This is very different to the distribution of effort and harvest recorded from other estuarine fisheries in NSW, which are dominated by boat-based fishing (Ghosn et al. 2010). Recreational fishing catch across the whole harbour is comprised predominantly of finfish with the ten most common taxa recorded including: Yellowtail scad (36.0%), yellowfin bream (15.3%), snapper (7.9%), tailor (6.9%), dusky flathead (6.6%), kingfish (5.7%), trumpeter whiting (4.8%), slimy mackerel (2.4%), sand whiting (1.9%) and yellow-finned leatherjacket (1.6%). A greater diversity of catch have been found east of the harbour bridge with yellowtail scad (35.3%), snapper (12.6%), kingfish (11.5%), yellowfin bream (11.2%) and dusky flathead (5.2%) being the most commonly caught species in this area (Ghosn et al. 2010).

3.15 Critical Habitat and Areas of Outstanding Biodiversity Value

No critical habitats listed under the FM Act or EPBC Act occur within or near the biodiversity study area. The AOBV for the Little Penguin population in the Manly Point Area is defined as ‘the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline’. This AOBV is located about 650 metres south-east of the biodiversity study area (Critical Habitat B) (refer Plate 16). As discussed in Section 3.12, the endangered population was considered to have a high likelihood of occurring within the biodiversity study area. An AoS under Part 7.3 of the BC Act has been completed for this species to inform the assessment of impacts (refer Appendix C) and summarised in Section 4.8.



Plate 16: Little Penguin AOBV in relation to the biodiversity study area (white X) (source: DECCW 2009)

3.16 Wildlife connectivity corridors

Little vegetation is present within the biodiversity study area, therefore there are no continuous wildlife corridors. Much of the vegetation in the biodiversity study area has either been cleared or replanted with landscaped vegetation. This urban landscape comprises a number of open spaces and grassed reserves, however, there are no continuous wildlife corridors between these areas or riparian corridors.

The waters of Manly Cove forms part of the marine corridor that is Sydney Harbour and is easily accessible for marine and estuarine species.

3.17 State Environmental Planning Policies

There are no Coastal Wetland or Littoral Rainforests, as defined in the *State Environmental Planning Policy (Resilience and Hazards) 2021* in the biodiversity study area. The nearest Coastal Wetland is about 1.7 kilometres north-west located near Addiscombe Road, Manly Vale (refer Figure 3-7). The nearest Littoral Rainforest is located about 1.3 kilometres east of the biodiversity study area at Collins Beach, Manly (refer Figure 3-7).

There are no nationally important wetlands or Ramsar Wetlands in the biodiversity study area or the wider study locality. The nearest nationally important wetland is Towra Point, over 20 kilometres south of the biodiversity study area (refer Figure 3-7). Sydney Harbour National Park (Dobroyd Head and North Head) are located about 1.1 kilometres south-west and south-east respectively. Two aquatic reserves: Cabbage Tree Bay and North Harbour are located about 900 metres east and one kilometre south of the biodiversity study area, respectively (refer Figure 3-7). Federation Point is a declared Wildlife Protection Area under the Manly LEP and is a dog exclusion zone in recognition of its importance as a nesting site for Little Penguins.

The biodiversity study area is in an area mapped as a Significant Seagrass and Rocky Foreshore under the *State Environmental Planning Policy (Biodiversity and Conservation) 2021*.

DUFFYS FOREST
KU-RING-GAI CHASE
TERREY HILLS
INGLESIDE
MONA VALE
WARRIEWOOD
ELANORA HEIGHTS
NARRABEEN
ST IVES
BELROSE
OXFORD FALLS
CROMER
DAVIDSON
COLLAROY
Long Reef
FRENCHS FOREST
BEACON HILL
DEE WHY
EAST KILLARA
KILLARA
FORESTVILLE
BROOKVALE
NORTH CURL CURL
CURL CURL
EAST LINDFIELD
KILLARNEY HEIGHTS
ALLAMBIE HEIGHTS
LINDFIELD
ROSEVILLE
MANLY VALE
CASTLE COVE
MANLY
SEAFORTH
Cabbage Tree Bay
CHATSWOOD
NORTHBRIDGE
LANE COVE
CAMMERAY
North Sydney Harbour
MOSMAN
VAUCLUSE
BALMAIN
ROZELLE
SYDNEY
ROSE BAY
GLEBE
SURRY HILLS
BONDI BEACH
REDFERN
MOORE PARK
BONDI
RANDWICK
ST PETERS
COOGEE
N

Protected Areas in the Study Locality

Manly, NSW

Project Code: 304500787-GS-018
Drawn By: TB, Checked By: AS
Rev: 01
Date: 2023-01-25
Figure No: 3-7

Stantec

Legend

- Biodiversity Study Area
- Study Locality (10km)

Marine Protected Area

- Aquatic Reserve
- Coastal Wetlands
- Coastal Wetlands Proximity Area
- Littoral Rainforest
- Littoral Rainforest Proximity Area

National Park

- Cadmans Cottage Historic Site
- Garigal National Park
- Ku-ring-gai Chase National Park
- Lane Cove National Park
- Sydney Harbour National Park

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by Esri and third party suppliers
2. Aquatic Reserve supplied by NSW DPI (2022)
3. Coastal wetlands, littoral rainforest, and proximity areas supplied by DPE
4. National Park supplied by NSW SS (2021)

0 1,000 2,000 3,000 Metres

Scale at A3: 1:80,000



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3.18 Matters of National Environmental Significance

There are nine types of MNES listed under the EPBC Act of which actions that have, or are likely to have, a significant impact on would require approval from the Australian Government Minister for the Environment (Commonwealth Minister). Of the nine types of MNES, four are potentially relevant to the proposal:

- Listed threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- Wetlands of international importance.

Threatened species and ecological communities listed under the EPBC Act are considered as MNES and are discussed in Sections 3.10 and 3.12. The location and/or relevance of migratory species, Commonwealth marine areas and wetlands of international importance are discussed in the following sections.

3.18.1 Migratory species

Migratory species are those animals that migrate to Australia and its external territories, or pass through or over Australian waters during their annual migrations. Listed migratory species may include any native species identified in an international agreement approved by the Minister. All listed migratory species are MNES under the EPBC Act. An action will require approval if the action has, will have, or is likely to have, a significant impact on a listed migratory species.

The PMST indicated 39 bird species and nine marine mammals/elasmobranchs (cartilaginous fishes, such as sharks and rays), have either been previously recorded or are predicted to occur within the study locality. An assessment of the likelihood of occurrence of all EPBC Act migratory species, in accordance with the criteria set out in Table 2-1, was carried out to determine the potential for these species to occur within the biodiversity study area (refer Appendix B). A summary of the likelihood of occurrence assessment is provided in Table 3-10.

All listed migratory species were considered to have a low occurrence in the biodiversity study area. Many of the migratory species are considered transient visitors to the biodiversity study area, and were not considered to rely on the habitat resources present in the biodiversity study area. Furthermore, similar habitat with less disturbance (i.e. humans and leashed dogs) are abundant across the study locality. Impacts to these species as a result of the proposal are unlikely, no AoSs have been completed and these species were not considered further in this assessment.

Table 3-10: Likelihood of occurrence summary of migratory species within the biodiversity study area

Scientific Name	Common Name	EPBC Act*	Number of records (source)	Likelihood of occurrence
Birds				
Actitis hypoleucos	Common Sandpiper	M, Ma	(PMST) / 3 (BioNet)	Low.
Anous stolidus	Common Noddy	M, Ma	(PMST) / 1 (BioNet)	Low.

Scientific Name	Common Name	EPBC Act*	Number of records (source)	Likelihood of occurrence
Apus pacificus	Fork-tailed Swift	M, Ma	(PMST) / 5 (BioNet)	Low.
Ardenna grisea	Sooty Shearwater	M, Ma	(PMST) / 3 (BioNet)	Low.
Ardenna pacifica	Wedge-tailed Shearwater	M, Ma	13 (BioNet)	Low.
Ardenna tenuirostris	Short-tailed Shearwater	M, Ma	38 (BioNet)	Low.
Arenaria interpres	Ruddy Turnstone	M, Ma	(PMST) / 17 (BioNet)	Low.
Calidris acuminata	Sharp-tailed Sandpiper	M, Ma	(PMST) / 7 (BioNet)	Low.
Calidris melanotos	Pectoral Sandpiper	M, Ma	(PMST)	Low.
Calidris ruficollis	Red-necked Stint	M, Ma	(PMST) / 26 (BioNet)	Low.
Calonectris leucomelas	Streaked Shearwater	M, Ma	(PMST) / 5 (BioNet)	Low.
Charadrius bicinctus	Double-banded Plover	M, Ma	(PMST)	Low.
Cuculus optatus	Oriental Cuckoo	M, Ma	(PMST) / 2 (BioNet)	None.
Fregata ariel	Lesser Frigatebird	M, Ma	(PMST)	Low.
Fregata minor	Great Frigatebird	M, Ma	(PMST)	Low.
Gallinago hardwickii	Latham's Snipe	M, Ma	(PMST) / 1 (BioNet)	None.
Hydroprogne caspia	Caspian Tern	M, Ma	17 (BioNet)	Low.
Limosa lapponica	Bar-tailed Godwit	M, Ma	(PMST) / 9 (BioNet)	Low.
Monarcha melanopsis	Black-faced Monarch	M, Ma	(PMST)	None.
Motacilla flava	Yellow Wagtail	M, Ma	(PMST)	None.
Myiagra cyanoleuca	Satin Flycatcher	M, Ma	(PMST)	None.
Numenius phaeopus	Whimbrel	M, Ma	(PMST) / 1 (BioNet)	Low.
Pandion haliaetus	Osprey	M, Ma	(PMST)	Low.
Phaethon lepturus	White-tailed Tropicbird	M, Ma	(PMST)	Low.
Philomachus pugnax	Ruff	M, Ma	(PMST)	Low.
Pluvialis fulva	Pacific Golden Plover	M, Ma	(PMST) / 15 (BioNet)	Low.
Pluvalis squatarola	Grey Plover	M, Ma	6 (BioNet)	Low.
Rhipidura rufifrons	Rufous Fantail	M, Ma	(PMST)	None.
Stercorarius longicaudus	Long-tailed Jaeger	M, Ma	1 (BioNet)	Low.

Scientific Name	Common Name	EPBC Act*	Number of records (source)	Likelihood of occurrence
Stercorarius parasiticus	Arctic Jaeger	M, Ma	4 (BioNet)	Low.
Stercorarius pomarinus	Pomarine Jaeger	M, Ma	4 (BioNet)	Low.
Sterna hirundo	Common Tern	M, Ma	6 (BioNet)	Low.
Sula leucogaster	Brown Booby	M, Ma	1 (BioNet)	Low.
Symposiachrus trivirgatus	Spectacled Monarch	M, Ma	(PMST)	None.
Thalasseus bergii	Crested Tern	M, Ma	94 (BioNet)	Low.
Tringa brevipes	Grey-tailed Tattler	M, Ma	(PMST) / 12 (BioNet)	Low.
Tringa incana	Wandering Tattler	M, Ma	2 (BioNet)	Low.
Tringa nebularia	Common Greenshank	M, Ma	(PMST) / 2 (BioNet)	Low.
Tringa stagnatilis	Marsh Sandpiper	M, Ma	(PMST)	Low.
Mammals and Elasmobranchs				
Balaenoptera edeni	Bryde's Whale	M	(PMST)	Low.
Caperea marginata	Pygmy Right Whale	M	(PMST)	Low.
Carcharhinus longimanus	Oceanic Whitetip Shark	M	(PMST)	Low.
Lagenorhynchus obscurus	Dusky Dolphin	M	(PMST)	Low.
Lamna nasus	Porbeagle	M	(PMST)	Low.
Mobula alfredi	Reef Manta Ray	M	(PMST)	None.
Mobula birostris	Giant Manta Ray	M	(PMST)	None.
Orcinus orca	Killer Whale	M	(PMST)	Low.
Physeter macrocephalus	Sperm Whale	M	(PMST)	Low.

* M = migratory (EPBC Act); Ma = marine (EPBC Act)

3.18.2 Commonwealth marine areas

Commonwealth marine areas extend from three to 200 nautical miles from the coast of Australia. Thus, the study locality and the study area lies outside of any Commonwealth marine areas. However, the coastal waters to the east of the biodiversity study area are within the Temperate East Marine Region which covers 383,352 square kilometres and includes eight marine reserves. The biodiversity study area is not within any Commonwealth marine reserves. The closest marine reserves are the Hunter Commonwealth Marine Reserve, over 140 kilometres north of the biodiversity study area, and the Jervis Commonwealth Marine Reserve, over 130 kilometres south of the biodiversity study area.

3.18.3 Wetlands of International Importance

Wetlands of international importance are defined by the Ramsar Convention which recognises these areas as being of significant value for their respective countries as well as for humanity as a whole. There are no nationally important wetlands or Ramsar Wetlands in the biodiversity study area or the wider study locality. The closest Ramsar Wetlands are located at Towra Point Nature Reserve, over 20 kilometres south of the biodiversity study area.

4 Impact assessment

This section assesses potential impacts to coastal and marine biodiversity in the biodiversity study area as a result of the construction and operation of the proposal. The main components of the proposal with potential to impact biodiversity are summarised below and detailed in Section 3 of the REF.

Construction:

- Vegetation clearing and grubbing during site establishment
- Movement and use of equipment, plant and vessels
- Disturbance of the seabed from vessel traffic, anchoring and piling
- Installation and removal of structures in the harbour
- Landscaping.

Operation:

- Persistence of the new structures.

This section details the extent and significance of land-side and water-side impacts as a result of the proposal including:

- Removal of vegetation and habitat (terrestrial and marine)
- Mobilisation of soils, sediments and contaminants
- Surface and underwater noise
- Vessel disturbance
- Alterations to hydrology
- Introduction/spread of weeds and/or marine pests and diseases (terrestrial and marine).

An overview of the terrestrial and marine habitat potentially impacted by the proposal is provided in Figure 4-1 and Figure 4-2.

4.1 Direct land-side construction impacts

4.1.1 Removal of native vegetation and habitat

The proposal would require the relocation of eight Bangalow Palms (about 26 square metres in area) and temporary removal of landscaped grass to facilitate the compound area (about 95 square metres) (refer Table 4-1). Removed or potentially relocated palms do not form part of any remnant PCT but do form potential habitat for some highly mobile, disturbance tolerant fauna. The removal or relocation of habitat resources is unlikely to have a substantial impact on native fauna as there is an abundance of similar habitat across the study locality.

In general, vegetation grubbing, demolition (i.e. excavation) of the Manly Sea Life building, dewatering (if needed) may expose soils and components of potential fill material which can then be easily mobilised. Contaminants in the soil can also be subsequently released into the surrounding environment. Erosion and sedimentation is most likely to impact localised harbour waters, particular during inclement weather (i.e. rainfall, high winds) if controls are not implemented. This could result in unfavourable, turbid conditions, the smothering of

sessile marine vegetation, habitat and fauna and water, sediment and biota contamination in Manly Cove and even the wider harbour (discussed below).

The proposal would involve the removal of about 1,085 square metres of potential suboptimal microbat roosting habitat, as a result of the demolition of the Manly Sea Life building and timber jetty. Controls would be implemented to survey for microbats at the start of construction so that individuals in the area are not harmed (refer Section 5). Once construction is completed the new boardwalk would provide about 1,151 square metres of similar suboptimal habitat for microbats.

Following the decommissioning of the construction compound area (i.e. completion of construction), the compound area would be restored and made good as part of the West Esplanade parkland. The eight Bangalow Palms may also be relocated along the boardwalk.

Table 4-1: Areas of terrestrial vegetation and habitat to be directly impacted by the proposal

Vegetation and habitat	Area to be directly and indirectly impacted/removed
Landscaped gardens and parks	95 square metres (compound area) Removal (or potential relocation) of eight Bangalow Palms (26 square metres)
Potential suboptimal microbat roosting habitat	960 square metres (Manly Sea Life building) and the timber jetty (125 square metres), more suboptimal than building structure

4.2 Direct water-side demolition/construction impacts

4.2.1 Removal/loss marine vegetation and native marine biota from existing structures

The proposal would involve the establishment of the marine works area (MWA) (waterside portion of the proposal area), demarcated by floating booms. Temporary piles may also be installed around the perimeter of the MWA to secure the silt boom (separating the works from public areas).

Removal of existing piles and seawall

The proposal would require removal of the existing Manly Sea Life building and existing timber jetty. This includes removal of the seawall adjacent to the Manly Sealife building, the existing timber jetty and associated piles and infrastructure (around 36 timber piles, timber stairs and 12 concrete piles). This would not, however, require large-scale disturbance of the seabed. The existing infrastructure within the subtidal and intertidal zone (i.e. piles and seawall) are densely colonised by encrusting and sessile biota (such as ascidians and oysters), macroalgae (mainly *Ecklonia radiata*) and other small, mobile macroinvertebrates such as gastropod snails and crabs. The communities present on the structures are consistent with Type 2 KFH as they meet the descriptions of estuarine rocky reefs and macroalgae (NSW DPI, 2013). It is estimated that, 260 square metres of subtidal marine habitat on the piles (including macroalgae) and about 240 square metres of subtidal seawall (including macroalgae) would be directly lost as part of the proposal. In proportion to the subtidal rocky reef habitat available in the biodiversity study area, this loss constitutes a decrease of 14 per cent. This habitat was considered likely White's Seahorse habitat and transient habitat for the Black Rockcod. Impacts to these species are discussed in Section 4.2.2.

Water-side works involving the removal of piles has potential to directly harm benthic habitat. Existing subtidal piles are also situated within unvegetated soft sediment (Type 3 KFH), and seagrass (medium density Halophila and low density Zostera Type 2 KFH) which may be impacted during removal. This is likely to occur as sediment around the pile is disturbed during the vibratory extraction process. A proportion of infauna may be lost, and soft sediment disturbed, however, soft sediments and associated benthic infauna are characteristic of the majority of subtidal habitat in the harbour and similar assemblages are ubiquitous in the study locality. Disturbed soft sediment habitat would quickly recolonise by infauna after the removal activities are complete.

As a conservative estimate an area up to 3 square metres (1 metre impact radius per pile) of benthic habitat could be affected during extraction. Based on the benthic mapping undertaken as part of this assessment, about 35 square metres of seagrass (Type 1 KFH), less than one square meter of subtidal rocky reef (Type 2 KFH) and about 143 square metres of unvegetated soft sediment (Type 3 KFH) would be impacted (refer Table 4-2). In proportion to the seagrass and unvegetated soft sediment in the biodiversity study area, this loss constitutes a decrease of about 0.4 per cent of seagrass, less than 0.1 per cent of subtidal rocky reef and 0.8 per cent of unvegetated soft sediment. While this loss alone is considered negligible, the cumulative impact of seagrass loss and degradation within Manly cove should be considered.

As indicated on Figure 4-2 the area east and west of the existing jetty is characterised by seagrass beds. Once the existing piles and jetty infrastructure has been removed, this area (about 125 square metres), would no longer be shaded and there is potential for seagrass and macroalgae to re-colonise. There is also potential for this area to undergo rehabilitation to facilitate this process. This would be done in consultation with NSW DPI (Fisheries).

Installation of piles

To support the new boardwalk, 16 steel piles would be installed by a barge mounted piling rig into the subtidal habitat east of the existing walkway near Manly Pavilion. Fourteen concrete columns and shear walls would be formed off existing slabs within the Manly Sea Life building (pump room) and would have marine interaction once completed. Thirteen of the steel piles would be driven into subtidal rocky reef with macroalgae (Type 2 KFH), and the remaining three piles in a meadow of medium density Halophila and low density Zostera (Type 1 KFH). Using the same method as above, about 19 square metres of seagrass (Type 1 KFH) and 61 square metres of subtidal rocky reef (Type 2 KFH) under the footprint of the piles would be permanently lost (including likely soft sediment below). In proportion to the seagrass and subtidal rocky reef in the biodiversity study area, this loss constitutes a decrease of about 0.2 per cent of seagrass (Type 1 KFH) and 1.8 per cent of subtidal rocky reef (Type 2 KFH). This loss is considered negligible and is not considered to have a measurable impact on marine biodiversity.

Anchor areas for the work barges during construction would be demarcated within designated areas and no-go zones established to protect sensitive seagrass, macroalgae or rocky reef habitat where possible. Designated anchoring areas would be limited to soft sediment areas which would be temporarily disturbed. A proportion of soft sediment seabed and associated infauna may therefore be disturbed but would be recolonised following completion of the piling activities. Therefore no permanent impact to seagrass, macroalgal or subtidal rocky reef habitat is expected. Measures to manage impacts to marine vegetation and habitat would be implemented through the Marine Ecology Management Plan (MEMP).

Additionally, temporary piles may be installed to secure the silt boom around the perimeter of the MWA to separate the construction area from the public areas. Currently, the outer corners are situated in unvegetated soft sediment (Type 3 KFH) in proximity to seagrass. Once the locations of the temporary piles are established, additional offsets may be required.

Once installed, subtidal piles would become available for recolonisation by fouling communities. Recolonisation may take months to years before the assemblages reach the same level of diversity as the existing assemblages and would also depend on the material of the new piles and any treatment or coatings that are applied to the piles. The 30 new piles would otherwise result in an overall net loss of submerged artificial surfaces (vertical area) and available habitat for encrusting and sessile biota to colonise.

Under Section 199 of the FM Act, consultation with NSW DPI (Fisheries) is required for any dredging and reclamation works. 'Dredging' under the *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013) is classified as disturbance of the seabed/streambed. In this case, this refers to removal and installation of piles. Section 205 of the FM Act states that a permit to 'harm' marine vegetation, as per the definition of 'harm' detailed in Section 3.8, would be required.

Table 4-2: Areas of marine vegetation and habitat to be directly and indirectly impacted by the proposal

Vegetation and habitat	Process	Area to be directly and indirectly impacted/removed
Vertical submerged marine habitat on existing piles and seawall (Type 2 KFH)	Demolition: Removal of structures	~500 square metres of subtidal marine habitat
Seagrass (Type 1 KFH)	Demolition: Removal of piles	~35 square metres
Subtidal rocky reef (Type 2 KFH)	Demolition: Removal of piles	~less than 1 square metre
Unvegetated soft sediment (Type 3 KFH)	Demolition: Removal of piles	~143 square metres
Seagrass (Type 1 KFH)	Construction: Piling	~19 square metres
Subtidal rocky reef (Type 2 KFH)	Construction: Piling	~61 square metres
Seagrass (Type 1 KFH)	Operational: Shading (refer to Section 4.6.1)	~97 square metres
Subtidal rocky reef (Type 2 KFH)	Operational: Shading (refer to Section 4.6.1)	~211 square metres

4.2.2 Impacts to threatened and protected species, populations, ecological communities and other marine fauna

Water-side activities have potential to impact subtidal foraging habitat for the Little Penguin, Black Rockcod and White's Seahorse. The foraging resource that the biodiversity study area represents would be made available for these species following the completion of construction thus, proposal impacts to potential foraging habitat for these species are only temporary. The loss of subtidal artificial habitat (primarily for White's Seahorse) is considered small in proportion to the available habitat in the study locality and the new piles would provide similar habitat during operation (once recolonised). Additional controls including a pre-clearance survey for White's Seahorse and Black Rockcod would be implemented (refer Section 5). Black Rockcod individuals would be encouraged to move away from the works area prior to construction commencing, however, less mobile fauna like White's Seahorse, which display high site fidelity, would be relocated if found in the pre-

construction survey. The specific process and timing of this would be dictated by NSW DPI (Fisheries) and outlined in a Syngnathid Management Plan (SMP) as part of the Marine Ecology Management Plan (MEMP).

Coastal and marine fauna including cetaceans, pinnipeds, sirenians, marine reptiles, seabirds, fish and mobile macroinvertebrates have the potential to be affected by water-side construction activities via temporary changes to water quality, temporary impacts and vessel strikes. In terms of water quality, there is potential for marine sands to be disturbed and mobilised during removal of the Sea Life building, piles and existing jetty and during the installation of new piles and jetty. Impacts beyond the biodiversity study area during both demolition and construction would not, however, be expected with the controls set out in the MEMP. The majority of highly mobile marine fauna would also temporarily seek out alternative unaffected habitat within the harbour. Less mobile fauna or those with strong site fidelity and high likelihood of occurrence, such as Syngnathids could be affected by local changes in water quality that may affect breeding, feeding and / or foraging behaviour. This would be addressed via the SMP which would be incorporated into the MEMP.

A temporary increase in vessel and barge activity during construction is associated with an increased risk of vessel strikes with Little Penguins, marine turtles, mammals and diving birds. The biodiversity study area is, however, considered suboptimal habitat for most marine turtles and mammals and very few individuals, if any, would be likely to occur during construction. Potential risks to Little Penguins foraging or passing through the biodiversity study area would be at an increased risk of injury or disturbance while barges and vessels facilitate the works. However, it is considered that Little Penguins are fast enough to avoid boat strikes, and as the penguins are already avoiding numerous vessels in the wider Manly Cove area, there would be a minimal increased risk to injury from the proposal. Risk of vessel strike would be incorporated into the CEMP and MEMP by ensuring contracting personnel are made aware of the presence of penguins and other marine fauna and that any sightings are reported.

An area of about 841 square metres at the western end of Manly Cove beach would be temporarily reclaimed for a laydown area for construction vehicles and for material handling (refer Figure 1-2). The reclamation area would be temporarily unavailable for species that may utilise sandy beach habitat (i.e. Little Penguin and other shore birds) and would be reinstated following the completion of construction. The foraging resource that the reclamation area represents is only a very small proportion of available habitat and is highly disturbed with high volumes of recreational users and pedestrian foot traffic (including leashed dogs). It is not anticipated that the temporary removal of this habitat would reduce species' range, disrupt breeding or reduce population sizes. Fauna protection fencing would be implemented prior to commencement of construction works to prevent potential fauna interactions.

4.2.3 Impacts on water quality (consequent indirect impacts on biota) due to construction

There is potential for coarse and fine debris to be mobilised during piling, removal of existing structures and vessel movement. This can crush, damage and/or smother marine vegetation and habitat depending on the size of debris. Larger debris would be disposed offsite and should not cause any impacts to marine biodiversity. Mobilisation of finer debris (i.e. sediments) can also result in the mobilisation of contaminants which may persist in biodiversity study area sediments. Depending on the volume and the size of fine debris, wave, tide and current actions, finer particles are not likely to persist in the area for long. The waters at Manly Cove and the wider harbour periodically experiences impacts from elevated turbidity, usually as a result of rainfall, tides, swell and stormwater discharge. Thus, marine assemblages in the biodiversity study area would be frequently exposed to these conditions

and the proposal is unlikely to introduce vastly different conditions. Mitigation measures for piling near sensitive seagrass beds and rocky reef communities would be incorporated into the MEMP as part of the CEMP to avoid indirect impacts to other marine habitats (refer Section 5).

There is also a risk, although small, of the presence of sediment bound contaminants that could be mobilised, if present. The release of these contaminants can alter water quality and adversely affect aquatic flora and fauna. Resuspension and disturbance of sediments could also have potential to exacerbate the effects of harmful algal blooms, if any, by the release of excess nutrients.

A preliminary water quality assessment of the stored water within the shark tank at Manly Sealife indicated concentrations above guideline levels for some parameters, including lead and copper (Stantec, 2023d). Discharing the water from the tanks into the harbour may have impacts on aquatic biodiversity as a result of reduced water quality.

4.2.4 Direct and indirect impacts to marine habitat from work barges

The operation and works from barges within the MWA may result in both direct and indirect impacts to marine vegetation via shading (if remaining stationary for extended periods of time) and/or disturbance of the seabed via anchoring and propeller thrust. Provided that areas of seagrass and macroalgae are clearly demarcated and 'no-go' zones established, and long periods of shading or anchoring in these areas is avoided then permanent damage or impacts to marine vegetation from work barges would not be expected. Given the large mapped area of seagrass around the wharf construction zone, specific suitable anchoring locations (i.e. in patches of bare sediment) may need to be established. Personnel and vessel contractors would need to be made aware of the importance of seagrasses and macroalgae and their location in relation to the works.

Mitigation of impacts to marine vegetation from work barges would be included as part the CEMP and MEMP.

4.2.5 Disturbance of acid sulfate soils

The marine portion of the biodiversity study area is mapped as high probability of ASS. Excavation is required in the footprint of the Manly Sea Life building, which may disturb ASS. If disturbed and then wetted, there is potential for surface run-off containing sulfuric acid and other associated contaminants (such as heavy metals), to be released into the marine environment. Effects to marine biota could increase the risk of fish kills, skin and gill problems and chronic growth and reproductive problems, among others. Susceptibility to diseases such as epizootic ulcerative syndrome (red spot disease) in fish may also be exacerbated. Longer term effects on marine biota include loss of habitat, assemblage changes (i.e. toward more acid-tolerant species) and high water temperatures. An ASS management plan would be incorporated into the CEMP and MEMP to manage potential for disturbance and mobilisation of ASS and effects to marine biota.

4.3 Indirect land-side construction impacts

4.3.1 Impacts to fauna from noise and vibration

Vegetation clearing in the biodiversity study area would temporarily remove or relocate (if possible) foraging habitat for highly mobile, disturbance tolerant fauna. This is addressed in Section 4.1.1. Land-side construction activities would also create noise and vibration in the

biodiversity study area (during day and/or night construction) and the responses of terrestrial fauna are likely to be similar to that of mobile marine fauna (i.e. move away from unfavourable conditions and return once disturbance is removed).

With the correct controls, the proposal construction is unlikely to cause indirect disturbance to mobile terrestrial fauna in the biodiversity study area.

4.3.2 Impacts of pests and diseases

Disturbance of vegetation can result in the introduction or spread of exotic flora (i.e. weeds). This can occur by the spread of opportunistic exotic vegetation or new species can be introduced via equipment, plant and footwear. Any foreign equipment or materials brought onto the construction site also has potential to introduce diseases such as Phytophthora (*Phytophthora cinnamomi*) and Myrtle Rust (*Puccinia psidii*). Although the grassed areas are regularly landscaped to maintain amenity for public use, the vegetation and habitat in the biodiversity study area and the surrounding areas are susceptible to weeds and diseases if not managed during construction.

4.4 Indirect water-side construction impacts

4.4.1 Impacts to biota from noise and vibration

In general, the potential impacts of excessive levels of underwater noise on marine fauna include:

- Behavioural disturbance that may affect important populations of species survival
- Noise masking interference with acoustic communication and echo location
- Permanent or temporary loss of auditory sensitivity
- Other tissue damage (lethal and sub-lethal).

It is expected that relatively high ambient noise environment already exists in the biodiversity study area and study locality due to the presence of existing vessel movements to and from Manly Wharf. Noise levels would be intermittent and vary depending on the type and the size of the vessel, where ferries could generate ambient noise levels of 141 to 145 dB (re: 1 µPa) at distances of 100 metres and 50 metres, respectively (Arup, 2011). Underwater dB are referenced to a standard pressure of 1 microPascal (µPa). In comparison, ambient underwater noise levels around Australian coastal waters are generally around 100 to 120 dB (re: 1 µpa) (Government of South Australia, 2012). The additional vessel noise from work barges during construction would be temporary and considered negligible in comparison with the existing underwater noise generated from existing ferry operations. The main sources of construction related noise would be from:

- Piling (bored and impact-driven techniques)
- Demolition and construction works involving the use of excavators, concrete saw and other construction equipment.

The following threatened and protected marine fauna have been identified as having a moderate to high likelihood of occurring within the biodiversity study area and may be subject to impacts from underwater noise during construction:

- Syngnathids (including White's Seahorse)
- Fish (including the Black Rockcod, Estuary Cod and the Eastern Blue Devil Fish)

- Seabirds including the Little Penguin
- Otariids (eared seals).

From an underwater noise perspective, impact piling is considered the worst case noise generating activity and has been used to determine buffer distances where marine fauna may be impacted by underwater noise. Typical source levels for impact piling range from Sound Exposure Level (SEL) 170–225 dB re 1 µPa for a single pulse, and peak levels range from 190–245 dB re 1 µPa.

Impacts to marine fauna from underwater noise are classified as either a Permanent Threshold Shift (PTS) or Temporary Threshold Shift (TTS). A PTS is a permanent reduction in hearing sensitivity caused by irreversible damage to the sensory hair cells of the ear or swim bladder, a TTS is a temporary reduction in hearing sensitivity as a result of exposure to sound. A behavioural response may include avoidance of preferred foraging locations and potentially increase in foraging effort. Behavioural responses are likely to cease once the underwater noise disturbance has stopped.

For marine fauna identified as having a moderate and high likelihood of occurrence in the biodiversity study area, the following buffer distances have been determined and presented in Table 4-3 with the methodology and process for determining the thresholds outlined in the underwater noise assessment by GHD (2023).

Table 4-3: PTS and TTS buffer distances for impact piling (worst-case), for threatened or protected species with potential to occur in the biodiversity study area (GHD, 2023)

Marine fauna group	Distance to meet criteria (metres)				
	PTS Peak	TTS Peak	PTS SEL	TTS SEL	Behavioural
Fish (no swim bladder)	<10	-	<10	154	1,099
Fish (swim bladder not involved in hearing)	<10	-	<10	154	1,099
Fish (swim bladder not involved in hearing) Syngnathids	<10	-	<10	154	1,099
Seabirds	-	-	99	-	2,902
Otariids	<10	<10	<10	27	470

Note: Criteria for peak levels are not provided for seabirds and distances presented are for PTS SEL and behavioural response

During piling activities two safety zones would be applied around each piling location. One being the shutdown zone, whereby the sighting of a marine fauna would trigger piling activities to be ceased as soon as reasonably practical and the other an observation zone which the movement of threatened or protected marine fauna would be monitored to identify any approach to the shut-down zone. The recommended shutdown and observation zones as per GHD, 2023 for threatened and protected marine fauna are presented in Table 4-4.

Table 4-4: Recommended shutdown and observation zones for threatened and protected marine fauna during piling activities (GHD, 2023)

Marine fauna type	Shutdown zone (metres)	Observation zone
Otariids	<10	30
Syngnathids and Black Rockcod	<10	160
Little Penguin and other diving birds	100	650[1]

[1]Note: There is no calculated TTS impact distance for diving birds/penguins. A 650 m observation zone has been adopted for consistency with the observation zone for humans.

An AOBV (formerly critical habitat) has been declared for the Little Penguin breeding ground around 500 metres south of the biodiversity study area. While the ships and construction activities are likely to deter penguins from swimming through the study area, there is potential for behavioural impacts of piling works affecting penguins within the AOBV.

It is anticipated that the highly mobile threatened marine fauna such as the Little Penguin, Black Rockcod and Otariids would would temporarily move away from unfavourable conditions during construction and seek refuge in other unaffected habitats in the study locality. Mitigation measures during impact piling operations have therefore been recommended to reduce the potential for impacts to highly mobile threatened marine fauna These measures would be incorporated in the CEMP and MEMP.

Syngnathids are known to inhabit the Manly Cove tidal pool artificial structures and Posidonia beds, which occur within the biodiversity study area and given their high fidelity and limited mobility, PTS, TTS and behavioural noise related impacts may occur in proximal habitat. Table 4-8 below indicates the calculated PTS, TTS and behavioural Sound Exposure Levels (SEL) for marine fauna that may occur within the biodiversity study area and Table 4-3 showing calculated buffer distances from piling locations. The closest mapped bed of Posidonia is located within three metres of a driven pile, whereby PTS related impacts such as mortality may occur if individuals are present. Given the proximity to known populations at Manly Cove tidal pool (around 80 metres east of piling locations), TTS related impacts (around 154 metres from piling location) would also affect most artificial habitat present on the Manly Cove tidal net. It is recommended that noise reduction options should be implemented to attenuate the underwater noise produced during piling to acceptable levels, with this level guided by NSW DPI (Fisheries) consultation. Furthermore, pre-clearance survey effort should take into account underwater noise related impacts, such as PTS and TTS.

Table 4-5: Behavioural and impulsive nosie criteria (GHD, 2023)

Thresholds	Marine species and noise criteria[1]									
	Low-frequency cetaceans (LF)	High-frequency cetaceans (HF)	Very high frequency cetaceans (VHF)	Sirenians (SI)	Phocid carnivores (in water) (PCW)	Other carnivores (in water) (OCW)	Marine turtle	Fish (no swim bladder)	Fish (swim bladder not involved in hearing)	Fish (swim bladder involved in hearing)
Likelihood of occurring?	Unlikely	Unlikely	Unlikely	Unlikely	Unlikely	Likely	Unlikely	Highly likely	Highly likely	Highly likely
Noise criteria (Impulsive noise), PTS[2] onset threshold	183 SEL Weighted (LF)	185 SEL Weighted (HF)	155 SEL Weighted (VHF)	190 SEL Weighted (SI)	185 SEL Weighted (PCW)	203 SEL Weighted (OCW)	210 SEL (Unweighted)	219 SEL (Unweighted)	210 SEL (Unweighted)	207 SEL (Unweighted)
	219 Peak (Unweighted)	230 Peak (Unweighted)	202 Peak (Unweighted)	226 Peak (Unweighted)	218 Peak (Unweighted)	232 Peak (Unweighted)	207 Peak (Unweighted)	213 Peak (Unweighted)	207 Peak (Unweighted)	207 Peak (Unweighted)
Noise criteria (Impulsive noise), TTS[3] onset threshold	168 SEL Weighted (LF)	170 SEL Weighted (HF)	140 SEL Weighted (VHF)	175 SEL Weighted (SI)	170 SEL Weighted (PCW)	188 SEL Weighted (OCW)	Low risk except when near source	186 SEL (Unweighted)	186 SEL (Unweighted)	186 SEL (Unweighted)
	213 Peak (Unweighted)	224 Peak (Unweighted)	196 Peak (Unweighted)	220 Peak (Unweighted)	212 Peak (Unweighted)	226 Peak (Unweighted)	-	-	-	-
Behavioural[4]	160 dB rms (Unweighted) (Impulsive noise) 120 dB rms (Unweighted) (Non-impulsive noise)						166 dB rms (Unweighted)	150 dB rms (Unweighted)		

Note 1: The peak and rms noise criteria are in units dB re: 1 µPa. The Sound exposure level (SEL) noise criteria are in units dB re: 1 μPa^2s and correspond to cumulative noise impacts, conservatively calculated over a 24 hour time period.

Note 2: Mortality or permanent injury.

Note 3: Temporary loss of hearing sensitivity.

Note 4: Behavioural criteria have been based on guidance provided by the NMFS Greater Atlantic Regional Fisheries Office (GARFO), available online at: **http://www.greateratlantic.fisheries.noaa.gov/protected/section7/guidance/consultation/index.html**

The behavioural thresholds can be adjusted if background noise levels are above the prescribed values.

Land-based construction activities would create noise and vibration in the biodiversity study area and the responses of terrestrial fauna are likely to be similar to that of mobile marine fauna (i.e. move away from unfavourable conditions and return once disturbance is removed). With the correct controls, proposal construction is unlikely to cause significant negative impacts to coastal or mobile marine fauna in the biodiversity study area.

4.4.2 Impacts of pests and diseases

Proposal activities over water have a small potential to introduce marine pests if vessels, equipment or plant are brought into the biodiversity study area from other estuaries where marine pests are present. Some of these pests such as Caulerpa are already established within the biodiversity study area and movements of vessels, plant and equipment could further spread Caulerpa within Manly Cove. Similarly there is a risk that vessels, plant and equipment used within the biodiversity study area transport fragments to other estuaries outside of the proposal locality. Controls would therefore be in place to ensure all equipment in contact with the water is properly cleaned and checked prior to and upon completion of construction so these risks are avoided (refer Section 5). These controls would be incorporated into the MEMP.

4.4.3 Commercial and recreational fishing

The proposal is unlikely to substantially impact populations of marine species important to recreational fishing. However, temporary disruption to recreational fishing in the biodiversity study area would be experienced during construction and the continuation of recreational fishing from the boardwalk may be restricted.

4.5 Key threatening processes

Eight Key Threatening Processes (KTPs) have potential to be triggered by the proposal. These are discussed below.

(1) Introduction of Non-indigenous Fish and Marine Vegetation to the Coastal Waters of NSW (FM Act)

Threat abatement actions prioritised in the Priority Action Statement – Actions for the introduction of non-indigenous fish and marine vegetation to coastal waters of NSW (Fisheries Scientific Committee, 1994) surrounds community and stakeholder liaison and awareness, legislative development and implementation, eradication and control and research, monitoring and mapping. The proposal is unlikely to interfere with any of these threat abatement actions albeit the potential to introduce/facilitate the spread of non-indigenous fish and marine vegetation. However, vessels and equipment should be sourced from local areas (see Section 5) to avoid introducing non-indigenous fish and marine vegetation. Thus, proposal activities are unlikely to further exacerbate this KTP.

(2) Clearing of Native Vegetation (BC Act) and (3) Land Clearance (EPBC Act)

The proposal would include minor clearing of native vegetation and therefore temporarily trigger this KTP, however, none of this is remnant native vegetation but rather landscaped grass and potentially plantings. Furthermore, areas of clearing would be rehabilitated and landscaped with native species to the Sydney region following the completion of construction.

There are currently no Threat Abatement Plans (TAPs) for these KTPs however recovery actions have been identified. These surround community and stakeholder liaison and

awareness, legislative development and implementation, eradication and control and research and monitoring. The proposal would not interfere with any of these actions or further exacerbate this KTP.

(4) Invasion and Establishment of Exotic Vines and Scramblers (BC Act), (5) Invasion of Native Plant Communities by Exotic Perennial Grasses (BC Act), (6) Loss and Degradation of Native Plant and Animal Habitat by Invasion of Escaped Garden Plants, Including Aquatic Plants (EPBC Act) and (7) Novel Biota and Their Impact on Biodiversity (EPBC ACT)

These KTPs surround the risk of the spread or establishment of exotic species. This KTP is unlikely to be triggered/further exacerbated by the proposal as:

- areas to be disturbed would be rehabilitated with native species, local to the Sydney region and maintained following construction completion
- controls would be implemented to avoid the introduction/spread of exotic species during construction.

(8) Installation and Operation of Instream Structures and Other Mechanisms That Alter Natural Flow Regimes of Rivers and Streams (FM Act)

The proposal would install 16 piles in subtidal marine habitat and remove the existing timber jetty and seawall associated with the Manly Sea Life building. The size of these structures are small in comparison to the extent of the biodiversity study area and therefore would not interfere with fish passage. Due to the size of these structures, alterations to hydrodynamics are likely to be localised and unlikely to impact any threatened species listed under the FM Act.

The identified threat abatement actions for this KTP include advice to consent authorities, community and stakeholder engagement, research and monitoring and habitat rehabilitation and protection. The proposal is unlikely to interfere with these actions with habitat rehabilitation proposed following proposal completion. Thus, the proposal is unlikely to further exacerbate or trigger this KTP.

4.6 Operational impacts

4.6.1 Impacts of shading to marine vegetation and habitat

Seagrasses have specific light requirements necessary for photosynthetic performance. Both long-term and short-term light deprivation directly influences seagrass photosynthesis and survival including growth and reproduction (Bité et al. 2007, Longstaff and Dennison 1999, Fitzpatrick and Kirkman 1995). The constructed boardwalk would sit permanently on or above the water's surface and avoid impacts to the seabed. However, the boardwalk would shade a portion of subtidal rocky reef and seagrass which may alter seagrass composition. About 211 square metres of subtidal rocky reef (Type 2 KFH) and about 97 square metres of seagrass (Type 1 KFH) would be shaded by the boardwalk (refer Table 4-2). Consideration during detailed design should be given to the use of perforated materials such as a grated boardwalk to minimise shading impacts on marine vegetation and habitat.

Upon completion of the proposal, the footprint of the timber jetty (about 125 square metres) and former Sea Life building (about 1123 square metres) would be effectively soft sediment and the footprint of the timber jetty would be unshaded. These areas would be considered suitable habitat for opportunistic seagrass species (i.e. Halophila and Zostera) and macroalgae to re-colonise the seabed and new piles over time. NSW DPI (Fisheries) should be consulted in regards to the offset requirements and potential for the new areas to

undergo rehabilitation (i.e. seagrass translocation) to facilitate this process. This would be completed in consultation with NSW DPI (Fisheries).

4.6.2 Alterations to hydrology

A wave climate and shoreline analysis was undertaken by Stantec to assess the shoreline changes of due to the proposal (Stantec, 2023c). The removal of the Sea Life building is predicted to result in an 80 square metre reduction in beach area, occurring over a 20 metre length of Manly Cove resembling the shoreline pre-development. This reduction in beach area is very small in comparison to the available beach habitat in Manly Cove, and would create additional subtidal soft sediment habitat to that created by removing the Sea Life building. This would see a gain in subtidal soft sediment habitat.

Additionally, the structures of the boardwalk are not expected to substantially alter coastal processes or hydrology of the biodiversity study area or the wider harbour. Any alterations to hydrodynamics are likely to be localised and unlikely to produce substantial impacts to marine biodiversity.

4.6.3 Impacts of light disturbance

As a safety feature, the proposal would require the installation of lighting. This may disturb marine fauna such as the Little Penguin returning from day time foraging at dusk / night. However, given the area is currently highly disturbed with pedestrian activity and well illuminated at night from commercial operations, these impacts are considered negligible. The Little Penguin is not currently known to nest below the Manly Pavilion or in the sandstone escarpment along Federation Point. However, consideration should be given to minimise impacts of light dispersion over water to prevent further impingement on Little Penguin foraging success in the area.



Indicative Terrestrial Vegetation and Habitat to be Impacted by the Proposal

Manly, NSW

Project Code: 304500787-GS-017
Drawn By: TB, Checked By: AS
Rev: 01
Date: 2023-01-25
Figure No: 4-1

Stantec

Legend

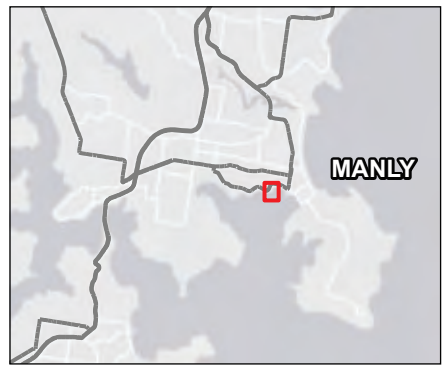
- Biodiversity Study Area
- Planted Tree
- Compound area

Notes:
1. Map displayed in GDA2020 MGA Zone 56

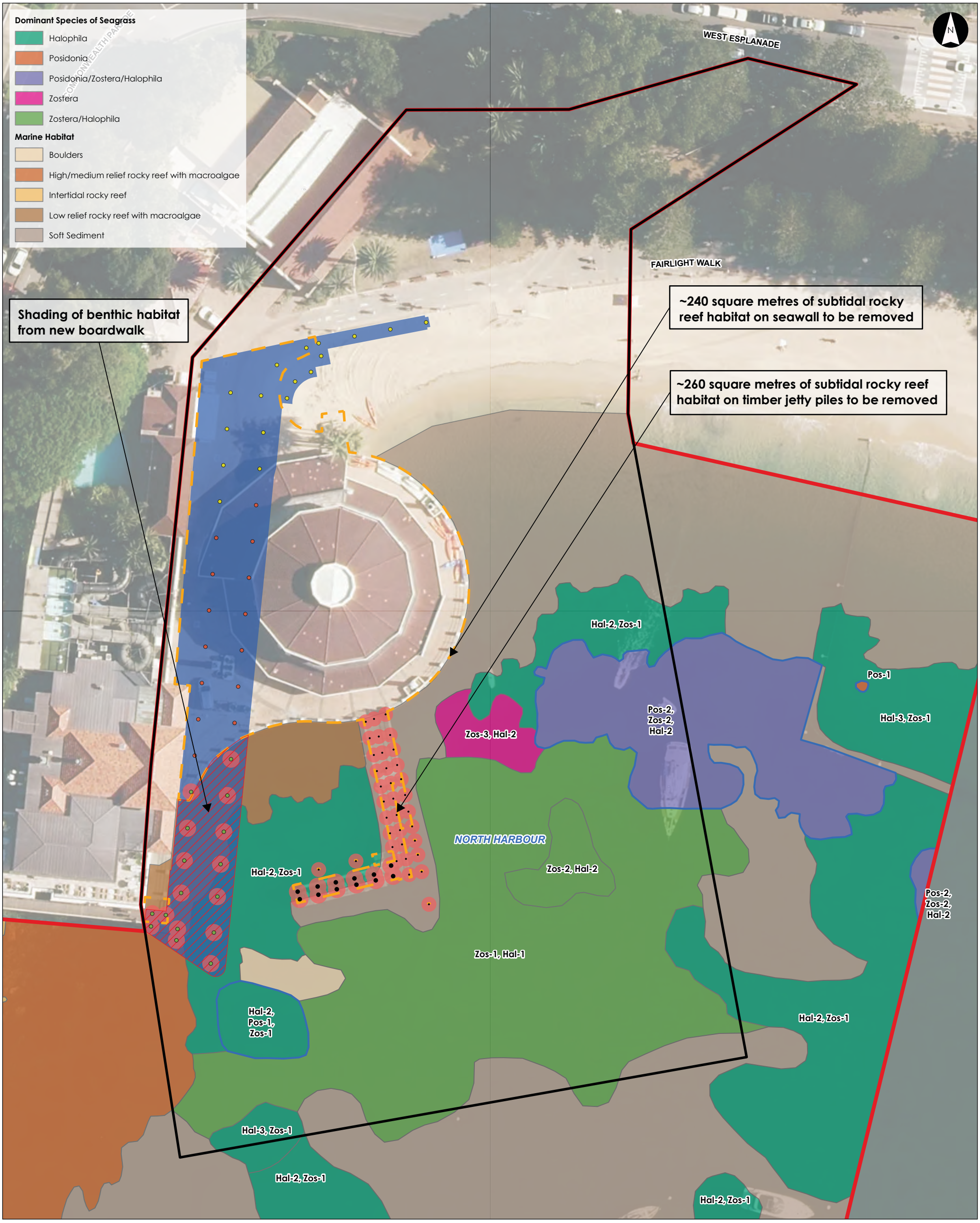
References:
1. Aerial imagery supplied by MetroMap (December, 2022)
2. Terrestrial Vegetation supplied by Stantec (2023)

0 15 30 45
Metres

Scale at A3: 1:1,000



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Indicative Marine Vegetation and Habitat to be Impacted by the Proposal

Manly, NSW

Project Code: 304500787-GS-015
Drawn By: TB, Checked By: AS
Rev: 01
Date: 2023-01-30
Figure No: 4-2

Stantec

Legend

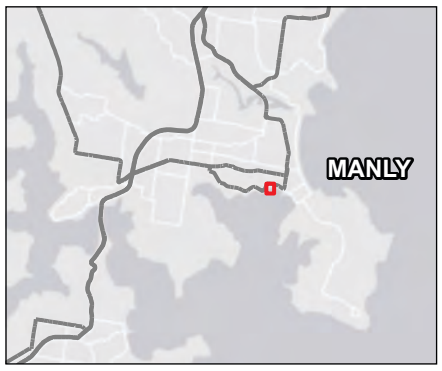
- Biodiversity Study Area
- Marine Works Area
- Bored pile
- Concrete column
- Driven pile
- Existing infrastructure to be removed
- New Boardwalk Infrastructure Benthic Marine Impact Area
- Piles Impact Area (1m radius)
- Existing Jetty Piles
- New Boardwalk Infrastructure

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by MetroMap (December, 2022)
2. Marine Habitat and Dominant Species of Seagrass supplied by Stantec (February, 2022)

0 5 10 15 20 25 Metres

Scale at A3: 1:550



This document has been prepared based on information provided by others as cited in the data sources. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

4.7 Cumulative impacts

Projects within the Northern Beaches LGA and the Sydney Ferries Network have been considered for the purposes of this cumulative impact assessment as per the REF.

Projects identified that could create cumulative impacts with the proposal have been detailed in Table 4-6.

Table 4-6: Past, present and future projects

Project	Biodiversity value impacted	Construction impacts	Operational impacts
Transport Manly Wharf 3 Upgrade	Protected and endangered marine vegetation, threatened / migratory marine species	Construction requires the removal of coastal and marine vegetation and habitat including around 171 square metres of seagrass and 31 square metres of macroalgae. This is relevant to the removal of vegetation (terrestrial and marine) and potential habitat for native, threatened and/or migratory species.	Operational impacts from potential scouring and shading involving the disturbance of around 31 square metres of seagrass and 48 square metres of macroalgae.
Transport Ferry Wharf Upgrade Program (FWUP). This includes the completed upgrades to 23 ferry wharfs within Sydney Harbour and plans to upgrade a further 7 wharves.	Protected marine vegetation, threatened / migratory marine species	Construction could potentially require the removal of coastal and marine vegetation. However, these areas are generally modified and the proportion of these areas to other similar areas in the harbour is small, even when combined. This is relevant to the removal of vegetation (terrestrial and marine) and potential habitat for native, threatened and/or migratory species.	Most locations would require the removal of existing structures in place of new structures. This is generally a temporary disturbance to coastal and marine vegetation and habitat and ecologically acceptable for coastal and marine species in the harbour.

Project	Biodiversity value impacted	Construction impacts	Operational impacts
Manly Wharf Second level upgrade – completed Manly Independent Assessment Panel approved development plans for the second-level of restaurants in October 2015 in accordance with the original conditions of consent as approved by the Land and Environment Court of NSW in July 2013.	Endangered population of Little Penguins at Manly	Disturbance to penguins nesting under the east wharf during construction.	Increased disturbance from noise, light and human interactions.
Manly Cove Pavilion Boardwalk Remedial Works	Endangered population of Little Penguins at Manly	Disturbance of potential Little Penguin habitat	Construction noise and disturbance during remediation activities. Works will be undertaken outside of breeding season to avoid impacts.

4.8 Assessments of significance

Assessments of Significance (AoSs) have been completed for threatened species/populations listed under the BC Act, FM Act and the EPBC Act that were identified as having a moderate to high potential to occur within the biodiversity study area due to the presence of nearby records and/or the presence of suitable habitat. These species were identified in Section 3.10 and Section 3.12 and include:

Six microbats:

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) listed as vulnerable under the BC Act
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*) listed as vulnerable under the BC Act
- Little Bent-winged Bat (*Miniopterus australis*) listed as vulnerable under the BC Act
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) listed as vulnerable under the BC Act
- Southern Myotis (*Myotis macropus*) listed as vulnerable under the BC Act
- Greater Broad-nosed Bat (*Scoteanax rueppellii*) listed as vulnerable under the BC Act.

Two fish:

- White's Seahorse (*Hippocampus whitei*) listed as endangered under the FM Act
- Black Rockcod (*Epinephelus daemelii*) listed as endangered under the FM Act and vulnerable under the EPBC Act

Marine bird population:

- Little Penguin (*Eudyptula minor*) in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline)

One endangered marine flora population:

- *Posidonia australis* seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie listed as endangered under the FM Act.

The full AoSs are provided in Appendix C. A summary of results is given in Table 4-7, Table 4-8 and Table 4-9.

Table 4-7: Summary table for assessments of significance under the BC Act

	Significance assessment question[1]					
Threatened species, or communities	**1**	**2**	**3**	**4**	**5**	**Likely significant impact?**
Little Penguin (*Eudyptula minor*) in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline) listed as an endangered population under the BC Act.	N	X	N	N	X	No.
Tree and Cave Microbats: Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat, Large-Eared Pied Bat, Little Bent-winged Bat, Large Bent-winged Bat, Southern Myotis, Greater Broad-nosed Bat	N	X	N	X	X	No.

Notes: Y = Yes (negative impact), N = No (no or positive impact), X = not applicable, ? = unknown impact. 1. *Section 7.2 of the BC Act*

Table 4-8: Summary table for assessments of significance under the FM Act

	Significance assessment question[1]							
Threatened species, or communities	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Likely significant impact?**
Posidonia australis seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie	X	N	N	N	X	N	N	No.
White's Seahorse	N	X	X	N	X	N	N	No.
Black Rockcod	N	X	X	N	X	N	N	No.

Notes: Y= Yes (negative impact), N= No (no or positive impact), X= not applicable, ?= unknown impact. 1. *Section 220ZZ of the FM Act*

Table 4-9: Summary table for assessments of significance under the EPBC Act

	Significance assessment question[1]									
Threatened species, or communities	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**Likely significant impact?**
White's Seahorse	N	N	N	N	N	N	N	N	N	No.
Black Rockcod	N	N	N	N	N	N	N	N	N	No.

Notes: Y= Yes (negative impact), N = No (no or positive impact), X = not applicable, ? = unknown impact. 1. *Matters of National Environmental Significance: Significant Impact Guidelines 1.1*

5 Avoidance and minimisation

Under the TfNSW Biodiversity Guidelines: *Protecting and managing biodiversity on RTA projects* (Roads and Traffic Authority (RTA), 2011) the management of biodiversity should aim to:

1. Avoid and minimise impacts first.
2. Mitigate impacts where avoidance is not possible.
3. Offset where residual impacts cannot be avoided.

Table 5-1 details measures to avoid, minimise or mitigate proposal impacts. These should be included in the CEMP and any associated sub-plans prior to construction.

Table 5-1: Mitigation measures

No.	Impact	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B1	All project impacts	Integrate the management of flora and fauna into the Construction Environmental Management Plan (CEMP). This is to include all terrestrial and marine flora and fauna and include but not be limited to such measures as: • Documenting and establishing site clearing limits and include on sensitive area plans • Preparation of a Marine Ecology Management Plan (MEMP) which would establish no go zones (including no anchoring zones in seagrass) and go slow zones (i.e. vessel speed restricted areas), sensitive area plans and targeted pre-clearance surveys. It would also include measures to prevent water pollution, limit sediment disturbance and barge movements, prolonged shading and a Syngnathid Management Plan (SMP) to be incorporated into the CEMP and MEMP. • Implementing tree protection measures outined in the Arborist report (Earthscape, 2023) • Pre-clearing surveys, vegetation removal, weed management and unexpected finds measures in line with the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011).	Contractor	Pre-construction	Effective	None.

No.	Impact	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B2	Removal of native vegetation and habitat	Pre-construction survey for microbats will be undertaken in accordance with Guide 1: Pre-construction process of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011) in the Manly Sea Life building precinct and timber jetty structures. If threatened microbats are detected or evidence of, a Microbat Management Plan will be developed in accordance with the Transport *Microbat Management Guidelines* (TfNSW, 2021) and included as part of the CEMP. This will be implemented by a suitably qualified bat (chiropteran) specialist to ensure the safety of individuals. Sensitive demolition (i.e. staged demolition) may also be utilised in order to protect individuals.	Contractor	Pre-construction/construction	Effective	Removal of the existing structures
B3	Retention of native vegetation and habitat	Implement the tree protection measures and the tree protection plan outlined in the Arborist report (Earthscape, 2023). Measures include tree protection fencing, ground and trunk protection and design requirements for the temporary haul road.	Transport for NSW / Contractor	Detailed design / Construction	Effective	None
B4	Removal/loss of marine vegetation and native biota from existing structures	Considerations during detailed design to promote colonisation of habitat-forming species could include the installation of structures which provide habitat complexity (i.e. designs available as part of the Living Seawalls Project).	Transport for NSW and Contractor	Detailed design	Effective	Loss of habitat from the removal of existing structures

No.	Impact	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B5	Removal/loss of marine vegetation and native biota from existing structures	Consult with NSW DPI Fisheries on any offsets that may be required for the project.	Contractor	Pre-construction	Effective	None
B6	Removal/loss of marine vegetation and native biota from existing structures	The piling activity shall mitigate the risk of sediment dispersal by applying industry best practice of minimising sediment disturbance during construction using pilling methods or any other seabed interference.	Contractor	Construction	Effective	Potential localised sediment mobilisation
B7	Removal/loss of marine vegetation and native biota from existing structures	Aquatic habitat will be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011) and Section 3.3.2 Standard precautions and mitigation measures of the *Policy and guidelines for fish habitat conservation and management Update 2013* (NSW DPI, 2013).	Contractor	Construction	Effective	Potential localised sediment mobilisation
B8	Impacts to threatened and protected species and other native fauna	Fauna will be managed in accordance with Guide 9: Fauna handling of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011).	Contractor	Construction	Effective	None

No.	Impact	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B9	Impacts to threatened and protected species and other native fauna	Complete a targeted survey for Black Rockcod and White's Seahorse within 24 hours prior to the commencement of water-side construction activities. Black Rockcod individuals will be encouraged to move away from the proposal area prior to silt curtain installation and White's Seahorse will be captured and relocated to nearby similar habitat using methods approved by NSW DPI (Fisheries). A White's Seahorse and broader SMP will be developed as part of the MEMP in consultation with NSW DPI (Fisheries) to dictate this activity. These activities are to be completed by a pre-qualified Section 37 permit holder under the FM Act.	Contractor	Pre-construction	Effective	
B10	Impacts to threatened and protected species other native fauna	The unexpected species finds procedure is to be followed under the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011) if threatened species or ecological communities, not assessed in the biodiversity assessment, are identified in the proposal area.	Contractor	Construction	Proven	Removal of the existing structures working next to potential threatened species habitat
B11	Impacts to threatened and protected species other native fauna	Considerations during detailed design to minimise impacts of light dispersion over water and rock platform to prevent further impingement on Little Penguin foraging behaviour and impacts on other native marine fauna. Potential use of perforated materials during detailed design such as a grated boardwalk to minimise shading impacts on marine vegetation and habitat below.	Transport for NSW and Contractor	Detailed design	Effective	Indirect impacts to threatened species

No.	Impact	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B12	Direct and indirect impacts to marine habitat from work barges	Work associated with positioning barges, drilling and pile driving will occur during calm conditions to prevent excessive scouring and other impacts.	Contractor	Construction	Effective	None
B13	Direct and indirect impacts to marine habitat from work barges	Minimise anchoring were possible and avoid anchoring on any marine vegetation particularly seagrass. This will include establishing 'no-go' zones. Specific anchoring locations (i.e. bare soft sediment within mapped seagrass) should need to be identified prior to water-side construction. Vessels should not remain stationary for an extended period of time over areas of seagrass. All personnel and vessels are to be made aware of the importance of seagrasses and macroalgae and their location in relation to the works. The number of barge anchor points will be minimised where possible. The anchoring locations should be selected to avoid permanent damage to seagrass meadows.	Contractor	Construction	Effective	Loss of habitat

B14	Impacts to biota from underwater noise and vibration	Standard management and mitigation procedures with respect to piling operations would be adopted as per *Underwater Piling Noise Guidelines* (Government of South Australia, 2012). This would include the following: • Avoid conducting piling activities (where practical) during times when threatened marine fauna are likely to be breeding, calving, feeding, migrating or resting in biologically important habitats located within the potential noise impact footprint. The Little Penguin breeding season is June through to February and White's Seahorse breeding season October to April. • Use low noise piling methods, instead of impact piling, where possible. • Presence of highly mobile threatened marine fauna (i.e. Little Penguin, Black Rockcod and Otariids) should be visually monitored by a suitably trained crew member for at least 30 minutes before the commencement of the piling procedure. • If no highly mobile threatened marine fauna are nearby, a soft start piling procedure should be used. This involves gradually increasing the piling impact energy over a 10-minute time period. Visual observations of marine fauna within the shutdown zone should be maintained by a trained crew member throughout the start period. • If no highly mobile threatened marine fauna are sighted within the observation zone during the soft start of normal operation procedures, the operator of the piling rig should be placed on stand-by to shut down the piling rig. • A record of procedures employed during the operations should be maintained by the piling contractor.	Contractor	Construction	Effective	None

No.	Impact	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B15	Impacts to biota from underwater noise and vibration	During piling, two safety zones will be applied around each piling location: • An observation zone, within which the movement of highly mobile threatened marine fauna (i.e. Little Penguin, Black Rockcod and Otariids) would be monitored to identify any approach to the shutdown zone. • A shutdown zone, within which the sighting of highly mobile threatened marine fauna would trigger piling activities to be ceased as soon as reasonably practical.	Contractor	Pre-construction/Construction	Effective	None
B16	Impacts to biota from underwater noise and vibration	Underwater noise reduction options should be adopted to attenuate the SEL for Syngnathids which are known to occur at Manly Cove tidal pool. Acceptable SEL to avoid impacts to Syngnathids would be guided by NSW DPI (Fisheries). Pre-clearance survey effort should take into account underwater noise related impacts, such as PTS and TTS which may include Manly Cove tidal pool. This would include: • Use of vibro-piling methods instead of impact piling. • If impact piling is needed then cushion blocks, bubble curtains and aerated, damped or dewatered outer pile casings should be considered.				
B17	Alteration of hydrology	The detailed design will aim to avoid/minimise any impact to coastal processes and hydrology.	Contractor	Detailed design	Effective	Minor residual loss of beach area.
B18	Impacts of pests and diseases	Weed species will be managed in accordance with *Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011).	Contractor	Construction	Effective	None

No.	Impact	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B19	Impacts of pests and diseases	Pathogens will be managed in accordance with Guide 2: Exclusion zones of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA, 2011).	Contractor	Construction	Effective	None
B20	Impacts of pests and diseases	Water-side equipment and vessels to be sourced from local suppliers where possible. Equipment and vessels must be cleaned and inspected prior to entering the proposal area. If any marine pests are encountered during water-side construction activities, the area of infestation must be isolated/not disturbed and NSW DPI (Fisheries) notified promptly.	Contractor	Construction	Effective	None
B21	Impacts of pests and diseases	Occurrence of any marine pests must be reported to NSW DPI (Fisheries).	Contractor	Construction	Effective	None
B22	Impacts on water quality due to construction	An Erosion and Sediment Control Plan (ERSP) will be developed as part of the CEMP and implemented prior to the commencement of works to manage sediment mobilisation and containment.	Contractor	Construction	Effective	Potential localised sediment mobilisation
B23	Impacts of water quality due to discharge of shark tank water	Further specialist advice from a risk assessor will be sought to determine the risk and the appropriate method of dispoal of water from the shark tank.	Transport	Pre-construction	Effetive	Minor

No.	Impact	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B24	Impacts on water quality due to construction	A spill management plan will be developed and communicated to all staff working on site. Appropriate land and aquatic spill kits are to be maintained on site and on barges. Aquatic spill kits must be specific for working within the marine environment. The spill kit must be appropriately sized for the volume of substances at the work site. All workers will be advised of the location of the spill kit and trained in its use.	Contractor	During construction	Effective	None
B25	Impacts on water quality due to construction	Prior to commencement of construction activities, sediment control device (such as sediment boom and curtain) will be installed around the MWA to contain disturbed sediment from the water surface by allowing suspended sediments to settle back on the bottom of the seabed overtime. The silt boom and curtain should extend from a minimum of 100 millimetres above the water line to a minimum of 2.5 metres below the water line before starting work. The devices should be checked regularly (at frequencies determined suitable in the CEMP) and maintained to ensure integrity. Installation should be undertaken during high tide periods from a boat. The device should be designed to rise and fall with the tide to prevent disturbance. Inspection of the device should be undertaken on a daily basis after ebbing tides, with additional inspection carried following storm events. Prior to removing the sediment control device, conditions within the curtain will be assessed visually and with a field instrument to verify that sediment has settled resulting in similar water turbidity to that outside the curtain.	Contractor	Construction	Effective	Potential localised sediment mobilisation

No.	Impact	Mitigation measures	Responsibility	Timing	Likely efficacy of mitigation	Residual impacts anticipated
B26	Impacts on water quality due to construction	NSW DPI (Fisheries) and the EPA are to be notified immediately if any fish kills occur in the vicinity of the works. In such cases, all works other than emergency response procedures are to cease until the issue is rectified and approval is given by NSW DPI (Fisheries) and/or the EPA for the works to proceed.	Contractor	Construction	Effective	None
B27	Impacts on water quality due to construction	Undertake a targeted site contamination assessment in the locations identified as potential contamination sources such as potential uncontrolled filling areas and marine sediments.	Transport for NSW and Contractor	Pre-construction	Effective	None
B28	Disturbance of acid sulfate soils	Preparation of an Acid Sulfate Soil Management Plan (ASSMP) that outlines the appropriate and necessary management measures to be put in place including for stockpiling and treatment (e.g., liming) methodologies for the soils.	Contractor	Pre-construction/ Construction	Effective	None

6 Offset strategy

The proposal would not clear any remnant native terrestrial vegetation (or PCTs) and would only require the clearance of about 95 square metres of landscaped grass to facilitate the compound area (refer Table 6-1). Following completion of the proposal the area would be reinstated. Eight Bangalow Palms of about 26 square metres in size would be removed and potentially relocated on the boardwalk (refer Table 6-1). If the trees are not relocated, replacement would be undertaken in accordance with the Tree and Hollow Replacement guidelines under the Transport *Biodiversity Policy* (TfNSW, 2022).

The proposal would result in the direct removal of the Manly Sea Life building and existing jetty which is potential roosting habitat for microbats. This area equates to about 1,085 square metres.

No meadows containing Posidonia are expected to be directly impacted by the proposal. Based on the current mapping, the proposal is expected to result in the direct loss of about 500 square meters (vertical area) of marine habitat and marine vegetation on artificial structures (Type 2 KFH). During the pile removal process around 35 square metres of seagrass (Type 1 KFH), less than one square metre of subtidal rocky reef (Type 2 KFH) and 143 square metres of unvegetated soft sediment would be affected (refer Table 6-1). It is anticipated that about 19 square metres of seagrass (Type 1 KFH) and 61 square metres of subtidal rocky reef (Type 2 KFH) would be impacted from piling activities associated with the new boardwalk (refer Table 6-1). During operation, residual impacts (i.e. shading from the boardwalk) to marine vegetation may also occur. This would result in the permanent coverage of about 97 square metres of seagrass (Type 1 KFH) and 211 square metres of subtidal rocky reef (Type 2 KFH).

On the completion of construction, the submerged surface area of the piles would be available for recolonisation of marine vegetation and other habitat-forming species. The footprint of the timber jetty (about 125 square metres) and former Manly Sea Life building (about 1123 square metres,) would be effectively soft sediment. These areas would be considered suitable habitat for opportunistic seagrass species (i.e. Halophila and Zostera). During operation, residual impacts (i.e. shading from the boardwalk) to marine vegetation may also occur. This would result in the permanent coverage of about 97 square metres of seagrass (Type 1 KFH) and 272 square metres of subtidal rocky reef (Type 2 KFH). A summary of net habitat gains and losses is provided in Table 6-1.

Considerations during detailed design to promote colonisation of habitat-forming species could include the installation of structures which provide habitat complexity (i.e. designs available as part of the Living Seawalls Project). Additionally, consideration should be given to the use of perforated grated materials for the boardwalk to minimise shading impacts on marine vegetation and habitat.

The *Policy and guidelines for fish habitat conservation and management Update 2013* (NSW DPI, 2013) requires a minimum 2:1 offset for the total area of the three 'Types' of KFH lost (see NSW DPI, 2013 for definitions) to help redress direct and indirect impacts of development. NSW DPI (2013) uses a rate of $52 per square metre, or $104 per square metre to meet the 2:1 offsetting requirement. This rate is subject to annual inflation from 1 July each financial year. The rate above is for the 2013–14 financial year and is subject to an annual increase in line with the Consumer Price Index per financial year. NSW DPI (Fisheries) can confirm the current rate through consultation. Additionally, Type 1 KFH and Type 2 KFH lost as a result of the proposal would be required to be offset under the Transport *Biodiversity Policy* (TfNSW, 2022).

Table 6-1: Net gain/loss of habitat

Vegetation and habitat	Process: Construction and demolition	Construction: Area to be directly impacted/removed (m^2)	Process: Operational impacts	Operational: Area to be directly/indirectly impacted (m^2)	Area to be reinstated (m^2)	Net loss/gain
Landscaped gardens and parks	Compound area establishment	~95	-	-	~95	No net loss
Removal of eight Bangalow Palms	Demolition	~25	-	-	~25 (if relocated)	No net loss (if relocated), otherwise a residual loss
Potential suboptimal microbat roosting habitat	Demolition: Removal of Sea Life building and existing timber jetty	~1,085	-	-	~1,151	Net gain
Vertical submerged marine habitat on existing piles and seawall (Type 2 KFH)	Demolition: Removal of structures	~500	-	-	30 piles to be installed (dimensions tbc)	Net loss
Seagrass (Type 1 KFH)	Demolition: Removal of piles	~35	-	-	-	Net loss
Subtidal rocky reef (Type 2 KFH)	Demolition: Removal of piles	< 1	-	-	-	Net loss
Unvegetated soft sediment (Type 3 KFH)	Demolition: Removal of piles	~143	-	-	~1,248	Net gain
Seagrass (Type 1 KFH)	Construction: Piling	~19	-	-	-	Net loss

7 Conclusion

Transport is proposing to demolish the former Manly Sea Life building to seabed level and extend the boardwalk adjacent to Manly Pavilion at Manly, NSW ('the proposal). The proposal would involve a number of land-side and water-side activities including the demolition of the former Manly Sea Life building and associated timber jetty and construction of a 100 metre long boardwalk. Construction of the proposal may be staged, so work impacts on the operation of the Manly Pavilion, the Manly Art Gallery and Museum and other businesses, are minimised. The demolition method, design and staging have also been developed to reduce impacts to the environment including noise, seagrass, Little Penguins (*Eudyptula minor*) and heritage. The demolition method has been altered from a cofferdam to a wet method to minimise impacts to seagrass and local marine life.

This BAR describes the existing environment within the biodiversity study area and identifies potential impacts to biodiversity as a result of construction and operation of the proposal. The biodiversity assessment was informed by a review of existing information and data in the biodiversity study area and the study locality, as well as a field investigations of the marine environment, conducted in February 2022, March 2022 and November 2022.

The proposal is located within the Northern Beaches Council LGA. The proposal is located at the western end of Manly Cove and the former Sealife building has been vacant since the closure of the Manly Sea Life Sanctuary in 2018.

The biodiversity study area is located on a highly modified, urban foreshore which is fringed by commercial buildings (Manly Pavilion and Manly Waterworks) and the Manly Art Gallery and Museum as well as the existing Sea Life building and timber jetty. The land-side component of the biodiversity study area is comprised of landscaped gardens with planted trees and grassed areas, and is generally used for recreational purposes. No remnant terrestrial vegetation or native PCTs occur within the biodiversity study area.

The marine component of the biodiversity study area contained a variety of subtidal habitats. A significant feature of this were large patches of seagrasses (including *Zostera muelleri* subsp*. capricorni*, *Halophila* sp. and *Posidonia australis*) distributed throughout the biodiversity study area. Another feature of the subtidal environment included subtidal rocky reef which ran along the foreshore of Federation Point consisting of boulders and crevices with areas of macroalgae, mainly kelp (*Ecklonia radiata*). The biodiversity study area also contained artificial habitats including existing timber jetty piles, subtidal seawall and the western portion of Manly Cove tidal pool which were colonised by encrusting invertebrates and macroalgae. A large portion of the subtidal biodiversity study area consisted of unvegetated soft sediment. No other marine vegetation such as mangrove or saltmarshes were recorded.

The habitat in the biodiversity study area provides potential habitat for 12 threatened fauna species (both terrestrial and marine) and two endangered populations. These included:

Six microbats:

- Eastern False Pipistrelle (Falsistrellus tasmaniensis) listed as vulnerable under the BC Act
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*) listed as vulnerable under the BC Act
- Little Bent-winged Bat (*Miniopterus australis*) listed as vulnerable under the BC Act.
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) listed as vulnerable under the BC Act
- Southern Myotis (*Myotis macropus*) listed as vulnerable under the BC Act

- Greater Broad-nosed Bat (*Scoteanax rueppellii*) listed as vulnerable under the BC Act.

One mammal:

- Grey-headed Flying Fox (*Pteropus poliocephalus*) listed as vulnerable under the BC Act and the EPBC Act.

Two fish:

- White's Seahorse (*Hippocampus whitei*) listed as endangered under the FM Act and EPBC Act
- Black Rockcod (*Epinephelus daemelii*) listed as endangered under the FM Act and vulnerable under the EPBC Act.

Two marine mammals:

- New Zealand Fur Seal (*Arctocephalus forsteri*) listed as vulnerable under the BC Act.
- Australian Fur Seal (*Arctocephalus pusillus*) listed as vulnerable under the BC Act.

Two endangered populations:

- Little Penguin (*Eudyptula minor*) in the Manly Point Area, listed as an endangered population under the BC Act.
- *Posidonia australis* seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie listed as endangered under the FM Act.

Although there are records of Grey-headed Flying Fox and Australian/New Zealand Fur Seals occurring within the study area, direct impacts to these animals were considered unlikely, given the limited amount of suitable habitat and (in terms of the seals), their infrequent sightings in the biodiversity study area.

The proposal would require removal and / or relocation of eight native- Bangalow Palms (*Archontophoenix cunninghamiana*) and temporarily disturb a small area of landscaped grass to facilitate the compound area. The removal/relocation of this vegetation is a small proportion relative to the available foraging resources in the wider study locality and is unlikely to have a measurable impact on overall habitat availability. If the Bangalow Palms are permanently removed, they would be replaced in accordance with the Tree and Hollow Replacement guidelines under the Transport *Biodiversity Policy* (TfNSW, 2022).. Furthermore, the majority of vegetation to be cleared is associated with the establishment of the compound area, thus, following decommissioning of the compound area (i.e. completion of construction), this area would be restored and made good. Potential risks of the spread/introduction of weeds and diseases and the potential for erosion and sediment mobilisation during construction activities would be managed in accordance with the relevant Transport guidelines.

As microbats could potentially occur within the un-used Manly Sea Life building and existing timber jetty, pre-clearance surveys would be undertaken prior to removal, so that if individuals are present they can be collected and relocated to nearby suitable habitat according to a Microbat Management Plan (if required).

The proposal would not require large-scale disturbance of the seabed or direct impacts to beds of the endangered seagrass *Posidonia australis*. Removal of the existing timber jetty structure (including piles) and subtidal seawall would impact about 500 square metres of subtidal rocky reef communities (Type 2 Key Fish Habitat (KFH)), 35 square metres of seagrass (Type 1 KFH) and 143 square metres of un-vegetated soft sediment (Type 3 KFH).

To support the new boardwalk, 16 steel piles would be installed by a barge mounted piling rig into the subtidal habitat east of the existing walkway near Manly Pavilion. Thirteen steel piles would be driven into subtidal rocky reef (Type 2 KFH), and three within medium density Halophila and low density Zostera seagrass (Type 1 KFH). This would result in the loss of 61 square metres of subtidal rocky reef (Type 2 KFH) and 19 square metres of seagrass (Type 1 KFH). During the operational phase of the proposal, around 211 square metres of subtidal rocky reef (Type 2 KFH) and about 97 square metres of seagrass (Type 1 KFH) would be shaded by the boardwalk. However, the removal of the existing timber jetty and Sea Life building would effectively become unshaded soft sediment, whereby seagrasses may recolonise the area over time if conditions are suitable.

Under Section 199 of the FM Act, consultation with NSW Department of Primary Industries (DPI) (Fisheries) is required for any dredging and reclamation works. 'Dredging' under the *Policy and Guidelines for Fish Habitat Conservation and Management* (NSW DPI, 2013) is classified as disturbance of the seabed/streambed. In this case, this refers to removal of structures and piling. Under Section 205 of the FM Act, a permit to 'harm' marine vegetation is required for this purpose and would therefore need to be obtained prior to construction.

Offsets for the residual loss of subtidal rocky reef, seagrass should be considered in accordance with the *Biodiversity Policy* (Transport for New South Wales, 2022), *Policy and guidelines for fish habitat conservation and management* Update 2013 (NSW DPI, 2013) and in consultation with NSW DPI (Fisheries).

Sediment mobilisation from piling and other water-side construction activities and vessel wash and scour were also identified as potential proposal impacts. However, the biodiversity study area is likely to be frequently exposed to elevated levels of sediment, associated with rainfall and sea conditions. Thus, with the appropriate controls set out in the Marine Ecology Management Plan (MEMP), a slight, temporary increase in these impacts is not expected to substantially impact marine biodiversity.

Caulerpa taxifolia (Caulerpa) was observed within the biodiversity study area and movements of vessels, plant and equipment could further spread Caulerpa (and potentially other marine pests) within Manly Cove and to other unaffected estuaries. Controls would therefore be in place to ensure all equipment in contact with the water is properly cleaned and checked prior to and upon completion of construction so these risks are avoided.

The proposal is unlikely to have a measurable impact on any threatened species or populations with a likelihood of occurrence within the biodiversity study area. Disturbances to potential habitat are expected to be mostly temporary and constitute only a small proportion of available habitat in the locality. The proposal is not expected to fragment or isolate threatened species populations or substantially impact any species' lifecycle, provided that the mitigation measures and controls outlined in this assessment are implemented as part of the Construction Environmental Management Plan (CEMP). In particular, mitigation measures are proposed to survey for Black Rockcod and White Seahorses prior to construction to minimise the risk of harm. The specific process and timing of this would be advised by NSW DPI (Fisheries) and outlined in a Syngnathid Management Plan (SMP) incorporated into the MEMP. Noise reduction options will also be implemented as part of the MEMP to attenuate the underwater noise produced during piling to acceptable levels, with this level guided by NSW DPI (Fisheries) consultation.

Species Impact Statements (SIS) or EPBC referral were not considered to be required as part of this assessment.

Considering the above and assuming recommended mitigation measures are implemented, the proposal is unlikely to significantly impact on biodiversity within the biodiversity study area.

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Appendix A

Species recorded

Recorded flora

Family	Scientific name	Common name	Native/exotic	Priority weed
Aizoaceae	*Carpobrotus rossii*	Pig Face	Native	N/A
Araucariaceae	*Araucaria heterophylla*	Norfolk Island Pine	Native	N/A
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm	Native	N/A
Arecaceae	*Phoenix canariensis*	Canary Island Palm	Exotic	N/A
Asphodelaceae	*Xanthorrhoea* sp.	-	Native	N/A
Dictyotaceae	*Padina* sp.	-	Native	N/A
Hydrocharitaceae	*Halophila* sp.	Paddleweed	Native	N/A
Lessoniaceae	*Ecklonia radiata*	Kelp	Native	N/A
Moraceae	*Ficus macrophylla*	Moreton Bay Fig	Native	N/A
Posidoniaceae	*Posidona australis*	Strapweed	Native	N/A
Sargassaceae	*Sargasssum* sp.	-	Native	N/A
Zosteraceae	*Zostera capricorni*	Eelgrass	Native	N/A

Recorded fauna

Family	Scientific name	Common name	Native/exotic
Balanidae	*Amphibalanus variegatus*	Variable Barnacle	Exotic
Diadematoida	*Centrostephanus rodgersii*	Spiny Sea Urchin	Native
Girellidae	*Girella tricuspidata*	Luderick	Native
Lottiidae	*Patelloida mimula*	-	Native
Monacanthidae	*Monacanthus chinensis*	Fanbelly Leatherjacket	Native
Mytilidae	*Mytilus edulis*	Blue Mussel	Native
Ostreidae	*Saccostrea glomerata*	Sydney Rock Oyster	Native
Plesiopidae	*Trachinops taeniatus*	Eastern Hulafish	Native
Pyuridae	*Pyura stolonifera*	Cunjevoi	Native
Turbindae	*Astralium tentoriiformis*	Common Tent Shell	Native
Sparidae	*Acanthopagrus australis*	Yellowfin Bream	Native
Urolophidae	*Trygonoptera testacea*	Common Stingray	Native

Appendix B

Habitat assessment table

Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the biodiversity study area during the current survey.
High	It is highly likely that a species inhabits the biodiversity study area and is dependent on identified suitable habitat (i.e. for breeding or important life cycle periods), has been recorded recently (within 20 years) in the locality (ten kilometres) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the biodiversity study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the biodiversity study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the biodiversity study area opportunistically or during migration. The species is unlikely to be dependent (i.e. for breeding or important life cycle periods) on habitat within the biodiversity study area, or habitat is in a modified or degraded state.
Low	It is unlikely that the species inhabits the biodiversity study area and has not been recorded recently in the study locality (ten kilometres). It may be an occasional visitor, but habitat similar to the biodiversity study area is widely distributed in the local area, meaning that the species is not dependent (i.e. for breeding or important life cycle periods) on available habitat. Specific habitat is not present in the biodiversity study area.
None	Suitable habitat is absent from the biodiversity study area.

Threatened species habitat assessment table

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
Amphibians					
Giant Burrowing Frog (*Heleioporus australiacus*)	V	V	The Giant Burrowing Frog is distributed in south eastern NSW and VIC, and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, VIC. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Individual frogs occupy a series of burrow sites, some of which are used repeatedly. The home ranges of both sexes appear to be non-overlapping suggesting exclusivity of non-breeding habitat. Home ranges are approximately 0.04 ha in size.	(PMST) / 10 (BioNet)	None. No suitable habitat in the biodiversity study area.
Green and Golden Bell Frog (*Litoria aurea*)	E	V	Since 1990 there have been approximately 50 recorded locations in NSW, most of which are small, coastal, or near coastal populations. These locations occur over the species' former range, however they are widely separated and isolated. Large populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands. Ephemeral and permanent freshwater wetlands, ponds, dams with an open aspect and fringed by Typha and other aquatics, free from predatory fish.	(PMST)	None. No suitable habitat in the biodiversity study area.
Stuttering Frog (*Mixophyes balbus*)	E	V	Occur along the east coast of Australia from southern QLD to north-eastern VIC. Found in	(PMST)	None.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor.		No suitable habitat in the biodiversity study area.
Red-crowned Toadlet (*Pseudophryne australis*)	V	-	It has restricted distribution from Pokolbin to Nowra and west to Mt VIC. Occurs in open forests and wet drainage lines below sandstone ridges that often have shale lenses or cappings in the Hawkesbury and Narrabeen Sandstones.	357 (BioNet)	None. No suitable habitat in the biodiversity study area.
Flora					
Bynoe's Wattle (*Acacia bynoeana*)	E	V	Found in central eastern NSW, from the Hunter District south to the Southern Highlands and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra. Occurs in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood (*Corymbia gummifera*), Scribbly Gum (*Eucalyptus haemastoma*), Drooping Red Gum (*E. parramattensis*), Old Man Banksia (*Banksia serrata*) and Small-leaved Apple (*Angophora bakeri*).	(PMST)	None. No suitable habitat in the biodiversity study area.
Downy Wattle (*Acacia pubescens*)	V	V	Concentrated around the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Occurs in open woodland and forest, in a variety of plant communities, including Cooks River/ Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	(PMST)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			The soils are characteristically gravely soils, often with ironstone.		
Sunshine Wattle (*Acacia terminalis* subsp. *terminalis*)	E	E	Very limited distribution between Botany Bay to the northern foreshore of Port Jackson. Recent collections have only been made from the Quarantine Station, Clifton Gardens, Dover Heights, Parsley Bay, Nielson Park, Cooper Park, Chifley and Watsons Bays. Coastal scrub and dry sclerophyll woodland on sandy soils. Habitat is generally sparse and scattered. Most areas of habitat or potential habitat are small and isolated.	(PMST) / 466 (BioNet)	None. No suitable habitat in the biodiversity study area.
Allocasuarina glareicola	E	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Grows in Castlereagh woodland on lateritic soil. Found in open woodland with *Eucalyptus parramattensis, Eucalyptus fibrosa*, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora. Common associated understorey species include *Melaleuca nodosa*, *Hakea dactyloides*, *Hakea sericea*, *Dillwynia tenuifolia*, *Micromyrtus minutiflora, Acacia elongata*, *Acacia brownei*, *Themeda australis* and *Xanthorrhoea minor*.	(PMST)	None. No suitable habitat in the biodiversity study area.
Nielsen Park She-oak (*Allocasuarina portuensis*)	E	E	The original known habitat of the Nielsen Park She-oak is at Nielsen Park, in Woollahra local government area. There are no plants left at the original site where it was discovered. However, propagation material has been planted successfully at a number of locations at Nielsen Park and other locations in the local area, e.g. Gap Bluff, Hermit Point and Vaucluse House. The original habitat is tall closed woodland. Canopy species include: *Ficus rubiginosa*, *Angophora costata*, *Elaeocarpus reticulatus* and *Gloichidion ferdinandi* with a shrub layer of *Pittosporum*	(PMST) / 64 (BioNet)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			revolutum, *Kunzea ambigua* and *Monotoca elliptica*. The original habitat occurs above a sandstone shelf approximately 20 m above the harbour. The shallow sandy soils are highly siliceous, coarsely textured and devoid of a soil profile. The plantings have occurred on similar soils.		
Asterolasia elegans	E	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Known from only seven populations, only one of which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*), Smooth-barked Apple (*Angophora costata),* Sydney Peppermint (E*ucalyptus piperita*), Forest Oak (*Allocasuarina torulosa*) and Christmas Bush (*Ceratopetalum gummiferum*).	(PMST)	None. No suitable habitat in the biodiversity study area.
Thick-lipped Spider-orchid (*Caladenia tessellata*)	E	V	Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Was more widespread across its distribution in the past. Some populations are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve, and Spectacle Island	(PMST)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			Nature Reserve. Further north it has been recorded from Yengo National Park and Werakata National Park. Grows in dry sclerophyll forest on the coast and adjacent ranges.		
Netted Bottle Brush (*Callistemon linearifolius*)	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Was more widespread across its distribution in the past. Some populations are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve, and Spectacle Island Nature Reserve. Further north it has been recorded from Yengo National Park and Werakata National Park. Grows in dry sclerophyll forest on the coast and adjacent ranges.	6 (BioNet)	None. No suitable habitat in the biodiversity study area.
Sand Spurge (*Chamaesyce psammogeton*)	E	-	Sand Spurge is found sparsely along the coast from south of Jervis Bay (at Currarong, Culburra and Seven Mile Beach National Park) to QLD (and Lord Howe Island). Grows on fore-dunes, pebbly strandlines and exposed headlands, often with Spinifex (*Spinifex sericeus*) and Prickly Couch (*Zoysia macrantha*). Flowering recorded in spring and summer.	7 (BioNet)	None. No suitable habitat in the biodiversity study area.
Leafless Tongue-Orchid (*Cryptostylis hunteriana*)	V	V	The Leafless Tongue Orchid has been recorded from as far north as Gibraltar Range National Park south into VIC around the coast as far as Orbost. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*).	(PMST)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
White-flowered Wax Plant (*Cynanchum elegans*)	E	E	Occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree (*Leptospermum laevigatum*) – Coastal Banksia (*Banksia integrifolia* subsp. *integrifolia*) coastal scrub; Forest Red Gum (*Eucalyptus tereticornis*) aligned open forest and woodland; Spotted Gum (*Corymbia maculata*) aligned open forest and woodland; and Bracelet Honeymyrtle (*Melaleuca armillaris*) scrub to open scrub.	(PMST)	None. No suitable habitat in the biodiversity study area.
Darwinia biflora	V	V	Occurs at 129 sites in the northern and north-western suburbs of Sydney, in the Ryde, Baulkham Hills, Hornsby and Ku-Ring-Gai local government areas. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury sandstone. Associated overstorey species include *Eucalyptus haemastoma*, *Corymbia gummifera* and/or *E. squam*osa. The vegetation structure is usually woodland, open forest or scrub-heath.	(PMST)	None. No suitable habitat in the biodiversity study area.
Deyeuxia appressa	E	E	A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area. Was first collected in 1930 at Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown. Was then collected in 1941 from Killara, near Hornsby. Has not been collected since and may now be extinct in the wild due to the level of habitat loss and development that has occurred within these areas.	(PMST)	None. No suitable habitat in the biodiversity study area.
Giant Spear Lily (*Doryanthes palmeri*)	V	-	Giant Spear Lily occurs in far north-east NSW and south-east QLD. In NSW, it occurs on the coastal ranges that are part of the Mt Warning Caldera. Its southern distributional limit is Mount Billen. The species is currently known from eleven sites within NSW, five of which are conservation	1 (BioNet)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			reserves. Most populations consist of only a few hundred individuals. Giant Spear Lily occurs on exposed rocky outcrops on infertile soils or on bare rock. It grows in a narrow band of vegetation along the cliff-tops and on steep cliff-faces or rocky ledges in montane heath next to subtropical rainforest, warm temperate rainforest or wet eucalypt forest.		
Epacris purpurascens var. *purpurascens*	V	-	Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Found in a range of habitat types, most of which have a strong shale soil influence.	21 (BioNet)	None. No suitable habitat in the biodiversity study area.
Camfield's Stringybark (*Eucalyptus camfieldii*)	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of Narrow-leaved Stringybark (*Eucalyptus oblonga*), Brown Stringybark (*E. capitellata*) and Scribbly Gum (*E. haemastoma*).	(PMST) / 50 (BioNet)	None. No suitable habitat in the biodiversity study area.
Narrow-leaved Black Peppermint (*Eucalyptus nicholii*)	V	V	This species is sparsely distributed but widespread on the New England Tablelands from Nundle to north of Tenterfield, being most common in central portions of its range. Found largely on private property and roadsides, and occasionally conservation reserves. Planted as urban trees, windbreaks and corridors. Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile	5 (BioNet)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			soils derived from granite or meta-sedimentary rock.		
Yellow Gnat-orchid (*Genoplesium baueri*)	E	E	Recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. About half the records were made before 1960 with most of the older records being from Sydney suburbs including Asquith, Cowan, Gladesville, Longueville and Wahroonga. No collections have been made from those sites in recent years. The species has been recorded at locations now likely to be within the several conservation reserves including Berowra Valley Regional Park, Royal National Park and Lane Cove National Park. May occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments. Found in sparse sclerophyll forest and moss gardens over sandstone	(PMST)	None. No suitable habitat in the biodiversity study area.
Caley's Grevillea (*Grevillea caleyi*)	CE	CE	Restricted to an 8 km2 area around Terrey Hills occurring in three major areas of suitable habitat, namely Belrose, Ingleside and Terrey Hills/Duffys Forest within the Ku-ring-gai, Pittwater and Warringah local government areas. Occurs on the ridgetop between elevation of 170 to 240 m asl in association with laterite soils and a vegetation community of open forest dominated by *Eucalyptus sieberi* and *E. gummifera*.	(PMST) / 76 (BioNet)	None. No suitable habitat in the biodiversity study area..
Hal (*Haloragodendron lucasii*)	E	E	The known locations of this species are confined to a very narrow distribution on the north shore of Sydney. Associated with dry sclerophyll forest. Reported to grow in moist sandy loam soils in sheltered aspects, and on gentle slopes below cliff-lines near creeks in low open woodland. Associated with high soil moisture and relatively high soil-phosphorus levels.	(PMST)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
Hibebertia superans	E	-	Occurs from Baulkham Hills to South Maroota in the northern outskirts of Sydney and at one locality at Mount Boss inland from Kempsey. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides.	1 (BioNet)	None. No suitable habitat in the biodiversity study area.
Hygrocybe reesiae	V	-	Known from type locality, LaneCove Bushland Park, Lane Cove and other locations in the Sydney region including Royal National Park, Chatswood, Castle Hill, Northbridge, Marsfield, East Linfield and the Blue Mountains (Mount Wilson, Hazelbrook). Also found in TAS. Occurs in gallery warm temperate forests dominated by Lilly Pilly (*Acmena smithii*), Grey Myrtle (*Backhousia myrtifolia*), Cheese Tree (*Glochidion ferdinandi*) and Sweet Pittosporum (*Pittosporum undulatum*). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.	2 (BioNet)	None. No suitable habitat in the biodiversity study area.
Lasiopetalum joyceae	V	V	Restricted on lateritic to shaley ridgetops on the Hornsby Plateau south of the Hawkesbury River between Berrilee and Duffys Forest. Occurs in heath on sandstone.	(PMST) / 1 (BioNet)	None. No suitable habitat in the biodiversity study area.
Deane's Tea-Tree (*Leptospermum deanei*)	V	V	Known from the Hornsby, Warringah, Ku-ring-gai and Ryde local government areas. Occurs in woodland on lower hill slopes or near creeks, sandy alluvial soil or sand over sandstone, riparian scrub woodland and open forest.	(PMST)	None. No suitable habitat in the biodiversity study area.
Macadamia Nut (*Macadamia integrifolia*)	-	V	The Macadamia Nut is found in remnant rainforest in northern NSW and south-east QLD. While specimens have been collected from the North	8 (BioNet)	None. No suitable habitat in the biodiversity study area..

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			Coast of NSW, this species is not known to occur naturally in NSW.		
Biconvex Paperbark (*Melaleuca biconvexa*)	V	V	Found only in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	(PMST) / 1 (BioNet)	None. No suitable habitat in the biodiversity study area.
Deane's Melaleuca (*Melaleuca deanei*)	V	V	Occurs in two distinct areas, in the Ku-ring-gai, Berowra, Holsworthy and Wedderburn areas, and there are also more isolated occurrences at Springwood, Wollemi National Park, Yalwal and the Central Coast areas. The species grows in heath on sandstone.	(PMST)	None. No suitable habitat in the biodiversity study area.
Angus's Onion Orchid (*Microtis angusii*)	E	E	Currently known from only one site at Ingleside, north of Sydney. It is not easy to define the preferred natural habitat of this orchid as the Ingleside location is highly disturbed. The dominant species occurring on the site are introduced weeds Coolatai grass (*Hyparrhenia hirta*) and *Acacia saligna*. The Ingleside population occurs on soils that have been modified but were originally those of the restricted ridgetop lateritic soils in the Duffys Forest - Terrey Hills - Ingleside and Belrose areas. These soils support a specific and distinct vegetation type, the Duffys Forest Vegetation Community which is listed as an endangered ecological community under the TSC Act and ranges from open forest to low open forest and rarely woodland.	(PMST) / 9 (BioNet)	None. No suitable habitat in the biodiversity study area.
Tall Knotweed (*Persicaria elatior*)	V	V	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is	(PMST)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.		
Hairy Geebung (*Persoonia hirsuta*)	E	E	The Hairy Geebung has been recorded in the Sydney coastal area, the Blue Mountains area and the Southern Highlands. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	(PMST) / 13 (BioNet)	None. No suitable habitat in the biodiversity study area.
Pimelea curviflora var. *curviflora*	V	V	Confined to the coastal area of Sydney between northern Sydney in the south and Maroota in the north-west. Former range extended south to the Parramatta River and Port Jackson region including Five Dock, Bellevue Hill and Manly. Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. This species has been recorded from the Currarong area in Jervis Bay, Royal National Park, Cronulla, Garie Beach and Port Stephens (Gan Gan Hill, Nelson Bay). The Sydney and Royal National Park populations were thought possibly extinct, but the species is now known to occur at Bass and Flinders Point in Cronulla. Villous Mint-bush is generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	(PMST) / 29 (BioNet)	None. No suitable habitat in the biodiversity study area.
Spiked Rice-flower (*Pimelea spicata*)	E	E	Broad distribution in western Sydney, occurring on the Cumberland Plain (Narellan, Marayong, Prospect Reservoir areas). Another smaller population is recorded in districts (Landsdowne to Shellharbour to northern Kiama) Illawarra. It	(PMST)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			grows on well-structured clay soils. On the inland Cumberland Plain sites it is associated with Grey Box and Ironbark. In the coastal Illawarra it occurs commonly in Coastal Banksia open woodland with a more well developed shrub and grass understorey.		
Villous Mintbush (*Prostanthera densa*)	V	V	This species has been recorded from the Currarong area in Jervis Bay, Royal National Park, Cronulla, Garie Beach and Port Stephens (Gan Gan Hill, Nelson Bay). The Sydney and Royal National Park populations were thought possibly extinct, but the species is now known to occur at Bass and Flinders Point in Cronulla. Villous Mint-bush is generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	(PMST) / 1 (BioNet)	None. No suitable habitat in the biodiversity study area.
Somersby Mintbush (*Prostanthera junonis*)	E	E	Has a north-south range of approximately 19 km on the Somersby Plateau in the Gosford and Wyong local government areas. The species is restricted to the Somersby Plateau. It occurs on both the Somersby and Sydney Town soil landscapes on gently undulating country over weathered Hawkesbury sandstone within open forest/low woodland/open scrub. It occurs in both disturbed and undisturbed sites.	(PMST)	None. No suitable habitat in the biodiversity study area.
Seaforth Mintbush (*Prostanthera marifolia*)	CE	CE	*Prostanthera marifolia* is currently only known from the northern Sydney suburb of Seaforth and has a very highly restricted distribution within the Sydney Basin Bioregion. The single population is fragmented by urbanisation into three small sites. All known sites are within an area of 2x2 km. Two of the sites are within the local government area of Manly and one site is in the local government area of Warringah. Occurs in localised patches in	(PMST) / 857 (BioNet)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			or in close proximity to the endangered Duffys Forest ecological community. Located on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses, a soil type which only occurs on ridge tops and has been extensively urbanised.		
Eastern Underground Orchid (*Rhizanthella slateri*)	V	E	Occurs from south-east QLD to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.	(PMST)	None. No suitable habitat in the biodiversity study area.
Scrub Turpentine (*Rhodamnia rubescens*)	CE	CE	Shrub or small tree to 25 metres high occurring in coastal districts north from Batemans Bay in NSW approximately 280 kilometres south of Sydney, to areas inland of Bundaberg in QLD. Populations typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 metres asl with rainfall of 1,000-1,600 mm. Commonly occurs in all rainforest subforms except cool temperate rainforest.	(PMST) / 2 (BioNet)	None. No suitable habitat in the biodiversity study area.
Native Guava (*Rhodomyrtus psidioides*)	CE	CE	Occurs from Broken Bay, approximately 90 km north of Sydney, NSW, to Maryborough in QLD. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW. Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. This species is characterised being extremely susceptible to	(PMST)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			infection by Myrtle Rust. Myrtle Rust affects all plant parts.		
Magenta Lilly Pilly (*Syzygium paniculatum*)	V	V	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	(PMST) / 124 (BioNet)	None. No suitable habitat in the biodiversity study area.
Tetratheca glandulosa	V	-	Endemic to NSW, with around about 150 populations from Yengo National Park to Lane Cove National Park. Associates in areas with shale cappings over sandstone. Occurs in heath, scrublands to woodlands and open forest. Common woodland tree species include: *Corymbia gummifera*, *C. eximia*, *Eucalyptus haemastoma*, *E. punctata*, *E. racemosa*, and/or *E. sparsifolia*, with an understorey dominated by species from the families *Proteaceae*, *Fabaceae*, and *Ericaceae*.	78 (BioNet)	None. No suitable habitat in the biodiversity study area.
Austral Toadflax (*Thesium australe*)	V	V	Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in TAS and QLD and in eastern Asia. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (*Themeda australis*).	(PMST)	None. No suitable habitat in the biodiversity study area.
Invertebrates					
Cauliflower Soft Coral (*Dendronephthya australis*)	E*	E	Cauliflower Soft Coral is a temperate soft coral species endemic to eastern Australia. The only estuaries where Cauliflower Soft Coral is known to	(PMST/DPI)	Low. Populations recorded within Sydney Harbour, records

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			grow in abundance are Port Stephens and the Brisbane Water area of Hawksbury River, NSW. They have been found sporadically in other locations in NSW waters including, Sydney Harbour, Terrigal, Botany Bay and Jervis Bay. The species is predominantly found in estuarine environments in NSW at depths of 1 – 15 m, however, it occasionally occurs offshore down to depths of 30 m. It is generally found in areas of sandy seabed where there is high current flow.		within Cabbage Tree Bay (ALA) about 1.3 kilometres east. No sightings recorded during the field survey.
Maroubra Woodland Snail (*Meridolum maryae*)	E	-	The Maroubra Woodland Snail is confined to a narrow band of habitat along the coast from the north-eastern corner of the Royal National Park to Palm Beach in Sydney. Records of the species are generally within 1 km of the ocean but occur up to 5 km inland. The species is found in the leaf litter of coastal vegetation communities, most commonly in heathland on foredunes also from areas of podsolised dunes/sand plains that support taller heath communities including Eastern Suburbs Banksia Scrub.	(PMST)	None. No suitable habitat in the biodiversity study area.
Birds					
Regent Honeyeater (*Anthochaera phrygia*)	CE	CE	Temperate woodlands and open forests of the inland slopes of south-east Australia. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature Eucalypts and Sheoaks.	(PMST)	None. No suitable habitat in the biodiversity study area.
Flesh-footed Shearwater (*Ardenna carneipes*)	V	M, Ma	Ranges throughout the Pacific and Indian Oceans, rarely into estuaries. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island (LHI) and New Zealand; the other along the coast of WA. Nest on LHI on sandy soils from Ned's Beach to	(PMST) / 1 (BioNet)	Low. Very unlikely to fly through, or forage in the biodiversity study area given this species rarely occurs in estuaries

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			Clear Place, with smaller colonies below Transit Hill and at Old Settlement Beach. Eggs are laid at the end of a burrow 1-2 metres in length.		
Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)	V	-	Dusky Woodswallows are widespread in eastern, southern and south WA. The species occurs throughout most of NSW, but is sparsely scattered in, or largely absent from, much of the upper western region. Most breeding activity occurs on the western slopes of the Great Dividing Range. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. Primarily eats invertebrates, mainly insects, which are captured whilst hovering or sallying above the canopy or over water. Also frequently hovers, sallies and pounces under the canopy, primarily over leaf litter and dead timber.	2 (BioNet)	None. No suitable habitat in the biodiversity study area.
Australasian Bittern (*Botaurus poiciloptilus*)	E	E	Occurs from south-east QLD to south-east SA, TAS and the south-west of WA. Occurs in terrestrial freshwater wetlands and, rarely, estuarine habitats.	(PMST) / 1 (BioNet)	Low. Preferred habitat not within the biodiversity study area however, it may fly through.
Bush Stone-curlew (*Burhinus grallarius*)	E	-	Occurs in open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Feed on insects and small vertebrates, such as frogs, lizards and snakes. Nest on the ground in a scrape or small bare patch.	13 (BioNet)	None. No suitable habitat in the biodiversity study area.
Sanderling (*Calidris alba*)	V	M, Ma	A regular summer migrant from Siberia and other Arctic breeding grounds to most of the Australian coastline. It is uncommon to locally common, arriving from September and leaving by May	3 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			(some may overwinter in Australia). Sanderlings occur along the NSW coast, with occasional inland sightings. Often found in coastal areas on low beaches of firm sand, near reefs and inlets, along tidal mudflats and bare open coastal lagoons; individuals are rarely recorded in near-coastal wetlands.		however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Red Knot (*Calidris canutus*)	E	CE, M, Ma	Common in all the main suitable habitats around the coast of Australia. Mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs.	(PMST) / 2 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Curlew Sandpiper (*Calidris ferruginea*)	E	CE, M, Ma	The breeding range of the Curlew Sandpiper is mainly restricted to the Arctic of northern Siberia, including Yamal Peninsula east to Kolyuchiskaya Gulf, Chokotka Peninisula, and also New Siberian Island. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms.	(PMST) / 3 (BioNet)	Moderate. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Great Knot (*Calidris tenuirostris*)	CE, M, Ma	V	In NSW, the species has been recorded at scattered sites along the coast down to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby,	(PMST)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			sandy spits and islets and sometimes on exposed reefs or rock platforms. Migrates to Australia from late August to early September, although juveniles may not arrive until October-November.		highly disturbed, widespread and suboptimal.
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	V	E	In summer, occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	(PMST) / 1 (BioNet)	None. No suitable habitat in the biodiversity study area.
South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*)	V	V	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central QLD coast to East Gippsland in VIC, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, SA. Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species), shredding the cones with the massive bill. Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.	(PMST) / 66 (BioNet)	None. No suitable habitat in the biodiversity study area.
Greater Sand Plover (*Charadrius leschenaultia*)		V, M, Ma	The Greater Sand-plover breeds in central Asia from Armenia to Mongolia, moving further south for winter. In Australia the species is commonly recorded in parties of 10-20 on the west coast,	(PMST) / 2 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			with the far northwest being the stronghold of the population. The species is apparently rare on the east coast, usually found singly. In NSW, the species has been recorded between the northern rivers and the Illawarra, with most records coming from the Clarence and Richmond estuaries. Almost entirely restricted to coastal areas in NSW, occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Roosts during high tide on sandy beaches and rocky shores; begin foraging activity on wet ground at low tide, usually away from the edge of the water; individuals may forage and roost with other waders.		however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Lesser Sand Plover (*Charadrius mongolus*)	V	E, M, Ma	The Lesser Sand-plover breeds in central and north eastern Asia, migrating further south for winter. In Australia the species is found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of QLD and northern NSW. Individuals are rarely recorded south of the Shoalhaven estuary, and there are few inland records. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms. Highly gregarious, frequently seen in flocks exceeding 100 individuals; also often seen foraging and roosting with other wader species. Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge.	(PMST) / 1 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Brown Treecreeper (eastern subspecies)	V	-	Endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains	2 (BioNet)	None.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
(*Climacteris picumnus victoriae*)			and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (Eucalyptus camaldulensis) Forest bordering wetlands with an open understorey of Acacias, saltbush, lignum, Cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.		No suitable habitat in the biodiversity study area.
Varied Sittella (*Daphoenositta chrysoptera*)	V	-	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy.	4 (BioNet)	None. No suitable habitat in the biodiversity study area.
Eastern Bristlebird (*Dasyornis brachypterus*)	E	E	The distribution of the Eastern Bristlebird has contracted to three disjunct areas of south-eastern	(PMST)	None.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			Australia. There are three main populations: Northern - southern QLD/northern NSW, Central - Barren Ground Nature Reserve, Budderoo Nature Reserve, Woronora Plateau, Jervis Bay National Park, Booderee National Park and Beecroft Peninsula and Southern - Nadgee Nature Reserve and Croajingalong National Park in the vicinity of the NSW/VIC border. Habitat for central and southern populations is characterised by dense, low vegetation including heath and open woodland with a heathy understorey. In northern NSW the habitat occurs in open forest with dense tussocky grass understorey and sparse mid-storey near rainforest ecotone; all of these vegetation types are fire prone.		No suitable habitat in the biodiversity study area.
Antipodean Albatross (*Diomedea antipodensis*)	V	V, M, Ma	The Antipodean Albatross is endemic to NZ, however forages widely in open water in the south-west Pacific Ocean, Southern Ocean and the Tasman Sea, notably off the coast of NSW. It breeds on the NZ islands of Antipodes Island, Campbell Island, Pitt Island and the Auckland Islands. This subspecies nests in open patchy vegetation, such as among tussock grassland or shrubs on ridges, slopes and plateaus. On Antipodes Island, they nest in relatively uniform densities, but avoid areas of tall vegetation on steep coastal slopes, or amongst the tall ferns on poorly drained parts of the peaks near the island's centre	(PMST)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area.
Gibson's Albatross (*Diomedea antipodensis gibsoni*)	V	V	In Australian territory, Gibson's Albatross has been recorded foraging between Coffs Harbour, NSW, and Wilson's Promontory, VIC. Gibson's Albatrosses are rarely observed in the Pacific Ocean or Indian Ocean. The only Australian record of this species is from a recapture off	(PMST)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			Wollongong, NSW, in September 1997. Gibson's Albatross breeds on Adams Island and Auckland Island, NZ. There are no breeding colonies of Gibson's Albatross in Australian territory. This albatross visits Australian waters while foraging and during the non-breeding season.		
Southern Royal Albatross (*Diomedea epomophora*)	-	E, M, Ma	During the non-breeding season, the Southern Royal Albatross has a wide and possibly circumpolar distribution, ranging north to about 35°S. The Southern Royal Albatross is moderately common throughout the year in offshore waters of southern Australia, mostly off southeastern NSW, VIC and TAS. Off SA, they are mostly seen May to September. It breeds on Campbell, Adams, Enderby and Auckland Islands, south of NZ. nests on flat or gently sloping ground on slopes, ridges, gullies and plateaux of large islands, and on the summits of islets. Depressions, gullies, lee slopes and vegetation provide shelter for its nests, but exposed sites are also needed nearby so that the Southern Royal Albatross can take off and land. Its nests are placed among vegetation that is sparse enough for easy access.	(PMST)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area.
Wandering Albatross (*Diomedea exulans*)	E	E, M, Ma	The Wandering Albatross breeds on Macquarie Island. Macquarie Island lies in the southwest Pacific Ocean, about half-way between NZ and Antarctica. A single breeding pair has also been recorded on Heard Island. The Territory of Heard Island and McDonald Islands are an Australian external territory and volcanic group of barren Antarctic islands, about two-thirds of the way from Madagascar to Antarctica. It feeds in Australian portions of the Southern Ocean. On breeding islands, the Wandering Albatross nests on coastal or inland ridges, slopes, plateaux and plains, often	(PMST) / 2 (BioNet)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			on marshy ground. Nests of the Wandering Albatross are sited on moss terraces, in dense tussocks, and often in loose aggregations on the west (windward) side of islands. It prefers open or patchy vegetation (tussocks, ferns or shrubs), and it requires nesting areas that are near exposed ridges or hillocks so that it can take off.		
Northern Royal Albatross (*Diomedea sanfordi*)	E	E, M, Ma	The Northern Royal Albatross ranges widely over the Southern Ocean, with individuals seen in Australian waters off south-eastern Australia. It breeds on Chatham Island and Taiaroa Head on the South Island of NZ. Its habitat includes subantarctic, subtropical, and occasionally Antarctic waters. The Northern Royal Albatross nests on flat or gently sloping ground, on slopes, ridges, gullies and plateaux of large islands, and on the summits of islets.	(PMST)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area.
Beach Stone-curlew (*Esacus magnirostris*)	CE	Ma	In NSW, the species occurs regularly to about the Manning River, and the small population of north-eastern NSW is at the limit of the normal range of the species in Australia. Found exclusively along the coast, on a wide range of beaches, islands, reefs and in estuaries, and may often be seen at the edges of or near mangroves. They forage in the intertidal zone of beaches and estuaries, on islands, flats, banks and spits of sand, mud, gravel or rock, and among mangroves. Beach Stone-curlews breed above the littoral zone, at the backs of beaches, or on sandbanks and islands, among low vegetation of grass, scattered shrubs or low trees; also among open mangroves.	1 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, it is highly disturbed and suboptimal. Habitat present is widely distributed in the study locality.
Little Penguin in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally	EP	-	Little Penguins are only found in southern Australia and New Zealand. In Australia little penguin colonies are scattered around the coastline from near Perth on the west coast, to	(PMST) / 27 (BioNet)	High. AOBV located about 700 meters south-east of the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline) (*Eudyptula minor*)			Sydney on the east coast, and around TAS. Phillip Island has only one remaining Little Penguin colony, part of which can be seen at the Penguin Parade which offers up-close views of little penguins. On land little penguins live in holes in the ground known as burrows. These burrows provide a place for Little Penguins to rest, nest and moult. Burrows also provide protection from predators and extreme heat. While on land little penguins remain inside their burrows during the day to avoid predators. Little Penguins spend approximately 80% of their lives at sea, returning to land to breed, moult and rest. Researchers use satellite and GPS trackers to record where penguins go at sea. Satellite tracking from Phillip Island Nature Parks shows that Phillip Island's Little Penguins swim an average 15 to 50 km a day. This includes diving up and down as they look for fish. The deepest little penguin dive recorded is 72 m. An average dive in search of fish is between 5 and 20 m.		Multiple records within the AOBV. Some individuals may venture into the study area to forage, but may be deterred by dogs and vessel traffic. Previous nesting habitat present within the sandstone escarpment at Federation Point no longer used. Breeding season May to February.
Red Goshawk (*Erythrotriorchis radiatus*)	CE	V	This unique Australian endemic raptor is distributed sparsely through northern and eastern Australia, from the western Kimberley Division of northern WA to north-eastern QLD and south to far north-eastern NSW, and with scattered records in central Australia. The species is very rare in NSW, extending south to about 30°S, with most records north of this, in the Clarence River Catchment, and a few around the lower Richmond and Tweed Rivers. Formerly, it was at least occasionally reported as far south as Port Stephens. Red Goshawks inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of	(PMST)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.		
Grey Falcon (*Falco hypoleucos*)	E	-	Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	(PMST)	None. No suitable habitat in the biodiversity study area.
White-bellied Storm-petrel (*Fregetta grallaria grallaria*)	V	V, Ma	A wide oceanic distribution in the south Pacific and Atlantic Oceans, ranging into tropical waters from various breeding grounds. The White-bellied Storm-Petrel (Tasman Sea) breeds on small offshore islets and rocks in the Lord Howe Island group, including Roach Island and Balls Pyramid. It nests in crevices between large volcanic rocks, and in burrows excavated in banks. Breeding colonies are often situated along dykes. In the non-breeding season, it reaches and forages over near-shore waters along the continental shelf of mainland Australia.	(PMST)	Low. Very unlikely to fly through, or forage in the biodiversity study area given this species rarely occurs in estuaries.
Little Lorikeet (*Glossopsitta pusilla*)	V	-	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in apples (*Angophora* spp.), paperbarks (*Melaleuca* spp.) and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Isolated flowering trees in open country (e.g. paddocks, roadside remnants) and urban trees also help sustain viable populations of the species.	33 (BioNet)	Low. Minimal potential habitat for foraging present in the biodiversity study area albeit highly disturbed and widely available.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
Painted Honeyeater (*Grantiella picta*)	V	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, VIC and southern QLD. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema.	(PMST)	None. No suitable remnant vegetation habitat in the biodiversity study area.
Sooty Oystercatcher (*Haematopus fuliginosus*)	V	-	Sooty Oystercatchers are found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels.	25 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Pied Oystercatcher (*Haematopus longirostris*)	E	-	The species is distributed around the entire Australian coastline, although it is most common in coastal TAS and parts of VIC, such as Corner Inlet. In NSW the species is thinly scattered along the entire coast, with fewer than 200 breeding pairs estimated to occur in the State. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. The chisel-like bill is used to pry open or break into shells of oysters and other shellfish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas. Nests are shallow scrapes in	8 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			sand above the high tide mark, often amongst seaweed, shells and small stones.		
White-bellied Sea-Eagle (*Haliaeetus leucogaster*)	V	Ma	Distributed along the coastline (including offshore islands) of mainland Australia and TAS. Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, and the sea).	(PMST) / 86 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Little Eagle (*Hieraaetus morphnoides*)	V	-	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. Occupies open Eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used.	4 (BioNet)	None. No suitable habitat in the biodiversity study area.
White-throated Needletail (*Hirundapus caudacutus*)	-	V, M, Ma	Widespread in eastern and south-eastern Australia. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. They also commonly occur over heathland but less often over treeless areas, such as grassland or swamps.	(PMST) / 22 (BioNet)	Low. May fly through the biodiversity study area however, this habitat is widely distributed and suboptimal.
Black Bittern (*Ixobrychus flavicollis*)	V	-	The Black Bittern is found along the coastal plains within NSW, although individuals have rarely being recorded south of Sydney or inland. It inhabits terrestrial and estuarine wetlands such as flooded grasslands, forests, woodlands, rainforests and mangroves with permanent water and dense waterside vegetation. The Black Bittern typically roosts on the ground or in trees during the day and forages at night on frogs, reptiles, fish and invertebrates. The breeding season extends	21 (BioNet)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			from December to March. Nests are constructed of reeds and sticks in branches overhanging the water.		
Swift Parrot (*Lathamus discolor*)	E	CE, Ma	On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Red Ironbark (*E. sideroxylon*), and White Box (*E. albens*).	(PMST) / 19 (BioNet)	None. No suitable habitat in the biodiversity study area.
Nunivak Bar-tailed Godwit (*Limosa lapponica baueri*)	-	V	The Nunivak bar-tailed godwit is a migratory wader which undertakes the largest non-stop flight of any bird. The trans-Pacific route from its breeding grounds in the Arctic to its non-breeding grounds in the southern hemisphere covers over 11,000 km. It is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Less frequently it occurs in salt lakes and brackish wetlands, sandy ocean beaches and rock platforms.	(PMST)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Black-tailed Godwit (*Limosa limosa*)	V	M, Ma	A migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently found at Kooragang Island (Hunter River estuary). Occurs in sheltered bays, estuaries and lagoons with large intertidal mudflats and sand flats. Also found at inland mudflats, swamps.	(PMST)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Square-tailed Kite (*Lophoictinia isura*)	V	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW	7 (BioNet)	None.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			it is often associated with ridge and gully forests dominated by *Eucalyptus longifolia*, *Corymbia maculata*, *E. elata*, or *E. smithii*. Individuals appear to occupy large hunting ranges of more than 100 km^2. They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.		No suitable habitat in the biodiversity study area.
Southern Giant Petrel (*Macronectes giganteus*)	E	E, M, Ma	The Southern Giant Petrel has a circumpolar pelagic range from Antarctica to approximately 20° S and is a common visitor off the coast of NSW. Over summer, the species nests in small colonies amongst open vegetation on Antarctic and subantarctic islands, including Macquarie and Heard Islands and in Australian Antarctic territory.	(PMST)	Low. Very unlikely to fly through, or forage in the biodiversity study area given this species rarely occurs in estuaries.
Northern Giant Petrel (*Macronectes halli*)	V	V, M, Ma	The Northern Giant-Petrel has a circumpolar pelagic distribution, usually between 40-64ºS in open oceans. Their range extends into subtropical waters (to 28ºS) in winter and early spring, and they are a common visitor in NSW waters, predominantly along the south-east coast during winter and autumn. Breeding in Australian territory is limited to Macquarie Island and occurs during spring and summer. Adults usually remain near the breeding colonies throughout the year (though some do travel widely) while immature birds make long and poorly known circumpolar and trans-oceanic movements. Hence most birds recorded in NSW coastal waters are immature birds. Northern Giant-Petrels seldom breed in colonies but rather as dispersed pairs, often amidst tussocks in dense vegetation and areas of broken terrain.	(PMST)	Low. Very unlikely to fly through, or forage in the biodiversity study area given this species rarely occurs in estuaries.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
Turquoise Parrot (*Neophema pulchella*)	V	-	Range extends from southern QLD through to northern VIC, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	1 (BioNet)	None. No suitable habitat in the biodiversity study area.
Barking Owl (*Ninox connivens*)	V	-	Found throughout continental Australia except for the central arid regions. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas.	7 (BioNet)	None. No suitable habitat in the biodiversity study area.
Powerful Owl (*Ninox strenua*)	V	-	In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains suggesting occupancy prior to land clearing. Now at low densities throughout most of its eastern range, rare along the Murray River and former inland populations may never recover. The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine (*Syncarpia glomulifera*), Black Sheoak (*Allocasuarina littoralis*), Blackwood (*Acacia melanoxylon*), Rough-barked Apple (*Angophora floribunda*), Cherry Ballart (*Exocarpus cupressiformis*) and a number of Eucalypt species.	1279 (BioNet)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
Eastern Curlew (*Numenius madagascariensis*)	-	CE, M, Ma	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including TAS. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass.	(PMST) / 4 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Sooty Tern (*Onychoprion fuscata*)	V	Ma	The Sooty Tern is found over tropical and sub-tropical seas and on associated islands and cays around Northern Australia. In NSW only known to breed at Lord Howe Island. Occasionally seen along coastal NSW, especially after cyclones. Large flocks can be seen soaring, skimming and dipping but seldom plunging in off shore waters. Breeds in large colonies in sand or coral scrapes on offshore islands and cays including Lord Howe and Norfolk Islands.	1 (BioNet)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.
Fairy Prion (southern) (*Pachyptila turtur subantarctica*)	-	V	The southern subspecies (subantarctica) of the Fairy Prion was first recorded on Macquarie Island in 1956, with breeding confirmed in 1978. Breeding has also been recorded on two offshore rock stacks at Macquarie Island, one near Langdon Point, the other near Davis Point. A second sub-population was found on Bishop and Clerk Islands in 1993. The species as a whole has been recorded breeding on subantarctic and cool temperate islands. The southern subspecies of the Fairy Prion is a marine bird, found mostly in temperate and subantarctic seas. The species' oceanic distribution is poorly known. The Fairy Prion sometimes forages over continental shelves and the continental slope, but it can come close	(PMST)	Low. Has potential to fly through the study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			inshore in rough weather. It may also feed in deep coastal waters. Off Wollongong, NSW, 79% of Fairy Prions were seen in waters over the continental slope while 21% were counted over neritic water (water more than 200 m deep). Data from the south-eastern Australian Seabird Atlas confirm this pattern, with 83% (of 24 505 individuals) seen over the continental slope, 9% over continental shelf and only 8% over open ocean. The southern Fairy Prion is found flying over the ocean where sea surface temperatures are 8.6° to 20.2 °C.		
Eastern Osprey (*Pandion cristatus*)	V	M, Ma	Total range of this species is from Esperance in WA to NSW and into VIC and TAS. In some states (VIC and TAS and southern NSW) the species is a rare vagrant. The only single historical breeding record in NSW is from the St. Georges Basin. Occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. Mostly found in coastal areas but occasionally travel inland along major rivers.	30 (BioNet)	Low. May fly through and forage in biodiversity study area however, the habitat is widely distributed and suboptimal.
Scarlet Robin (*Petroica boodang*)	V	-	The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and re-growth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps.	1 (BioNet)	None. No suitable habitat in the biodiversity study area.
Sooty Albatross (*Phoebetria fusca*)	V	M, Ma	The Sooty Albatross has sometimes been observed foraging in inshore waters in southern Australia. The Sooty Albatross is a rare, but probably regular migrant to Australia, mostly in the autumn-winter months, occurring north to south-east QLD, NSW, VIC, TAS and SA. The Sooty Albatross breeds on islands in the southern Indian	(PMST)	Low. Very unlikely to fly through, or forage in the biodiversity study area given this species rarely occurs in estuaries.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			and Atlantic Oceans, and forages south of 30° S, between southern NSW and Argentina.		
Gould's Petrel (*Pterodroma leucoptera leucoptera*)	V	E	Breeds on both Cabbage Tree Island, 1.4 km offshore from Port Stephens and on nearby Boondelbah island. The range and feeding areas of non-breeding petrels are unknown. The first arrival of Gould's petrel on cabbage tree Island occurs from mid to late September. Principal nesting habitat is located within two gullies which are characterised by steeply, sloping rock scree with a canopy of Cabbage Tree Palms. They nest predominantly in natural rock crevices among the rock scree and also in hollow fallen palm trunks, under mats of fallen palm fronds and in cavities among the buttresses of fig trees.	(PMST)	Low. Very unlikely to fly through, or forage in the biodiversity study area given this species rarely occurs in estuaries.
Kermadec Petrel (western) (*Pterodroma neglecta neglecta*)	V	V	Ranges over subtropical and tropical waters of the South Pacific. Balls Pyramid (near Lord Howe Island) and Phillip Island (near Norfolk Island) are the only known breeding sites in Australian waters. Breeds on islands across the South Pacific. In Australia it breeds on Ball's Pyramid and Phillip Island (near Norfolk Island). Nests in a crevice amongst rocks.	(PMST)	Low. Very unlikely to fly through, or forage in the biodiversity study area given this species rarely occurs in estuaries.
Rose-crowned Fruit-Dove (*Ptilinopus regina*)	V	-	Coast and ranges of eastern NSW and QLD, from Newcastle to Cape York. Vagrants are occasionally found further south to VIC. Rose-crowned Fruit-doves occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.	2 (BioNet)	None. No suitable habitat in the biodiversity study area.
Superb Fruit-Dove (*Ptilinopus superbus*)	V	Ma	The Superb Fruit-dove occurs principally from north-eastern in QLD to north-eastern NSW. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and	4 (BioNet)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.		
Pilotbird (*Pycnoptilus floccosus*)	-	V	The Pilotbird is found from the Wollemi National Park and Blue Mountains National Park in NSW through to the Dandenong Ranges, near Melbourne in VIC. Its natural habitat is temperate wet sclerophyll forests and occasionally temperate rainforest, where there is dense undergrowth with abundant debris.	(PMST)	None. No suitable habitat in the biodiversity study area.
Australian Painted Snipe (*Rostratula australis*)	E	E, Ma	Most records are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in WA. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	(PMST)	None. No suitable habitat in the biodiversity study area.
Little Tern (*Sternula albifrons*)	E	M, Ma	Migrates from eastern Asia, this species is found along the north, east and south-east Australian coasts. In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to VIC. It breeds in spring and summer along the entire coast from TAS to northern QLD. This species is almost exclusively coastal, preferring sheltered environments.	(PMST) / 5 BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Australian Fairy Tern (*Sternula nereis nereis*)	-	V	Within Australia, the Fairy Tern occurs along the coasts of VIC, TAS, SA and WA; occurring as far north as the Dampier Archipelago near Karratha. The subspecies has been known from NSW (NSW) in the past, but it is unknown if it persists there. The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above	(PMST)	Low. Some potential foraging and roosting habitat present in the biodiversity study area however, it is highly disturbed and unlikely to be used by the species.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			the high tide line and below vegetation. The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline. The bird roosts on beaches at night. Predates small bait-sized fish via shallow dives in shallow water.		
Buller's Albatross (*Thalassarche bulleri*)	-	V, M, Ma	Buller's Albatross breed in NZ (Snares, Solander and Chatham Islands), but are regular visitors to Australian waters. They are frequently seen off the coast from Coffs Harbour, south to TAS and west to Eyre Peninsula. In Australia, Buller's Albatross are seen over inshore, offshore and pelagic waters. They appear to congregate over currents where water temperature exceeds 16 °C.	(PMST) / 1 (BioNet)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area.
Northern Buller's Albatross (*Thalassarche bulleri platei*)	-	V, M, Ma	The Pacific Albatross is a non-breeding visitor to Australian waters. Foraging birds are mostly limited to the Pacific Ocean and the Tasman Sea, although birds do reach the east coast of the Australian mainland. Occurrence within the Australian Fishing Zone is likely, however, the threat from longline injury is considered low. The Pacific Albatross is a marine, pelagic species. It occurs in subtropical and subantarctic waters of the South Pacific Ocean. Habitat preferences are poorly known. In NZ, the species has been observed in association with fishing boats close inshore and over waters of 180–360 m depth although it is not so strongly associated with fishing grounds as are other albatrosses.	(PMST)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area.
Indian Yellow-nosed Albatross (*Thalassarche carteri*)	-	V, M, Ma	The Indian Yellow-nosed Albatross forages mostly in the southern Indian Ocean where it is particularly abundant off WA. In the Australasian region, the species occupies inshore and offshore	(PMST)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			waters, particularly where there are calm seas and light winds.		through the biodiversity study area.
Shy Albatross (*Thalassarche cauta*)	V	E, M, Ma	This species is circumpolar in distribution, occurring widely in the southern oceans. Islands off Australia and NZ provide breeding habitat. In Australian waters, the Shy Albatross occurs along the east coast from Stradbroke Island in QLD along the entire south coast of the continent to Carnarvon in WA. Although uncommon north of Sydney, the species is commonly recorded off southeast NSW, particularly between July and November, and has been recorded in Ben Boyd National Park. This pelagic or ocean-going species inhabits subantarctic and subtropical marine waters, spending the majority of its time at sea. Occasionally the species occurs in continental shelf waters, in bays and harbours. Known breeding locations include Albatross Island off TAS, Auckland Island, Bounty Island and The Snares, off NZ, where nesting colonies of 6-500 nests occur and may contain other species such as the Australian Gannet. Located on sheltered sides of islands, on cliffs and ledges, in crevices and slopes, nests are used annually and consist of a mound of mud, bones, plant matter and rocks.	(PMST) / 5 (BioNet)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area.
Chatham Albatross (*Thalassarche eremita*)	-	E, M, Ma	Breeding for the Chatham Albatross is restricted to Pyramid Rock, Chatham Islands, off the coast of NZ. The principal foraging range for this species is in coastal waters off eastern and southern NZ, and TAS.	(PMST)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area.
Campbell Albatross (*Thalassarche impavida*)	-	E, M, Ma	The Campbell Albatross is a non-breeding visitor to Australian waters. Non-breeding birds are most commonly seen foraging over the oceanic	(PMST)	None. Generally associated with pelagic waters, unlikely to

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			continental slopes off TAS, VIC and NSW. They breed only on sub-Antarctic Campbell Island (New Zealand), south of New Zealand. After breeding, birds move north and may enter Australia's temperate shelf waters.		fly close to the coast or through the biodiversity study area.
Black-browed Albatross (*Thalassarche melanophris*)	V	V, M, Ma	The Black-browed Albatross has a circumpolar range over the southern oceans, and are seen off the southern Australian coast mainly during winter. This species migrates to waters off the continental shelf from approximately May to November and is regularly recorded off the NSW coast during this period. The species has also been recorded in Botany Bay National Park Inhabits antarctic, subantarctic, subtropical marine and coastal waters over upwellings and boundaries of currents. Can tolerate water temperatures between 0 ºC and 24 ºC. Spends most of its time at sea, breeding on small isolated islands.	(PMST) / 13 (BioNet)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area.
Salvin's Albatross (*Thalassarche salvini*)	-	V, M, Ma	Salvin's Albatross breeds on Bounty, Snares and Chatham Islands, south of NZ, as well as on Crozet Island in the Indian Ocean. The species forages over most of the southern Pacific Ocean, where it is particularly common in the Humboldt Current, off South America. There are small numbers in the Indian Ocean and sometimes in the South Atlantic Ocean. During the non-breeding season, the species occurs over continental shelves around continents.	(PMST)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area..
White-capped Albatross (*Thalassarche steadi*)	-	V, M, Ma	Breeding colonies occur on islands south of NZ. The White-capped Albatross is a marine species and occurs in subantarctic and subtropical waters. The White-capped Albatross is probably common off the coast of south-east Australia throughout the year.	(PMST)	None. Generally associated with pelagic waters, unlikely to fly close to the coast or through the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
Eastern Hooded Plover (*Thinornis cucullatus cucullatus*)	CE	V, Ma	The Eastern Hooded Dotterel is endemic to southern Australia and is nowadays found mainly along the coast from south of Jervis Bay, NSW, south through VIC and TAS to the western side of the Eyre Peninsula (SA). In south-eastern Australia Eastern Hooded Dotterel prefer sandy ocean beaches, especially those that are broad and flat, with a wide wave-wash zone for feeding, much beachcast seaweed, and backed by sparsely vegetated sand-dunes for shelter and nesting. Occasionally Eastern Hooded Dotterel are found on tidal bays and estuaries, rock platforms and rocky or sand-covered reefs near sandy beaches, and small beaches in lines of cliffs. They regularly use near-coastal saline and freshwater lakes and lagoons, often with saltmarsh.	1 (BioNet)	Moderate. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Masked Owl (*Tyto novaehollandiae*)	V	-	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Dry Eucalypt forests and woodland, typically prefers open forest with low shrub density. Requires old trees for roosting and nesting.	2 (BioNet)	None. No suitable habitat in the biodiversity study area.
Sooty Owl (*Tyto tenebricosa*)	V	-	Occupies the easternmost one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands. Territories are occupied permanently. Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist Eucalypt forests.	4 (BioNet)	None. No suitable habitat in the biodiversity study area.
Fish and Syngnathids					
Black Rockcod (*Epinephelus daemelii*)	E*	V	In Australia, the distribution of black cod ranges from southern QLD through NSW to northern VIC. However, records from QLD and VIC are rare,	(PMST) / (DPI)	High. Suitable habitat present (ie medium-high relief rocky

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			and the NSW coastline forms the species' main range, both in Australia and internationally. Adults are usually found in saves, gutters and beneath bommies on rocky reefs from nearshore areas to at least 50 metres depth. Small juveniles are often recorded in coastal rock pools while larger juveniles are found around rocky shores in estuaries. The use of estuaries may be an important part of the ecology of juvenile black cod in NSW waters. The black cod is territorial and often have a high site fidelity. Endemic temperate Australian species found only between Forster and Wollongong, NSW. White's seahorse inhabits shallow inshore areas in estuaries, harbours and bays, where it lives on rocky reefs, sponges, seagrass beds, and under piers and jetties to 25 m.		reef) and known populations in the wider harbour. Several ALA records, one about 100 metres east of the biodiversity study area and several at Cabbage Tree Bay Aquatic Reserve.
White's Seahorse (*Hippocampus whitei*)	E*, P*	E, Ma	Endemic temperate Australian species found only between Forster and Wollongong, NSW. White's Seahorse inhabits shallow inshore areas in estuaries, harbours and bays, where it lives on rocky reefs, sponges, seagrass beds, and under piers and jetties to 25 m.	(PMST) / (DPI)	High. Sedentary populations known in the harbour in similar habitats (ie subtidal artificial). Multiple records on ALA and recorded by Seadragon Pty Ltd.
Macquarie Perch (*Macquaria australasica*)	E	E	The Murray-Darling form of the Macquarie Perch is still known to exist in waterways of VIC, NSW and the ACT. The eastern form is confined to the Hawkesbury-Nepean and Shoalhaven river systems including a number of Sydney's water supply reservoirs. The Macquarie Perch is a riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover. As well as aquatic vegetation, additional cover may	(PMST) / (DPI)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			comprise of large boulders, debris and overhanging banks.		
Australian Grayling (*Prototroctes maraena*)	E	V	The Australian Grayling occurs in rivers and streams on the eastern and southern flanks of the Great Dividing Range but is diadromous. During the freshwater phase of the life cycle, this species inhabits lower altitude reaches of both large rivers and smaller streams spawning in the tidal freshwater reaches of rivers, presumably among a gravel streambed. Very little is known of the Australian grayling's specific habitat requirements during the estuarine or marine phase of the life cycle.	(PMST) / (DPI)	Low. May occur in the biodiversity study area during the marine phase of life-cycle albeit at the end of its range, no records in the study locality and habitat is widespread.
Mammals					
New Zealand Fur Seal (*Arctocephalus forsteri*)	V	Ma	Occurs in Australia and New Zealand. Reports of non-breeding animals along southern NSW coast particularly on Montague Island, but also at other isolated locations to north of Sydney. Prefers rocky parts of islands with jumbled terrain and boulders.	(PMST) / 1 (BioNet)	Moderate. May swim through and forage in the biodiversity study area or may rest on the rocky intertidal foreshore, albeit boat traffic renders the biodiversity study area suboptimal. Historically recorded in North Harbour (ALA).
Australian Fur Seal (*Arctocephalus pusillus*)	V	Ma	Reported to breed at Seal Rocks, near Port Stephens and Montague Island in southern NSW. Haul outs are observed at isolated places along the NSW coast. Prefers rocky parts of islands with flat, open terrain. They occupy flatter areas than do New Zealand fur-seals where they occur together. The Australian fur-seal prefers to utilise oceanic waters of the continental shelf for foraging and generally does not dive deeper than 150 m.	(PMST) / 4 (BioNet)	Moderate. May swim through and forage in the biodiversity study area or may rest on the rocky intertidal foreshore, albeit boat traffic renders the biodiversity study area suboptimal. Historically recorded in North Harbour (ALA).

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
Sei Whale (*Balaenoptera borealis*)	-	V, M	Sei Whales have been infrequently recorded in Australian waters. The similarity in appearance of sei whales and Bryde's whales (*Balaenoptera edeni*) has resulted in confusion about distributional limits and frequency of occurrence, particularly in warmer waters (>20 °C) where Bryde's whales are more common. Sei whales were thought to be the most common whales reported by whalers off Albany, WA while hunting sperm whales (Physeter macrocephalus), however, these may have been misidentified Bryde's whales. There are several reports of presumed sei whale sightings by fishermen around the shelf edge (50 km offshore) off the coast of NSW. The Australian Antarctic waters are important feeding grounds for sei whales, as are temperate, cool waters. Sightings of sei whales feeding in the Bonney Upwelling area indicate that this area is potentially also an important feeding ground. Breeding occurs in tropical and subtropical waters.	(PMST)	Low. Usually associated with open water. Very unlikely to swim through the biodiversity study area boat traffic and shallow water depth renders the biodiversity study area suboptimal.
Blue Whale (*Balaenoptera musculus*)	E	E, M	Oceanic within Southern Hemisphere between 20° to 70° S including NSW waters. However, much of the Australian continental shelf and coastal waters have no particular significance to the whales and are only used for migration and opportunistic feeding. The only known areas of significance to the Blue Whale are feeding areas around the southern continental shelf, notably Perth Canyon, in WA and the Bonney Upwelling and adjacent upwelling areas of SA and VIC. Preferring open seas rather than coastal waters. While breeding areas have not yet been identified, it is likely that they occur in tropical areas of high localised biological production, as, unlike the	(PMST)	Low. Usually associated with open water. Very unlikely to swim through the biodiversity study area boat traffic and shallow water depth renders the biodiversity study area suboptimal.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			humpback whale (Megaptera novaeangliae) and southern right whale (*Eubalaena australis*), the blue whale has a thin blubber layer, which implies that they cannot fast during the winter season. This is supported by the occurrence of the blue whale in tropical upwelling areas in the eastern tropical Pacific Ocean, such as the Costa Rica Dome and the waters west of the Galapagos Islands. Wintering areas, where some blue whale sightings have been reported, include the Indonesian archipelago and the waters adjacent to the Solomon Islands and other island groups of the south-west Pacific. Satellite tagging has confirmed that the pygmy blue whale feeds off the Perth Canyon and head north in March/April to potential breeding grounds in Indonesian waters by June.		
Fin Whale (*Balaenoptera physalus*)	-	V, M	Fin whales are widely distributed in both hemispheres between latitudes 20–75° S. This species is common in temperate waters, the Arctic Ocean and Southern Ocean. In the Southern Ocean/Subantarctic this species is often found in areas of complex and steep bathymetry, such as deep ravines, where fish and other prey are known to concentrate. Fin whales have been observed during aerial surveys in SA waters between November and May. The Australian Antarctic waters are important feeding grounds for fin whales. Sightings of fin whales feeding in the Bonney Upwelling area indicate that this area is also a potentially important feeding ground. There are no known mating or calving areas in Australian waters.	(PMST)	Low. Usually associated with open water. Very unlikely to swim through the biodiversity study area boat traffic and shallow water depth renders the biodiversity study area suboptimal.
Eastern Pygmy-possum (*Cercartetus nanus*)	V	-	Found in a broad range of habitats from rainforest through to wet and dry sclerophyll forest and	505 (BioNet)	None.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			woodland to heath, but in most areas woodlands and heath appear to be preferred.		No suitable habitat in the biodiversity study area.
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V	Forages over a broad range of open forest and woodland habitats, this species is a cave roosting bat which favours sandstone escarpment habitats for roosting, in the form of shallow overhangs, crevices and caves.	(PMST) / 337 (BioNet)	Low. May fly through the biodiversity study area, however specific habitat is not present.
Spot-tailed Quoll (southeastern mainland population) (*Dasyurus maculatus*)	V	V	Wet and dry sclerophyll forests and rainforests, and adjacent open agricultural areas. Generally associated with large expansive areas of habitat to sustain territory size. Requires hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites.	(PMST) / 6 (BioNet)	None. No suitable habitat in the biodiversity study area.
Dugong (*Dugong dugon*)	E	M, Ma	Major concentrations of dugongs along the QLD coast occur in wide, shallow, protected bays and mangrove channels, and in the inside edge of large inshore islands. These areas coincide with significant seagrass beds. They also use deep-water habitats. Large numbers have been sighted in water more than 10 metres deep in several areas including the Torres Strait, the northern Great Barrier Reef region, and Hervey Bay in southeast QLD. A large proportion of the world's dugong population is found in northern Australian waters from Moreton Bay in the east to Shark Bay in the west. Dugongs are also occasionally reported much further south in NSW.	(PMST)	Low. Some potential foraging habitat present in the study area however, is highly disturbed and not considered in core range.
Southern Right Whale (*Eubalaena australis*)	E	E, M	This species occurs in temperate and subpolar waters of the Southern Hemisphere, with a circumpolar distribution between about 20° S and 55° S with some records further south to 63° S. The southern right whale migrates between summer feeding grounds in Antarctica and winter breeding grounds around the coasts of southern	(PMST) / 2 (BioNet)	Low. Usually associated with open water. Very unlikely to swim through the biodiversity study area boat traffic and shallow water depth renders the

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			Australia, NZ, South Africa and South America. This species feed in the open oceans in summer and move inshore in winter for calving and mating with calving females usually remaining very close to the coast. The southern right whale is not believed to feed in Australian waters at all. The southern right whale is constrained in their ability to colonise unused areas of potentially suitable habitat due to a high degree of site fidelity (individuals returning to the same breeding site each year).		biodiversity study area suboptimal.
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	V	-	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings.	1 (BioNet)	Moderate. Potential foraging and suboptimal roosting habitat in the biodiversity study area.
Southern Brown Bandicoot (eastern) (*Isoodon obesulus obesulus*)	E	E	This species prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	(PMST) / 5 (BioNet)	None. No suitable habitat in the biodiversity study area.
Humpback Whale (*Megaptera novaeangliae*)	V	V, M	Occurs in oceanic and coastal waters worldwide. The population of Australia's east coast migrates from summer, cold-water feeding grounds in Subantarctic waters to warm-water winter breeding grounds in the central Great Barrier Reef. They are regularly observed in NSW waters in June and July, on the northward migration and October and November, on the southward migration. As with the WA population, the eastern Australian population also tend to migrate further offshore during their northward migration. Three major aggregation areas have been previously identified for the eastern Australian population in QLD around the southern end of the Great Barrier Reef, Hervey Bay and in the Gold Coast region.	(PMST)	Low. Usually associated with open water. Very unlikely to swim through the biodiversity study area boat traffic and shallow water depth renders the biodiversity study area suboptimal.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			The southern end of the Great Barrier Reef is a suspected calving area. The breeding area for the eastern population of the humpback whale is presumed to be off the coast between central and northern QLD. Some feeding has been observed in Australia's coastal waters but this is thought to primarily be opportunistic and forms only a small portion of their nutritional requirements. Feeding has been observed close to shore off Eden, NSW, from late September until late November. Feeding behaviour has also been reported off Fraser Island, QLD. Feeding may also occur in northern waters of the Great Barrier Reef, as well as VIC, as sightings of humpback whales have been reported in these areas in summer months.		
Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)	V	-	Found along the east coast from south QLD to southern NSW. Occurs in dry sclerophyll forest, woodland swamp forests and mangrove forests east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in manmade structures. Usually solitary but have been recorded to roost communally.	19 (BioNet)	Moderate. Potential foraging and suboptimal roosting habitat in the biodiversity study area.
Southern Myotis (*Myotis macropus*)	V	-	Generally, roost in groups close to water in caves, mine shafts, hollow-bearing trees, and storm water channels, buildings, under bridges and in dense foliage. Forages over streams and pools catching insects and small fish.	107 (BioNet)	Moderate. Potential foraging and suboptimal roosting habitat in the biodiversity study area.
Parma Wallaby (*Notamacropus parma*)	V	-	Once occurred from north-eastern NSW to the Bega area in the southeast. Their range is now confined to the coast and ranges of central and northern NSW from the Gosford district to the QLD border. Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest. Typically feed at	(PMST)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			night on grasses and herbs in more open eucalypt forest and the edges of nearby grassy areas.		
Greater Glider (southern and central) (*Petauroides volans*)	-	E	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north QLD through to central VIC (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. An isolated inland subpopulation occurs in the Gregory Range west of Townsville, and another in the Einasleigh Uplands.	(PMST)	None. No suitable habitat in the biodiversity study area.
Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*)		V	As in NSW, most of the QLD distribution is coastal, extending southward along the eastern seaboard from north of Mackay and continuing through the NSW-Qld border. However, isolated subpopulations are found inland in the Blackdown and Canarvon Ranges of central QLD. The yellow-bellied glider (south-eastern) occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests.	(PMST)	None. No suitable habitat in the biodiversity study area.
Brush-tailed Rock-wallaby (*Petrogale penicillate*)	E	V	Range extends from south-east QLD to the Grampians in western VIC, roughly following the line of the Great Dividing Range. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	(PMST)	None. No suitable habitat in the biodiversity study area.
Long-nosed Bandicoot (North Head population) (*Perameles nasuta*)	EP	-	Restricted to North Head in the Manly Local Government Area. Essentially a solitary animal that occupies a variety of habitats on North Head. Forages mainly at or after dusk, digging for invertebrates, fungi and tubers. The conical holes it leaves in the soil are often seen at the interface of naturally vegetated and areas of open grass	4851 (BioNet)	Low. Population restricted to remnant vegetation at North Head, which is around 1 kilometre east of the biodiversity study area. Individuals may venture into

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			around the Quarantine Station, former Defence Lands and Saint Patrick's Estate. Shelters during the day in a well-concealed nest based on a shallow hole lined with leaves and grass, sometimes under debris, sometimes hidden with soil and with the entrance closed for greater concealment.		the biodiversity study area due to lack of resources, predation risk and disturbance.
Koala (combined populations of QLD, NSW and the ACT) (*Phascolarctos cinereus*)	V	E	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 Eucalypt species and 30 non-Eucalypt species, but in any one area will select preferred browse species.	(PMST) / 4 (BioNet)	None. No suitable habitat in the biodiversity study area.
New Holland Mouse (*Pseudomys novaehollandiae*)	-	V	Distribution is fragmented across all eastern states of Australia, where it inhabits open heath lands, open woodlands with heath understorey and vegetated sand dunes.	(PMST) / 2 (BioNet)	None. No suitable habitat in the biodiversity study area.
Grey-headed Flying-fox (*Pteropus poliocephalus*)	V	V	Generally found within 200 km of the eastern coast of Australia, from Rockhampton in QLD to Adelaide in SA. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young.	(PMST) / 819 (BioNet)	High. Feed trees present in the biodiversity study area, known camp about 2 kilometres north-west. Foraging likely.
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	V	-	Wide-ranging species found across northern and eastern Australia. Roosts singly or in groups of up	8 (BioNet)	Moderate. Potential foraging and suboptimal roosting habitat

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows.		in the biodiversity study area.
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	V	-	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	6 (BioNet)	Moderate. Potential foraging and suboptimal roosting habitat in the biodiversity study area.
Eastern Cave Bat (*Vespadelus troughtoni*)	V	-	Found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals.	1 (BioNet)	Moderate. Potential foraging and suboptimal roosting habitat in the biodiversity study area.
Reptiles					
Loggerhead Turtle (*Caretta caretta*)	E	E, M, Ma	The Loggerhead Turtle has a worldwide distribution in coastal tropical and subtropical waters. In Australia, Loggerheads occur in coral reefs, bays and estuaries in tropical and warm temperate waters off the coast of QLD, NT, WA and NSW.	(PMST) / 6 (BioNet)	Low. May swim through and forage in the biodiversity study area albeit not considered core range.
Green Turtle (*Chelonia mydas*)	V	V, M, Ma	Green Turtles occur in seaweed-rich coral reefs and coastal seagrass pastures in tropical and subtropical areas of Australia. Usually ocean-dwelling but also occurs in coastal waters on the north or central coast with some straying south of the central coast. Green Turtles spend their first five to ten years drifting on ocean currents. During this pelagic (ocean-going) phase, they are often found in association with driftlines and rafts of Sargassum (a floating marine plant that is also carried by currents). Once Green Turtles reach 30 to 40 cm curved carapace length, they settle in shallow benthic foraging habitats such as tropical	(PMST) / 8 (BioNet)	Low. May swim through and forage in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			tidal and sub-tidal coral and rocky reef habitat or inshore seagrass beds. The shallow foraging habitat of adults contains seagrass beds or algae mats on which Green Turtles mainly feed. In Australia there are seven separate genetic management units for the green turtle, and three of these occur in QLD. The entire Great Barrier Reef area is an important feeding area for turtles which nest locally, as well as for those which nest in other regions and countries.		
Leatherback Turtle (*Dermochelys coriacea*)	E	E, M, Ma	Occur throughout the world's tropical and temperate seas and in all coastal waters of Australia. Most sightings are in temperate waters. Occurs in inshore and offshore marine waters. Rarely breeds in Australia, with the nearest regular nesting sites being the Solomon Islands and Malayan Archipelago. Occasional breeding records from NSW coast, including between Ballina and Lennox Head in northern NSW.	(PMST) / 1 (BioNet)	Low. May swim through the biodiversity study area albeit not considered core range or forage habitat.
Hawksbill Turtle (*Eretmochelys imbricata*)	-	V, M, Ma	Major nesting of Hawksbill Turtles in Australia occurs at Varanus Island and Rosemary Island in WA, and in the northern Great Barrier Reef and Torres Strait, QLD. Hawksbill Turtles spend their first five to ten years drifting on ocean currents. Hawksbill Turtles spend their first five to ten years drifting on ocean currents. During this pelagic phase, they are often found in association with rafts of *Sargassum* sp. (floating marine algae that is also carried by currents). Once Hawksbill Turtles reach 30 to 40 cm curved carapace length, they settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat. They primarily feed on sponges and algae. They have also been found, though less frequently, within seagrass habitats of coastal waters, as well as the deeper	(PMST) / 1 (BioNet)	Low. May swim through or forage in the biodiversity study area albeit not considered core range.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			habitats of trawl fisheries. Hawksbill Turtles have been seen in temperate regions as far south as northern NSW.		
Broad-headed Snake (*Hoplocephalus bungaroides*)	E	V	Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in hollows in large trees within 200 metres of escarpments in summer.	(PMST)	None. No suitable habitat in the biodiversity study area.
Flatback Turtle (*Natator depressus*)	-	V, M, Ma	The Flatback Turtle is only found in the tropical waters of northern Australia, Papua New Guinea and Irian Jaya and is one of only two species of sea turtle without a global distribution. Post-hatchling and juvenile flatback turtles do not have the wide dispersal phase in the oceanic environment like other sea turtles. Adults inhabit soft bottom habitat over the continental shelf of northern Australia, extending into Papua New Guinea and Irian Jaya although the extent of their range is not fully known. Hatchling to subadult Flatback Turtles lack a pelagic life stage and reside in the Australian continental shelf. Flatback Turtles require sandy beaches to nest. Sand temperatures between 25 °C and 33 °C are needed for successful incubation. Beaches free from light pollution are required to prevent disorientation, disturbance, and to allow nesting females to come ashore.	(PMST)	Low. May swim through or forage in the biodiversity study area albeit not considered core range.
Sharks					
Grey Nurse Shark (east coast population) (*Carcharias taurus*)	CE*	CE	Grey Nurse Sharks are usually found in inshore coastal waters usually less than 40 metres in depth. This species congregates at a number of rocky reef sites with gravel or sand filled gutters, overhangs or caves known as 'aggregate sites' and key aggregate sites refer to those areas occupied by a larger number of grey nurse sharks.	(PMST) / (DPI)	Low. May swim through or forage in the biodiversity study area albeit widespread. No aggregate sites known in the harbour.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			Individuals spend most of their time within or in close proximity to aggregate sites but may undertake excursions of varying lengths of time away from site. In NSW, aggregations of grey nurse sharks (east coast population as listed under the EPBC Act) can be found at reefs off the following locations: Byron Bay, Brooms Head, Solitary Islands, South West Rocks, Laurieton, Forster, Seal Rocks, Port Stephens, Sydney, Bateman's Bay, Narooma and Montague Island. Relatively little is known about the migratory habits of Grey Nurse Sharks in Australian waters but tagged sharked have been recorded moving over 800 kilometres between sites in relatively short periods of time.		
White Shark (*Carcharodon carcharias*)	V*	V, M	In Australia, White Sharks have been recorded from central QLD around the south coast to north-west WA, but may occur further north on both coasts. White Sharks are widely, but not evenly, distributed in Australian waters. This species can be found from close inshore around rocky reefs, surf beaches and shallow coastal bays to outer continental shelf and slope areas. The majority of recorded White Shark movements occur between the coast and 100 metres in depth but have been recorded to dive to depth of over 1,200 m. Individuals may travel long distances in a relatively short time, but can remain in the same areas for weeks to months. In NSW, the Stockton Beach/Hawks Nest area are identified as primary residency areas for juvenile White Sharks.	(PMST) / (DPI)	Low. May swim through or forage in the biodiversity study area albeit widespread.
Whale Shark (*Rhincodon typus*)	-	V, M	In Australia, the Whale Shark is known from NSW, QLD, NT, WA and occasionally VIC and SA, but it is most commonly seen in waters off northern WA, NT and QLD. The Whale Shark is an oceanic and	(PMST)	Low. Usually associated with open water. Very unlikely to swim through the

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	BC Act / FM Act*	EPBC Act			
			coastal, tropical to warm-temperate pelagic shark. It is often seen far offshore, but also comes close inshore and sometimes enters lagoons of coral atolls. The Whale Shark is generally encountered close to or at the surface, as single individuals or occasionally in schools or aggregations of up to hundreds of sharks. This species is generally found in areas where the surface temperature is 21–25 °C, preferably with cold water of 17 °C or less upwelling into it, and salinity of 34 to 34.5 parts per thousand.		biodiversity study area boat traffic and shallow water depth renders the biodiversity study area suboptimal.

* Distribution and habitat requirement information adapted from:

Australian Government DCCEEW https://www.environment.gov.au/biodiversity/threatened/species.

NSW DPIE-EES http://www.environment.nsw.gov.au/threatenedSpeciesApp/. and

NSW DPI (Fisheries) listed threatened species, populations and ecological communities https://www.dpi.nsw.gov.au/fishing/species-protection/what-current.

+ Data source includes

The NSW DPI (Fisheries) Threatened species lists https://www.dpi.nsw.gov.au/fishing/species-protection/what-current.

Number of records from the NSW DPIE-EES Wildlife Atlas record data (Accessed December 2022, data retrieved for the years 2002-2022) http://www.bionet.nsw.gov.au/. and

Australian Government DCCEEW PMST http://www.environment.gov.au/epbc/protected-matters-search-tool.

Key:

EP = endangered population

CE = critically endangered

E = endangered

V = vulnerable

M = migratory (EPBC Act only)

Ma = marine (EPBC Act only)

Migratory species habitat assessment table

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
Birds				
Common Sandpiper (*Actitis hypoleucos*)	M, Ma	Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats.	(PMST) / 3 (BioNet)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.
Common Noddy (*Anous stolidus*)	M, Ma	Mainly occurs in ocean off the QLD coast. Breeds on or near islands, on rocky islets and stacks with precipitous cliffs, or on shoal or cays or coral or sand. This species feeds main on fish but are known to take squid, molluscs and aquatic insects in offshore areas.	(PMST) / 1 (BioNet)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.
Fork-tailed Swift (*Apus pacificus*)	M, Ma	Recorded in all regions of NSW. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher.	(PMST) / 5 (BioNet)	Low. Exclusively aerial and unlikely to land in the biodiversity study area however, it may fly through.
Sooty Shearwater (*Ardenna grisea*)	M, Ma	In Australia, the Sooty Shearwater breeds on islands off NSW and TAS. The Sooty Shearwater forages in pelagic (open ocean) sub-tropical, sub-Antarctic and Antarctic waters. The Sooty Shearwater breeds mainly on subtropical and sub-Antarctic islands, as well as on the mainland of NZ. The Sooty Shearwater forages in pelagic (open ocean) sub-tropical, sub-Antarctic and Antarctic waters. The species migrates and forages in the North Pacific and Atlantic Oceans during the non-breeding season. Sooty Shearwaters may forage inshore occasionally, especially during rough weather.	(PMST) / 3 (BioNet)	Low. Prefers open coast and therefore has very little potential to fly through the biodiversity study area or forage.
Wedge-tailed Shearwater (*Ardenna pacifica*)	M, Ma	The Wedge-tailed Shearwater breeds on the east and west coasts of Australia and on off-shore islands. The Wedge-tailed Shearwater is a	13 (BioNet)	Low. Prefers open coast and therefore has very little

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
		pelagic, marine bird known from tropical and subtropical waters.		potential to fly through the biodiversity study area or forage
Short-tailed Shearwater (*Ardenna tenuirostris*)	M, Ma	In summer months, the Short-tailed Shearwater is the most common shearwater along the south and south-east coasts of Australia. The Short-tailed Shearwater is found in coastal waters.	38 (BioNet)	Low. Prefers open coast and therefore has very little potential to fly through the biodiversity study area or forage
Ruddy Turnstone (*Arenaria interpres*)	M, Ma	The Ruddy Turnstone's distribution is almost cosmopolitan. It occurs on coastlines and only occasionally inland. They are mainly found on exposed rocks or reefs, often with shallow pools, and on beaches.	(PMST) / 17 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Sharp-tailed Sandpiper (*Calidris acuminata*)	M, Ma	The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in NZ. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	(PMST) / 7 (BioNet)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.
Pectoral Sandpiper (*Calidris melanotos*)	M, Ma	In NSW, the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. Prefers shallow fresh to saline wetlands.	(PMST)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
		The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.		
Red-necked Stint (*Calidris ruficollis*)	M, Ma	It is distributed along most of the Australian coastline with large densities on the VIC and TAS coasts. The Red-necked Stint breeds in Siberia and sporadically in north and west Alaska, probably from Taymyr region to Anadyr Territory and Koryakland. The Red-necked Stint mostly forages on bare wet mud on intertidal mudflats or sandflats, or in very shallow water; mostly in areas with a film of surface water and mostly close to edge of water. Roosts on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle, sometimes in saltmarsh or other vegetation.	(PMST) / 26 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Streaked Shearwater (*Calonectris leucomelas*)	M, Ma	Found in the western Pacific, breeding on the coast and on offshore islands of Japan, Russia, and on islands off the coasts of China, North Korea and South Korea. This marine species can be found over both pelagic and inshore waters.	(PMST) / 5 (BioNet)	Low. Prefers open coast and therefore has very little potential to fly through the biodiversity study area or forage
Double-banded Plover (*Charadrius bicinctus*)	M, Ma	The Double-banded Plover can be found in both coastal and inland areas. The Double-banded Plover is found on littoral, estuarine and fresh or saline terrestrial wetlands and also saltmarsh, grasslands and pasture. It occurs on muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours and margins of fresh or saline terrestrial wetlands such as lakes, lagoons and swamps, shallow estuaries and rivers.	(PMST)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Oriental Cuckoo (*Cuculus optatus*)	M, Ma	Occurs from the coastal region of the NT to the south of NSW coast. This species is very	(PMST) / 2 (BioNet)	None.

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
		secretive inhabiting forests, occurring in coniferous, deciduous and mixed forest.		No suitable habitat in the biodiversity study area.
Lesser Frigatebird (*Fregata ariel*)	M, Ma	Breeding populations are found in the tropical waters of Indian and Pacific Oceans, except in the east Pacific, and the South Atlantic on remote tropical and sub-tropical islands. Mainly feeds on fish but can snatch bird eggs and chicks as well as scavenge.	(PMST)	Low. Prefers open coast and therefore has very little potential to fly through the biodiversity study area or forage.
Great Frigatebird (*Fregata minor*)	M, Ma	Breeding populations found on small, remote tropical and sub-tropical islands of the Indian and Pacific Oceans and the South Atlantic. Kleptoparasitic behaviour leads to stealing fish and squid from other bird species as well as snatching small chicks.	(PMST)	Low. Prefers open coast and therefore has very little potential to fly through the biodiversity study area or forage.
Latham's Snipe (*Gallinago hardwickii*)	M, Ma	Recorded along the east coast of Australia from Cape York Peninsula through to south-eastern SA. Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level.	(PMST) / 1 (BioNet)	None. No suitable habitat in the biodiversity study area.
Caspian Tern (*Hydroprogne caspia*)	M, Ma	Within Australia, the Caspian Tern has a widespread occurrence and can be found in both coastal and inland habitat. The Caspian Tern breeds on variable types of sites including low islands, cays, spits, banks, ridges, beaches of sand or shell, terrestrial wetlands and stony or rocky islets or banks. Breeding is recorded from the Menindee Lakes. This species usually forages in open wetlands, including lakes and rivers.	17 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Bar-tailed Godwit (*Limosa lapponica*)	M, Ma	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	(PMST) / 9 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
				biodiversity study area is highly disturbed, widespread and suboptimal.
Black-faced Monarch (*Monarcha melanopsis*)	M, Ma	Widespread in eastern Australia. Mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest.	(PMST)	None. No suitable habitat in the biodiversity study area.
Yellow Wagtail (*Motacilla flava*)	M, Ma	Breeds in northern latitudes and travels south before the onset of winter. Occurs in a variety of damp or wet habitats with low vegetation. Outside of the breeding season, it is also found in cultivated areas.	(PMST)	None. No suitable habitat in the biodiversity study area.
Satin Flycatcher (*Myiagra cyanoleuca*)	M, Ma	Widespread in eastern Australia and vagrant to New Zealand. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	(PMST)	None. No suitable habitat in the biodiversity study area.
Whimbrel (*Numenius phaeopus*)	M, Ma	The Whimbrel is a regular migrant to Australia and New Zealand, with a primarily coastal distribution. The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats.	(PMST) / 1 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Osprey (*Pandion haliaetus*)	M, Ma	The Osprey occurs in Indonesia, Philippines, Palau Islands, New Guinea, Solomon Islands, New Caledonia and Australia. The breeding range	(PMST)	Low. Has potential to fly through or forage in the biodiversity

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
		of the Osprey extends around the northern coast of Australia (including many offshore islands) from Albany in WA to Lake Macquarie in NSW; with a second isolated breeding population on the coast of SA, extending from Head of Bight east to Cape Spencer and Kangaroo Island. The total range (breeding plus non-breeding) around the northern coast is more widespread, extending from Esperance in WA to NSW, where records become scarcer towards the south, and into VIC and TAS, where the species is a rare vagrant. Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia		study area and forage however, this species has a wide-ranging habitat and is highly mobile.
White-tailed Tropicbird (*Phaethon lepturus*)	M, Ma	The White-tailed Tropicbird can be found over pelagic waters and the coast of tropical and subtropical seas. It feeds on small fish, especially flying-fish, squid and some crustaceans (especially crabs). Its diet varies locally, for example taking mostly fish in the Seychelles. Most prey is caught by plunge-diving but flying-fish can be taken on the wing. Breeding is seasonal in places but elsewhere can be more or less continuous. It is loosely colonial, nesting in rocky crevices or sheltered scrape on the ground on small-remote islands preferring inaccessible spots on cliffs where take-off is relatively easy.	(PMST)	Low. Prefers open coast and therefore has very little potential to fly through the biodiversity study area or forage.
Ruff (*Philomachus pugnax*)	M, Ma	The Ruff is a rare but regular non-breeding visitor to Australia, being recorded in all States and Territories. In NSW the species has been recorded at Kurnell, Tomki, Casino, Ballina, Kooragang Island, Broadwater Lagoon and Little Cattai Creek. The Ruff is found on generally fresh,	(PMST)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
		brackish of saline wetlands with exposed mudflats at the edges.		
Pacific Golden Plover (*Pluvialis fulva*)	M, Ma	Most Pacific Golden Plovers occur along the east coast, and are especially widespread along the QLD and NSW coastlines. In non-breeding grounds in Australia this species usually inhabits coastal habitats, though it occasionally occurs around inland wetlands. Pacific Golden Plovers usually occur on beaches, mudflats and sandflats (sometimes in vegetation such as mangroves, low saltmarsh such as *Sarcocornia*, or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in saltworks.	(PMST) / 15 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Grey Plover (*Pluvialis squatarola*)	M, Ma	Non-breeding visitor to Australia, Grey Plovers usually forage on large areas of exposed mudflats and beaches of sheltered coastal shores such as inlets, estuaries and lagoons. They usually roost in sandy areas, such as on unvegetated sandbanks or sand-spits on sheltered beaches or other sheltered environments such as estuaries or lagoons.	6 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Rufous Fantail (*Rhipidura rufifrons*)	M, Ma	Occurs in coastal and near coastal districts of northern and eastern Australia. In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (*Eucalyptus microcorys*), Mountain Grey Gum (*E. cypellocarpa*), Narrow-leaved Peppermint (*E. radiata*), Mountain Ash (*E. regnans*), Alpine Ash (*E. delegatensis*), Blackbutt (*E. pilularis*) or Red Mahogany (*E. resinifera*); usually with a dense shrubby understorey often including ferns.	(PMST)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
Long-tailed Jaeger (*Stercorarius longicaudus*)	M, Ma	The long-tailed jaeger breeds in the high Arctic of Eurasia and North America, where it is the most widely distributed and most northerly breeding jaeger species. Outside of the breeding season, the long-tailed jaeger spends most of its time at sea, rarely within sight of land. However, it returns to land to breed, nesting on Arctic and sub-Arctic tundra, at elevations of up to 1,300 metres. It prefers to nest on dry ground, often quite far inland.	1 (BioNet)	Low. Has potential to fly through the biodiversity study area and forage however, this species has a wide-ranging habitat and is highly mobile.
Arctic Jaeger (*Stercorarius parasiticus*)	M, Ma	The Arctic Jaeger breeds on the northernmost coasts of Eurasia and North America. This marine species is predominately coastal but will migrate over land.	4 (BioNet)	Low. Has potential to fly through the biodiversity study area and forage however, this species has a wide-ranging habitat and is highly mobile.
Pomarine Jaeger (*Stercorarius pomarinus*)	M, Ma	The Pomarine Jaeger breeds in the far northern reaches of Europe, Asia and America. In the winter, the pomarine jaeger migrates to areas between the Tropic of Capricorn and the Tropic of Cancer, as well as along the coasts of Argentina and Australia. During the breeding season, the Pomarine Jaeger inhabits areas of tundra. At other times of the year it occurs in coastal habitats.	4 (BioNet)	Low. Has potential to fly through the biodiversity study area and forage however, this species has a wide-ranging habitat and is highly mobile.
Common Tern (*Sterna hirundo*)	M, Ma	The species is a non-breeding migrant to Australia, where it is widespread and common on the eastern coast south to eastern VIC, and common on parts of the northern coast, mainly east of Darwin. Common Terns are marine, pelagic and coastal. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and	6 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
		estuaries with muddy, sandy or rocky shores. However, off Wollongong, NSW, Common Terns were recorded in all marine zones but generally recorded in offshore and pelagic waters, 11–55 km from shore.		
Brown Booby (*Sula leucogaster*)	M, Ma	In Australia, the Brown Booby is found from Bedout Island in WA, around the coast of the NT to the Bunker Group of islands in QLD with occasional reports further south in NSW and VIC. The Brown Booby uses both marine and terrestrial habitat. The species occurs in, but is not restricted to, tropical waters of all major oceans, often staying close to breeding islands. The species is known to approach mainland coastlines more than other boobies and has been recorded in coastal waters, harbours and estuaries and near offshore islands but seldom flying over land. Off north-west WA, Brown Boobies are most abundant 18–36 km from land, but also occur inside and outside these limits. The species is often concentrated where wavelets are about 2 m high (just high enough to break), and sea surface-temperature is less than 25.5 °C. The Brown Booby flies low, seldom higher than 30 m above the sea surface.	1 (BioNet)	Low. Has potential to fly through the biodiversity study area and forage however, this species has a wide-ranging habitat and is highly mobile.
Spectacled Monarch (*Symposiachrus trivirgatus*)	M, Ma	Occurs along the entire east coast of Australia. Breeds in dense scrub in gullies of coastal ranges.	(PMST)	None. No suitable habitat in the biodiversity study area.
Crested Tern (*Thalasseus bergii*)	M, Ma	Found across all of Australian coastline. They breed in colonies on small offshore islands in dense packs of nests. Though the Crested Tern is usually a strictly coastal species, there are occasional records in the arid interior of Australia.	94 (BioNet)	Low. Has potential to fly through the biodiversity study area and forage however, this species has a wide-ranging habitat and is highly mobile.
Grey-tailed Tattler (*Tringa brevipes*)	M, Ma	Within Australia, the Grey-tailed Tattler has a primarily northern coastal distribution and is found	(PMST) / 12 (BioNet)	Low.

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
		in most coastal regions. The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide.		Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Wandering Tattler (*Tringa incana*)	M, Ma	The non-breeding range includes Australia and is around the Pacific rim, along the coasts of North, Central and South America, from south California, south to Ecuador, including the Galapagos Islands. The Wandering Tattler is generally found on rocky coasts with reefs and platforms, points, spits, piers, offshore islands and shingle beaches or beds. It is occasionally seen on coral reefs or beaches, and tends to avoid mudflats. Foraging habitat is among rocks or shingle, or in shallow pools at edges of reefs or beaches, mainly along the tideline. Wandering Tattlers have been recorded roosting or perching on top of boulders surrounded by or close to water.	2 (BioNet)	Low. Some potential foraging habitat present in the biodiversity study area however, the species is unlikely to be dependent on the resources as the biodiversity study area is highly disturbed, widespread and suboptimal.
Common Greenshank (*Tringa nebularia*)	M, Ma	The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia.	(PMST) / 2 (BioNet)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.
Marsh Sandpiper (*Tringa stagnatilis*)	M, Ma	The Marsh Sandpiper is found on coastal and inland wetlands throughout Australia. In WA they are mainly found around the coast. The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and	(PMST)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
		intertidal mudflats and also regularly at sewage farms and saltworks.		
Marine Mammals and Sharks				
Bryde's Whale (*Balaenoptera edeni*)	M	Bryde's Whale occur in temperate to tropical waters, both oceanic and inshore, bounded by latitudes 40° N and 40° S, or the 20 °C isotherm. Bryde's Whales have been recorded from all Australian states except the NT, including one sighting each in VIC and NSW and 11 reported strandings in SA (7), NSW (2), VIC (1) and QLD (1). Bryde's Whales are found year-round primarily in temperatures exceeding 16.3 °C. The coastal from of Bryde's Whale appears to be limited to the 200 m depth isobar, moving along the coast in response to availability of suitable prey. The offshore form is found in deeper water (500 m to 1000 m). Dive times are relatively short, averaging 1.27 minutes but potentially lasting 9 minutes. This suggests that Bryde's Whales use the upper layers of the ocean, and can therefore be considered pelagic.	(PMST)	Low. Usually associated with open water. Very unlikely to swim through the biodiversity study area boat traffic and shallow water depth renders the biodiversity study area suboptimal.
Pygmy Right Whale (*Caperea marginata*)	M	Records of Pygmy Right Whales in Australian waters are distributed between 32° S and 47° S, but are not uniformly spread around the coast. The northern distribution of pygmy right whales may be limited on the west and east coasts of Australia by the warm, south-flowing Leeuwin and East Australian currents. Few or no records are available for NSW, eastern VIC, and the northern part of the Great Australian Bight, while WA has fewer records than comparative eastern Australian states. Concentrations of stranded animals have occurred at the entrance of the gulfs in South Australia and around TAS, but live sightings have predominated in the former region.	(PMST)	Low. Usually associated with open water. Very unlikely to swim through the biodiversity study area boat traffic and shallow water depth renders the biodiversity study area suboptimal.

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
		The numerous strandings in TAS may be due to the proximity of the Subtropical Convergence, an apparently important feeding zone for pygmy right whales. Pygmy right whales have primarily been recorded in areas associated with upwellings and with high zooplankton abundance, particularly copepods and small euphausiids which constitute their main prey. There is some evidence to indicate that the area south of 41° S is important for weaned pygmy right whales, possibly because of the higher prey abundance in these waters.		
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	M	The Oceanic Whitetip Shark is widespread throughout tropical and subtropical pelagic waters of the world (30°N to 35°S). Within Australian waters, it is found in from Cape Leeuwin (WA) through parts of the NT, down the east coast of QLD and NSW to Sydney. It has not been recorded within the Gulf of Carpentaria or the Arafura Sea, preferring pelagic waters. A single specimen has been recorded in SA.	(PMST)	Low. Some potential foraging habitat present in the biodiversity study area however, is suboptimal and widely distributed.
Dusky Dolphin (*Lagenorhynchus obscurus*)	M	In Australia, Dusky Dolphins are known from only 13 reports since 1828, with two sightings in the early 1980s. They occur across southern Australia from WA to TAS, with unconfirmed sightings south of continental Australia but confirmed sightings near Kangaroo Island, SA, and off TAS, and a recent stranding in the latter State. Given the lack of understanding of the species' distribution in Australian waters, no key localities have yet been identified. Dusky Dolphins occur mostly in temperate and subantarctic waters. They are considered to primarily inhabit inshore waters but may also be pelagic at times.	(PMST)	Low. Some potential foraging habitat present in the biodiversity study area however, is suboptimal and widely distributed.
Porbeagle (*Lamna nasus*)	M	The Porbeagle is wide-ranging and inhabits temperate, subarctic and subantarctic waters of	(PMST)	Low.

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
		the North Atlantic and Southern Hemisphere. The Porbeagle primarily inhabits oceanic waters and areas around the edge of the continental shelf. They occasionally move into coastal waters, but these movements are temporary. The Porbeagle utilises a broad vertical range of the water column and is known to dive to depths exceeding 1300 m. The Porbeagle is thought to be reasonably flexible in the types of habitat used for foraging.		Some potential foraging habitat present in the biodiversity study area however, is suboptimal and widely distributed.
Reef Manta Ray (*Mobula alfredi*)	M	Distributed in the Indo-West Pacific: Red Sea, South Africa, Thailand to WA; north to Japan (Yaeyama Island), to Solitary Island, Australia as far east as French Polynesia and the Hawaiian Islands. Reported in the Atlantic (Canary and Cape Verde islands) but this species may be restricted more or less to the Indian and Western Pacific only. Adults are commonly sighted inshore, within a few kilometers of land; found around coral and rocky reefs as well as along productive coastlines with consistent upwelling, tropical island groups, atolls and bays.	(PMST)	None. No suitable habitat in the biodiversity study area.
Giant Manta Ray (*Mobula birostris*)	M	The Giant Manta Ray occurs in tropical, sub-tropical and temperate waters of the Atlantic, Pacific and Indian Oceans. Commonly sighted along productive coastlines with regular upwelling, oceanic island groups and particularly offshore pinnacles and seamounts. Widespread, although relatively uncommon in Australian waters; also Cocos (Keeling) Islands and Christmas Island in the eastern Indian Ocean. Elsewhere the species is circumglobal, usually offshore, often around oceanic islands, sometimes coastal, and most common in tropical waters. Giant Manta Rays aggregate around Ningaloo Reef during autumn and winter.	(PMST)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
Killer Whale/Orca (*Orcinus orca*)	M	In Australia, Orcas are recorded from all states, with concentrations reported around TAS. Sightings are also frequent in SA and VIC. A sighting at Yirrkala in April 1999 provides evidence that they also occur in NT waters. Orcas are frequently seen in the Antarctic south of 60° S and have been recorded from Heard and Macquarie Islands. Macquarie Island appears to be a key locality, with orcas regularly reported there. The preferred habitat of orcas includes oceanic, pelagic and neritic (relatively shallow waters over the continental shelf) regions, in both warm and cold waters. They may be more common in cold, deep waters, but off Australia, orcas are most often seen along the continental slope and on the shelf, particularly near seal colonies. Orcas have regularly been observed within the Australian territorial waters along the ice edge in summer.	(PMST)	Low. Usually associated with open water. Very unlikely to swim through the biodiversity study area boat traffic and shallow water depth renders the biodiversity study area suboptimal.
Sperm Whale (*Physeter macrocephalus*)	M	Sperm Whales have been recorded from all Australian states. Females and young male Sperm Whales are restricted to warmer waters, generally north of approximately 45° S, while older males travel to and from colder waters and to the edge of the Antarctic pack-ice. Sperm Whales have concentrated in a narrow area only a few miles wide at shelf edge off Albany, WA, moving westwards through the year. Off the WA coast, where the continental shelf slopes less steeply, Sperm Whales appear to be less concentrated close to shelf edge and more widely dispersed offshore. Similar concentrations of Sperm Whales have been found elsewhere in Australia, such as south-west of Kangaroo Island, SA. The habitat of the Sperm Whale is difficult to categorise due to	(PMST)	Low. Usually associated with open water. Very unlikely to swim through the biodiversity study area boat traffic and shallow water depth renders the biodiversity study area suboptimal.

Common Name (Scientific Name)	Status EPBC Act	Habitat requirements	Number of records (source)	Likelihood of occurrence
		the cosmopolitan nature of this species and its ability to inhabit all oceans. Sperm Whales tend to inhabit offshore areas with a water depth of 600 m or more, and are uncommon in waters less than 300 m deep.		

* Distribution and habitat requirement information adapted from:

Australian Government DCCEEW https://www.environment.gov.au/biodiversity/threatened/species.

NSW DPIE-EES http://www.environment.nsw.gov.au/threatenedSpeciesApp/. and

NSW DPI (Fisheries) listed threatened species, populations and ecological communities https://www.dpi.nsw.gov.au/fishing/species-protection/what-current.

+ Data source includes

The NSW DPI (Fisheries) Threatened species lists https://www.dpi.nsw.gov.au/fishing/species-protection/what-current.

Number of records from the NSW DPIE-EES Wildlife Atlas record data (Accessed December 2022, data retrieved for the years 2002-2022) http://www.bionet.nsw.gov.au/. and

Australian Government DCCEEW PMST http://www.environment.gov.au/epbc/protected-matters-search-tool.

Key:

M = migratory (EPBC Act only)

Ma = marine (EPBC Act only)

Protected species habitat assessment table

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	FM Act	EPBC Act			
Birds					
Cattle Egret (*Bubulcus ibis*)	-	Ma	The Cattle Egret was originally native to Africa, south-west Europe, and Asia. Originally the bird's Asian distribution was from Pakistan, south to Sri Lanka, north to the Himalayas and east to Korea, Japan, and the Philippines. Two major distributions have been located; from north-east WA to the Top End of the NT and around south-east Australia. The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare.	(PMST)	None. No suitable habitat in the biodiversity study area.
Red-capped Plover (*Charadrius ruficapillus*)	-	Ma	The Red-capped Plover is widespread throughout Australia found in wetlands, especially in arid areas, and prefers saline and brackish waters.	(PMST)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.
Black-winged Stilt (*Himantopus himantopus*)	-	Ma	The Black-winged Stilt has a wide range, including Australia, Central and South America, Africa, southern and south-eastern Asia and parts of North America and Eurasia. More locally it also occurs through Indonesia, New Guinea, the Solomon Islands, the Philippines and New Zealand. Although widespread on the Australian mainland, it is an uncommon visitor to TAS. The Black-winged Stilt is a social species, and is usually found in small groups. Black-winged Stilts prefer freshwater and saltwater marshes, mudflats, and the shallow edges of lakes and rivers.	(PMST)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.
Rainbow Bee-eater (*Merops ornatus*)	-	Ma	The Rainbow Bee-eater is widely distributed throughout Australia and eastern Indonesia. The Rainbow Bee-eater is distributed across much of mainland Australia, and occurs on several near-	(PMST)	None. No suitable habitat in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	FM Act	EPBC Act			
			shore islands. The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation.		
Blue-winged Parrot (*Neophema chrysostoma*)	-	Ma	The Blue-winged Parrot occurs in TAS and VIC, with sparse populations in NSW, SA and the NT. The Blue-winged Parrot inhabits a range of habitats from coastal, sub-coastal and inland areas, right through to semi-arid zones. Throughout their range they favour grasslands and grassy woodlands. They are often found near wetlands both near the coast and in semi-arid zones.	(PMST)	None. No suitable habitat in the biodiversity study area.
Fairy Prion (*Pachyptila turtur*)	-	Ma	The Fairy Prion is found throughout oceans and coastal areas in the Southern Hemisphere. This marine species apparently occurs mainly offshore, but may move inshore during stormy weather. Its diet is comprised mostly of crustaceans (especially krill), but occasionally includes some fish and squid.	(PMST)	Low. Has potential to fly through the biodiversity study area and forage however, this species has a wide-ranging habitat and is highly mobile.
Red-necked Avocet (*Recurvirostra novaehollandiae*)	-	Ma	The Red-necked Avocet is found throughout mainland Australia, but breeds mainly in the south-western interior. Out of breeding season, it visits most of the rest of Australia, but is only an accidental visitor to TAS or the Cape York Peninsula. The Red-necked Avocet is found in large shallow freshwater or saltwater wetlands and estuarine mudflats.	(PMST)	Low. Prefers specific habitat not in the biodiversity study area however, it may fly through.
Great Skua (*Stercorarius skua*)	-	Ma	This species breeds in Iceland, Norway, Svalbard (to Norway), the Faroe Islands (to Denmark), the Scottish islands and a few on mainland Scotland. It is a migratory species, normally wintering off the Atlantic coast of France and the Iberian Peninsulas, but juveniles can reach as far as	(PMST)	Low. Has potential to fly through the biodiversity study area and forage however, this species has a wide-ranging habitat and is highly mobile.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	FM Act	EPBC Act			
			Cape Verde, the coast of Brazil, areas of the Caribbean and small numbers also winter on the Grand Banks of Newfoundland (Canada). This marine species avoids land during migration and winter, aggregating in winter in areas where it can scavenge from fisheries. It has a hugely varied diet owing to be being a highly opportunistic feeder. Individuals regularly show individual specialisations in diet and feeding with some colony-specific learning. Breeding begins in May, and it is loosely colonial but highly territorial, breeding on islands on flat ground with some vegetation cover, usually avoiding human contact. Most birds breed within 1 km of their birth place.		
Fish and Syngnathids					
Shortpouch Pygmy Pipehorse (*Acentronura tentaculate*)	P	Ma	This species is found on tropical inshore reefs. It also occurs in temperate waters associated with shallow sandflats in protected and somewhat silty coastal areas among sparse low plant growth and in algae on rocks. This species inhabits waters of 7-40 m in depth. Pipefishes feed on small living crustaceans.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Elegant Wrasse (*Anampses elegans*)	P	-	Elegant Wrasse are a widespread but uncommon species found on coral reef and rocky reef habitats at depths from 2 to 35 m. The distribution of elegant wrasse extends from southern QLD to Montague Island on the NSW south coast, particularly around inshore islands. The species is also found at Lord Howe Island, especially in the shallow lagoon habitat, and at nearby Elizabeth and Middleton Reefs, and they have also been recorded from Norfolk Island, the Kermadec Islands, New Zealand and Easter Island. Elegant wrasse are a subtropical, warm-temperate species that are active during the day.	(PMST)	High. Potential habitat is present in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	FM Act	EPBC Act			
Estuary Cod (*Epinephelus coioides*)	P	-	Occurs in tropical and warm temperate marine waters of the Indo-Pacific including the Persian Gulf, India, the Philippines, Singapore, Hong Kong, Taiwan, Fiji and around numerous other islands. In Australia they are most common in QLD, the NT and WA; however, they are known to occur as far southwards as the Sydney area. Estuary cod inhabit turbid coastal reefs and are often found in brackish water over mud and rubble. They are frequently misidentified as Epinephelus tauvina (Greasy grouper) or Epinephelus malabaricus (Malabar grouper), which look similar and have overlapping distributions. Estuary cod also have a variety of common names including estuary rock cod, orange-spotted grouper, orange-spotted cod, green grouper, greasy cod, spotted river cod and brown-spotted grouper.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Queensland Groper (*Epinephelus lanceolatus*)	P	-	This species has a wide distribution throughout the tropical waters of the Indo-West Pacific. In Australia they occur along all tropical and warm temperate coasts but are rarely found in cooler waters to the south. QLD Gropers occupy a variety of habitats throughout their growth stages including estuaries and coral reefs. This species is usually solitary and inhabit caves and around wrecks and structures. They are ambush predators that swallow prey whole.	(PMST)	Moderate. Potential habitat is present in the biodiversity study area albeit towards the end of the species range.
Girdled Pipefish (*Festucalex cinctus*)	P	Ma	Endemic to tropical and temperate waters of the NT, QLD and NSW. Usually inhabits sheltered coastal bays and estuaries, on patches of rubble, sand or in areas of sparse seagrass, algal and sponge growth. Most specimens were dredged or trawled in depths of 8-31 m but divers collected some specimens over rubble bottoms in depths of	(PMST)	High. Potential habitat is present in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	FM Act	EPBC Act			
			12 m. In Sydney Harbour it is most common in depths of 10-20 m.		
Tiger Pipefish (*Filicampus tigris*)	P	Ma	The Tiger Pipefish is relatively common in subtropical waters of Australia's east and west coasts. A relic population also occurs in the warmer waters of Spencer Gulf, SA. Inhabits areas near channels in inshore sheltered bays and estuaries with sandy or muddy bottoms, or along seagrass bed edges at 2-30 m. Feeds on aggregations of mysid shrimps in sheltered bays adjacent to tidal channels.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Upside-down Pipefish (*Heraldia nocturna*)	P	Ma	Endemic to temperate waters of southern and southeastern Australia, from about Hastings, NSW, southwards to VIC, to Port Davey on the west coast of TAS, westwards through SA to Geographe Bay, WA. Upsidedown Pipefish inhabit sheltered inshore rocky reefs in harbours, bays and coves where they are found under ledges, in holes, crevices and small caves at 2-30 m."	(PMST)	High. Potential habitat is present in the biodiversity study area.
Beady Pipefish (*Hippichthys penicillus*)	P	Ma	Widespread in the tropical Indo-west-central Pacific, from the Red Sea and East Africa across the Indian Ocean to north-eastern Australia, north to Taiwan, Japan, Micronesia and east to Samoa and Tonga. This species usually inhabits brackish waters in mangrove estuaries, tidal creeks and sometimes in freshwater reaches in the lower parts of rivers and streams.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Big-belly Seahorse (*Hippocampus abdominalis*)	P	Ma	Known from temperate waters of New Zealand and southern Australia, where it occurs from about South West Rocks, NSW, southwards to the northern Great Australian Bight, SA, and south to the Derwent Estuary, TAS. Big-belly Seahorses live in a range of habitats from low rocky reefs in shallow estuaries, to deep tidal channels and deeper coastal reefs to 100 m. They cling to	(PMST)	High. Potential habitat is present in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	FM Act	EPBC Act			
			seagrasses, sponges, macroalgae such as kelp holdfasts and other structures on reefs.		
Crested Pipefish (*Histiogamphelus briggsii*)	P	Ma	Endemic to temperate waters of south-eastern Australia, from NSW, south to VIC and TAS, and westwards to Gulf St Vincent. Crested Pipefish inhabit inshore sandy areas, singly or in small aggregations, often amongst detached seaweed or along the margins of Posidonia seagrass beds and in open sandy areas at 3–20 m; most common in Bass Strait."	(PMST)	High. Potential habitat is present in the biodiversity study area.
Javelin Pipefish (*Lissocampus runa*)	P	Ma	Endemic to temperate waters of southern and eastern Australia; known from southern Qld, southwards to TAS, and across to about Rottnest Island, south-WA. Usually inhabits tidepools and sheltered bays, usually in seagrass and algal beds, and rocky and shelly rubble substratum to about 20 m.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Sawtooth Pipefish (*Maroubra perserrata*)	P	Ma	Endemic to temperate southern Australian waters from southern QLD to Rottnest Island, WA. The Sawtooth Pipefish inhabits coastal rocky reefs at 3-25 m, sheltering beneath ledges and in caves during day.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Red Pipefish (*Notiocampus ruber*)	P	Ma	Endemic to temperate waters of southern and south-eastern Australia from Sydney Harbour, NSW, south and west to Flinders Island in Bass Strait, TAS, VIC, SA and the Recherche Archipelago, WA; usually inhabits rocky reefs, often in crevices, in association with sponges and encrusting and filamentous red algae at 5–20 m.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Eastern Blue Devil (*Paraplesiops bleekeri*)	P	-	Eastern Blue Devil are a shy, secretive fish found in caves, crevices and under ledges on inshore reefs and estuaries. Eastern blue devil fish are distributed from southern QLD to Montague Island on the NSW south coast. They can be found in	(PMST)	High. Potential habitat is present in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	FM Act	EPBC Act			
			waters between 3-30 m and are generally solitary occupying caves, crevices or under ledges.		
Weedy Seadragon (*Phyllopteryx taeniolatus*)	P	Ma	Endemic to temperate coastal waters of southern Australia, from about Newcastle (NSW) south to Actaeon Island (TAS) and across southern Australia to about Geraldton (WA).	(PMST)	High. Potential habitat is present in the biodiversity study area.
Spiny Pipehorse (*Solegnathus spinosissimus*)	P	Ma	Known from temperate waters of Australia and New Zealand. In Australian waters, Spiny Pipehorses have been recorded from off Caloundra, southern QLD, to southern TAS, throughout Bass Strait to south of Cape Otway, VIC. In the southern part of their range, Spiny Pipehorses inhabit relatively shallow waters. Specimens have been collected from muddy, silty, shelly and rubble substrates, and rocky reefs, and may be washed ashore after storms. Spiny Pipehorses use their prehensile tails to cling to macroalgae and sessile invertebrates on the substrate.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Robust Ghostpipefish (*Solenostomus cyanopterus*)	P	Ma	Widespread in the tropical Indo-west Pacific, from East Africa and the Red Sea, eastwards to Fiji and southern Japan, and south to Australia. Known in Australian waters from the Shark Bay region, WA, around the tropical north and southwards to at least Sydney Harbour, NSW. Robust Ghostpipefish live in protected coastal and lagoon reefs, deeper coastal reefs and deep, clear estuaries with seagrass or macro-algae in 15-25 m.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Ornate Ghostpipefish (*Solenostomus paradoxus*)	P	Ma	Widespread in tropical and warm-temperate regions of the Indo-west Pacific, from East Africa, eastwards to Fiji and Tonga, north to southern Japan, south to Australia and New Caledonia. Ornate Ghost Pipefish inhabit protected coastal, lagoon and outer reef areas with drop-offs or rock	(PMST)	High. Potential habitat is present in the biodiversity study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	FM Act	EPBC Act			
			faces, in depths of 3-35 m. They often associate with Crinoids (featherstars), Gorgonians and black corals. Although usually solitary, they may be seen in pairs, or even in small groups.		
Spotted Pipefish (*Stigmatopora argus*)	P	Ma	Found from the Hawkesbury River, NSW to Shark Bay, WA in temperate waters. Usually among vegetation in bays and estuaries, but sometimes offshore among floating Sargassum.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Widebody Pipefish (*Stigmatopora nigra*)	P	Ma	Known from temperate waters of southern Australia and New Zealand. The widebody pipefish occurs from about Fraser Island in southern QLD to north of Perth (WA), and around TAS. It is common in sheltered seagrass and algal beds from intertidal depths to 35 m.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Double-end Pipehorse (*Syngnathoides biaculeatus*)	P	Ma	In Australian waters, known from Geraldton to Shark Bay, and north to Ashmore and Cartier Reefs, WA, and from the Timor Sea, the NT, eastwards to QLD and south to Batemans Bay (NSW). Inhabits shallow, protected waters of bays, lagoons and estuaries including mangrove areas, in association with seagrass beds and macroalgae in depths at 0-10 m. Juveniles sometimes found clinging to floating algae and plant debris including *Sargassum* sp. rafts.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Bentstick Pipefish (*Trachyrhamphus bicoarctatus*)	P	Ma	Widespread in the tropical Indo-west Pacific. Bentstick Pipefish are known in Australian waters from the central coast of WA, northwards throughout the waters of the NT and QLD to central NSW. They live in sheltered coastal lagoon and reef areas on sandy and rubble habitats amongst seagrasses and macroalgae at 1-30 m.	(PMST)	High. Potential habitat is present in the biodiversity study area.
Hairy Pipefish (*Urocampus carinirostris*)	P	Ma	In Australia, known from the Shoalwater Bay region (QLD) to northern TAS, VIC, and to the Ceduna region of SA, and in south-WA where it	(PMST)	High.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	FM Act	EPBC Act			
			reaches the Perth region. Rare in SA. Inhabits the lower reaches of rivers, sheltered estuaries and shallow reefs in seagrass and algal beds a 0-6 m. One of the most common estuarine pipefishes in eastern Australia, occurring year-round in seagrass beds in Western Port (VIC), and abundant in seagrass beds in Moreton Bay (QLD).		Potential habitat is present in the biodiversity study area.
Mother-of-pearl Pipefish (*Vanacampus margaritifer*)	P	Ma	Endemic to sub-tropical and temperate Australia, from North Stradbroke island, QLD, southwards to Jurien Bay, WA, absent from TAS. Inhabits shallow estuarine and coastal waters in seagrass beds), macroalgae (Ecklonia spp. and other brown algae), rocky reef, boulder, rubble, sandy and muddy habitats between 2-15 m.	(PMST)	High. Potential habitat is present in the biodiversity study area.
All Seahorses, Seadragons, Pipefish, Pipehorses, Ghostpipefish and Seamoths (*Syngnathidae*)	P	-	Syngnathiformes are distinct in appearance compared to their other bony fish relatives. There are many distinguishing morphological, behavioural and reproductive features that separate the Seahorse, Seadragon, Pipefish, Pipehorse, Ghostpipefish and Seamoth families. Depending on the surrounding environment, Syngnathiformes can be highly variable in colour and shape. Some Syngnathiformes have the ability to change colour in minutes or to grow additional skin to mimic seagrasses and seaweeds they inhabit. This characteristic is a major defence and feeding strategy. Their small fins restrict them to slow movement giving them little opportunity to escape from predators, or to actively chase their prey when feeding. These species occupy a variety of habitats.	DPI	High. Potential habitat is present in the biodiversity study area.
Reptile					
Yellow-bellied Seasnake (*Pelamis platurus*)	-	Ma	The Yellow-bellied Seasnake is the most widely distributed of all sea snake species. In the beginning of the 21st century, the species was	(PMST)	Low.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	FM Act	EPBC Act			
			found to range from the east coast of Africa through the Indian and Pacific Oceans to the west coast of the Americas. It was found in most Australian waters with the exception of the colder southern coastline. The greatest density of populations was thought to exist south of the tropics where it was most commonly found on beaches after storms. Populations were also found in tropical seas and the Gulf of Carpentaria. The population living near the central coast of NSW was thought to be permanent and breeding, though no new studies have confirmed this. Most Australian specimens have been washed ashore by a combination of ebbing tides and onshore winds. The Yellow-bellied Seasnake is usually found within a few kilometres of the coast and prefers shallow inshore waters found to be between 11.7–36 °C. Nevertheless, the species is the most pelagic of all known sea snakes, occurring in the open waters well away from coasts and reefs.		Prefers specific habitat not in the biodiversity study area.

* Distribution and habitat requirement information adapted from:

Australian Government DCCEEW https://www.environment.gov.au/biodiversity/threatened/species.

NSW DPIE-EES http://www.environment.nsw.gov.au/threatenedSpeciesApp/. and

NSW DPI (Fisheries) listed threatened species, populations and ecological communities https://www.dpi.nsw.gov.au/fishing/species-protection/what-current.

+ Data source includes

The NSW DPI (Fisheries) Threatened species lists https://www.dpi.nsw.gov.au/fishing/species-protection/what-current.

Number of records from the NSW DPIE-EES Wildlife Atlas record data (Accessed December 2022, data retrieved for the years 2002-2022) http://www.bionet.nsw.gov.au/. and

Australian Government DCCEEW PMST http://www.environment.gov.au/epbc/protected-matters-search-tool.

Key:

Ma = marine (EPBC Act only)

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (source)	Likelihood of occurrence
	FM Act	EPBC Act			
P = protected (FM Act)					

Appendix C

Assessments of significance

Preamble

The Assessments of Significance (AoSs) have been completed by Jake Ludlow and Kate Reeds ecologists for Stantec for marine and coastal threatened species listed under the BC Act, FM Act and the EPBC Act that were identified as having a moderate to high potential to occur within the biodiversity study area due to the presence of nearby records and/or the presence of suitable habitat. These species and populations were identified in Section 3.10 and Section 3.12 and include:

Six microbats:

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) listed as vulnerable under the BC Act
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*) listed as vulnerable under the BC Act
- Little Bent-winged Bat (*Miniopterus australis*) listed as vulnerable under the BC Act
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) listed as vulnerable under the BC Act
- Southern Myotis (*Myotis macropus*) listed as vulnerable under the BC Act
- Greater Broad-nosed Bat (*Scoteanax rueppellii*) listed as vulnerable under the BC Act.

Two fish:

- White's Seahorse (Hippocampus whitei) listed as endangered under the FM Act and EPBC Act
- Black Rockcod (*Epinephelus daemelii*) listed as endangered under the FM Act and vulnerable under the EPBC Act.

Endangered populations:

- Little Penguin (*Eudyptula minor*) in the Manly Point Area, listed as an endangered population under the BC Act.
- Posidonia *australis* seagrass endangered populations in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie listed as endangered under the FM Act.

No TECs occur within or the biodiversity study area thus, no AoSs for TECs are required for the proposal.

Under the BC Act a 5-part test of significance is applied to determine whether an activity is likely to have a significant impact on listed threatened species, ecological communities, or their habitats, or will be carried out in a declared area of outstanding biodiversity value. The test of significance is set out in section 7.3 of the BC Act.

Part 7A of the FM Act lists threatened species, populations and ecological communities and key threatening processes (KTPs) for species, populations and ecological communities in NSW waters. Section 220ZZ of the FM Act outlines significant impact considerations to threatened species, populations and ecological communities listed under the FM Act. Under the FM Act, a '7-part test' is carried out to assess the likelihood of significant impact upon threat-listed species, populations or ecological communities listed under the FM Act. The document *Threatened Species Assessment Guidelines: The Assessment of Significance* (NSW DPI, 2008) outlines a set of guidelines to help proponents of a development or activity with interpreting and applying the factors of assessment in the 7-part test. The guidance provided by the NSW DPI (2008) has been used here in preparing the 7-part test.

For the species listing under the EPBC Act, a significance assessment has been completed in accordance with the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DoE, 2013). Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment that is affected, and upon the intensity, duration, magnitude and geographic extent of the impacts (DoE, 2013). Importantly, for a 'significant impact' to be 'likely', it is not necessary for a significant impact to have a greater than 50 per cent chance of happening. it is sufficient if a significant impact on the environment is a real or not remote chance or possibility (DoE, 2013).

Species listed under the BC Act/FM Act and the EPBC Act have been assessed using the corresponding assessment guidelines separately.

Assessment of significance (BC Act)

Little Penguin (*Eudyptula minor*) in the Manly Point Area (being the area on and near the shoreline from Cannae Point generally northward to the point near the intersection of Stuart Street and Oyama Cove Avenue, and extending 100 metres offshore from that shoreline)

The Little Penguin population at Manly is the only know breeding population on the mainland of NSW (NSW NPWS, 2003b). Breeding occurs between June and February however, the species is known to use burrows during other times of the year to rest and moult.



Adult penguins usually forage in nearby areas (up to 10-30 km from their nest) with the adults' foraging range known to greatly reduce once young have hatched. Young birds (<3 years of age) exhibit philopatry, moulting in their natal colonies. Little Penguins breed from 3-4 years of age. An Area of Outstanding Biodiversity Value (AOBV) has been declared for this species which has known nesting burrows and potential foraging sites at Manly Point and along the eastern shoreline of Spring Cove. Potential habitat areas have also been identified to occur at Dobroyd Head, Little Manly Point and Cannae Point (NSW NPWS, 2002). These areas occur outside of the biodiversity study area although, anecdotal evidence suggests the species utilise the sandstone escarpment at Federation Point, Manly.

The targeted field survey in March 2022 did not indicate the presence of penguins at any known nesting areas within or near the biodiversity study area.

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species or their habitats are outlined below:

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

The proposal construction activities have potential to cause temporary changes to water quality, temporary increases in vessel movements (i.e. vessel strike) and temporary impacts from construction noise and vibration, particularly from piling which may affect the Little Penguin if the appropriate mitigation measures are not employed.

The Little Penguin is highly mobile and it would be anticipated that individuals if present would temporarily seek unaffected habitat elsewhere in the harbour during construction. Potential risks to Little Penguins foraging or passing through the biodiversity study area would be an increased risk of injury and disturbance from noise and turbulence while barges and vessels facilitate the works. However, it is considered that Little Penguins are fast enough to avoid boat strikes, and as the penguins are already avoiding numerous vessels in the wider locality there would be no increased risk to injury from the proposal. The constant presence of vessels has likely deterred foraging Little Penguins from the area as repeated disturbance can result in loss of fitness (Cannell, 2011).

It is expected that a relatively high ambient noise environment already exists in the biodiversity study area due to the presence of existing vessel movements, however, there would be additional noise from construction activities (mainly pile driving and vessel movements). Noise from pile driving is likely to have the greatest impact on Little Penguins

and could result in behavioural changes as far as the Little Penguin AOBV (formerly critical habitat), located around 650 metres south-east of the biodiversity study area. Standard management and mitigation procedures with respect to piling operations would be adopted as per *Underwater Piling Noise Guidelines* (Government of South Australia, 2012) and would be incorporated into the CEMP.

Additionally, there is an increased risk of vessel strike during construction, however this will be managed by incorporating go slow zones. With the above measures in place, the proposal is not likely to have an adverse effect on the life cycle of the species such that the local population of the species is likely to be placed at risk of extinction.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

    (a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

    (b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

3. *In relation to the habitat of a threatened species or ecological community:*

    (a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*

    (b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*

    (c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.*

During construction, demolition and construction activities would result in the direct loss of subtidal marine habitat (including rocky reef and seagrass), while the operational phase may also lead to a reduction in seagrass cover due to indirect effects of shading from the proposed boardwalk. The seagrass communities present within the biodiversity study area provide habitat for fish, the primary food source of the Little Penguin. However, there are extensive meadows of seagrass and other foraging habitat (foraging range can extend up to 30 kilometres) in the locality that will not be impacted by the works.

The sandstone escarpment near Federation Point near the biodiversity study area has historically been used for nesting, however targeted surveys did not indicate any evidence of recent use within the area. Furthermore the escarpment no construction work is anticipated in this area and therefore it would not be directly affected by the proposal.

Hence, the proposal is unlikely to remove, modify, fragment or isolate Little Penguin habitat from other areas of habitat as a result of the proposal. The small area of marine habitat modified is unlikely to be important to the long-term survival of the species.

4. *Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).*

The Little Penguin AOBV is not likely to be removed or modified as a result of the proposal as the biodiversity study area is more than 650 metres outside of Little Penguin AOBV. However, some behavioural effects may arise due to underwater noise, however mitigations measures to manage indirect impacts from underwater noise are discussed in Item 1 above.

5. *Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.*

A KTP is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. Key threatening processes are listed under the BC Act and at present, there are currently 38 listed KTPs under the BC Act. Broadly, the KTPs include threats to threatened species, population and ecological communities as well as causes which result in species, population or ecological communities to become threatened. No KTPs under the BC Act are applicable to Little Penguins and relevant to this assessment.

Conclusion

Provided that all mitigation controls identified in the MEMP and CEMP are adopted, the proposal is unlikely to have any significant direct or indirect impacts on Little Penguin population in the Manly Point Area.

Tree roosting bats Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) / Cave-roosting microbats (Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Little Bent-winged Bat (*Miniopterus australis*), Southern Myotis (*Myotis macropus*) - vulnerable (BC Act)

Eastern False Pipistrelles prefer hollows in Eucalypts usually over 20 m tall in wet sclerophyll forest and coastal mallee (Atlas of Living Australia, 2023a). Eastern Coastal Free-tailed Bats are known to roost and breed in dry Eucalypt Forest, wet sclerophyll forest and riparian habitat (Atlas of Living Australia, 2023b). Greater Broad-nosed Bats can occupy a range of habitat but are most frequently found in tall wet forests (NSW DPIE, 2022). The Eastern Coastal Free-tailed Bat also has been found to breed in mangrove forests while the breeding ecology of the Greater Broad-nosed Bat remains more obscure.

Large and Little Bent-winged Bats occur along the east coast of Australia and are known to roost in man-made structures such as caves, abandoned mines, bridges and culverts (NSW DPIE, 2019; NSW DPIE 2020b). The Southern Myotis is found in the coastal range from north-west of Australia and south to western Victoria (NSW DPIE, 2020a). The Southern Myotis is known to forage over water and also roost in man-made structures (NSW DPIE, 2020a).

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species or their habitats are outlined below:

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.*

The biodiversity study area does not occur within or next to any known maternity sites for these species thus, the proposal is unlikely to interfere with breeding. The proposal would remove some potential, suboptimal roosting habitat by removing the Sea Life building and existing timber jetty. Although suboptimal, individuals may reside within the structures and pre-clearance surveys would be undertaken prior to constructions work, with any individuals, if present, relocated to nearby suitable habitat according to a Microbat Management Plan) (MMP). The construction of the new boardwalk would provide similar, although suboptimal habitat for the species to potentially inhabit. The removal of a small amount of landscaped vegetation would temporarily remove some foraging habitat but is unlikely to affect foraging resources for these species in the wider locality. Furthermore, their nocturnal foraging times are unlikely to coincide with land-side construction during the day and most of these areas may reinstated following construction completion.

The proposal would create some disturbance over the water during water-side construction activities which would render this foraging habitat unavailable for the Southern Myotis during construction. However, the proposal would not substantially modify this foraging resource to permanently preclude it from the species foraging territory and upon completion of construction, this area would be once again available as foraging territory for the Southern Myotis. Furthermore, the proportion of potential habitat to be impacted by the proposal is very small compared to what is available in the wider locality. Thus, the proposal is unlikely to adversely affect the life cycle of these species such that a viable local population of the species is likely to be placed at risk of extinction.

2. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

    (a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

(b) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

3. In relation to the habitat of a threatened species or ecological community:

(a) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

(b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

(c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

The proposal would remove potential suboptimal roosting habitat for the species, and a small area of landscaped trees which may be relocated following the completion of construction. Although the Sea Life building and existing jetty is considered suboptimal, individuals may still reside in the man-made habitat features available. As discussed in Question 1, pre-clearance surveys will be undertaken prior to construction work, with individuals, if present relocated.

The biodiversity study area forms part of a fragmented landscape of urban, landscaped/modified vegetation and structures. The removal of this area of vegetation and the suboptimal habitat in the structures is not predicted to further fragment or isolate habitat for these species. Furthermore, better condition, landscaped habitat is likely to be restored following construction completion and similar structure would be installed rendering this disturbance to be temporary in most areas. As discussed in Question 1, water-side activities may render potential foraging habitat for the Southern Myotis unavailable during construction. However, this is not expected to be a surmountable impact to the species foraging range. Thus, proposal is also not going to substantially affect the foraging habitat for these species during construction and is unlikely to modify, fragment or isolate habitat important to the long-term survival of these species in the locality.

4. Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

This question is not applicable, as no AOBVs have been listed for these species.

5. Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community.

Of the KTPs listed under the BC Act, *Clearing of native vegetation* has the greatest potential to impact potential foraging habitat and suboptimal roosting habitat for these microbat species but is considered to impose only minimal impact on the total extent of potential habitat in the locality. Furthermore, the native vegetation to be cleared are landscaped vegetation and no remnant native vegetation would be impacted by the proposal.

Invasion and establishment of exotic vines and scramblers and *Invasion of native plant communities by exotic perennial grasses* may occur as a result of the proposal if weed controls are not implemented during and after the construction. However, weed invasion is

likely to be limited to groundcover grass and herbaceous weeds and these weeds are unlikely to greatly impact on these species.

Conclusion

Provided that all mitigation controls identified in the CEMP are adopted and a MMP is implemented (if present), the proposal is unlikely to have any significant direct or indirect impacts on the microbat species and a SIS is not recommended.

7-part test (FM Act)

White's Seahorse (*Hippocampus whitei*) – endangered (FM Act)

White's Seahorse has limited geographical distribution in Australia and is endemic to nine estuaries, coastal lakes and embayments from Wallis Lake in the north to Lake Illawarra in the south, along approximately 300 kilometre of the NSW coast (Harasti, et al., 2014). White's seahorse is known to occur at depths of between one and 15 metres and can be found in a wide range of habitat types (both natural and artificial). Natural habitat for White's Seahorse in estuaries includes marine vegetation (i.e. seagrass, macroalgae on rocky reef and mangroves) as well as sponges and corals (Australian Museum, 2019; Harasti, et al., 2014; Kuiter, 2009). In Sydney, they are often found associated with artificial structures, particularly protective swimming net enclosures and jetty pylons. Their use of artificial habitats appears to be most common in areas where natural habitat (such as seagrass, sponges and soft corals) has been lost (Fisheries Scientific Committee, 2019). The species is found to prefer habitats with dense epibiotic growth and avoids areas devoid of growth, possibly in relation to the greater availability of shelter and prey in these areas (Harasti, et al., 2010). Densities in artificial habitats such as swimming nets can be as much as one per square metre, but estimates in natural habitat have been around an order of magnitude less (Harasti, et al., 2012).

Data collected on breeding pairs found that White's Seahorse displays life-long monogamy, with three pairs observed remaining bonded over three consecutive breeding years (Harasti, et al., 2012). The breeding season for White's Seahorse extends between October to April (Australian Museum, 2019).

The existing piles and structures, tidal pool and Posidonia beds are considered to be suitable habitat for White's Seahorse. No individuals were found during targeted surveys, however being highly cryptic, the species is difficult to detect. A population of White's Seahorse is known to inhabit the Manly Cove tidal pool which part occurs in the biodiversity study area (Sea Dragon Diving Co. pers. com., 2022).

The following questions test whether a proposed development or activity is likely to significantly affect White's Seahorse:

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction*

The proposal will directly remove about 500 square meters (vertical area) of densely colonised artificial habitat which is considered to provide suitable habitat for White's Seahorse. The precise number of White's Seahorse with potential to be impacted by the proposal, although likely to be small, is uncertain. The loss of individuals from the removal of suitable habitat could affect the viability of local populations due to their monogamous breeding behaviour and site fidelity although the proportion of suitable habitat to be impacted is small relative to that available in the harbour. Targeted surveys by a suitably pre-qualified marine ecologist would be completed prior to the commencement of water-side construction activities to capture and relocate individuals to like-for-like habitat, as advised by NSW DPI Fisheries. The specific process and timing of this would be dictated by NSW DPI (Fisheries) and outlined in a Syngnathid Management Plan (SMP) incorporated into the Marine Ecology Management Plan (MEMP).

Additionally during construction, underwater noise from piling activities may also impact individuals that may reside in the biodiversity study area, however it is likely that ambient noise exists within the study locality due to commercial and recreational vessels. Standard management and mitigation procedures with respect to piling operations would be adopted as per *Underwater Piling Noise Guidelines* (Government of South Australia, 2012) and would be incorporated into the CEMP. With these measures place, the proposal is unlikely to

adversely affect the life cycle of the White's Seahorse such that a viable local population of the species is likely to be placed at risk of extinction.

2. *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.*

Not applicable.

3. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

    (a) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

    (b) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable.

4. *In relation to the habitat of a threatened species, population or ecological community:*

    (a) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

    (b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

    (c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the threatened species, population or ecological community in the locality

As indicated in above Item 1, White's Seahorse are generally associated with subtidal artificial structures which are present in the biodiversity study area. However, the optimal habitat and known populations are found elsewhere in the harbour (i.e. Manly Cove tidal pool) (Sea Dragon Diving Co. pers. com., 2022). The proposal would permanently remove about 500 square metres suitable subtidal artificial habitat for the White's Seahorse. During operation, the proposal would also shade a portion of subtidal rocky reef and seagrass which may lead to a change in assemblages in this small area. These are small proportions of potential habitat for the species in the biodiversity study area and the wider harbour. Furthermore, piles to be installed would form potential habitat for the species once habitat-forming species have colonised. Thus, although the proposal will remove potential habitat important for the long-term survival of the species, replacement habitat would be reinstated and habitat removal would not fragment or isolate potential habitat for the species in the harbour.

5. *Whether the proposed development or activity is likely to have an adverse effect on any critical habitat (either directly or indirectly)*

Critical habitat refers to those areas listed in the Register of Critical Habitat kept by NSW DPI (Fisheries). This question is not applicable, as no critical habitat has been listed for White's Seahorse.

6. *Whether the proposed development or activity is consistent with a recovery plan or threat abatement plan*

There is no recovery plan or Threat Abatement Plan (TAP) for this species. The Scientific Committee has recommended management actions for White's Seahorse, including:

- Collate and synthesise data collected to quantify the significance of high and moderate risk threat interactions with White's Seahorse (medium priority)
- Reduce the impact of public and private boat moorings that impact on White's Seahorse habitats (high priority)
- Councils to maintain best practice management of protective swimming nets by using the suggested NSW DPI seahorse friendly cleaning methods (high priority)
- Consider information on White's Seahorse distribution, abundance and habitat preferences during development and review of Marine Park Zoning Plans (medium priority)
- Negotiate with relevant authorities to encourage the identification, assessment and modification of natural resource management plans and policies to minimise impacts on White's Seahorse habitats (medium priority)
- Continue to monitor the distribution and abundance of White's Seahorse at important sites (Port Stephens and Sydney Harbour) to inform population status and to assist in determining the effectiveness of recovery actions (high priority)
- Develop and trial artificial habitats to promote recovery of White's Seahorse populations (high priority)
- Implement research using eDNA to investigate the occurrence of White's Seahorse in estuaries and embayments across its range (high priority)
- Implement genetics research to investigate population structure of White's Seahorse across its entire range (NSW and QLD) (medium priority)
- Encourage the reporting of sightings of seahorses along the east coast of Australia to iSeahorse and iNaturalist (medium priority).

The proposal would not interfere with any of the above recommendations. Targeted surveys during pre-construction to capture and relocate individuals could be completed in consultation with NSW DPI (Fisheries) to align with some of the above management recommendations (see Section 5).

7. Whether the proposed development constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

A KTP is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community.

The KTP of *Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams* (FM Act) is of relevance given instream structures would be placed in or adjacent to potential White's Seahorse habitat. These structures are unlikely to substantially alter nearshore natural tidal flow and therefore would not be exacerbated by the proposal to significantly impact White's Seahorse.

Conclusion

Provided that all mitigation controls identified in the MEMP and CEMP are adopted and a SMP is implemented, the proposal is unlikely to have any significant direct or indirect impacts on White's Seahorse and a SIS is not recommended.

Black Rockcod (*Epinephelus daemelii*) – endangered (FM Act)

Black Rockcod, also known as Black Cod or Saddled Rockcod, occurs from southern Queensland to Kangaroo Island in South Australia and are found offshore at Lord Howe Island, Norfolk Island, Kermadec Islands and the North Island of New Zealand (Heemstra & Randall, 1993). New South Wales is the centre of the species distributional range in Australia. They are protogynous hermaphrodites (i.e. change sex from female to male) and at the time of spawning, males establish a harem within their territory. Black Rockcod are opportunistic carnivores, eating mainly other fish and crustaceans.

Black Rockcod are mostly found in caves and gutters in coastal areas. Dispersal of eggs is thought to be pelagic and juveniles can recruit to rockpools (Griffiths, 2002). Adults are highly territorial, usually adopting a cave as core territory. Black Rockcod have been observed by divers or caught by anglers in estuaries, including Sydney Harbour. Although the locations of these occurrences have generally been at the mouths of estuaries and involved juvenile fish, there is anecdotal evidence that Black Rockcod have been caught in embayments of the harbour.

The medium/high relief rocky reef is considered to be suitable habitat for the Black Rockcod. No individuals were found during targeted surveys undertaken Stantec in November 2022.

The following questions test whether a proposed development or activity is likely to significantly affect Black Rockcod:

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction*

The few individuals that may occur are more likely to be part of one or many populations in nearby coastal areas. Since any Black Rockcod in the harbour are likely to form a very small proportion of a viable population of the species, and with the appropriate proposal controls to complete targeted surveys for individuals and encouraging them to vacate the biodiversity study area prior to water-based construction activities, proposal impacts would be negligible.

Although it is anticipated that individuals in the biodiversity study area would likely move away from the disturbance and seek refuge elsewhere during construction, the proposal will produce underwater noise and vibration during construction (mainly from piling) which may affect individuals if present. Standard management and mitigation procedures with respect to piling operations would be adopted as per Underwater Piling Noise Guidelines (Government of South Australia, 2012) and would be incorporated into the MEMP.

With these mitigation measures in place, the proposal impacts are considered negligible and would not affect the viability of local populations such that the species is placed at risk of extinction.

2. *In the case of an endangered population, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction*

Not applicable for a threatened species.

3. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

    (a) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

    (b) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

Not applicable for a threatened species.

4. *In relation to the habitat of a threatened species, population or ecological community:*

    (a) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

    (b) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

    (c) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the threatened species, population or ecological community in the locality

    As discussed above, Black Rockcod are mostly found in caves and gutters in coastal areas. Dispersal of eggs is thought to be pelagic and juveniles can recruit to rockpools (Griffiths, 2002). Adults are highly territorial, usually adopting areas of high relief rocky reef, such as a cave, for core territory. Although very few, if any, Black Rockcod may occur in suitable suboptimal habitat within the biodiversity study area now, more individuals may have occurred there in the past when the species was more prevalent, as there are past reports of many large individuals being caught in estuaries (NSW Department of Industry and Investment, 2009). In the future, if populations of Black Rockcod were to recover, the artificial structure areas in the study area may again become more commonly occupied.

    Black Rockcod are known to occur in estuaries, particularly on medium to high relief rocky reefs. The proposal would remove 62 square metres of subtidal rocky reef and 500 square metres of densely colonised artificial habitat on piles and the seawall. During operation, the proposal will also shade 211 square meters of subtidal rocky reef. Indirect disturbance from underwater construction noise and vibration, vessel/barge traffic and anchoring are likely to occur during construction. The area of habitat removal is not considered to be substantial enough to fragment or isolate Black Rockcod habitat and the disturbance in the biodiversity study area would be temporary. Individuals would likely move away to similar abundant habitat in the locality, and return once the disturbance has ceased.

    Shading of a small portion of subtidal rocky reef habitat could trigger changes to community assemblages in this area. However, the removal of the existing structure is likely to encourage macroalgae to recolonise a similar area to the newly shaded area (under the existing boardwalk), inherently providing alternative habitat. With the proposal controls discussed in Question 1 in place, the proposal is not likely to fragment or isolate habitat important to the long-term survival of the species.

5. *Whether the proposed development or activity is likely to have an adverse effect on any critical habitat (either directly or indirectly)*

    Critical habitat refers only to those areas listed in the Register of Critical Habitat kept by NSW DPI (Fisheries). This question is not applicable, as no critical habitat has been listed for Black Rockcod.

6. *Whether the proposed development or activity is consistent with a recovery plan or threat abatement plan*

State and Commonwealth recovery plans have been developed for the Black Rockcod. The specific objectives of the Commonwealth recovery plan are to:

- Mitigate medium and high risk threats to Black Rockcod
- Initiate and support scientific research to increase knowledge of the distribution, abundance, reproductive biology, life history, ecology, migratory patterns and genetics of Black Rockcod

- Monitor fishery management strategies where necessary to reduce potential for interaction with Black Rockcod (either directly or indirectly)
- Establish an on-going monitoring program to document the status of Black Rockcod populations and their habitats and to evaluate the effectiveness of recovery actions
- Provide enhanced compliance and protection for important Black Rockcod habitats
- Educate the community about the identification of Black Rockcod, increase awareness of the status of and threats to Black Rockcod populations, and enhance community support for recovery actions
- Improve understanding of the threats to the survival of Black Rockcod and contribute to management actions to ameliorate identified threats.

The key objectives of the recovery plan are to mitigate medium and high risk threats to Black Rockcod. Included among these risks are the loss or degradation of estuarine and intertidal nursery habitats. As the proposal would temporarily impact a very small proportion of Black Rockcod suboptimal habitat in the harbour, it is not considered a substantial loss or degradation of estuarine habitat. Thus, the proposal is not considered to interfere with any recovery objectives for the Black Rockcod.

7. *Whether the proposed development constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

A KTP is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community.

The KTP of *Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams* (FM Act) is of relevance given instream structures would be placed in or adjacent to Black Rockcod habitat. However, these structures are unlikely to substantially alter nearshore natural tidal flow and therefore would not be exacerbated by the proposal to impact Black Rockcod.

Conclusion

Provided that all mitigation controls identified in the MEMP and CEMP are adopted, the proposal is unlikely to have any significant direct or indirect impacts on Black Rockcod and a SIS is not recommended.

Posidonia australis seagrass in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie - endangered population under the FM Act

Posidonia australis (Posidonia), is widespread, subtidally in temperate and cool-temperate marine waters of south-eastern, southern and south-western Australia (Fisheries Scientific Committee 2010). The largest meadows of Posidonia are generally found on soft sedimentary environments within the protected waters of marine bays and marine dominated coastal lakes. Posidonia, along with other seagrasses, is an important driver of fisheries productivity in coastal waters and is crucial to the maintenance of estuarine biodiversity. It provides important feeding and refuge areas for many species of fish, molluscs and crustaceans, many of which are targeted commercially and recreationally.

Around 1,082 square metres of mixed Posidonia was recorded in the biodiversity study area.

The following questions test whether a proposed development or activity is likely to significantly affect Posidonia:

1. *In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction*

Not applicable

2. *In the case of an endangered population, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction*

Around 1,082 square metres of mixed Posidonia was recorded in the biodiversity study area. With the nearest meadow about 3 metres from the nearest proposed boardwalk pile impact area. The proposal would not cause any direct impact to these beds, however, there is potential for indirect impacts via the mobilisation of suspended sediments during the construction phase (i.e. through pile driving and movements from work barges/vessels).

Suspended sediments could potentially impact Posidonia by light attenuation (reducing photosynthesis) and or smothering if sediments settled onto the Posidonia beds. However, any risks to Posidonia would largely mitigated via sediment control devices such as sediment booms and curtains.

Work barges or vessels involved in the construction works will also not be permitted to anchor in any seagrass beds or cause prolonged shading over seagrass beds including Posidonia. Furthermore, all personnel and vessels are to be made aware of the importance of seagrasses and macroalgae and their location in relation to the works. Risk of pollution via vessel spills would also be mitigated via appropriate controls and impact reduction measures.

With mitigation measures in place, it is unlikely that the local population of Posidonia will be placed at risk of extinction.

3. *In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

    (a) *is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*

    (b) *is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction*

Not applicable.

4. *In relation to the habitat of a threatened species, population or ecological community:*

(a) *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*

(b) *whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*

(c) *the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the threatened species, population or ecological community in the locality*

As discussed in Question 2, current populations of Posidonia will be not be removed, modified, fragmented or isolated to the extent that it would affect the long term survival of the population. There is opportunity to increase the area of Posidonia as part of the future operation of the proposal.

5. *Whether the proposed development or activity is likely to have an adverse effect on any critical habitat (either directly or indirectly)*

Critical habitat refers only to those areas listed in the Register of Critical Habitat kept by NSW DPI (Fisheries). This question is not applicable, as no critical habitat has been listed for Posidonia.

6. *Whether the proposed development or activity is consistent with a recovery plan or threat abatement plan*

Recovery actions for this species include:

- conducting research into the biology and ecology of *Posidonia australis* including cultivation and rehabilitation techniques
- promoting the replacement of existing moorings within seagrass beds to environmentally friendly moorings
- avoiding the establishment of new mooring blocks in proximity to *Posidonia australis* plants
- educating boat owners to avoid anchoring in or mooring boats over fragile *Posidonia australis* beds
- improving protection for *Posidonia australis* through land use and coastal zone management planning processes
- ensuring that structures such as jetties, pontoons, berthing areas, boat ramps and slip rails and their associated use avoid shading or physical damage to *Posidonia australis* beds
- ensuring that dredging and reclamation activities do not directly or indirectly damage *Posidonia australis* beds
- preventing sedimentation and poor water quality by improving land management practices, conserving and restoring riparian (river bank) vegetation and using effective erosion control measures
- educating coastal communities about the ecological importance of *Posidonia australis* and ways to assist with its protection and recovery
- monitoring and assessing the impact of threatening processes affecting the survival of endangered populations of *Posidonia australis*
- undertaking compliance action where activities cause unauthorised harm to *Posidonia australis* seagrass.

Providing that the sediment control measures and work barge management measures identified are adopted, then it would be ensured that the proposal would not directly or indirectly damage Posidonia beds. The proposal would not therefore interfere with any of the above recommendations

7. *Whether the proposed development constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.*

A KTP is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population or ecological community. There are no KTPs relevant to the proposal that have potential to impact on *Posidonia australis*.

Conclusion

Provided that all mitigation controls identified in the MEMP and CEMP are adopted, the proposal is unlikely to have any significant direct or indirect impacts on the endangered population of *Posidonia australis* seagrass in Port Hacking, Botany Bay, Sydney Harbour, Pittwater, Brisbane Waters and Lake Macquarie. A SIS is not recommended.

Significant impact assessment (EPBC Act)

White's Seahorse (*Hippocampus whitei*) – endangered (EPBC Act)

White's Seahorse has limited geographical distribution in Australia and is endemic to nine estuaries, coastal lakes and embayments from Wallis Lake in the north to Lake Illawarra in the south, along approximately 300 kilometre of the NSW coast (Harasti, et al., 2014). White's seahorse is known to occur at depths of between one and 15 metres and can be found in a wide range of habitat types (both natural and artificial). Natural habitat for White's Seahorse in estuaries includes marine vegetation (i.e. seagrass, macroalgae on rocky reef and mangroves) as well as sponges and corals (Australian Museum, 2019; Harasti, et al., 2014; Kuiter, 2009). In Sydney, they are often found associated with artificial structures, particularly protective swimming net enclosures and jetty pylons. Their use of artificial habitats appears to be most common in areas where natural habitat (such as seagrass, sponges and soft corals) has been lost (Fisheries Scientific Committee, 2019). The species is found to prefer habitats with dense epibiotic growth and avoids areas devoid of growth, possibly in relation to the greater availability of shelter and prey in these areas (Harasti, et al., 2010). Densities in artificial habitats such as swimming nets can be as much as one per square metre, but estimates in natural habitat have been around an order of magnitude less (Harasti, et al., 2012).

Data collected on breeding pairs found that White's Seahorse displays life-long monogamy, with three pairs observed remaining bonded over three consecutive breeding years (Harasti, et al., 2012). The breeding season for White's Seahorse extends between October to April (Australian Museum, 2019).

The existing piles and structures, tidal pool and Posidonia beds are considered to be suitable habitat for White's Seahorse. No individuals were found during targeted surveys, however being highly cryptic, the species is difficult to detect. A population of White's Seahorse is known to inhabit the Manly Cove tidal pool which part occurs in the biodiversity study area (Sea Dragon Diving Co. pers. com., 2022).

An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:

(a) Lead to a long-term decrease in the size of an important population of a species

The proposal will directly remove about 500 square meters (vertical area) of densely colonised artificial habitat which is considered to provide suitable habitat for White's Seahorse. The precise number of White's Seahorse with potential to be impacted by the proposal, although likely to be small, is uncertain. The loss of individuals from the removal of suitable habitat could affect the viability of local populations due to their monogamous breeding behaviour and site fidelity although the proportion of suitable habitat to be impacted is small relative to that available in the harbour. Targeted surveys by a suitably pre-qualified marine ecologist would be completed prior to the commencement of water-side construction activities to capture and relocate individuals to like-for-like habitat, as advised by NSW DPI Fisheries. The specific process and timing of this would be dictated by NSW DPI (Fisheries) and outlined in a Syngnathid Management Plan (SMP) incorporated into the MEMP as part of the CEMP.

Additionally during construction, underwater noise from piling activities may also impact individuals that may reside in the biodiversity study area, however it is likely that ambient noise exists within the study locality due to commercial and recreational vessels. Standard management and mitigation procedures with respect to piling operations would be adopted as per Underwater Piling Noise Guidelines (Government of South Australia, 2012) and would be incorporated into the MEMP.

(b) Reduce the area of occupancy of the species

As indicated in above, White's Seahorse are generally associated with subtidal artificial structures which are present in the biodiversity study area. However, the optimal habitat and known populations are found elsewhere in the harbour (i.e. Manly Cove tidal pool) (Sea Dragon Pty Ltd). The proposal would permanently remove about 500 square metres suitable subtidal artificial habitat for the White's Seahorse. This area is considered small proportions of potential habitat for the species in the study locality and the wider harbour. The new piles to be installed would form potential habitat once habitat-forming species have colonised. The surface area of the newly installed piles would amount to a similar area than that to be removed. The small loss of this specific area would not remove other areas from occupancy by the White's Seahorse as these areas are still available as transit or dispersal areas for the species. Thus, the proposal is unlikely to reduce the area of occupancy of the White's Seahorse.

(c) Fragment an existing population into two or more populations

As indicated in (a) and (b), the White's Seahorse habitat occurs in nearshore areas in the harbour. This species exhibits high site fidelity and does not have a pelagic juvenile stage. Young are known to either disperse short distances from or simply settle at the birth site. Although high abundances of this species are not known to occur on the subtidal timber jetty piles and seawall there are multiple known locations in the harbour where juveniles may disperse from. However, the proposal is not expected to install any structures or alter ferry operations such that potential dispersal corridors along the foreshore would become fragmented or isolated. Thus, the proposal is unlikely to fragment an existing population of White's Seahorse in the harbour into two or more populations.

(d) Adversely affect habitat critical to the survival of a species

Habitat critical to the survival of a species refers to areas that are necessary for activities such as:

- Foraging, breeding, roosting, or dispersal
- For the long-term maintenance of the species including the maintenance of other species essential to the survival of the species, such as pollinators
- To maintain genetic diversity and long-term evolutionary development, or
- For the reintroduction of populations or recovery of the species.

See (a) and (b). The proposal has potential to alter habitat for the species. However, a portion of lost habitat would be reinstated and the remaining habitat would be altered but still be available and considered a potential area of occupancy. Thus, the proposal is unlikely to adversely affect habitat critical to the survival of the White's Seahorse.

(e) Disrupt the breeding cycle of a population

Research found that White's Seahorse displays life-long monogamy, with three pairs observed remaining bonded over three consecutive breeding years (Harasti, et al., 2012). Thus, the loss of any individuals would disrupt the breeding cycle of White's Seahorse. No individuals are expected to be lost as a result of the proposal (see (a)). Any individuals occurring within the MWA would be collected and relocated prior to construction by a suitably qualified marine ecologist using researched methods to avoid disruption to their lifecycle. Habitat would be selected by a marine ecologist and individuals would only be relocated to nearby, like-for-like habitat, as advised by NSW DPI (Fisheries). The specific process and timing of this would be dictated by NSW DPI (Fisheries) and outlined in a Syngnathid Management Plan (SMP) incorporated into the MEMP as part of the CEMP. Hence, the proposal is unlikely to disrupt the breeding cycle of a population.

(f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

See (b) and (c). The proposal is unlikely to modify, destroy, remove or isolate or decrease the availability of quality of habitat to the extent that the White's Seahorse is likely to decline.

(g) Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat

Use of equipment and movement of vessels and barges have potential to act as vectors for introduced species. Invasive species that would alter White's Seahorse habitat could be introduced via the aforementioned vectors however, proposal controls would be in place to avoid introducing or spreading invasive species. Thus, the proposal is unlikely to introduce or spread invasive species that are harmful to White's Seahorse.

(h) Introduce disease that may cause the species to decline

As per (g).

(i) Interfere substantially with the recovery of the species

There is currently no recovery plan or recommendations for a recovery plan for the White's Seahorse. When this species was initially nominated for listing under the EPBC Act, the Fisheries Scientific Committee had recommended management actions for the White's Seahorse, including:

- Collate and synthesise data collected to quantify the significance of high and moderate risk threat interactions with White's Seahorse (medium priority)
- Reduce the impact of public and private boat moorings that impact on White's Seahorse habitats (high priority)
- Councils to maintain best practice management of protective swimming nets by using the suggested NSW DPI seahorse friendly cleaning methods (high priority)
- Consider information on White's Seahorse distribution, abundance and habitat preferences during development and review of Marine Park Zoning Plans (medium priority)
- Negotiate with relevant authorities to encourage the identification, assessment and modification of natural resource management plans and policies to minimise impacts on White's Seahorse habitats (medium priority)
- Continue to monitor the distribution and abundance of White's Seahorse at important sites (Port Stephens and Sydney Harbour) to inform population status and to assist in determining the effectiveness of recovery actions (high priority)
- Develop and trial artificial habitats to promote recovery of White's Seahorse populations (high priority)
- Implement research using eDNA to investigate the occurrence of White's Seahorse in estuaries and embayments across its range (high priority)
- Implement genetics research to investigate population structure of White's Seahorse across its entire range (NSW and QLD) (medium priority)
- Encourage the reporting of sightings of seahorses along the east coast of Australia to iSeahorse and iNaturalist (medium priority).

The proposal would not interfere with any of the above recommendations. Targeted surveys during pre-construction to capture and relocate the species could be completed in consultation with NSW DPI (Fisheries) to align with some of the above management recommendations.

Conclusion

Provided that all mitigation controls identified in the MEMP and CEMP are adopted and a SMP is implemented, the proposal is unlikely to have any significant direct or indirect impacts on White's Seahorse and an EPBC referral is not recommended.

Black Rockcod (*Epinephelus daemelii*) – vulnerable (EPBC Act)

Black Rockcod, also known as Black Cod or Saddled Rockcod, occurs from southern Queensland to Kangaroo Island in South Australia and are found offshore at Lord Howe Island, Norfolk Island, Kermadec Islands and the North Island of New Zealand (Heemstra & Randall, 1993). New South Wales is the centre of the species distributional range in Australia. They are protogynous hermaphrodites (i.e. change sex from female to male) and at the time of spawning, males establish a harem within their territory. Black Rockcod are opportunistic carnivores, eating mainly other fish and crustaceans.

Black Rockcod are mostly found in caves and gutters in coastal areas. Dispersal of eggs is thought to be pelagic and juveniles can recruit to rockpools (Griffiths, 2002). Adults are highly territorial, usually adopting a cave as core territory. Black Rockcod have been observed by divers or caught by anglers in estuaries, including Sydney Harbour. Although the locations of these occurrences have generally been at the mouths of estuaries and involved juvenile fish, there is anecdotal evidence that Black Rockcod have been caught in embayments of the harbour.

The medium/high relief rocky reef is considered to be suitable habitat for the Black Rockcod. No individuals were found during targeted surveys undertaken Stantec in November 2022.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

(a) Lead to a long-term decrease in the size of an important population of a species

Although the species may have been prevalent in estuaries in the past (NSW Department of Industry and Investment, 2009), it is unlikely that viable populations of Black Rockcod currently occur in the estuary but rather a few individuals that occur would form part of one or many important populations in nearby coastal areas. Any Black Rockcod in the harbour are likely to form a very small proportion of an important population of the species, and appropriate proposal controls to complete targeted surveys for individuals prior to water-based construction activities so that individuals could be encouraged away from the biodiversity study area, would be implemented. Standard management and mitigation procedures with respect to piling operations would be adopted as per Underwater Piling Noise Guidelines (Government of South Australia, 2012) and would be incorporated into the MEMP.

Thus, proposal impacts would unlikely impact the species such that an important population of the species would experience a long-term decrease in size.

(b) Reduce the area of occupancy of an important population

As indicated in (a), Black Rockcod are mostly found in caves and gutters in coastal areas thus, the small number of individuals in the harbour are likely to form part of an important population in nearby coastal areas. There is subtidal rocky reef habitat in the biodiversity study area which can form habitat for the species although the availability of gutters and caves may be limited compared to high relief reef habitat further south along Federation Point and elsewhere in the harbour. The proposal would permanently remove 62 square metres of subtidal rocky reef habitat to support the new boardwalk and remove potential transient artificial habitat on the seawall and piles (500 square metres) which the species may use to forage.

Since any Black Rockcod in the harbour are likely to form a very small proportion of a viable population of the species, and with the appropriate controls to complete targeted surveys for individuals prior to water-based construction activities to encourage any individuals in the study areas to vacate, proposal impacts would likely be negligible and would not disrupt the breeding cycle of an important population.

(c) Fragment an existing important population into two or more populations

As indicated in (a), the small number of individuals in the harbour are likely to form part of an important population in nearby coastal areas. The occupancy of these individuals in the harbour are likely to mostly surround medium to high relief rocky reef areas, as refuges, and open water as transiting areas. The proposal would not install any structures or remove substantial areas of important habitat to fragment important populations of Black Rockcod as connectivity in the biodiversity study area and the wider harbour would be maintained.

(d) Adversely affect habitat critical to the survival of a species

See (b).

(e) Disrupt the breeding cycle of an important population

Black Rockcod are protogynous hermaphrodites (i.e. change sex from female to male) and at the time of spawning males establish a harem within their territory. Dispersal of eggs is thought to be pelagic and juveniles can recruit to rockpools (Griffiths, 2002). As indicated in (a), Black Rockcod in the harbour are likely to form part of an important population in nearby coastal areas. The habitat in the biodiversity study area is a small proportion of habitat potentially occupied by the species in its breeding cycle. Since any Black Rockcod in the harbour are likely to form a very small proportion of a viable population of the species, and with the appropriate proposal controls discussed in item (b), proposal impacts would be negligible and are not considered to disrupt the breeding cycle of an important population.

(f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

See (b) and (c).

(g) Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Use of equipment and movement of vessels and barges have potential to act as vectors for introduced species. However, there are no known invasive species that could be introduced that could directly cause Black Rockcod to decline. Invasive species that cwould alter Black Rockcod habitat could be introduced via the aforementioned vectors however, proposal controls would be in place to avoid introductions. Thus, the proposal is unlikely to introduce or spread invasive species that are known to be harmful to Black Rockcod.

(h) Introduce disease that may cause the species to decline

As per (g).

(i) Interfere substantially with the recovery of the species

State and Commonwealth recovery plans have been developed for the Black Rockcod. The specific objectives of the Commonwealth recovery plan are to:

- Mitigate moderate and high risk threats to Black Rockcod
- Initiate and support scientific research to increase knowledge of the distribution, abundance, reproductive biology, life history, ecology, migratory patterns and genetics of Black Rockcod
- Monitor fishery management strategies where necessary to reduce potential for interaction with Black Rockcod (either directly or indirectly)
- Establish an on-going monitoring program to document the status of Black Rockcod populations and their habitats and to evaluate the effectiveness of recovery actions
- Provide enhanced compliance and protection for important Black Rockcod habitats
- Educate the community about the identification of and 'best practice' catch and release methods for Black Rockcod, increase awareness of the status of and threats to Black Rockcod populations, and enhance community support for recovery actions

- Improve understanding of the threats to the survival of Black Rockcod and contribute to management actions to ameliorate identified threats.

The key objectives of the recovery plan are to mitigate medium and high risk threats to Black Rockcod. Included among these risks are that juvenile Black Rockcod are impacted by the loss or degradation of estuarine and intertidal nursery habitats. As the project would impact a small proportion of suitable Black Rockcod habitat in the estuary, and be temporary in nature, it is not considered a substantial loss or degradation of estuarine habitat. Thus, the project is not considered to interfere with any recovery objectives for the Black Rockcod.

Conclusion

Provided that all mitigation controls identified in the MEMP and CEMP are adopted, the proposal is unlikely to have any significant direct or indirect impacts on Black Rockcod and an EPBC referral is not recommended.

Appendix D - Statement of Heritage Impact

artefact

Memo: Manly Sea Life Stage 1 Assessment

Project: Manly Sea Life Stage 1	**Date: 25/03/2024**
To: Belinda Crichton, Senior Principal – Environmental Scientist, Stantec	**From:** Sarah-Jane Zammit, Senior Associate, Artefact

INTRODUCTION

Project Background

Transport for NSW (TfNSW) is seeking to demolish the redundant former Manly Sea Life Building on Manly Cove West and to renew and revitalise the adjacent boardwalk.

The former Manly Sea Life Building is located directly adjacent to the State Heritage Register (SHR) listed Manly Pavilion (SHR number 01433) and locally heritage listed Manly Cove Amenities Block (Manly LEP 2013 item number I250).

Artefact Heritage (Artefact) were engaged by Stantec on behalf of TfNSW to produce a non-Aboriginal Statement of Heritage Impact (SoHI) to accompany the Review of Environmental Factors (REF) application to assess the impact of the Manly Sea Life demolition on the surrounding heritage context.

The aim of the SoHI was to identify any potential impacts of the proposed works on the significance of the adjacent locally listed items, recommend mitigation measures to reduce the level of heritage impact of the proposed works and to identify management and statutory obligations.

In December 2023, it was decided that the proposed works would be divided into two stages as follows:

- Stage 1 – demolition of the former Manly Sea Life Building to promenade level
- Stage 2 – finalisation of work including structural works below the promenade level, removal of the existing jetty and planning is still underway for the revitalisation of the space.

The work has been staged to ensure the demolition of the former Manly Sea Life Building proceeds as soon as possible as the existing building is in poor repair and poses a public safety risk. Details of the Stage 2 work would be confirmed following detailed design and would be subject to a separate environmental assessment.

This memo is prepared to identify any potential impacts of the proposed works as part of Stage 1 on the significance of the adjacent locally listed items, recommend mitigation measures to reduce the level of heritage impact of the proposed works and to identify management and statutory obligations.

Study area

The Manly Sea Life Building is located on the Manly Cove foreshore, off the West Esplanade in Manly (Figure 1). The site sits within the Manly local government area (LGA).

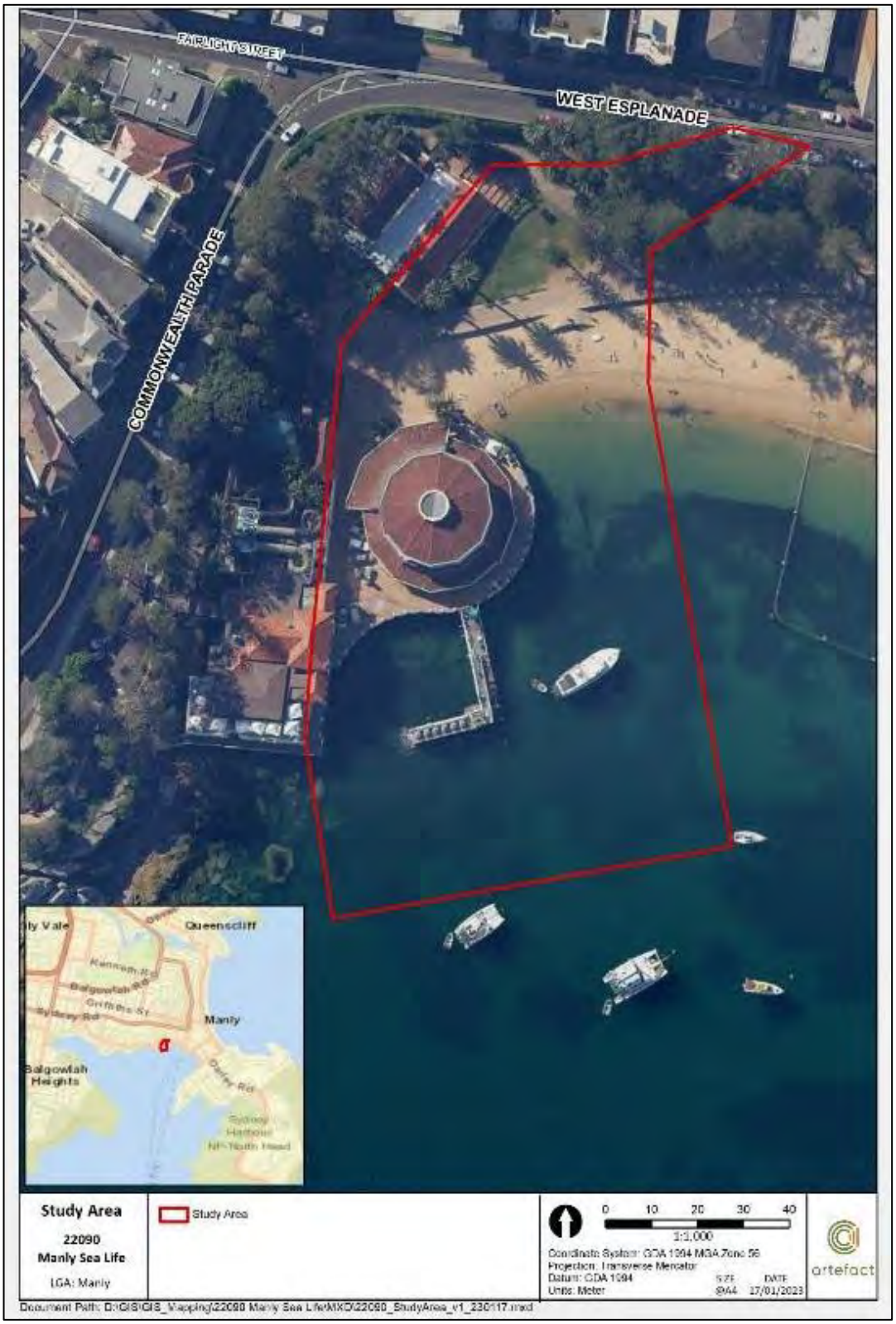


Figure 1: Manly Sea Life Building works study area

Limitations

The memo assesses the non-Aboriginal impacts of the demolition of the Manly Sea Life Building only. This memo does not include an assessment of Aboriginal cultural heritage values and archaeology, or maritime archaeological impacts of the proposed works in Stage 1. A detailed assessment of archaeological impacts would be undertaken and provided as part of Stage 2 works.

Legislative Context

The study area comprises the Manly Sea Life Building, which is not listed on any heritage registers however it is located adjacent to various locally and state listed items as outlined in Table 1. The Manly Sea Life Building is located adjacent to Manly Pavilion, which is also a heritage item listed on registers. The curtilages of these items are illustrated in Figure 2.

Table 1: Results of register searches for the Manly Sea Life and heritage items in the vicinity (200m radius).

Register	Manly Sea Life	Other items
World Heritage List	Not listed	No items listed
National Heritage List	Not listed	No items listed
Commonwealth Heritage List	Not listed	No items listed
State Heritage Register	Not listed	• Manly Cove Pavilion SHR #01433 • Manly Wharf SHR #01434
Section 170 Registers (NSW Transport Asset Holding Entity [formerly RailCorp] s170)	Not listed	• Manly Cove Pavilion, Dressing Pavilion and Amenities Block (item ID 4920001) is under review for s170 register listing • Manly Wharf (item ID 4920067) is listed on RMS s170 heritage register

Register	Manly Sea Life	Other items
Manly LEP 2013	Not listed	• Harbour Foreshore LEP #I1 • All Stone Kerbs LEP #I2 • Residential Flat Building 'Hilder Lea' LEP #I98 • House LEP #I115 • Manly Wharf LEP #I145 • Auckland Garage Building (former service station) LEP #I156 • Reserve Park LEP #I237 • Governor Phillip Monument LEP #I248 • Manly Cove Pavilion LEP #I249 • Manly Cove Amenities block LEP #I250 • Park LEP #I251 • Residential Flat Buildings LEP #I252 • House LEP #I92 • House, "Loldis" LEP #I235 • Uniting Church LEP #I253
SEPP (Biodiversity and Conservation) 2021	Not listed	• Manly Wharf, listing number 52 •
Register of the National Estate (RNE) (Non-Statutory)	Not listed	• Manly Reservoir R64 RNE Listing number 102238
National Trust of Australia (NT) NSW Register (Non-Statutory)	Not listed	• Earls Court Hotel Item ID 7360 • Hotel Manly Formerly Pier Hotel Item ID 7949 • Esplanade Park Fairlight, Item ID 7478

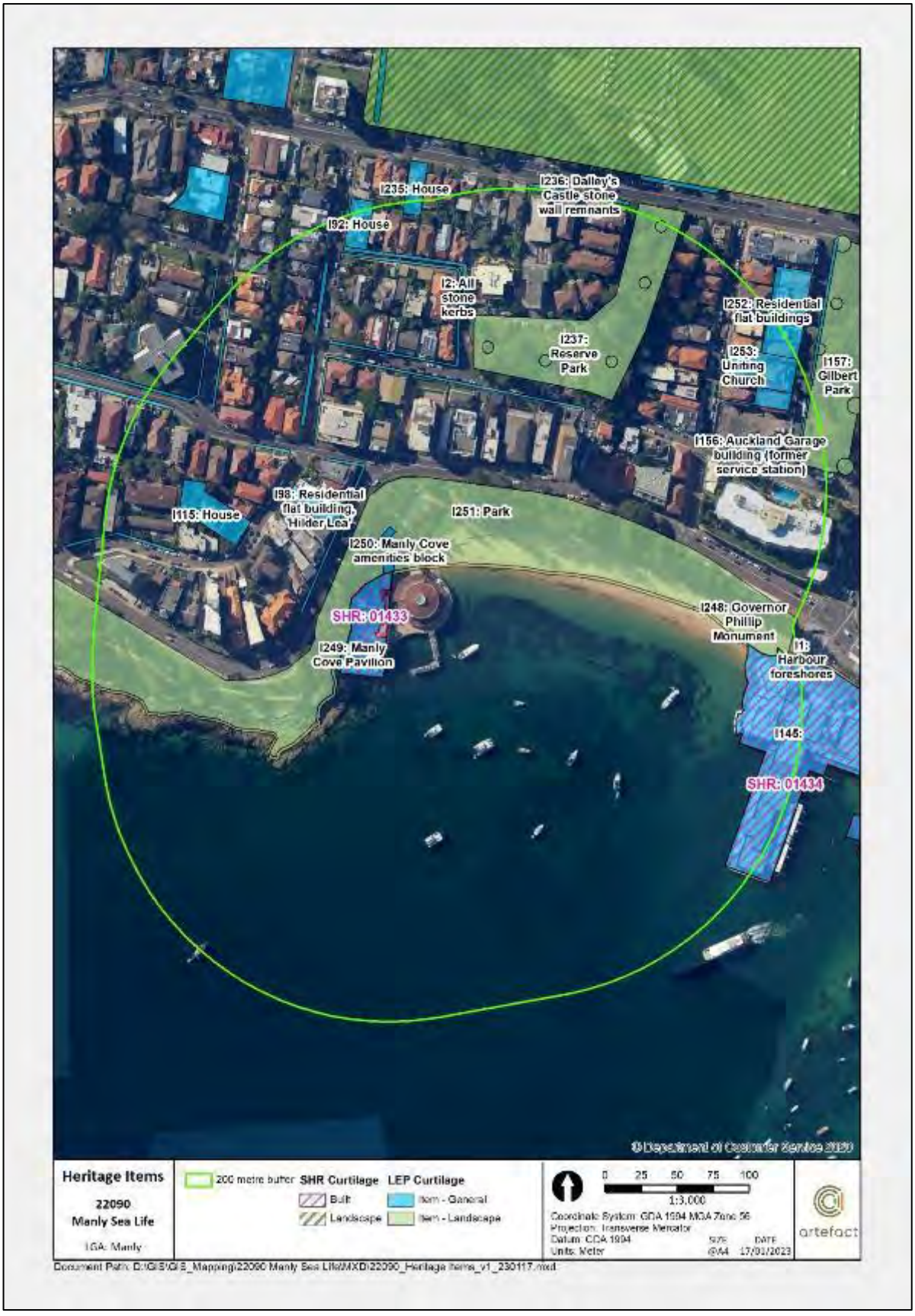


Figure 2: SHR and Manly LEP items within the vicinity (200m radius) of Manly Sea Life (Source: Artefact, 2023).

HISTORICAL BACKGROUND

Aboriginal historical context

The cove on which the study area now stands was named Kay-yee-my in the local Aboriginal dialect.[1] Although the exact name of the Aboriginal group that originally inhabited the land (and gave it its name) is unknown, they cared for Country for tens of thousands of years. The open forests that once surrounded Kay-yee-my were criss-crossed by Aboriginal trackways – a prominent trackway ran north from Kay-yee-my to Broken Bay via the Palm Beach peninsula and is recorded on William Dawes' 1791 map of Sydney (Figure 3).



Figure 3. Detail of William Dawes' map of Sydney, 1791. Note northern trackway beginning near study area. (Source: National Library of Australia).[2]

[1] Karskens, 2015.
[2] Accessed via Trove <http://nla.gov.au/nla.obj-230635598>.

Non-Aboriginal History

Early non-Aboriginal land grants and colonisation

The earliest noted European observation of Manly occurred on 21st January 1788, when Captain Arthur Phillip led the First Fleet north from Botany Bay to Port Jackson. Phillip named the cove 'Manly' for the 'confidence and manly nature' of the Aboriginal men he witnessed ashore.[3] On 1 January 1810, the first European land grants at Manly Cove were allocated to Richard Cheers, who received 100 acres of land, and Gilbert Baker, who received 30 acres.[4] Cheers and Baker's land, which comprised much of the area to the east of the Corso, were purchased by D'Arcy Wentworth in 1818.[5] Upon Wentworth's death, the land passed on to his daughter Katherine, with whom it remained until the 1870s.[6]

Development at Manly was comparatively slow to occur (Figure 4). In 1836, the town was little more than a collection of huts that housed the camp of fourteen convicts who were clearing North Head for the establishment of the Quarantine Station.[7] In 1842, John Thompson was granted 100 acres of land at the eastern extent of Manly Cove – the study area falls within Thompson's grant (Figure 5).[8] John Thompson appears not to have developed the land and sold his estate by 1853 Henry Gilbert Smith, around the time of Thompson's appointment to Deputy Surveyor-General in 1853.[9]



Figure 4. Painting of Manly Cove, c. 1840s. Approximate study area in red (Source: State Library of NSW).[10]

[3] Phillip, 1789 [2003].
[4] Metherell, T. 2009. 'Manly's Stone Quarries, c1850-1940'. *Manly Local Studies.* MC/14/2667. March 2009, p. 1.
[5] NBRS&P, 2002: 9.
[6] NBRS&P, 2002: 9.
[7] NBRS&P, 2002: 10.
[8] *Sydney Herald*, 10 Mar 1842: 2.
[9] Accessed via the Dictionary of Sydney <https://dictionaryofsydney.org/contributor/thompson_john>.
[10] Accessed via State Library of NSW <https://collection.sl.nsw.gov.au/record/9NaAKz5Y>.

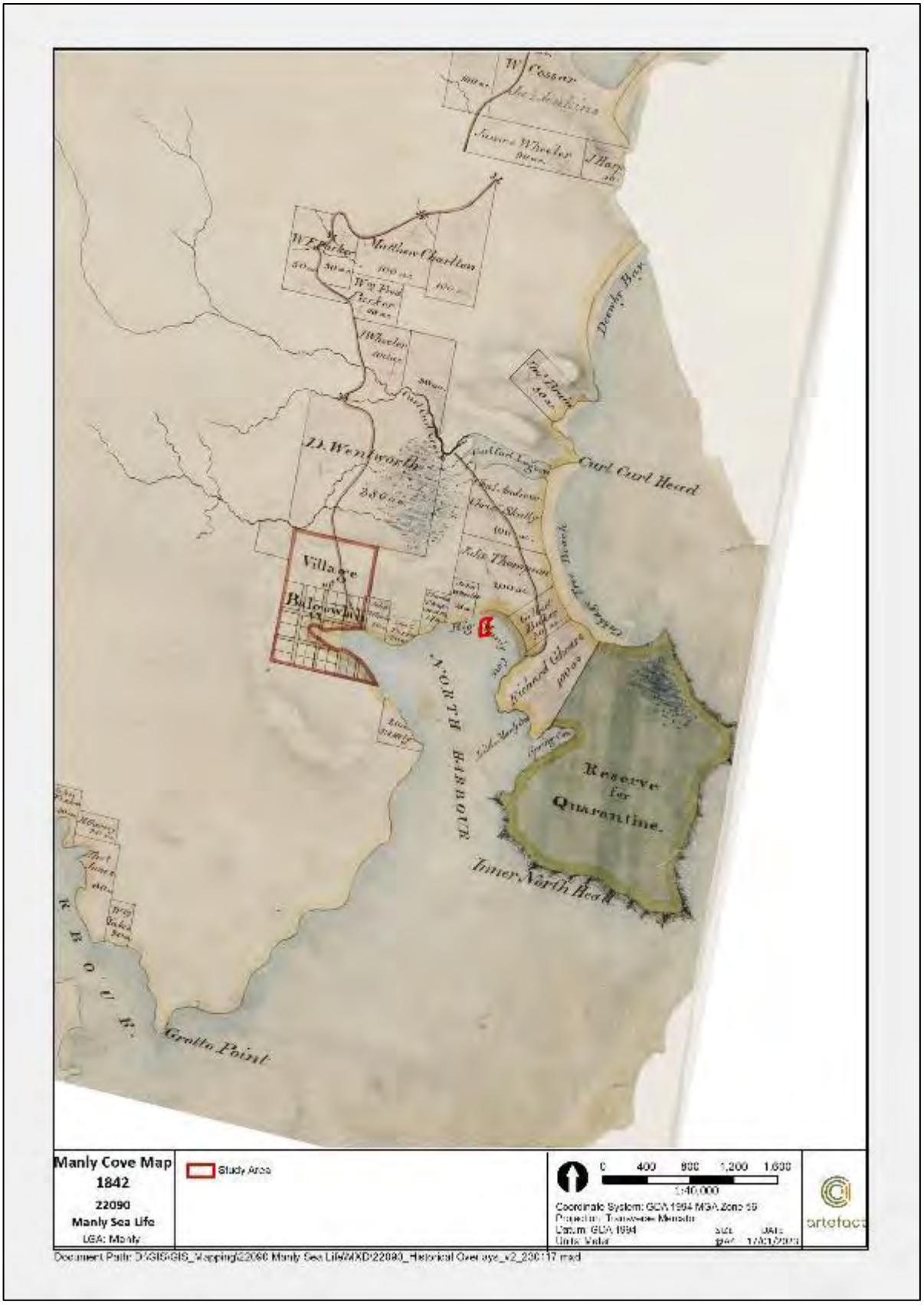


Figure 5: Parish of Manly Cove map, 1842. Approximate study area indicated in red. (Source: State Library of NSW).[11]

Nineteenth century development

Henry Gilbert Smith, often referred to as the 'father of Manly' was a man with a vision and apparent wealth. In purchasing the Thompson estate, Smith intended to transform Manly Cove into a resort-style village called "New Brighton." By the end of 1853, he had purchased 200 acres of land at Manly for a total cost of £2,189.[12] At this time, Manly was home to only 12 families.[13] However, Smith manifested his vision for New Brighton quickly – by 1855 he had already constructed the Manly Wharf and Pier Hotel, laid out the route of the Manly Corso, and funded the earliest ferry services from Manly to Sydney.[14] Smith additionally funded the erection of cottages, a school, church, gardens, the Kangaroo Street stone kangaroo and the first Norfolk Island pines along the ocean front in Manly.[15]

In 1858, at the westernmost extent of Manly Cove, Smith constructed Manly's first baths – the study area stands on the site of these baths (Figure 6 and Figure 7). The baths consisted of five rooms for warm-water bathing and four rooms for cold-water bathing, likely within the c.1856 stone cottage, as in addition to a saltwater bathing enclosure.[16] Newspapers reported that pipes supplied water to the baths, which were heated by a steam engine and boilers.[17] Photographs and plans dated to the 1870s show these timber-framed bathing structures and timber and corrugated iron enclosures, in addition to the stone cottage, a brick WC, timber palisade fencing and a low stone sea wall along the edge of the beach (Figure 6, Figure 7 and Figure 8). The c.1856 stone cottage was likely constructed using locally-cut stone, while the retaining walls may have been constructed from locally-cut stone, loose boulders or fallen rocks and may have been built into the stone bedrock.[18] Manly's first reservoir to the north of West Esplanade provided fresh water to the baths via the extant watercourse/drainage channel cut into the rock, which may have been cut as early as the 1860s and required excavation of the surrounding stone, but does not appear on plans until c.1891 (Figure 11).[19]

Manly remained a resort town with a limited permanent population until the 1870s, when Katherine Wentworth's estate – which had encompassed much of the area to the east of the Corso – was opened up to subdivision. By 1877, the population of Manly had grown to 1,000 and the township was incorporated.[20]

In 1878, two pools were proposed to be built on either end of Manly Cove – a Gentlemen's Pool on the eastern end and a Ladies Pool on the western end to replace the Henry Gilbert Smith Baths. The Ladies Pool, which stood on the study area, was constructed by Mr Darton in 1885 to architect John Smedley's design (Figure 8).[21] The baths consisted of a long timber bathing shed supported by a rubble groyne installed by divers (Figure 11). Several structures were constructed in association with the baths, including waiting and dressing rooms and the earlier stone bathkeeper's cottage was extended, which contained hot water bathing facilities.[22] By 2 January 1886, under the lease of Mr Charles Kindred, twenty-five dressing rooms were constructed, as well as fresh-water shower-baths, a windmill for raising water for fresh and salt warm baths and the stone cottage was refitted (Figure

[12] Muir, 1996: 4.
[13] Curby, 2001: 1.
[14] Curby, 2001: 4-5.
[15] Pike, A.F. 1967 [2006]. 'Smith, Henry Gilbert (1802–1886)'. *Australian Dictionary of Biography.* Accessed: <https://adb.anu.edu.au/biography/smith-henry-gilbert-2671>.
[16] *Sydney Morning Herald*, 4 Dec 1857: 8.
[17] *Sydney Morning Herald*, 15 Jan 1857: 8.
[18] Metherell, 2009: 4-5.
[19] Metherell, 2009: 5.
[20] Manly Council, n.d.
[21] Manly Library Local Studies, n.d.(a). 'Ladies' Baths, West Esplanade'. *Northern Beaches Council.* TRIM MC/12/113256. Accessed via <https://northernbeaches.recollect.net.au/nodes/view/12861>; *Sydney Morning Herald,* 15 Aug 1885.
[22] Manly Library Local Studies, n.d.(a); *Sydney Morning Herald,* 15 Aug 1885.

9).[23] An 1891 surveyor's plan shows a long rock-cut drainage channel "aqueduct" running north-south along the rock face to the north-west of the study area; although some sources indicate the channel was cut in c.1890, the channel may date to the c.1860s (Figure 11).[24]

J.A. Fergusson took over the lease in 1889, followed by Leon Ferret in 1897. In 1897, the bathing enclosure was extended by 40 feet, likely resulting in the partial relocation of the stone groyne, and a fence extended to increase privacy, the stone cottage extended to the south in timber and thirty additional timber-framed accommodation boxes installed (Figure 10, Figure 11).[25] By the end of the nineteenth century, Manly Cove had become Sydney's centre for waterfront recreation, and Henry Gilbert Smith's resort-village vision had been realised.



Figure 6. The western end of Manly Cove in c.1875, showing the Henry Gilbert Smith baths. Bathing enclosure to left and bathhouse to right (Source: Northpoint, 2019: 25).[26]

[23] Manly Library Local Studies, n.d.(a): 2.
[24] NBRS&P, 2002: 40.
[25] Manly Library Local Studies, n.d.(a): 3.
[26] Private collection, Facebook in Northpoint, 2019: 25.



Figure 7. Henry Gilbert Smith's Baths, c. 1870s. Bathing enclosure to left and bathhouse to right (Source: Northern Beaches Library Service).[27]

[27] Accessed via Northern Beaches Library Service <https://northernbeaches.recollect.net.au/nodes/view/12861>.

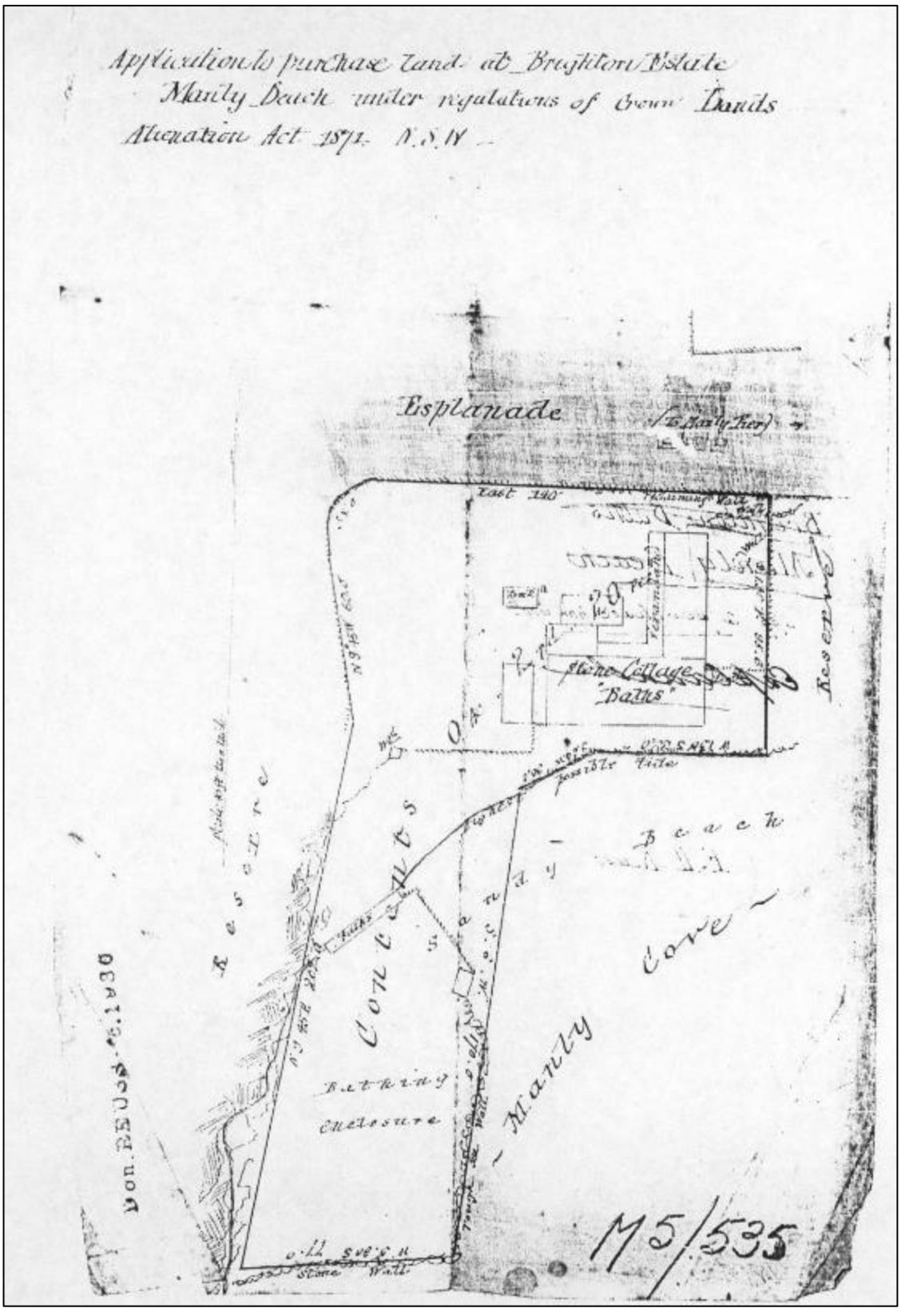


Figure 8. Plan of the Henry Gilbert Smith baths in the late 1870s (Source: Northern Beaches Council History Hub, M5.535).[28]

[28] Accessed via Northern Beaches Council History Hub <https://northernbeaches.recollect.net.au/nodes/view/9623>.



Figure 9. Photograph of the change rooms and timber fence associated with the Ladies Baths, c.1880s (Source: Northpoint, 2019: 27).[29]



Figure 10. Photograph of Manly Cove associated with the Women's Baths. Note that although the image is dated c.1910-1920 on the SLNSW website, it is likely to date to the 1880s (Source: State Library of NSW, Call No. PXE 711/273).[30]

[29] Private collection, Facebook in Northpoint, 2019: 27.
[30] Accessed via State Library of NSW Catalogue <https://collection.sl.nsw.gov.au/record/9qoQB2O1>.

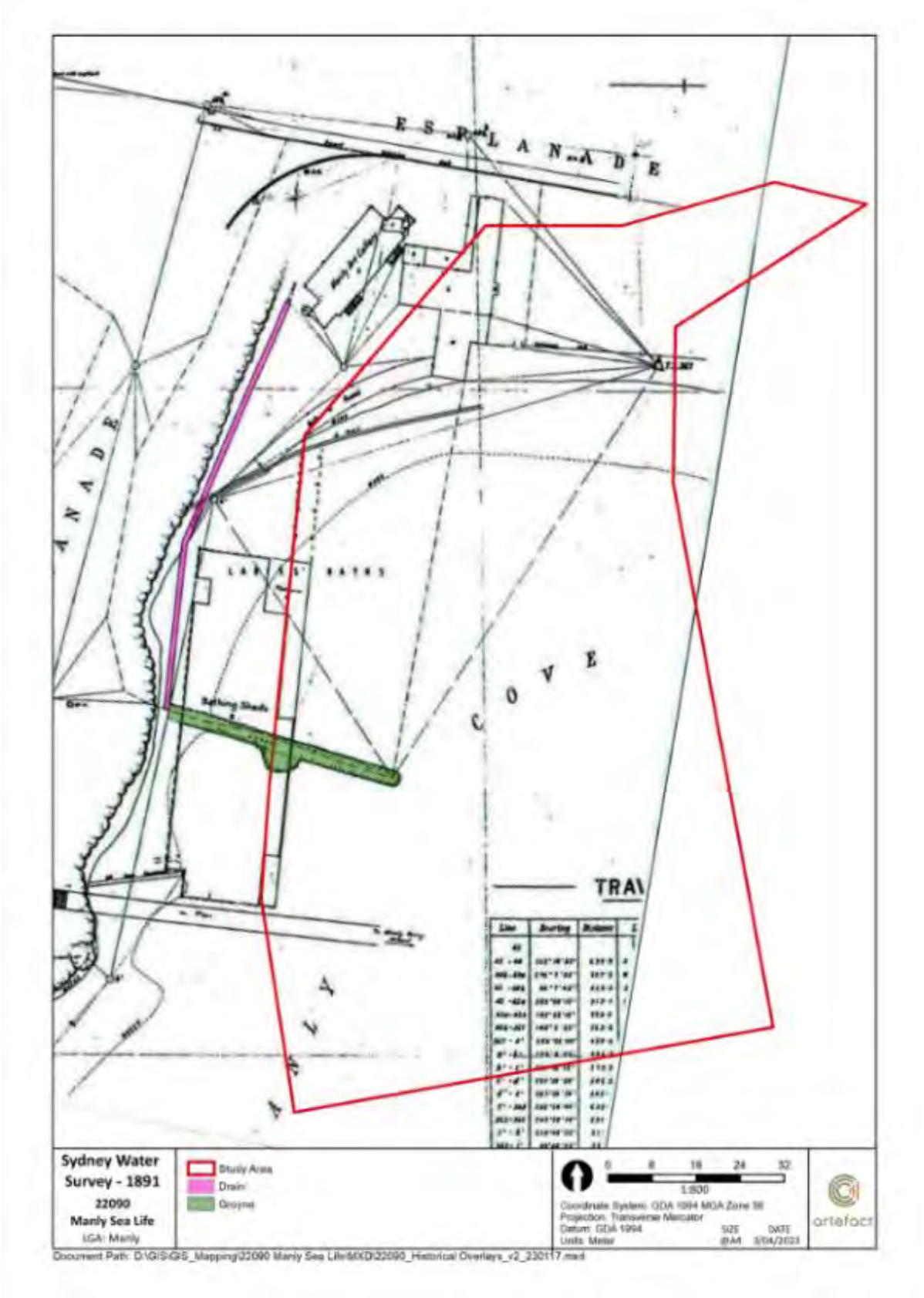


Figure 11. Sydney Water Survey, c. 1891 with updates dating to 1933. Drain in pink and groyne in green. Approximate location of study area in red (Source: NBRS&P Architects, 2002: 40).

Twentieth century

The face of the West Esplanade changed quickly over the course of the first half of the twentieth century (Figure 12 to Figure 18). In 1902, a man named William Gocher swam in the cove at midday, an act that was forbidden at the time. This demonstration prompted Manly Council to legalise daylight sea bathing at Manly Cove. By 1904, a surf lifesaving club was established at Manly, potentially the first in the world.[31] Photographs and maps from the 1906 to 1907, however, show the baths, stone sea wall and the enclosure to have changed little since the 1890s (Figure 12, Figure 13 and Figure 14).

In July 1912, a storm damaged the women's baths; in 1919, the dressing sheds were removed.[32] The timber and stone were removed and retained by Manly Council for future use elsewhere in response to a request from the Sydney Harbour Trust.[33] However, the bathing enclosure itself was not removed and instead partially rebuilt with timber pylons and metal mesh fencing and reusing the stone groyne, as demonstrated by photographs from the 1910s and 1920s (Figure 16, Figure 18 and Figure 19). In 1922, the Manly Concert Pavilion was constructed along the grassy bank to the north of the study area (Figure 17).[34]

During the early 1930s, development heightened in the western portion of Manly Cove. In 1930, the Manly Concert Pavilion was converted into the Manly Art Gallery (Figure 20).[35] The gallery remains the oldest metropolitan regional art gallery in the state. In 1931, the Port Jackson Steam Company – which at this point operated the Manly Ferry – designed and constructed the Manly harbour pool in order to attract visitors and expand the ferry's clientele. The pool was bounded to the south by a 335m-long boardwalk that ran from Manly Wharf to the rocky outcrop on which the study area sits (Figure 20).[36] To the north of the pool, the height of the c.1870s West Esplanade sea wall was raised using concrete surmounted with a stone capping and a decorative Inter-War stone edging by 1932 (Figure 22). Floodlights were installed along the promenade, beach and underwater at this time.[37] By 1938, the sea wall was further raised and refinished in rough-trowelled cement render and the area behind the sea wall lined with a formalised path, trees and gardens (Figure 24, Figure 25 and Figure 26).

Improvements had been made to Smith's 1855 wharf – which serviced the growing passenger ferry industry – during the late nineteenth and early twentieth century.[38] By the 1930s, the decision was made to rebuild the wharf entirely, and construction on the new wharf finished in 1941.[39] The contract for the wharf was given to a young architect named Arthur Baldwinson who designed the imposing modernist wharf that stands today.[40]

The remaining elements of the Ladies Pool and associated structures were demolished in the early 1930s to make way for the Port Jackson Steam Company's newest venture – a grand Dressing Pavilion built in the Inter-War Mediterranean style in 1933 (Figure 21).[41] The Pavilion housed with a large men's dressing room in the left wing and smaller women's dressing room in the right wing, as

[31] Manly SLSC, 2006.
[32] Manly Council Minutes 18 February 1919 & 31 October 1919 and in Manly Library Local Studies, n.d.(a): 3.
[33] Manly Council Minutes 18 February 1919 & 31 October 1919 and in Manly Library Local Studies, n.d.(a): 3.
[34] Northpoint, 2019: 34.
[35] Northpoint, 2019: 34.
[36] Northpoint, 2019: 17.
[37] Northpoint, 2019: 41.
[38] Ibid, 12.
[39] Heritage NSW, n.d.
[40] Heritage NSW, n.d.
[41] NBRS&P, 2002: 31.

well as a lifesaving club, kiosk, and restaurant.[42] With the construction of the harbour pool and Dressing Pavilion, patronage of Manly increase to 250,000 per year.[43]



Figure 12. Map of the Village of Manly, c. 1906 showing the curtilage of the Ladies Baths (Source: Historical Lands and Record Viewer, 3373101.jp2).

[42] Northpoint, 2019: 18.
[43] Northpoint, 2019: 18.



Figure 13. Photograph of the Harbour Beach with the baths in background in c. 1907 showing the Ladies Baths (Source: Manly Local Studies, 2015).[44]



Figure 14. Early 1900s photograph of the baths from the north-west, showing the changing shed and drying facilities (Source: Brooke in NBRS 2002:16).[45]

[44] Accessed via Manly Library Local Studies Blog <http://manlylocalstudies.blogspot.com/2015/05/roslyn-hall.html>.
[45] Brooke S. 1989. *The Good Old Days, A Pictorial History of Australia.* Silverwater: Bullion Books, pp 158-159; NBRS 2002:16.

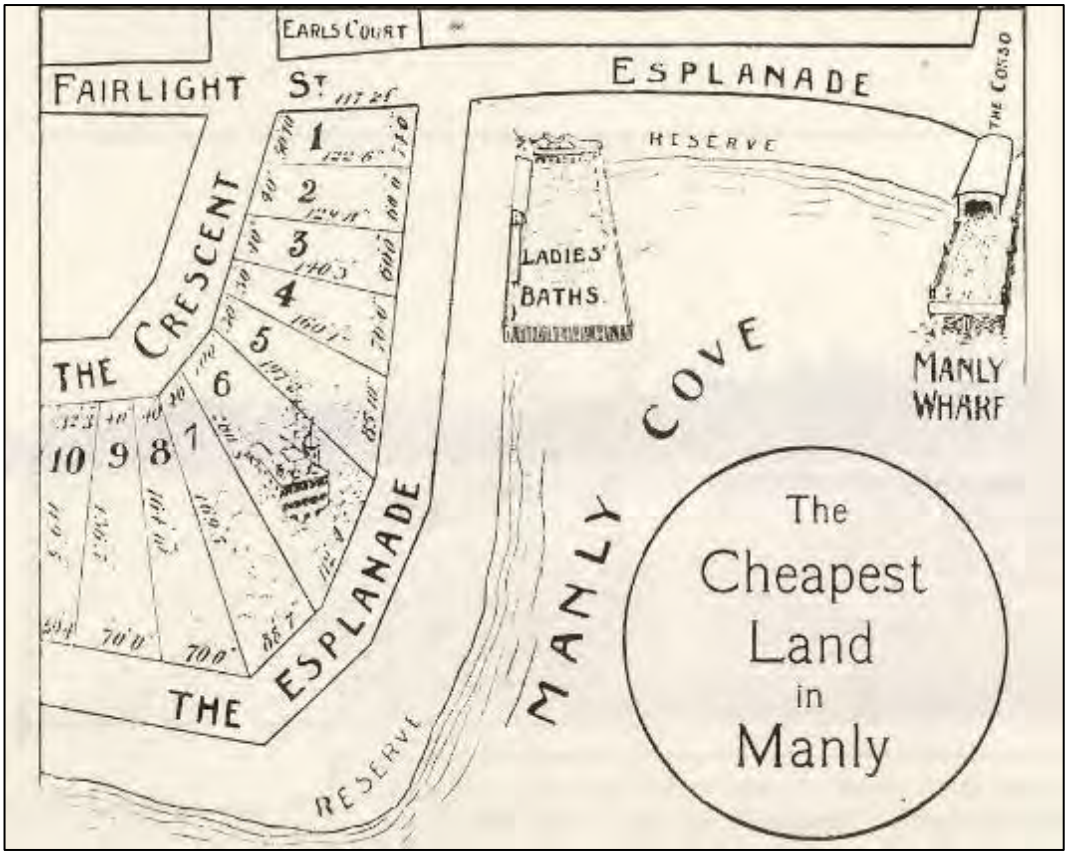


Figure 15. 1911 Auction poster, showing the Ladies Baths (Source: Manly Local Studies in Northpoint, 2019: 31).[46]



Figure 16. Study area in 1920s (Source: Northern Beaches Library Service).[47]

[46] Manly Local Studies in Northpoint, 2019: 31.
[47] Accessed via Northern Beaches Library Service <https://northernbeaches.recollect.net.au/nodes/view/39008>.



Figure 17. The stone sea wall along the beach in the vicinity of the baths in 1924, with the West Esplanade Concert Pavilion behind (Source: Pittwater Local Studies Collection).[48]

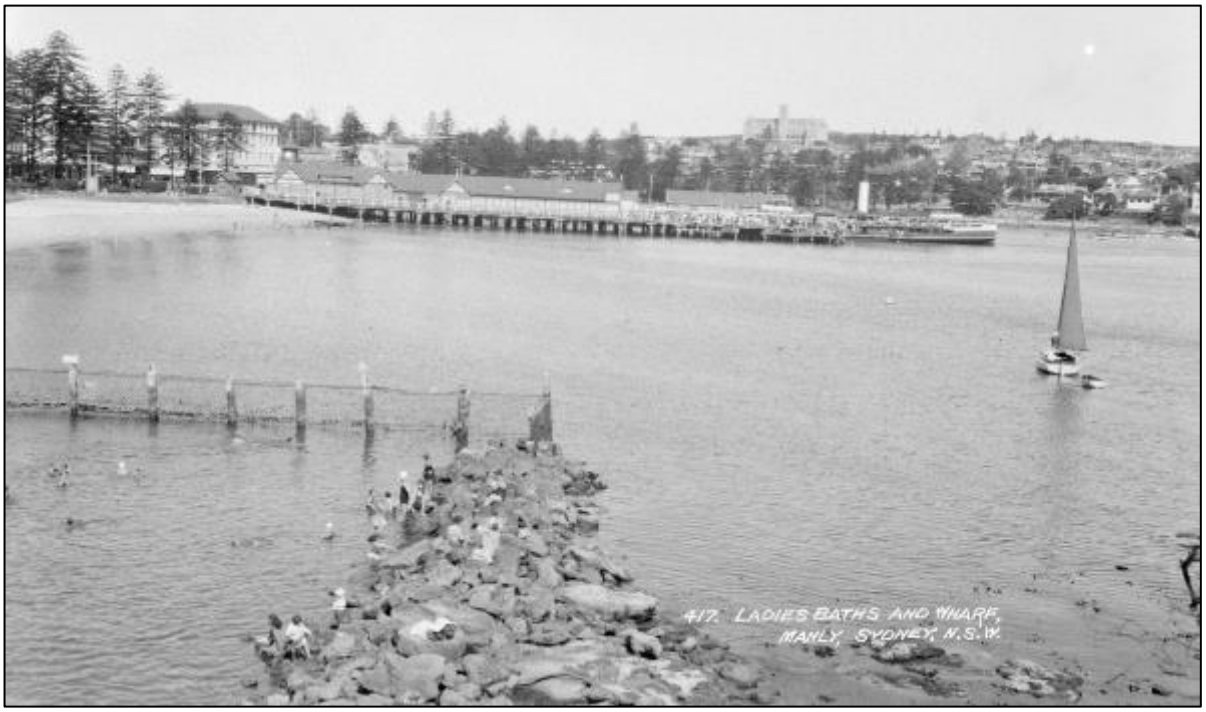


Figure 18. Ladies' Pool and wharf, 1928 (Source: State Library of NSW, a1470 Online).[49]

[48] Pittwater Local Studies Collection in Northpoint 2019: 37.
[49] Accessed via State Library of NSW <https://collection.sl.nsw.gov.au/record/9NaDWZWY>.

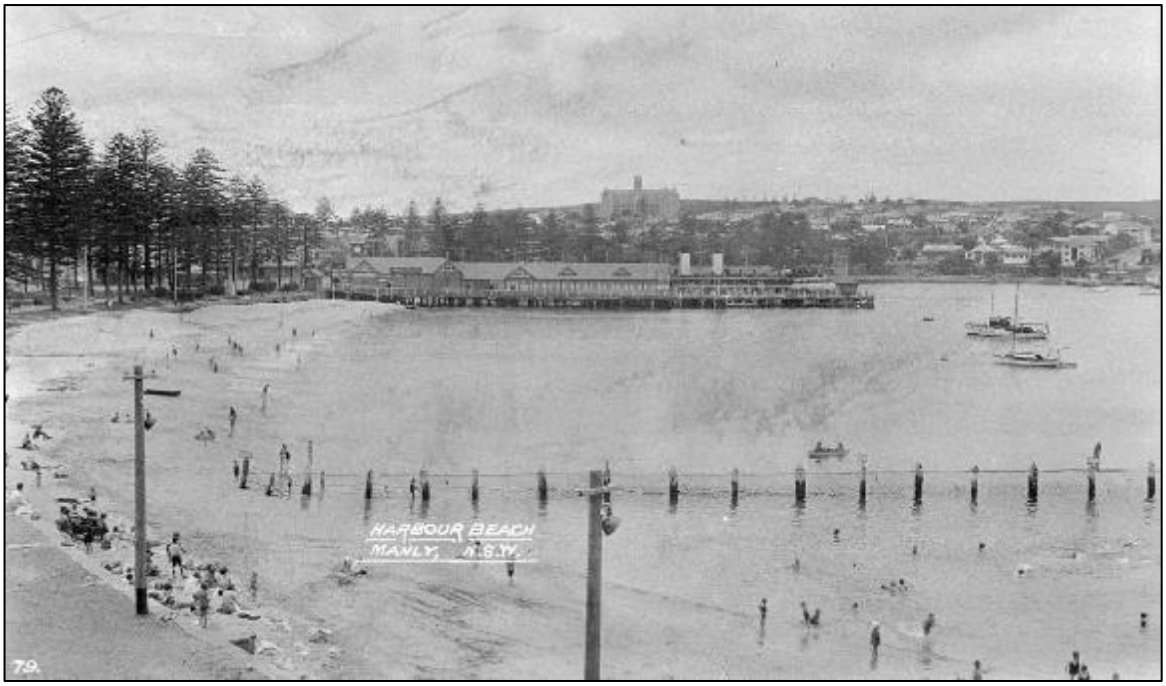


Figure 19. Ladies' Pool and wharf, 1928. (Source: State Library of NSW, a1470 Online).[50]



Figure 20. Aerial view of Manly Cove, 1930s (Source: State Archives NSW).[51]

[50] Accessed via State Library of NSW <https://collection.sl.nsw.gov.au/record/9NaDWZWY/ojVXONWM7aW6W>.
[51] Accessed via State Archives NSW <https://www.records.nsw.gov.au/image/12932_a012_a012X2451000061>.



Figure 21. Manly pool looking towards the Dressing Pavilion in the 1930s (Source: Northern Beaches Library Service, MML/2023).[52]



Figure 22. The West Esplanade sea wall in 1932, showing an Inter-War concrete and stone addition (Source: Photosau in Northpoint, 2019: 49).

[52] Accessed via Northern Beaches Library Service History Hub <https://northernbeaches.recollect.net.au/>.



Figure 23. Manly Boardwalk and pool with the Manly Pavilion in the background dated 1934.53



Figure 24. 1936 photograph of the West Esplanade landscaping (Source: Manly Local Studies in Northpoint 2019: 52).[54]

[53] Tatham, Harriet, 2018. *Manly boardwalk revival triggers wave of support and fond memories,* posted 15 Aug 2018, accessed 31 October 2022, URL: <https://www.abc.net.au/news/2018-08-15/should-the-manly-boardwalk-be-rebuilt/10118472>.
[54] Manly Local Studies via < http://www.photosau.com.au/Manly/scripts/ExtSearch.asp?SearchTerm=004602> in Northpoint 2019: 52.



Figure 25. 1937 photograph of the West Esplanade landscaping, the pool and Pavilion (Source: Manly Local Studies in Northpoint 2019: 53).[55]



Figure 26. 1938 photograph of the West Esplanade sea wall, showing the newly refurbished wall (Source: Manly Local Studies in Northpoint 2019: 50).[56]

[55] Manly Local Studies via <http://digital.sl.nsw.gov.au/delivery/DeliveryManagerServlet?dps_pid=FL1906088> in Northpoint 2019: 53.
[56] Manly Local Studies via <http://www.photosau.com.au/Manly/scripts/ExtSearch.asp?SearchTerm=101083> in Northpoint 2019: 50.



Figure 27. Manly Boardwalk (date unknow) before and after it was destroyed by the 'Sygna Storm' in May 1974.[57]



Figure 28. Manly Harbour pool diving tower, with the Manly Pavilion in the background (date unknown)[58]

[57] Tatham, Harriet, 2018, *Manly boardwalk revival triggers wave of support and fond memories,* posted 15 Aug 2018, accessed 31 October 2022, URL: https://www.abc.net.au/news/2018-08-15/should-the-manly-boardwalk-be-rebuilt/10118472

[58] Tatham, Harriet, 2018, *Manly boardwalk revival triggers wave of support and fond memories,* posted 15 Aug 2018, accessed 31 October 2022, URL: https://www.abc.net.au/news/2018-08-15/should-the-manly-boardwalk-be-rebuilt/10118472



Figure 29. Early photograph showing Manly Cove and Manly Wharf and the boardwalk are visible in the distance. Date unknown. [59]



Figure 30. Early photograph potentially from Federation Point with Manly Cove, the boardwalk and potentially the Manly Pavilion visible in the distance. Date unknown. [60]



Figure 31. Early photograph showing the Manly Pavilion arched colonnade to the western façade of Manly Pavilion. Date unknown. [61]

[59] Ziegler, Sydney O., for the Manly Municipal Council, [1967?], Manly South Pacific Playground. page 25
[60] Ziegler, Sydney O., for the Manly Municipal Council, [1967?], Manly South Pacific Playground. page 31
[61] Ziegler, Sydney O., for the Manly Municipal Council, [1967?], Manly South Pacific Playground. page 37

1960 to Present

Little further development occurred on the West Esplanade until 1964, when a large, circular brick aquarium was constructed at the study area (Figure 32).[62] Named 'Marineland' and constructed by DSM MacDonald Pty Ltd, the aquarium was the largest in the Southern Hemisphere and third largest in the world (Figure 34).[63] Marineland quickly became popular not just amongst tourists, but also fishermen and divers. In the absence of a scientific marine biology institute in Sydney, fishermen looking to preserve any strange and rare marine species they found throughout the region often sent them to Marineland:

> *A strange fish, with fins like arms and legs, was captured by two Royal Australian Navy divers in Sydney Harbour today… The four-inch-long fish, which changes colour from white to pink, was safely transferred to Marineland at Manly…*[64]
>
> *Spearfishermen captured a 6ft sunfish south of Port Hacking today… It was taken to Marineland at Manly tonight…*[65]
>
> *Pictured here is the fluorescent coral found in Sydney Harbor – the first such coral found outside New Caledonia… it is on display at Marineland, Manly…*[66]

In 1974, one of the worst storms in recorded Sydney history hit ground at Manly. Named 'the Sygna Storm' after a ship it caused to run aground in Newcastle, the storm decimated the long 1931 boardwalk that connected the Dressing Pavilion to Manly Wharf.[67] The boardwalk was never rebuilt.

In 1981, the Manly Waterworks were constructed by Mutual Pools Pty Ltd immediately west of 'Marineland' (and west of the study area), and consisted of four tunnel slides and a terminating pool.[68] In 1987, 'Marineland' was largely demolished and a new circular brick aquarium was constructed by Marinescape under the supervision of Ian Mellsop, reopening with the name 'Underwater World.'[69] According to a report in the local *Manly Daily*, "Underwater World has been designed to blend in with the colouring of tiles and glass of surrounding buildings such as Manly Pier and the Art Gallery and Museum."[70] The Art Gallery and Museum was extended at this time to the south-west. Underwater World, which was only the second circular 'oceanarium' in the world, extended seven metres below the ocean and featured a long transparent tunnel through which visitors could walk and observe sea life.[71]

In 1992, 'Underwater World' rebranded once again as 'Oceanworld' (Figure 35 and Figure 36), the name it retained until 2012 when it was relaunched as the 'Manly Sea Life Sanctuary'. In 2018, the 'Manly Sea Life Sanctuary' closed.

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[62] Northpoint, 2019: 18.
[63] Northpoint, 2019: 18; Adam, S.A. N.d. 'History of Manly, Marineland'. *Sylvia Adam*. Accessed via <https://sylviaadam.wordpress.com/manly-sea-life-sanctuary/>.
[64] *Canberra Times*, 21 May 1965: 10.
[65] *Canberra Times*, 30 Nov 1964: 1.
[66] *Australian Women's Weekly*, 14 Dec 1966: 11.
[67] Northpoint, 2019: 19.
[68] *Manly Daily* quoted in Manly Library Local Studies, n.d.(b). 'Manly Waterworks'. *Northern Beaches Council*. Accessed via <https://northernbeaches.recollect.net.au/nodes/view/13342>.
[69] Manly Library Local Studies, n.d.(c). 'Underwater World / Oceanworld'. *Northern Beaches Council*. Accessed via <https://northernbeaches.recollect.net.au/nodes/view/13304>.
[70] *Manly Daily* quoted in Manly Library Local Studies, n.d.(b). 'Manly Waterworks'. *Northern Beaches Council*. Accessed via <https://northernbeaches.recollect.net.au/nodes/view/13342>.
[71] Manly Library Local Studies, n.d.(b).



Figure 32. 'Marineland' under construction, 1962 (Source: Northern Beaches Library Service).



Figure 33. 'Marineland' under construction, circa 1962.[72]

[72] Adam, S.A. N.d. 'History of Manly, Marineland'. *Sylvia Adam.* Accessed via <https://sylviaadam.wordpress.com/manly-sea-life-sanctuary/>.



Figure 34. 'Marineland', c. 1960s, with Manly Pavilion in background (Source: Northern Beaches Library Service).



Figure 35. 'Oceanworld', c. 1987 (Source: Northern Beaches Library Service).[73]

[73] Accessed via Northern Beaches Library Service <https://northernbeaches.recollect.net.au/nodes/view/44902>.

Aerial imagery analysis

Aerial imagery of the study area in 1929 (Figure 36) reveals that the beachfront was largely devoid of structures, with the exception of the two wharves to the east, the remaining structures associated with the Ladies Pool and the Manly Concert Pavilion. An irregular row of juvenile Norfolk Pines – said to have been planted by Henry Gilbert Smith – is visible on the grassy bank north of the shoreline. Although the rocky groyne that formed the southern boundary of the Ladies Pool is not visible in this 1929 aerial image, it was extant, as indicated by the outline of the bathing enclosure in the aerial, as well as a 1928 image that shows the groyne above the waterline (Figure 18).

Aerial imagery confirms that the Ladies Pool and associated structures, removed in the early 1930s, had been removed and replaced by the Dressing Pavilion by 1943 (Figure 36). The Dressing Pavilion and new Manly Wharf are visible in the 1943 aerial, connected by the long east-west boardwalk. The Manly Art Gallery appears on the grassy bank north of the study area, and a sandstone retaining wall had been formalised at the edge of the grass and the sandy shore. Roads and residential structures are more prominent on the Esplanade and the Norfolk Pines had noticeably grown. Few changes are observed in the 1950 and 1960 aerial imagery (Figure 37), except the addition of two small southern piers towards the western end of the boardwalk. South of the Pavilion, a pontoon or similar structure has been constructed, jutting out into the water to the south-east.

The original circular 'Marineworld' building is visible in aerial imagery from 1964 (Figure 38). The boardwalk is not present in the 1977 imagery, having been destroyed in the major storm of 1974. It is likely that the south-east pontoon noted above was also destroyed in this storm, as it is no longer evident in the aerial imagery. By 1985, the slides of the Manly Waterworks can be seen at the rear of 'Marineworld' (Figure 39). The 1990 aerial shows the site much as it is today, with the new 'Oceanworld'/'Manly Sea Life Sanctuary' building having replaced the former 'Marineworld' building, with the addition of a jetty to the south and a paved area and concrete theatre-style seating to the north of the 'Manly Sea Life Sanctuary' building. The paved area and concrete theatre-style seating has partially covered the western end of the stone seawall.



Figure 36. Aerial view of study area, 1929 and 1943.[74]

[74] 1929: NSW Spatial Service. 1943: SIXMaps.

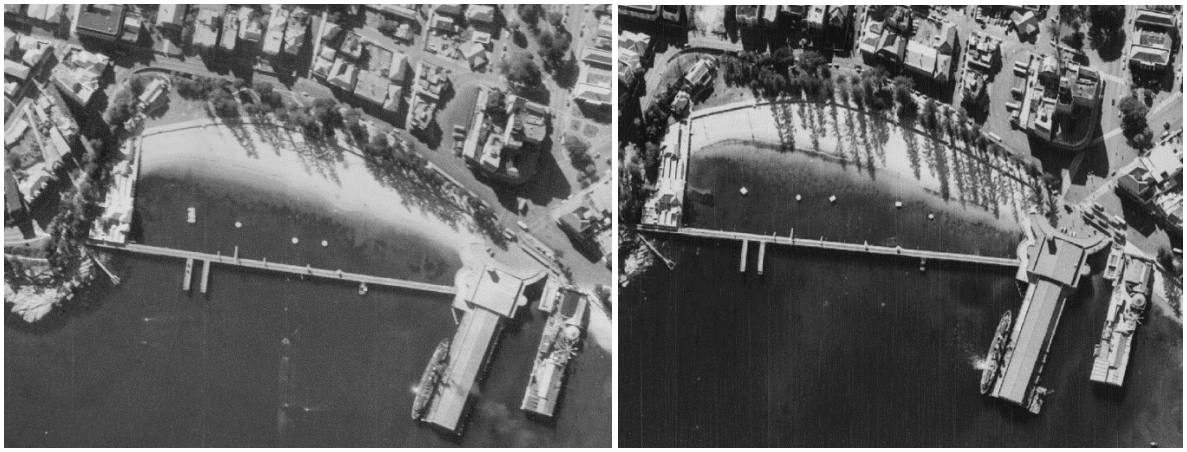


Figure 37. Aerial view of study area, 1950 and 1960 (Source: NSW Spatial Service).

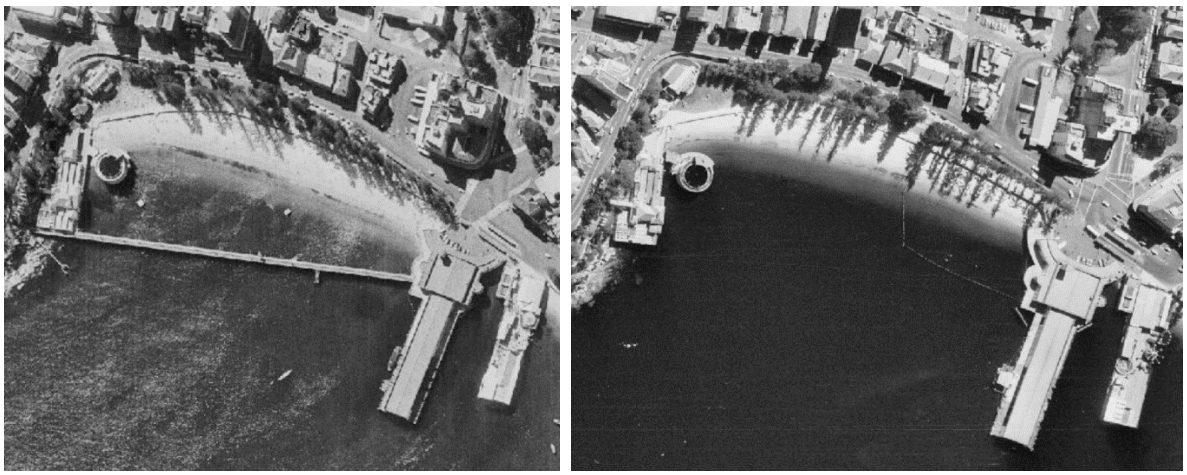


Figure 38. Aerial view of study area, 1964 and 1977 (Source: NSW Spatial Service).



Figure 39. Aerial view of study area, 1985 and 1990 (Source: NSW Spatial Service).

PHYSICAL CONTEXT

Site Inspection

A site inspection was conducted on14 October 2022 by Katherine Chalmers (Heritage Consultant) and Gabriela McPherson (Heritage Consultant) of Artefact Heritage. No additional site inspection was undertaken for the preparation of this memo. The aim of the site inspection was to inspect the area of proposed impacts, inform a preliminary assessment of archaeological potential, and to identify heritage items and heritage significant fabric within the study area and in the vicinity that may be affected by the project. The inspection was undertaken on foot and a photographic record was made.

Context

The Manly Sea Life Building is a structure which has been suspended within the ocean at Manly Cove. Manly Cove is a small, open beach space with sandstone retaining walls which support the adjacent park and public accessway (Figure 40 and Figure 41). The 'Park' known as West Esplanade Reserve runs from Lauderdale Street in Fairlight in the west to Manly Wharf in the east. The Manly Cove portion of the park houses the local heritage listed Governor Philip Monument and cultural plantings of Norfolk Island pine, Moreton Bay Figs, Port Jackson figs and Canary Island Palms (Figure 43 and Figure 44). Photographs in this section of the report are taken by Artefact in 2022 unless noted otherwise.



Figure 40: Wider Manly Cove context looking north from ferry.



Figure 41: View of Manly Sea Life in wider context from Manly Wharf.



Figure 42: West Esplanade Reserve looking west from Manly Wharf, showing the line of Norfolk Island Pines.



Figure 43: Monument to Governor Phillip in West Esplanade Park.

Manly Sea Life Building

The Manly 'Marineland' aquarium was the first building to be located on the site and was a brick building constructed c.1962.[75] After suffering extreme damage in the late 1980s, the building was extended to what is the current day Manly Sea Life Building which is suspended within the water at Manly Cove.

The Manly Sea Life Building is a two storey building with a bell cast tile roof. The lower floor is a facebrick structure with simple glazed windows, fibre cement sheet eaves upstand, and a timber boarded exterior soffit which carries into the front of house area of the first floor of the aquarium. Internally the first floor has a glazed aquarium tunnel and a back of house shark tank and plant room. The second storey is externally clad in fibre cement sheeting with simple glazed window and surrounds the penguin enclosure. The tiled bellcast roof to the upper floor has openable louvres in the centre above the penguin enclosure.

The building has a public pedestrian walkway which wraps around all sides of the building with scattered areas of planting. The eastern side of the pedestrian walkway offers public bench seating which overlooks Manly Cove.

[75] Morcombe, John, 2015, *Manly's Marineland was both an eyesore and an attraction'* The Daily Telegraph, 9 October 2015, accessed 31 October 2022, URL: https://www.dailytelegraph.com.au/newslocal/northern-beaches/manlys-marineland-was-both-an-eyesore-and-an-attraction/news-story/bd87c4070f57ac4e9a3fb78e295ac664



Figure 44: View of Manly Sea Life from West Esplanade Park.



Figure 45: View of northern facade of Manly Sea Life showing entrance to former aquarium.



Figure 46: View of Southern side of Manly Sea Life



Figure 47: Jetty adjoining Manly Sea Life



Figure 48: Detail shot of Manly Sea Life façade



Figure 49: Walkway and seating area on the eastern side of Manly Sea Life



Figure 50: View showing proximity of Manly Sea Life to Manly Pavilion

Other Items

Manly Wharf

On the eastern side of Manly Cove directly opposite the Manly Sea Life Building is the state heritage listed Manly Wharf. Manly Wharf 1 and 2 and its associated buildings are supported on timber piers with a concrete platform and are described by the SHR as being:

> *"…built in a modernistic transport idiom, with typical stylistic features of [the] era including play of circular and rectangular geometric terms, bayed facade to the water (marine connotations), wide arc plan at entrance, clock tower with "fins", flat roofing marked by wide fascia board."*[76]



Figure 51: Entrance to Manly Wharf from the Corner of Belgrave Street and the Esplanade.



Figure 52: View of Manly Wharf from the western end of West Esplanade Park.

Manly Pavilion

On the western side of Manly Cove directly adjacent to the Manly Sea Life Building is the state heritage listed Manly Pavilion near Federation Point.

[76] Heritage NSW, n.d. "Manly Wharf," *State Heritage Register*. Accessed on 14 Oct 2022 via <https://apps.environment.nsw.gov.au/dpcheritageapp/ViewHeritageItemDetails.aspx?ID=5051365>.

The Manly Pavilion is a rendered inter-war Mediterranean style building with an arched colonnade to the western façade and a boardwalk which is almost level with the current pavement level. [77] The central portion of the Pavilion building is two storey which sits between two symmetrical single storey wings. The building has been rendered and painted in an off-white colour, with a hipped terracotta tile roof and a band of decorative tiles to the upper level. [78]



Figure 53: View of Manly Pavilion behind Manly Sea Life.



Figure 54: Manly Pavilion facade



Figure 55: Manly Pavilion Colonnade



Figure 56: North Wing of Manly Pavilion

Manly Cove Amenities Block

Also, on the western side of Manly Cove directly adjacent to the Manly Sea Life Building is the locally heritage listed Manly Cove Amenities block.

[77] Heritage NSW, n.d. "Manly Pavilion," *State Heritage Inventory*. Accessed 17 October 2022 via <https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2020873>.
[78] Heritage NSW, n.d. "Manly Pavilion," *State Heritage Inventory*. Accessed 17 October 2022 via <https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2020873>.

The Manly Cove Amenities Block is also an inter-war painted masonry building with a hipped terracotta tile roof. The central portion of the western façade has a glazed tile frieze at the top and is divided into three bays with horizontal decorative piers.[79] The male and female amenities are accessed via stairs and a pair of timber pergolas, and a modern extension has been added to the eastern side of the building to provide accessible amenities. [80]



Figure 57: locally heritage listed Manly Cove Amenities Block.

[79] Heritage NSW, n.d. "Manly Cove Amenities Block," *State Heritage Inventory*. Accessed 17 October 2022 via <https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2020185>.
[80] Heritage NSW, n.d. "Manly Cove Amenities Block," *State Heritage Inventory*. Accessed 17 October 2022 via <https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2020185>.

SIGNIFICANCE ASSESSMENT

Methodology

Determining the significance of heritage items or a potential archaeological resource is undertaken by utilising a system of assessment centred on the *Burra Charter* (Australia ICOMOS 2013). The principles of the charter are relevant to the assessment, conservation and management of sites and relics. The assessment of heritage significance is outlined through legislation in the *Heritage Act* and implemented through the *NSW Heritage Manual*, the *Archaeological Assessment Guidelines*[81] and the document *Assessing Significance for Historical Archaeological Sites and 'Relics'.*[82]

If an item meets one of the seven heritage criteria and retains the integrity of its key attributes, it can be considered to have heritage significance (see Table 2). The significance of an item or potential archaeological site can then be assessed as being of local or State significance. If a potential archaeological resource does not reach the local or state significance threshold, then it is not classified as a relic under the *Heritage Act*.

'State heritage significance', in relation to a place, building, work, relic, moveable object or precinct, means significance to the State in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.

'Local heritage significance', in relation to a place, building, work, relic, moveable object or precinct, means significance to an area in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item.[83]

Table 2. NSW heritage assessment criteria

Criteria	Description
A – Historical Significance	An item is important in the course or pattern of the local area's cultural or natural history.
B – Associative Significance	An item has strong or special associations with the life or works of a person, or group of persons, of importance in the local area's cultural or natural history.
C – Aesthetic or Technical Significance	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in the local area.
D – Social Significance	An item has strong or special association with a particular community or cultural group in the local area for social, cultural or spiritual reasons.
E – Research Potential	An item has potential to yield information that will contribute to an understanding of the local area's cultural or natural history.
F – Rarity	An item possesses uncommon, rare or endangered aspects of the local area's cultural or natural history.
G - Representativeness	An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places of cultural or natural environments (or the cultural or natural history of the local area).

[81] NSW Heritage Office 1996, 25-27.
[82] NSW Heritage Branch 2009.
[83] This section is an extract based on the Heritage Office Assessing Significance for Historical Archaeological Sites and Relics 2009:6.

Existing heritage assessments

Statement of Significance

The Manly Sea Life Building is not currently identified as a heritage item at the local or state level. It does not satisfy any of the criteria to achieve heritage significance at the local (or state) level.

Significant views and vistas

Whilst the Manly Sea Life Building is not considered to be of heritage significance, the building has 2 state heritage listed items and 15 locally listed heritage items within the 200m buffer of the study area. The views towards and from these locally listed items have the potential to be impacted due to the proposed works at the Manly Sea Life Building.

The removal of the Manly Sea Life Building would allow full views of Manly Wharf from Manly Pavilion and vice versa and restore the full view of the 'Park' and 'Harbour Foreshore' from Manly Pavilion, thereby enhancing the setting of the Pavilion.



Figure 58: View of Manly Wharf from Manly Pavilion.



Figure 59: View of Manly Pavilion from Manly Wharf



Figure 60: View of Sea Life from Governor Philip Monument and the 'Park'. The removal of Sea Life would enable the view of the entire extent of the Pavilion as well as the LEP listed amenities block.



Figure 61: Manly Sea Life interrupts the view of the 'Park' and 'Harbour Foreshores' from Manly Pavilion, which negates from the setting of the pavilion.

Other Structures

There are a number of listed heritage sites which are within the vicinity (200m buffer) of Manly Sea Life and may be impacted as a result of the proposed Stage 1 works. Refer to Table 1 for the heritage items in the vicinity of Manly Sea Life.

ARCHAEOLOGICAL ASSESSMENT

Introduction

This section discusses the study area's potential to contain historical archaeological resources. The potential for the survival of archaeological remains is significantly affected by ground disturbance activities which may have caused demolition and/or partial or total removal. This assessment is therefore based on consideration of the current ground conditions, and analysis of the historical development of the study area.

'Archaeological potential' refers to the likelihood that an area contains physical remains associated with an earlier phase of occupation, activity or development of that area. This is distinct from 'archaeological significance' and 'archaeological research potential'. These designations refer to the cultural value of potential archaeological remains and are the primary basis of the recommended management actions included in this document.

Archaeological potential

The archaeological potential of each site is presented in terms of the likelihood of the presence of archaeological remains, considering the land use history and previous impacts at the site. This evaluation is presented using the following grades of archaeological potential:

Table 3: Grading of archaeological potential

Grading	Rationale
Nil	No evidence of historical development or use, or where previous impacts would have removed all archaeological potential
Low	Research indicates little historical development, or where there have been substantial previous impacts, disturbance and truncation in locations where some archaeological remains such as deep subsurface features may survive
Moderate	Analysis demonstrates known historical development and some previous impacts, but it is likely that archaeological remains survive with some localised truncation and disturbance
High	Evidence of multiple phases of historical development and structures with minimal or localised twentieth century development impacts, and it is likely the archaeological resource would be largely intact

Land use summary

The European occupation of the study area has been divided into five general phases of historical activity, which are outlined in Table 4 below and illustrated in Figure 62. Note that the Phase 3 stone groyne and the Phase 4 bathing enclosure are beneath the high-water mark and although they are mentioned in this summary, they are not assessed for archaeological impact, as this will be

discussed in the concurrent maritime archaeology report prepared by Cosmos Archaeology as part of Stage 2 works.

Table 4: Land use summary

Phase	Discussion
Phase 1: Early settlement (1788-1853)	– Prior to and following John Thompson's grant in 1842, the area appears to have been undeveloped. It is unlikely that Thompson built any structures or modified the land within the study area. – There is no documentary evidence for specific uses of the study area and no recorded structures occupied the study area during this time. – If the area was used during this phase, it is likely to have experienced low intensity land use. – The land may have been modified by the removal of trees, but excavation or extensive soil disturbance is unlikely.
Phase 2: The Henry Gilbert Smith Baths (1853-1885)	– Following Henry Gilbert Smith's purchase of the study area, Smith attempted to turn Manly into a resort-style village. Within the study area, Smith was responsible for the construction of the first baths in Manly, in 1853. – The structures comprised both internal and external bathing facilities, including a stone cottage with multiple rooms for hot and cold water bathing, timber changing rooms on timber posts, an external saltwater bathing enclosure with a stone groyne and mixed timber and corrugated iron palisade fencing, a brick WC structure, pipes for water supply, a steam engine, a stone-cut drainage channel/"aqueduct" and a low stone sea wall. – The construction of most structures would have required little excavation other than that required for timber postholes, due to the use of the natural landscape. The construction of the stone cottage, brick WC and the retaining wall are likely to have required excavation works and redistribution/spreading of soil and sand. – An early version of the drainage channel/"aqueduct" was established at this time, but the exact course and nature of the channel is unknown. – A bathkeeper may have lived on site within the stone cottage, but other occupants would have been temporary users of the bathing facilities.
Phase 3: Ladies' baths (1885-c.1930)	– A bathkeeper may have lived on site during this phase, but other occupants would have been temporary users of the bathing facilities. The baths were exclusively used by women during this phase. – The Henry Gilbert Smith Baths were replaced with the Ladies' Baths in 1885, designed by architect John Smedley and constructed by Mr Darton. The design included the reuse of the earlier stone cottage, with the addition of a timber extension to the south. A new long timber bathing shed on a rubble groyne and waiting and dressing rooms were also constructed at this time. – In 1886, under Charles Kindred's lease, the stone cottage was refitted to include twenty-five dressing rooms. Fresh-water shower-baths and a windmill to the north (outside the study area) were erected for raising water for fresh and salt warm baths. The stone-cut drainage channel/"aqueduct" is likely to have been formalised at this time, involving quarrying of the side of the cliff and cutting of a drain into the stone. – In 1887, the bathing enclosure was extended by 40 feet, likely resulting in the partial relocation of the stone groyne, and a fence was extended to increase privacy. Thirty additional accommodation boxes were installed on the beach on timber posts. – Following storm damage in 1912, the dressing sheds were demolished in 1919 and the bathing enclosure partially rebuilt with timber pylons and metal mesh fencing, reusing the stone groyne. – In 1922, the Manly Concert Pavilion was constructed along the grassy bank to the north of the study area. – A bathkeeper may have lived on site, but other occupants would have been temporary users of the bathing facilities.

Phase	Discussion
Phase 4: The Pavilion and Public Baths (1930-1964)	– In c.1930, the remaining elements of the Ladies Pool and associated structures, including the stone cottage, were demolished, and the Manly Concert Pavilion was converted into the Manly Art Gallery. – In the 1931-33, the bathing pool extended, through the construction of a boardwalk which connected the western edge of the cove to the wharf. A Dressing Pavilion, built in the Inter-War Mediterranean style, was constructed at the western edge of the baths. both involving piling into the rock with turpentine timber piles. – In c.1932, the c.1870s West Esplanade sea wall was raised using concrete, surmounted with a stone capping and a decorative Inter-War stone edging. Floodlights were installed along the promenade, beach and underwater. – In 1938, the sea wall was further raised and refinished in rough-trowelled cement render and the area behind the sea wall lined with a formalised path, trees and gardens. – Users would have been temporary users of the bathing facilities, in addition the Surf Life Saving Club. – The structures from this period did not result in the removal of the stone-cut drainage channel or the stone groynes from Phases 2 and 3. – The stone cliff was cut during this phase for the extension of the Dressing Pavilion, likely resulting in the removal of archaeological remains from earlier phases to the western side of the Pavilion.
Phase 5: The Aquarium (1964-Present)	– In 1964, the Aquarium was constructed to the east of the Dressing Pavilion, only to be replaced in c.1987 with the existing Aquarium structure. – The Aquarium involved excavation for steel/concrete piling and the foundations of the building. Extensive excavation of the sea bed was required for the shark tank in 1987. – The Manly Art Gallery was extended to the south-west in the late 1970s/early 1980s, which is likely to have partially removed remains of the earlier stone cottage structures from Phase 2 and 3. – The landscaping to create the concrete theatre style seating and paved walkway would have encapsulated the western end of the stone retaining wall from Phases 2 to 4 in situ.

Relevant archaeological investigations

The following archaeological investigations have been conducted in the vicinity of the Manly Sea Life site.

Manly Bathers Pavilion Conservation Management Plan (NBRS&P, 2002)

The *Manly Bathers Pavilion Conservation Management Plan* (CMP) prepared by NBRS&P in 2002 provides a brief assessment of historical (non-Aboriginal) archaeological potential and significance for the Pavilion and the immediately surrounding area. The CMP notes that the excavation of a section of the original cliff face to widen the rock ledge adjacent to the Pavilion would have resulted in the removal of archaeological deposits in that area. It also identifies the potential for the demolished timber structures and the remaining section of the rubble groyne from the of the 1885 Ladies Baths to be extant, as well as an 1890s rock-cut drainage channel “aqueduct” to the north-west of the study area. The CMP identifies the drainage channel as being of ‘some interest in terms of engineering works’ though as ‘unlikely to reveal more than is already apparent to view’.[84] The CMP also notes that though the Pavilion is located in the intertidal zone, the potential for maritime archaeological deposits is neither apparent not threatened by continued occupation of the site’.[85] Although the CMP does not assess the levels of potential or significance for these archaeological structures, it notes that the site has research potential for the extant elements of the Ladies Bathing

[84] NBRS&P, 2002: 40.
[85] NBRS&P, 2002: 40.

Pavilion and the rock-cut drainage channel.[86] However, the CMP later assesses the Manly Bathers Pavilion site as not meeting the level of State significance for its research potential.[87]

Manly Wharf 3 Upgrade Maritime Archaeological Assessment (Comber Consultants, 2022)

The *Manly Wharf 3 Upgrade Maritime Archaeological Assessment* prepared by Comber Consultants in August 2022 provides an assessment of the potential and significance of maritime archaeological deposits in the vicinity of the Manly Wharf, located 200m to the south-east of the study area.[88] The report identifies four phases of occupation, including: Prior to the cargo wharf in 1895 (Phase 1); Cargo wharf c1895-1927 (Phase 2); Amusement Pier 1931-2000 (Phase 3); and 2000 to present (Phase 4). The assessment identifies that there is low potential for Phases 1, 3 and 4 and moderate potential for Phase 2.[89]

The assessment determined that the wharf site had low potential for artefacts of State or local significance related to the early history of Manly prior to the cargo wharf in 1895 (Phase 1), including its association with H G Smith.[90]

The potential structural remains of the cargo wharf (Phase 2) from c.1895 to 1927 and the artefacts associated with wharf workers, vessel crews, wharf equipment and personal items were assessed as meeting the threshold for State or local significance under the criteria for historical, association, social, research, rarity and representative values. The area of the wharf was therefore assessed as having moderate potential to contain relics of local or State significance through their ability to exhibit evidence of daily use of the wharves pertaining to personal, domestic, commercial and industrial uses.[91]

The remains of the amusement pier phase (Phase 3 - 1931-2000) and related artefacts were determined as having low archaeological significance despite their medium to high potential.[92]

1.1.1.1 8-28 The Corso, Manly Archaeological Excavation Report (GML, 2011)

The 8-28 The Corso, Manly Archaeological Excavation Report prepared by GML in 2011, provides a post-excavation recording of the salvage excavation of a site 320m to the east of the study area. The site was found to comprise five main phases, including: the early colonial phase from 1809 to c1856 (Phase 1); the first Manly Post Office and New Brighton Hotel from c1856 to c1877 (Phase 2), the Late Victorian and Edwardian Phase c1877-c1910 (Phase 3); the early twentieth century from c1910 to 1953 (Phase 4); and the Coles supermarket from c1953 to 2010 (Phase 5).[93]

Despite the development of the site for the Coles supermarket in the second half of the twentieth century, several structural remains and artefacts relating to the earlier phases of the site were retained *in situ* and were identified as archaeological relics of local significance. Such relics included the remains of the first Manly Post Office, nineteenth-century bottle dumps, deposits associated with the hotel, 1870s animal butchery remains, the remains of the c1890 Phoenix House, a nineteenth-

[86] NBRS&P, 2002: 43.
[87] NBRS&P, 2002: 46.
[88] Comber Consultants, 2022. *Manly Wharf 3 Upgrade Maritime Archaeological Assessment*. Report prepared for Artefact on behalf of Transport for New South Wales. Version F.2022, 22 August 2022.
[89] Comber Consultants, 2022. *Manly Wharf 3 Upgrade Maritime Archaeological Assessment*. Report prepared for Artefact on behalf of Transport for New South Wales. Version F.2022, 22 August 2022, pp. 27-28.
[90] Comber Consultants, 2022. *Manly Wharf 3 Upgrade Maritime Archaeological Assessment*. Report prepared for Artefact on behalf of Transport for New South Wales. Version F.2022, 22 August 2022, p. 32.
[91] Comber Consultants, 2022. *Manly Wharf 3 Upgrade Maritime Archaeological Assessment*. Report prepared for Artefact on behalf of Transport for New South Wales. Version F.2022, 22 August 2022, p. 32.
[92] Comber Consultants, 2022. *Manly Wharf 3 Upgrade Maritime Archaeological Assessment*. Report prepared for Artefact on behalf of Transport for New South Wales. Version F.2022, 22 August 2022, p. 32.
[93] GML, 2011. *8-28 The Corso, Manly Archaeological Excavation Report*. Report prepared for Richard Crookes Constructions, December 2011, p. 9.

century well and three sandstone cesspits. The archaeological resource was assessed as meeting the threshold for local significance.[94]

Summary of historical archaeological potential

Based on the review of the information obtained from historical sources, previous archaeological works in the surrounding area and the current condition of the site, it can be concluded that the study area has potential to contain historical archaeological remains. Table 5 below provides a summary of the type of the anticipated archaeological remains and their likelihood of survival relative to the phase of historical development with which they are associated.

The graphic representation of the site's archaeological potential is presented in Figure 63

Table 5: Archaeological potential

Phase of development	Feature or activity	Description of potential remains	Degree of survival
Phase 1: Early settlement (1788-1853)	Archaeological features associated with low intensity land use and land clearances.	Remains would be highly ephemeral and likely removed during later occupation phases. Later ground disturbance from natural erosion and human activity is likely to have removed the archaeological resource. Remains could include evidence of burning, tree stumps and roots, tree boles, archaeobotanical remains, informal tracks, isolated artefacts or artefact scatters or landscape modification. The land may have been modified by the removal of trees, but excavation or extensive soil disturbance is unlikely.	Nil-low
Phase 2: The Henry Gilbert Smith Baths (1853-1885)	Archaeological features associated with the baths, including the bathing enclosure and associated bathing structures, fencing, drainage channel, retaining wall, as well as landscaping and excavation.	Ephemeral structures, including post holes from the bathing structures, fencing along the shore and along the stone groyne. Structures with substantial foundations would include the stone cottage, the extensions/associated structures, the Stone sea wall, the brick WC and the original stone groyne. The remains of the original drainage channel may be intact along the western side of the Bathing Pavilion and Waterworks. Earthworks including foundation trenches and the excavation and redistribution of soil from the cottage foundations and WC. Underfloor deposits, although unlikely, may be associated with the stone cottage and its associated structures. Underfloor deposits associated with the timber-framed bathing structures are unlikely.	Low

[94] GML, 2011. *8-28 The Corso, Manly Archaeological Excavation Report*. Report prepared for Richard Crookes Constructions, December 2011, p. 55.

Phase of development	Feature or activity	Description of potential remains	Degree of survival
		Artefactual deposits may be associated with the brick WC. Artefactual scatters or isolated artefacts may be present but are likely to have been disturbed due to later earthworks. Later ground disturbance from natural erosion and human activity may have removed or truncated the archaeological resource. This is likely within the footprint of the Art Gallery, which includes the WC and the majority of the footprint of the stone cottage and its associated structures, other than the south-eastern corner.	
Phase 3: Ladies' baths (1885-c.1930)	Archaeological features associated with the baths, including the bathing enclosure and associated bathing structures, fencing, stone-cut drainage channel, retaining wall, as well as landscaping and excavation.	Ephemeral structures, including post holes from the bathing structures, extensions to the stone cottage and fencing along the shore and along the relocated stone groyne. Structures with substantial foundations from this phase include the 1922 Manly Concert Pavilion (now the Manly Art Gallery) and alterations to the stone sea wall and the relocated stone groyne. The remains of the stone-cut drainage channel may be intact along the western side of the Bathing Pavilion and Waterworks. Underfloor deposits, although unlikely, may be associated with the stone cottage and its associated structures. Underfloor deposits associated with the timber-framed bathing structures are unlikely. Artefactual deposits would generally be unlikely, but may be associated with the brick WC, which was likely infilled during this phase prior to the construction of the 1922 Concert Pavilion, which is still extant. Artefactual scatters or isolated artefacts may be present but are likely to have been disturbed and relocated from the earthworks associated with landscaping during this phase. Later ground disturbance from natural erosion and human activity may have removed or truncated the archaeological resource, particularly within the footprint of the Art Gallery, which includes the WC and the majority of the footprint of the stone cottage and its associated structures.	Moderate
Phase 4: The Pavilion and Public Baths (1930-1964)	Demolition of structures associated with the Ladies' Baths. Construction and use of the Pavilion and Public Baths, alterations to the Manly Art Gallery and	Demolition layers associated with the demolition of the remaining structures of the Ladies' Baths. Extant elements include the Pavilion and the Manly Art Gallery, including foundations, foundation trenches, services and superstructures, as well as gardens and hardstands.	Moderate

Phase of development	Feature or activity	Description of potential remains	Degree of survival
	stone sea wall and landscaping.	Alterations to the western end of the stone sea wall may be intact beneath the existing landscaping. Lighting and related services dating to 1932 may be present along the retaining wall, beach or pool. Timber post holes associated with the Public Baths would be outside of the study area. Artefactual scatters or deposits associated with phase would be unlikely.	
Phase 5: The Aquarium (1964-Present)	Construction of the 1964 and 1987 aquariums and related excavation work.	Remains would include concrete foundations, foundation trenches, services, and hardstands. Artefactual scatters or deposits would be unlikely.	High (Extant)

Archaeological significance

The significance assessment of historical archaeological sites and items requires a specialised framework in order to consider the range of values associated with each site/item. This because of the challenges associated with the often unknown nature and extent of buried archaeological remains and judgment is usually based on anticipated attributes. To facilitate assessment of archaeological significance, the NSW Heritage Branch (now Heritage NSW) arranged the seven heritage criteria into four groups (see below). The value of archaeological sources primarily lies in their research potential or the ability to provide additional information about a site/item that is not contained in historical records. The assessment of archaeological research potential is augmented by three additional questions posed by Bickford and Sullivan.[95] The following significance assessment of the study area's potential archaeological remains has been carried out by using these criteria as outlined in the *Assessing Significance for Historical Archaeological Sites and 'Relics'*.

NSW Heritage criteria for assessing significance related to archaeological sites and relics

Archaeological research potential (NSW Criterion E)

There is nil to low potential for archaeological remains associated with the Phase 1 (c.1788-1846) early settlement, comprising low intensity land use and land clearances, within the study area. Remains would be likely to have been removed during later occupation phases due to a combination of natural erosion processes and human activity. If any remains from Phase 1 were to survive, they would likely be heavily disturbed or truncated and would therefore be unlikely to possess archaeological research potential. Such truncated remains of Phase 1 are therefore unlikely to be able to contribute knowledge that no other resource or site can. However, if remains from this period were found to be substantially intact, the archaeological resource would meet the threshold for local

[95] Anne Bickford and Sharon Sullivan, 'Assessing the Research Significance of Historic Sites', in *Site Surveys and Significance in Australian Archaeology*, ed. Sharon Sullivan and Sandra Bowdler (Canberra: Research School of Pacific Studies, ANU, Canberra, 1984), 19–26.

significance for its research value pertaining to questions about the specific use of the study area during this period due to the lack of extant documentation. Such remains may be directly relevant to general questions about human history or other substantive questions relating to Australian history.

Archaeological remains associated with Phase 1 may reach the local significance threshold under this criterion if present with sufficient integrity.

There is low potential for archaeological remains associated with the Phase 2 (1853-1885) Henry Gilbert Smith Baths, due to later ground disturbance from natural erosion and human activity which may have removed or truncated the archaeological resource. Structural remains related to Phase 2 could include both ephemeral and more substantial remains. Underfloor deposits, although unlikely, may be associated with the stone cottage and its associated structures. Artefactual deposits may also be associated with the brick WC. Artefactual scatters or isolated artefacts may be present but are likely to have been disturbed due to later earthworks. The potential remains associated with the Henry Gilbert Smith Baths are likely to be able to contribute knowledge that no other resource or site can about the earliest bathing facilities in the Manly area. As such, the Phase 2 archaeological resource would have research value and would meet the threshold for local significance.

Archaeological remains associated with Phase 2 would reach the local significance threshold under this criterion if present with sufficient integrity.

There is moderate potential for archaeological remains associated with the Phase 3 (1885-1930) Ladies' Baths, despite the likely effects of ground disturbance from natural erosion and human activity which may have disturbed the archaeological resource. Archaeological features associated with the baths, as well as landscaping and excavation, may be extant. Artefactual deposits may include the underfloor deposits associated with the stone cottage and its associated structures and the use and infilling of the WC prior to the constructed of the 1922 Concert Pavilion. Artefactual scatters or isolated artefacts may be present but are likely to have been disturbed and relocated from the earthworks associated with landscaping during this phase. The archaeological resource dating to Phase 3 may contribute knowledge that no other resource or site can about bathing facilities specifically for women in the local Manly area.

Archaeological remains associated with Phase 3 would reach the local significance threshold under this criterion.

There is moderate potential for archaeological remains associated with the Phase 4 (1930-1964) Pavilion and Public Baths. Remains could include demolition layers associated with the demolition of the remaining structures of the Ladies' Baths, alterations to the western end of the stone sea wall and lighting and related services dating to 1932. Other elements are still extant and are not considered to comprise an archaeological resource. Artefactual scatters or deposits associated with phase would be unlikely. The archaeological resource dating to Phase 4 would be unlikely to contribute knowledge that no other resource or site can about bathing facilities in Manly in the twentieth century. The remains therefore have little research value.

Archaeological remains associated with Phase 4 would not reach the local or State significance threshold under this criterion.

There is high potential for elements associated with the Phase 5 (1964-Present) Aquarium relating to the construction of the 1964 and 1987 aquariums, as well as alterations to the Manly Art Gallery and stone sea wall and landscaping. The majority of such features are unlikely to be considered to be archaeological remains due to their extant nature. Artefactual scatters or deposits from this phase would be unlikely. The archaeological resource dating to Phase 5 would be unlikely to contribute knowledge that no other resource or site can about public aquariums in the twentieth century. The remains therefore have little research value.

Archaeological remains associated with Phase 5 would not reach the local or State significance threshold under this criterion.

Association with individuals, events or groups of historical importance (Criteria A, B & D)

The Phase 1 (c.1788-1853) early settlement is associated with John Thompson, who became the Deputy Surveyor-General in 1853. It is unlikely that Thompson built any structures or modified the land within the study area. Any remains associated with low intensity land use and land clearances would be highly ephemeral and were likely removed or heavily disturbed during later occupation phases. Any archaeological resource relating to this phase is unlikely to meet the threshold for local significance as they are unlikely to demonstrate a particular or special connection with John Thompson.

Archaeological remains associated with Phase 1 would be unlikely to reach the local significance threshold under this criterion.

The Phase 2 (1853-1885) Henry Gilbert Smith Baths are associated with Henry Gilbert Smith, who is often referred to as the 'father of Manly'. Henry Gilbert Smith was responsible for the construction of multiple buildings and iconic landmarks within the Manly area. Although remains relating to the bathing structures may not be directly relatable to Henry Gilbert Smith, the remains would have a special connection with Henry Gilbert Smith. The structures are also associated with the users of the baths and may have a special connection with the bathers, particularly if artefactual deposits, artefact scatters or isolated artefacts are present in the archaeological record. Potential remains from Phase 2 are therefore likely to have a special association with individuals and groups of historical importance to the Manly area.

Archaeological remains associated with Phase 2 would reach the local significance threshold under this criterion.

The Phase 3 (1885-1930) Ladies' Baths are associated with the women who used the baths, in addition to the architect John Smedley, builder Mr Darton, leasee Charles Kindred and the bathkeepers who looked after the site. The remains would have a special connection with John Smedley, as he was a well-known local architect who lived along Smedley's Point to the south-east of the study area. If artefactual deposits can be dated, then this could infer information about the users, such as Mr Darton and Charles Kindred, who appear to have had a special connection to the baths and associated features. The structures are also associated with the bathkeepers and users of the baths and may have a special connection with these bathers, particularly if artefactual deposits, artefact scatters or isolated artefacts are present in the archaeological record. Potential remains from Phase 2 are therefore likely to have associative significance for their connection to these named individuals, and the broader Manly community.

Archaeological remains associated with Phase 3 would reach the local significance threshold under this criterion.

The Phase 4 (1930-1964) Pavilion and Public Baths are associated with the Port Jackson Steam Company, which was responsible for the running of the Manly Ferry and transporting and attracting many tourists and locals to Manly. The remains would also be associated with those who frequented the baths during this phase. Although the remains of the public baths therefore have a connection to a group of historical importance to Manly, such remains would be unlikely to meet the threshold for local significance for this criterion. The demolition layers associated with the demolition of the remaining structures of the Ladies' Baths as well as the alterations to the western end of the stone sea wall, lighting and related services would be associated with the Manly Council, but would be unlikely to demonstrate a special connection.

Archaeological remains associated with Phase 4 would not reach the local significance threshold under this criterion if present with sufficient integrity.

The Phase 5 (1964-Present) Aquarium and upgrades to the surrounding area are associated with Mutual Pools Pty Ltd, DSM MacDonald, Marinescape and Manly Council, but due to the late date and the extant elements not being considered to be archaeological remains, this phase would not meet the threshold for local archaeological significance under this criterion.

Archaeological remains associated with Phase 5 would not meet the threshold for local or State significance for this criterion.

Aesthetic or technical significance (Criterion C)

The ephemeral remains from Phase 1 (c.1788-1853) early settlement would be unlikely to demonstrate aesthetic or technical significance at the local level, as they are likely to be truncated and disturbed. Although it is recognised that exposed in situ archaeological remains may have distinctive/attractive visual qualities, only rarely are these considered 'important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW'.

Archaeological remains associated with Phase 1 would be unlikely to meet the threshold for local significance for this criterion.

Ephemeral remains dating to Phase 2 (1853-1885) Henry Gilbert Smith Baths would be unlikely to demonstrate aesthetic or technical significance at the local level, as they are likely to be truncated and disturbed. The more substantial potential remains from Phase 2 (1853-1885), such as the drainage channel, the stone groynes, stone retaining wall, early services and the foundations of the stone cottage, might demonstrate aesthetic significance and technical significance for their demonstration of the early approaches to providing hot and cold bathing facilities in the Manly area. Such features and artefacts may be able to demonstrate the changes in technology over time. Artefacts or features associated with the remains from these phases would likely only meet this criterion if they were 'aesthetically attractive', aged or worn. Although it is recognised that exposed in situ archaeological remains may have distinctive/attractive visual qualities, only rarely are these considered 'important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW'.

Archaeological remains associated with Phase 2 may meet the threshold for local significance for this criterion.

Ephemeral remains dating to Phase 3 (1885-1930) Ladies' Baths would be unlikely to demonstrate aesthetic or technical significance at the local level, as they are likely to be truncated and disturbed. The more substantial potential remains from Phase 3 (1885-1930), such as the drainage channel, the stone groynes, stone retaining wall, early services and the foundations of the stone cottage, might demonstrate aesthetic significance and technical significance for their demonstration of the early approaches to providing hot and cold bathing facilities in the Manly area. Such features and artefacts may be able to demonstrate the changes in technology over time. Artefacts or features associated with the remains from these phases would likely only meet this criterion if they were 'aesthetically attractive', aged or worn. Although it is recognised that exposed in situ archaeological

remains may have distinctive/attractive visual qualities, only rarely are these considered 'important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW'.

Archaeological remains associated with Phase 2 may meet the threshold for local significance for this criterion.

The potential remains from Phase 4 (1930-1964) Pavilion and Public Baths would be unlikely to embody distinctive characteristics or changes in technology that are not otherwise known or well-presented elsewhere.

Archaeological remains associated with Phase 4 would not meet the threshold for local significance for this criterion.

As elements from Phase 5 would not be considered to be archaeological remains, this phase would not meet the threshold for local archaeological significance under this criterion.

Archaeological remains associated with Phase 5 would not meet the threshold for local significance for this criterion.

Ability to demonstrate the past through archaeological remains (Criteria A, C, F & G)

The ephemeral remains from Phase 1 (c.1788-1853) early settlement would be unlikely to demonstrate the past through archaeological remains at the local level, as they are likely to be truncated and disturbed by later phases. The expected lack of integrity of remains from this period would mean that the remains are unlikely to be legible or readily able to be interpreted.

Archaeological remains associated with Phase 1 would be unlikely to meet the threshold for local significance for this criterion.

The ephemeral remains from Phase 2 (1853-1885), relating to the Henry Gilbert Smith Baths, would be unlikely to demonstrate the past through archaeological remains at the local level, as they are likely to be truncated and disturbed. The low integrity of ephemeral remains from this period would mean that the remains are unlikely to be legible or readily interpreted. However, Phase 2 (1853-1885) remains such as the drainage channel, the stone groynes, stone retaining wall, early services, the foundations of the stone cottage and associated artefacts may contain well-preserved or rare examples of technologies of particular significance. Such remains would be likely to be able to demonstrate continuity and change in the use of the study area relating to public bathing in the Manly area.

Archaeological remains associated with Phase 2 would meet the threshold for local significance for this criterion.

The ephemeral remains from Phase 3 (1885-1930) Ladies' Baths would be unlikely to demonstrate the past through archaeological remains at the local level, as they are likely to be truncated and disturbed. The low integrity of ephemeral remains from this period would mean that the remains are unlikely to be legible or readily interpreted. However, like Phase 2, Phase 3 (1885-1930) remains may contain well-preserved or rare examples of technologies of particular significance. Such remains would be likely to be able to demonstrate continuity and change in the use of the study area relating to public bathing in the Manly area.

Archaeological remains associated with Phases 3 would meet the threshold for local significance for this criterion.

Although the potential archaeological remains and extant elements of Phase 4 (1930-1964) Pavilion and Public Baths demonstrate the use of the study area and are typical of these phases in the history of Manly, they would be unlikely to meet the threshold for local significance.

Archaeological remains associated with Phase 4 would not meet the threshold for local significance for this criterion.

Although the potential archaeological remains and extant elements of the Phase 5 (1964-Present) Aquarium and surrounding landscaping demonstrate the use of the study area and are typical of these phases in the history of Manly, they would be unlikely to meet the threshold for local significance. The additions to the Art Gallery are extant and are not considered part of the archaeological resource.

Archaeological remains associated with Phase 5 would not meet the threshold for local significance for this criterion.

Bickford and Sullivan's questions

- *Can the site contribute knowledge that no other resource can?*

The archaeological resource from Phase 1 (c.1788-1853) associated with low intensity use and land clearances would be unlikely to contribute knowledge that no other resource can, due to this activity being well documented across NSW. The archaeological resources from Phase 2 (1853-1885) and Phase 3 (1885-1930) have some potential to contribute knowledge that no other resource can; although several photographs and small number of plans dating to the late 19th and early 20th centuries document the baths and bathing structures associated with these phases. Ground truthing of these elements could contribute knowledge about areas and features that are not as well documented, such as the layout of the stone cottage and associated structures, the technologies used in the bathing structures and the stone-cut drainage channel. The archaeological resources dating to Phases 4 (1930-1964) and Phase 5 (1964-Present) would be unlikely to demonstrate information not otherwise available from the historical record.

- *Can the site contribute knowledge that no other site can?*

The archaeological resource from Phase 1 (c.1788-1853) associated with low intensity use and land clearances would be unlikely to contribute knowledge that no other site can, due to the widespread undertaking of such activities across the Manly area. The archaeological resource from Phase 2 (1853-1885) has the potential to contribute knowledge that no other site can, due to the potential archaeological resource's association with the first public baths in the Manly area. The archaeological resource from Phase 3 (1885-1930) has the potential to contribute knowledge that no other site can, due to its connection with the earliest women's public baths in the Manly area. The archaeological resources dating to Phase 4 (1930-1964) and Phase 5 (1964-Present) would be unlikely to demonstrate knowledge not otherwise available from other sites.

- *Is this knowledge relevant to general questions about human history or other substantive questions relating to Australian history, or does it contribute to other major research questions?*

The archaeological resource associated with Phase 1 (c.1788-1853) would be unlikely to contribute to major research questions or other substantive questions relating to Australian history due to its nil to potential and likely truncated nature. Remains from Phase 2 (1853-1885) and Phase 3 (1885-

1930) relating to the public baths may be able to contribute to major research questions about bathing practices, as well as propriety and changing technologies during the late 19th century and early 20th century. Remains from Phase 4 (1930-1964) and Phase 5 (1964-Present) would be unlikely to contribute to major research questions or other substantive questions relating to Australian history.

Summary statement of archaeological significance

The potential remains from Phase 1 (c.1788-1853) related to low intensity land use and land clearances have been assessed as having nil to low potential. However, if remains from this period were found to be substantially intact, such remains may meet the threshold for local significance for their research value. It is unlikely that such archaeological remains would be able to meet the local threshold for associative significance, aesthetic or technical significance or their ability to demonstrate the past through archaeological remains due to a lack of integrity.

The potential remains from Phase 2 (1853-1885), related to the Henry Gilbert Smith Baths, have been assessed as having low to moderate archaeological potential. The remains would be associated with Henry Gilbert Smith, who is often referred to as the 'father of Manly', as well as the bathers who frequented the baths. Such remains would therefore be likely to be able to demonstrate a particular or special connection with individuals and groups of historical significance to the local area, particularly if artefactual deposits, artefact scatters or isolated artefacts were present. The archaeological resource would be likely to contribute knowledge that no other resource or site can about the first baths in Manly and therefore would have research potential at the local level. Likewise, the remains may demonstrate aesthetic or technical significance at the local level and would be able to demonstrate the past through archaeological remains.

The potential remains from Phase 3 (1885-1930) related to Ladies' baths have been assessed as having moderate to high potential. The remains would be associated with the women who used the baths, as well as John Smedley, Mr Darton, and Charles Kindred. Such remains would therefore be likely to be able to demonstrate a particular or special connection with individuals and groups of historical significance to the local area, particularly if artefactual deposits, artefact scatters or isolated artefacts were present. The archaeological resource would be likely to contribute knowledge that no other resource or site can about the early women's baths in Manly and therefore would have research potential at the local level. Likewise, the remains may demonstrate aesthetic or technical significance at the local level and would be able to demonstrate the past through archaeological remains.

The potential remains from Phase 4 (1930-1964) related to the Pavilion and Public Baths have been assessed as having moderate to high potential. Although the remains would be associated with the Port Jackson Steam Company, Manly Council and bathers, such remains would be unlikely to be able to demonstrate a significant connection. The archaeological resource would be unlikely to contribute knowledge that no other resource or site can and therefore would have little or no research potential. Likewise, the remains would be unlikely to demonstrate aesthetic or technical significance or ability to demonstrate the past through archaeological remains.

The potential remains from Phase 5 (1964-Present) related to the construction and use of the Pavilion and Public Baths, as well as alterations to the Manly Art Gallery and stone sea wall and landscaping, have been assessed as having high potential. However, due to their late date, such remains would be unlikely to meet the threshold for local or State significance through their lack of archaeological research potential, aesthetic or technical merit or ability to demonstrate the past through archaeological remains that is not otherwise attested by other sources. Despite the associations with individuals, events or groups of historical importance, including Mutual Pools Pty

Ltd, DSM MacDonald, Marinescape and Manly Council, such remains would be unlikely to directly demonstrate a special connection.

Summary of historical archaeological potential and significance

This archaeological assessment has identified nil to moderate potential for historical archaeological remains of local significance, including remains associated with early settlement, the Henry Gilbert Smith Baths and the Ladies' baths. These remains are summarised in Table 6.

Table 6: Historical archaeological potential and significance

Phase	Anticipated remains	Potential for survival	Significance
Phase 1: Early settlement (1788-1853)	Archaeological features associated with low intensity land use and land clearances.	Nil-Low	Local (if sufficient remains present)
Phase 2: The Henry Gilbert Smith Baths (1853-1885)	Archaeological features associated with the baths, including the bathing enclosure and associated bathing structures, fencing, drainage channel retaining wall, as well as landscaping and excavation.	Low	Local
Phase 3: Ladies' baths (1885-c.1930)	Archaeological features associated with the baths, including the bathing enclosure and associated bathing structures, fencing, stone-cut drainage channel, retaining wall, as well as landscaping and excavation.	Moderate	Local
Phase 4: The Pavilion and Public Baths (1930-1964)	Demolition of structures associated with the Ladies' Baths. Construction and use of the Pavilion and Public Baths.	Moderate	Nil
Phase 5: The Aquarium (1964-Present)	Construction of the Aquariums. Alterations to the Manly Art Gallery and stone sea wall and landscaping.	High (Extant)	Nil

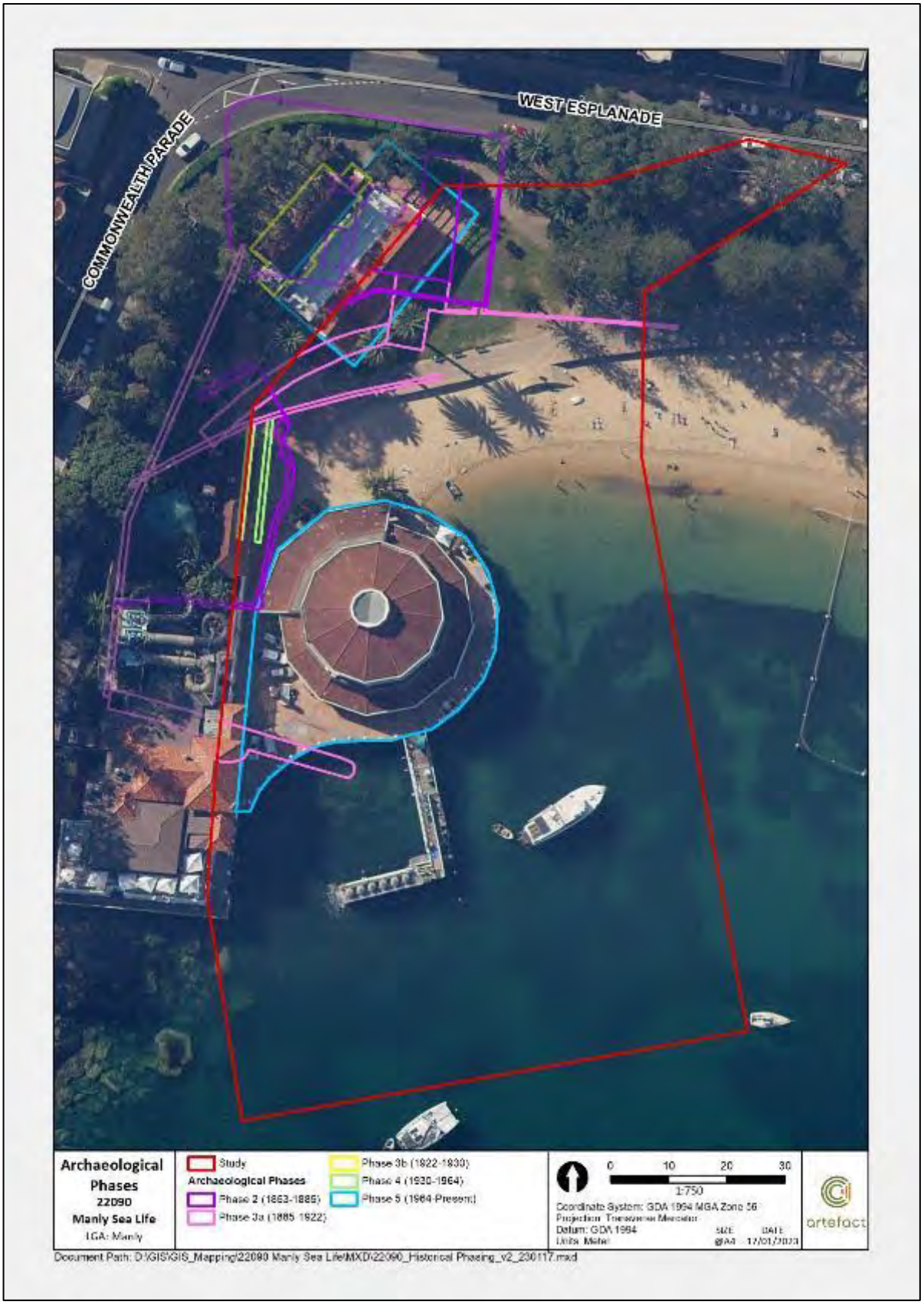


Figure 62: Map of the historical archaeological phasing of the study area (Source: Artefact Heritage Services, 2022).

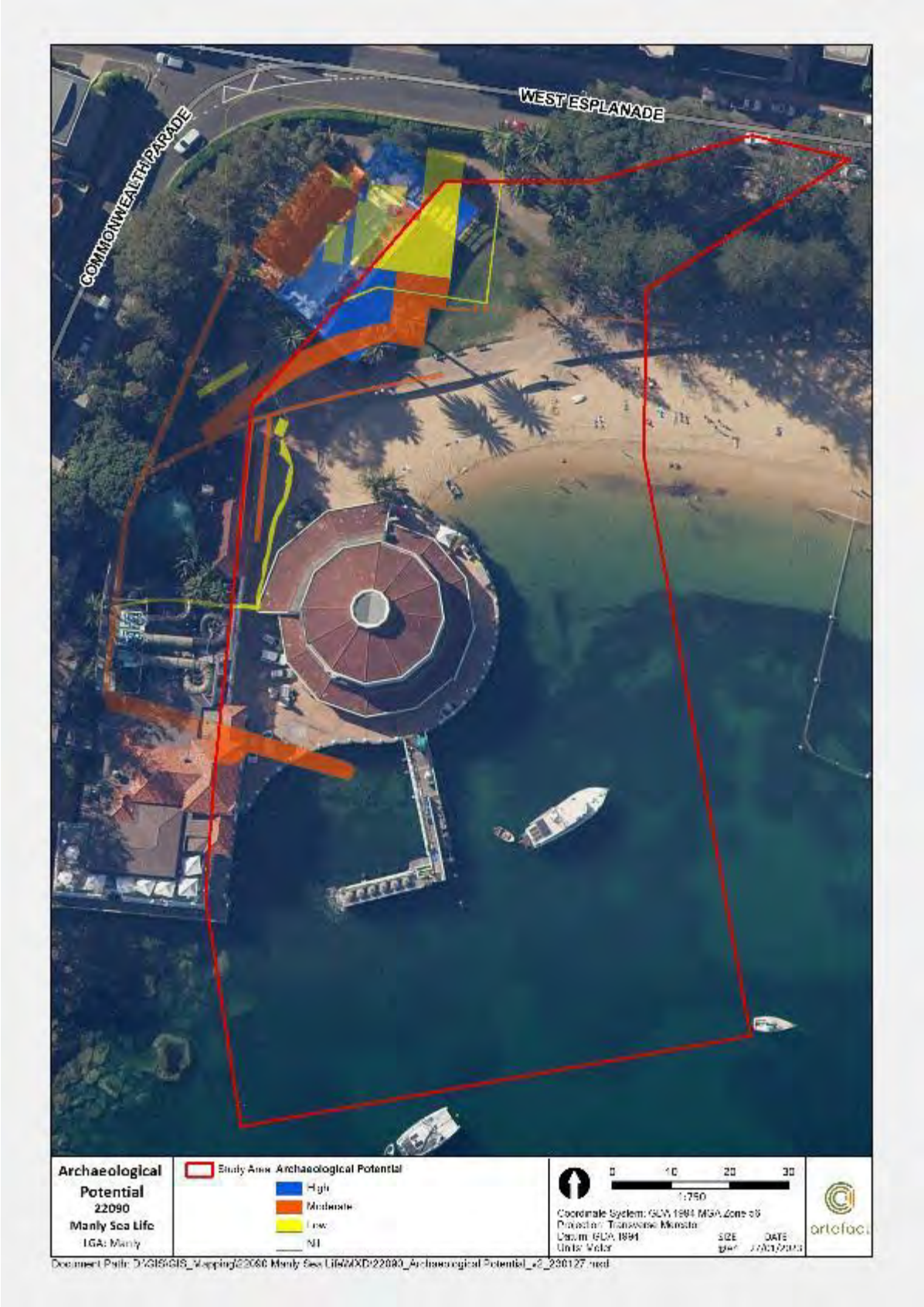


Figure 63: Map of the historical archaeological potential of the study area (Source: Artefact Heritage Services, 2022).

THE PROPOSED WORKS

Introduction

TfNSW proposes to demolish the former Manly Sea Life Building to promenade level and create a vibrant public space for locals and tourists that would celebrate Aboriginal culture, sensitively respond to the heritage values of the state heritage listed Manly Pavilion and provide a canvas for a range of community activities. The proposed work would be staged as follows:

- Stage 1 – demolition of the former Manly Sea Life Building to promenade level
- Stage 2 – finalisation of work including structural works below the promenade level, removal of the existing jetty and planning is still underway for the revitalisation of the space.

The work has been staged to ensure the demolition of the former Manly Sea Life Building proceeds as soon as possible as the existing building is in poor repair and poses a public safety risk. Details of the Stage 2 work would be confirmed following detailed design and would be subject to a separate environmental assessment.

The Proposal

As part of the Stage 1 work, TfNSW proposes to demolish the former Manly Sea Life Building (the proposal). Key features of the proposal would include (refer Figure 64):

- dewatering and temporary remedial work below the promenade level to facilitate demolition
- demolition of the former Manly Sea Life Building down to promenade level
- retention of the circular footprint and existing structural elements below the promenade level including the concrete foundations and shark tank
- temporary infill of existing stairs and other penetrations on the promenade slab
- temporary reclamation of a portion of Manly Cove Beach with gabion basket or rock/sand bag retaining wall to allow for a construction vehicle turning circle and plant staging area.

For the purposes of the Stage 1 REF, the proposal footprint, proposal area and compound areas have been defined as follows:

- Proposal footprint - the area directly impacted by proposed work, including the removal of structures and installation of temporary structures.
- Proposal area - the area around the proposal footprint required for construction including the compound area and beach reclamation area.
- Compound areas - the temporary facilities required for construction, including for example an office and amenities compound, construction compound and materials handling areas. These compound areas would likely be in the vicinity of the Manly Art Gallery and Museum and on a reclaimed section of Manly Cove Beach. The exact locations would be determined prior to construction.

Specialist disciplines apply individual study areas relevant to the nature of the aspect being assessed.

Major Design Features

Dewatering and remedial work

Dewatering and remedial work below the promenade level would be required to facilitate demolition of the existing Manly Sea Life building above promenade level. These works would include:

- Dewatering of the shark and sediment level tanks. Further specialist advice from a risk assessor will be sought to determine the risk and the appropriate method of disposal of water from the tanks.
- Partial filling of the void below the promenade by pouring approximately 300mm of concrete ballast at the same time as dewatering. This is required to resolve the buoyancy issues once water from the tanks is removed. The void above the concrete ballast would be kept intact.
- Temporary bracing underneath the promenade slab.
- Terminating the existing services and providing a temporary switchboard and water point above the promenade for future use.
- Treatment of the penguin pool water on site to achieve water standard for discharge into water course

Demolition

The existing Manly Sea Life Building comprises four levels. Levels 2, 3 and 4 are above the promenade level and would be removed as part of the proposal. The key stages of demolition would be:

- removal of all fixtures, fittings, and equipment from inside the building
- removal of roof tiles, insulation, cladding and glass panels from the building
- demolition of masonry walls and roof framing

The demolition material would be processed on the beach laydown area, prior to being disposed of at a waste facility licensed to accept the relevant class of waste. There would be no stockpiling of material between Stages 1 and 2.

Temporary Work

Temporary work would be undertaken following demolition of Manly Sea Life Building as follows:

- make good of the existing promenade slab
- covering of existing stairs and other penetrations on the promenade slab with engineered concrete to finish flush with the existing promenade slab level. As the promenade slab is built on radial beams the final surface would have a slight gradient.

The temporary work would removed after the completion of Stage 1 works, expected to be an approximate duration of 4 months.

Beach Reclamation Area

Temporary reclamation of approximately 675 square metres of Manly Cove Beach would be required to facilitate vehicle movements and material laydown and processing. The process for the beach reclamation would be as follows:

- excavate down to scour level along the southern and eastern edges of the laydown area (approximately -1.0AHD)
- place rock bags up to approximately +0.0AHD to create a retaining wall below the sand level
- build the retaining wall with sand bags (hessian bags) up to approximately +2.5 AHD. Above sand level, sand bags would be used to continue the retaining wall up
- import approximately 1,150 tonnes of sand
- lay a geotextile layer to separate sand and aggregates
- import approximately 600 tonnes of aggregate and asphalt pavement.

The beach reclamation area would be returned to public use after the completion of Stage 1 works, expected to be an approximate duration of 4 months.

Other features

Potential works that could be included in the interim between Stage 1 and Stage 2 are as follows:

- fixed street furniture such as benches and tables
- large planting in planter boxes (similar to what is provided by the Manly Pavilion)
- painted concrete.



Figure 64: Proposal areas (Source: Stantec, 2024)

HERITAGE IMPACT ASSESSMENT

Overview

This section assesses the heritage impact of the proposed works at the study area on heritage values within the study area. Justifications are also provided for the proposed works.

Within this approach, the objective of a heritage impact assessment is to evaluate and explain how the proposed works will affect the heritage value of the study area and/or place. A heritage impact assessment should also address how the heritage value of the site/place can be conserved or maintained, or preferably enhanced by the proposed works.

In order to consistently identify the impact of the proposed works, the terminology contained in the following table has been referenced throughout this document. The terminology and definitions are based on those contained in guidelines produced by the International Council on Monuments and Sites (ICOMOS)[96] and the Heritage Council of NSW[97]and are shown in Table 7.

Table 7: Terminology for assessing the magnitude of heritage impact.

Grading	Definition
Major adverse	Actions that would have a severe, long-term and possibly irreversible impact on a heritage item. Actions in this category would include partial or complete demolition of a heritage item or addition of new structures in its vicinity that destroy the visual setting of the item. These actions cannot be fully mitigated.
Moderate adverse	Actions that would have an adverse impact on a heritage item. Actions in this category would include removal of an important part of a heritage item's setting or temporary removal of significant elements or fabric. The impact of these actions could be reduced through appropriate mitigation measures.
Minor adverse	Actions that would have a minor adverse impact on a heritage item. This may be the result of the action affecting only a small part of the place or a distant/small part of the setting of a heritage place. The action may also be temporary and/or reversible.
Negligible	Actions that are so minor that the heritage impact is considered negligible.
Neutral	Actions that would have no heritage impact.
Minor positive	Actions that would bring a minor benefit to a heritage item, such as an improvement in the item's visual setting.
Moderate positive	Actions that would bring a moderate benefit to a heritage item, such as removal of intrusive elements or fabric or a substantial improvement to the item's visual setting.
Major positive	Actions that would bring a major benefit to a heritage item, such as reconstruction of significant fabric, removal of substantial intrusive elements/fabric or reinstatement of an item's visual setting or curtilage.

[96] Including the document Guidance on Heritage Impact Assessments for Cultural World Heritage Properties, ICOMOS, January 2011.
[97] https://www.environment.nsw.gov.au/resources/heritagebranch/heritage/material-threshold-policy.pdf

Table 8: Terminology for heritage impact types

Impact	Definition
Physical	Impacts resulting from works located within and outside the curtilage boundaries of the heritage item.
Visual	Impact to views, vistas and setting of the heritage item resulting from proposed works within and outside the curtilage boundaries of the heritage item.
Potential	Impacts resulting from increased noise, vibrations and construction works located within and outside the curtilage boundaries of the heritage item.

Assessment of Heritage Impacts

Harbour Foreshore (LEP #I1)

Physical heritage impacts

The establishment of the site compound would result in the western extent of Manly Cove Foreshore opposite the Manly Art Gallery and Museum being levelled by a maximum of 1m and the excavation and refill of a portion of Manly Cove beach. For the duration of construction, these areas of grass and sand would be inaccessible to the public. As such the works have been assessed as having a temporary **minor adverse** physical impact on a portion of the locally significant Harbour Foreshore. The beach reclamation area would remain in situ until the completion of the Stage 1 works, which is anticipated to be 4 months duration. The foreshore would be returned to its pre-works state on removal of the reclamation area.

Visual heritage impacts

During construction, part of the Manly Cove Harbour Foreshore vista would be impeded by the establishment of the site compound which would be surrounded by hoarding. The construction compound would be visually intrusive for the duration of construction, thereby having a temporary **minor adverse** visual impact on the Manly Cove Foreshore. The beach reclamation area would remain in situ until the completion of the Stage 1 works, which is anticipated to be 4 months duration. The foreshore would be returned to its pre-works state on removal of the reclamation area.

The Manly Sea Life Building has been identified as an intrusive structure which is recommended for removal.[98] As the proposed works would result in its demolition, and the reinstatement of the historic views towards the Manly Pavilion across the foreshore, the proposed works would result in a **major positive** visual impact on the Harbour Foreshore and other surrounding heritage items.

Park (LEP #I251)

Physical heritage impacts

During construction, the western extent of the beach and grass area of the 'Park' would be reclaimed for the site compound. The grass area in front of the Art Gallery would be levelled and this portion of beach would be excavated and reprofiled to create a level surface for the movement of machinery and goods. The compound would also impede public use of this portion of the 'Park'. This proposed works would have a temporary **minor adverse** physical impact on a portion of the locally listed 'Park'. The construction haul road and compound area within the 'Park' would be removed after Stage 1 works. These areas may be reinstated as part of Stage 2 works as required.

[98] Heritage NSW, n.d. "Manly Pavilion," *State Heritage Inventory.* Accessed 17 October 2022 via <https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2020873>.

Visual heritage impacts

The site compound would be surrounded by hoarding and construction machinery would be visually prominent. As such the proposal is visually intrusive, impacting vistas of the 'Park' from various vantage points as well as views of surrounding heritage items from the 'Park', which is a key element of the Park's significance. Therefore, the proposal would have temporary **minor adverse** visual impact on views of the Park for the duration of the construction works. The construction haul road and compound area within the 'Park' would be removed after Stage 1 works, which are anticipated to be 4 months duration.

The Manly Sea Life Building has been identified as an intrusive structure which is recommended for removal.[99] As the proposed works would result in its demolition, and the reinstatement of the historic views towards the Manly Pavilion across the foreshore, the proposed works would result in a **major positive** visual impact on the Park and other surrounding heritage items.

Impacts to Heritage Items in the Vicinity

This section assesses the potential physical and visual impacts of the proposed works on heritage items within the study area itself and its vicinity. The heritage impacts of the proposed works are outlined in Table 9.

Table 9: Assessment of heritage impact.

Item Name	Item/Listing Number	Physical impacts	Visual impacts
Manly Cove Pavilion	SHR #01433 LEP #I249	During demolition, vibration monitoring would be occurring to mitigate any damage to heritage fabric. In addition, during certain stages of the works the pavilion may be inaccessible or have limited access from the West Esplanade. However, the demolition plan has been designed to minimise impact to the use and access of the Pavilion. As such the works have been assessed as having **minor adverse** physical impacts on the Manly Pavilion.	The site compound would be visually intrusive, distorting views of the Pavilion from vantage points around the Cove. As such the works have been assessed as having a temporary **minor adverse** visual impact on Manly Pavilion. The proposed works would see the demolition of the Manly Sea Life Building which has been identified as an intrusive structure which negatively impacts the significance of the state listed Manly Cove Pavilion.[100] The Manly Sea Life Building currently obscures the views of the Manly Pavilion from the Manly Foreshore, ferry wharf and Park. As the proposed works would result in the demolition of the intrusive structure and the reinstatement of the historic views to and from the Manly Pavilion across the foreshore, it would increase the Pavilions visual prominence resulting in a **major positive** impact on the

[99] Heritage NSW, n.d. "Manly Pavilion," *State Heritage Inventory.* Accessed 17 October 2022 via <https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2020873>.
[100] Heritage NSW, n.d. "Manly Pavilion," *State Heritage Inventory.* Accessed 17 October 2022 via <https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2020873>.

Item Name	Item/Listing Number	Physical impacts	Visual impacts
			significance of the Manly Pavilion and surrounding listed items.
Manly Wharf	SHR #01434 LEP #I145	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	During the proposed works, the construction area would intrude upon views of the Wharf from Manly Pavilion, therefore there would be temporary **minor adverse** visual impacts on the Wharf. The proposed works would see the demolition of the Manly Sea Life Building which has been identified as an intrusive structure which is recommended for removal.[101] As the proposed works would result in the demolition of the intrusive structure and the reinstatement of the historic views to and from the Manly Wharf across the foreshore and towards the Manly Pavilion, the proposed works would result in a **major positive** impact on the significance of the Manly Wharf and surrounding listed items.
All Stone Kerbs	LEP #I2	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	The proposed works would see the demolition of the existing Manly Sea Life Building. As the views towards the Manly Sea Life Building are fully obstructed/ not currently visible from this item, the existing views towards and from this item would remain unchanged. As the views towards and from this item would remain unchanged, the works have been assessed as having a **neutral** visual impact to the item.
Residential Flat Building 'Hilder Lea'	LEP #I98	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	The proposed works would see the demolition of the existing Manly Sea Life Building. As the views towards the Manly Sea Life Building are fully obstructed/ not currently visible from this item, the existing views towards and from this item would remain unchanged. As the views towards and from this item will remain unchanged, the works have been assessed as having a **neutral** visual impact to the item.

[101] Heritage NSW, n.d. "Manly Pavilion," *State Heritage Inventory.* Accessed 17 October 2022 via <https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2020873>.

Item Name	Item/Listing Number	Physical impacts	Visual impacts
House	LEP #I115	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	The proposed works would see the demolition of the existing Manly Sea Life Building. As the views towards the Manly Sea Life Building are fully obstructed/ not currently visible from this item, the existing views towards and from this item would remain unchanged. As the views towards and from this item will remain unchanged, the works have been assessed as having a **neutral** visual impact to the item.
Auckland Garage Building (former service station)	LEP #I156	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	The proposed works would see the demolition of the existing Manly Sea Life Building. As the views towards the Manly Sea Life Building are fully obstructed/ not currently visible from this item, the existing views towards and from this item would remain unchanged. As the views towards and from this item will remain unchanged, the works have been assessed as having a **neutral** visual impact to the item.
Reserve Park	LEP #I237	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	The proposed works would see the demolition of the existing Manly Sea Life Building. As the views towards the Manly Sea Life Building are fully obstructed/ not currently visible from this item, the existing views towards and from this item would remain unchanged. As the views towards and from this item will remain unchanged, the works have been assessed as having a **neutral** visual impact to the item.
Governor Phillip Monument	LEP #I248	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	The proposed works will see the demolition of the Manly Sea Life Building which has been identified as an intrusive structure which is recommended for removal.[102] As the proposed works would result the demolition of the intrusive structure and the reinstatement of the historic views along the Manly foreshore the proposed works would result in a **minor positive** visual impact on

[102] Heritage NSW, n.d. "Manly Pavilion," *State Heritage Inventory.* Accessed 17 October 2022 via <https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2020873>.

Item Name	Item/Listing Number	Physical impacts	Visual impacts
			the significance of the Governor Philip Monument and surrounding listed items. Due to the distance between the Western Esplanade and the Governor Philip Monument, the monument is not readily visible from. As such the works have been assessed as having **neutral** visual impacts to the item.
Manly Cove Amenities block	LEP #I250	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	The proposed works will see the demolition of the Manly Sea Life Building which has been identified as an intrusive structure which is recommended for removal.[103] The Manly Sea Life Building currently obscures the views of the Manly Cove Amenities Block from the Manly Foreshore and Park. As the proposed works will result the demolition of the intrusive structure and the reinstatement of the historic views to and from the Manly Cove Amenities Block across the foreshore the proposed works will result in a **major positive** visual impact on the significance of the Manly Cove Amenities Block and surrounding listed items. During the proposed works, the hoarding around the site compound will likely obscure views of the Amenities Block from the Park and Foreshore. However, this impact will be temporary and has been assessed as a **minor adverse** visual impact.
Residential Flat Buildings	LEP #I252	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	The proposed works would see the demolition of the existing Manly Sea Life Building. As the views towards the Manly Sea Life Building are fully obstructed/ not currently visible from this item, the existing views towards and from this item will remain unchanged. As the views towards and from this item will remain unchanged, the works have been assessed as having **neutral** visual impacts to the item.

[103] Heritage NSW, n.d. "Manly Pavilion," *State Heritage Inventory.* Accessed 17 October 2022 via <https://www.hms.heritage.nsw.gov.au/App/Item/ViewItem?itemId=2020873>.

Item Name	Item/Listing Number	Physical impacts	Visual impacts
House	LEP #I92	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	The proposed works would see the demolition of the existing Manly Sea Life Building. As the views towards the Manly Sea Life building are fully obstructed/ not currently visible from this item, the existing views towards and from this item will remain unchanged. As the views towards and from this item will remain unchanged, the works have been assessed as having a **neutral** visual impact to the item.
House, "Loldis"	LEP #I235	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	The proposed works would see the demolition of the existing Manly Sea Life Building. As the views towards the Manly Sea Life Building are fully obstructed/ not currently visible from this item, the existing views towards and from this item will remain unchanged. As the views towards and from this item will remain unchanged, the works have been assessed as having a **neutral** visual impact to the item.
Uniting Church	LEP #I253	As the proposed Manly Sea Life Building works would not physically impact this listing, the works have been assessed as having a **neutral** physical impact to the item.	The proposed works would see the demolition of the existing Manly Sea Life Building. As the views towards the Manly Sea Life Building are fully obstructed/ not currently visible from this item, the existing views towards and from this item would remain unchanged. As the views towards and from this item would remain unchanged, the works have been assessed as having a **neutral** visual impact to the item.

Heritage considerations for the proposal

Heritage guidelines[104] prepared by the NSW Heritage Office (now Heritage NSW, DPC) outline design considerations for projects that involve demolition.

Design considerations are discussed in Table 10.

[104] 'Statements of Heritage Impact', Heritage Office and Department of Urban Affairs and Planning 2002

Table 10: Heritage considerations for Manly Sea Life (Source: NSW Heritage Office, 2002).

Heritage Consideration	Discussion
Have all options for retention and adaptive re-use been explored? Have the consultant's recommendations been implemented? If not, why not?	N/A – the Manly Sea Life Building is considered an intrusive element and not of heritage significance. The site compound would have an impact on the 'Park' and 'Foreshore' however the adverse impacts would only be incurred for the duration of the construction, and works would ultimately have positive impacts for the cove with the removal of an intrusive structure.
Is demolition essential at this time or can it be postponed in case future circumstances make its retention and conservation more feasible?	The Manly Sea Life Building is considered an intrusive element and therefore its demolition would have a positive impact on the surrounding heritage listed items (Manly Pavilion and Manly Cove Amenities Block). As the Sea Life Building has been vacant for many years, it has fallen into disrepair so its demolition should be complete as soon as possible.
Has the advice of a heritage consultant been sought?	Yes, by Artefact Heritage; recommendations and mitigation measures are provided in this memo.
Can all of the significant elements of the heritage item be kept, and any new development be located elsewhere on the site?	Yes, no works are proposed to any significant fabric of the Manly Pavilion or Manly Cove Amenities Block. Works are only proposed to the intrusive Manly Sea Life Building. The 'Park' and 'Foreshore' would be temporarily impacted during the project works; however works would be limited to areas of moderate to low significance. The impacts to the 'Park' due to the compound area and haul road would be removed following Stage 1 works. The beach reclamation area would remain until the completion of Stage 2 works.
How is the impact of the new development on the heritage significance of the item or area to be minimised?	Overall, the removal of Manly Sea Life Building would have a major positive impact on the heritage items surrounding it by removing a structure considered visually intrusive, and reinstating vistas between significant items such as Manly Pavilion and Manly Wharf. The impacts to the 'Park' due to the compound area and haul road would be removed following Stage 1 works. The beach reclamation area would remain until the completion of Stage 2 works.
Why is the new development required adjacent to the heritage item?	Currently the Manly Sea Life Building is in a state of disrepair posing a risk to the public and environment. In addition, it blocks views of the Pavilion from Manly Cove.
How does the new development affect views to and from the heritage items? What has been done to minimise negative effects?	The removal of the Manly Sea Life Building would enhance views of Manly Pavilion, the Manly Cove Amenities Block, the Park and Harbour Foreshore and Manly Wharf from various points around the cove.
Is the new development sympathetic to the heritage item?	The demolition of the Manly Sea Life Building seeks to enhance the cultural significance of Manly Pavilion as it would return the visual prominence of the Pavilion throughout the cove.

Heritage Consideration	Discussion
Will the public, and users of the item, still be able to view and appreciate its significance?	The proposal seeks to enhance views of various items around the Cove including the Wharf and Pavilion and reinstate sight lines between these items which had been interrupted by the Manly Sea Life Building.

Statement of Heritage Impact

A statement of heritage impact has been prepared according to Heritage NSW's guidelines in Table 11 below.

Table 11. Preliminary Statement of Heritage Impact for the proposed works

Development	Discussion
What aspects of the Proposal respect or enhance the heritage significance of the study area?	The proposed works would significantly enhance the heritage significance of the Manly Pavilion and the Manly Cove Amenities Block as it would allow the reinstatement of the historic view towards the buildings from Manly Cove. The proposed works would also enhance the significance and views to and from the state listed Manly Wharf, and the locally listed Manly Cove Foreshore and Park. The Manly Sea Life Building has been identified as an intrusive element therefore its removal would positively impact the surrounding heritage context.
What aspects of the Proposal could have a detrimental impact on the heritage significance of the study area?	The proposed location of the construction compound could detrimentally impact the significance of the Manly Cove Harbour Foreshore and Park, however the impact would be temporary as both areas would be made good upon completion of the works In either Stage 1 (Park) or Stage 2 (Foreshore). During demolition vibration monitoring, saw cutting methodology and pulverisers will be implemented so as to mitigate potential damage to the heritage fabric of the Pavilion.
Have more sympathetic options been considered and discounted?	Various design options have been reviewed with relation to the demolition methodology. The coffer dam demolition option would allow greater dry access for demolition, however the installation of the piles would potentially result in vibration which might negatively impact on the Manly Pavilion and Amenities Block. The proposed below water dewatering of the shark tank and temporary remedial works below the promenade level to facilitate demolition are unlikely to impact the Manly Pavilion and Amenities Block the least.

Assessment against relevant policies

Conservation Management Plan policies

The following table records the policies that are assessed as being directly relevant to the proposed works. A full list of policies can be seen in the Manly Bathers Pavilion CMP.[105]

[105] NBRS&P Heritage, 2002, *Manly Bathers Pavilion West Esplanade, Manly NSW 2902 Conservation Management Plan.*

Table 12: Assessment of proposal against Manly Pavilion CMP policies (Source: NBRS&P Heritage)

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
6.01	Setting	*Proposed changes to the setting of the Manly Bathers Pavilion should be guided by an analysis of the existing views of the Pavilion from Manly Cove and The Esplanade and the harbourside character of the existing setting*	Yes	The removal of the Manly Sea Life Building would increase the visibility of the Manly Bathers Pavilion and reinstate the historic setting of the Pavilion with relation to the Esplanade, Manly Cove and the harbourside.
6.02	Setting	*In general no new development should be permitted within the designated curtilage, which would detract from the landmark qualities of the Manly Bathers Pavilion by obscuring present views of the Pavilion and particularly of the arcaded loggia and the roofscape*	Yes	No new development is proposed within the designated curtilage. The removal of the Manly Sea Life Building would have a positive impact on the views towards the Manly Bathers Pavilion by the removal of the intrusive Manly Sea Life Building.
6.03	Setting	*Any development of the site should respect the original siting of the Manly Bathers Pavilion as a prominent feature set against the promontory landscape. New development should only be considered in areas west of the facade line and should not impinge on those significant views identified as being essential to the significance of the place.*	Yes	The removal of the Manly Sea Life Building would reinstate significant views of Manly Pavilion. Thereby the development would have positive impacts on the SHR listed Pavilion.
6.06	Setting	*Proposed work, which may have additional adverse impacts on the exterior form and qualities of the building as an Inter-War Mediterranean design with Italianate influences are unacceptable.* *Conversely, work which reverses existing negative impacts on the exterior of the building to reinforce the original aesthetic qualities are to be promoted.*	Yes	The Manly Sea Life Building has been identified as an intrusive element which should be removed. The proposed works would reverse the negative visual impacts of the Manly Sea Life Building resulting in a positive impact on the views towards the Manly Bathers Pavilion.

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
6.07	Setting	*Any proposal to alter adjacent buildings or structures including the Public Toilets, Manly Art Gallery or Oceanworld* [Manly Sea Life] *or jetty structures should be subject to a heritage impact statement which* *assess the potential positive or negative impacts of the proposal on the values of the Manly Bathers Pavilion*	Yes	Refer to Section Assessment of Heritage Impacts of this report.
8.03	Related Places	*Oceanworld* [Manly Sea Life] *building is regarded as intrusive*	Yes	The proposed works would reverse the negative visual impacts of the Manly Sea Life Building resulting in a positive impact on the views towards the Manly Bathers Pavilion.
11.04	Changes	*Changes to significant fabric & changes within the defined curtilage or involving the setting generally of the Manly Bathers Pavilion shall be subject to preparation of a Statement of Heritage* *Impacts based on this Conservation Plan*	Yes	Refer to Section Assessment of Heritage Impacts of this report.
11.07	Changes	*Building fabric and contents which are identified in this plan as being insignificant or of an* *intrusive nature may be removed altered or adapted provided that such action allows the potential for recovery of significance and does not damage surrounding original fabric*	Yes	The CMP identifies Manly Sea Life as intrusive fabric as it impinges on the setting of the Pavilion. Therefore, the proposed works would reverse the negative visual impacts of the Manly Sea Life Building resulting in a positive impact on the views towards the Manly Bathers Pavilion.

Policy #	Overarching policy	Policy detail	Are works consistent with CMP policy? (Yes/No?)	Comments
15.02	New Work	*New work such as additions to the place may be acceptable where it does not distort or obscure the cultural significance of the place, or detract from its interpretation and appreciation.*	Yes	The new work removes intrusive material (Manly Sea Life Building) and would enhance the overall pavilion setting and setting of Manly Cove overall.
45.01	Landscape & Setting	*The harbour's edge landscape character of the site of the Manly Bathers Pavilion should be maintained and enhanced by the implementation of an* *appropriate Landscape Plan of Management. This should include consideration of views to and from the Manly Bathers Pavilion.* *It should address maintenance and enhancement of the neglected cliff face* *and slope to the west to further screen the rear of the building while maintaining strategic vistas along the approach steps to the boardwalk*	No	The proposed works do not require the implementation of a Landscape Plan of Management. The proposed works would enhance the setting of the Manly Bather's Pavilion through the demolition of the Manly Sea Life Building.

Burra Charter

The conservation articles provided in Table 13 below from the Burra Charter, which are of particular relevance to the proposal, should be followed.

Table 13: Relevant articles from the *Burra Charter*[106]

Article No.	Article	Proposal
2.2	*The aim of conservation is to retain the cultural significance of a place.*	The proposed works enhances the cultural significance of Manly Pavilion as it removes an intrusive structure and enables the Pavilion to be appreciated across its Manly Cove context.

[106] Australia ICOMOS 2013. *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance.*

Article No.	Article	Proposal
8	*Conservation requires the retention of an appropriate setting. This includes the retention of the visual and sensory setting, as well as the retention of spiritual and other cultural relationships that contribute to the cultural significance of the place.* *New construction, demolition, intrusions, or other changes which would adversely affect the setting or relationships are not appropriate.*	The removal of the Manly Sea Life Building, would enhance the overall Manly Cove setting, reinstating the visual connections between Manly Wharf and Manly Pavilion. During proposed works views would be impeded and pedestrian access in the western portion of the cove would be negatively impacted, however, the impact would be temporary.
11	*The contribution of related places and related objects make to the cultural significance of the place should be retained.*	As the Manly Sea Life Building is regarded as an intrusive structure, particularly for Manly Pavilion, as such its removal would enhance the Pavilion setting. During the proposed works views between heritage items within the Cove would be impeded, however following the dismantling of the site compound at the end of construction views between heritage items such as the 'Park' and Manly Pavilion would be enhanced.
15.2	*Changes which reduce cultural significance should be reversible, and be reversed when circumstances permit*	The compound laydown for construction would impact use of the western extent of the 'Park' and 'Harbour Foreshore'. The impacts to the 'Park' due to the compound area and haul road would be removed following Stage 1 works. The beach reclamation area would remain until the completion of Stage 2 works.
22.1	*New work such as additions or other changes to the place may be acceptable where it respects and does not distort or obscure the cultural significance of the place or detract from its interpretation and appreciation*	The Manly Sea Life Building is considered intrusive in respect to Manly Pavilion, therefore its removal would enhance the cultural significance of the Pavilion by enabling to be viewed and appreciated from more vantage points throughout the Cove.
26.1	*Work on a place should be preceded by studies to understand the place which should include analysis of physical, documentary, oral and other evidence, drawing on appropriate knowledge and skills.*	This memo has been prepared to identify and assess the heritage values of items within the area.

CONCLUSION

Conclusion

Manly Sea Life is not listed on any statutory or non-statutory registers. It is located within close proximity to **2** heritage items listed on the SHR and **15** locally listed heritage items listed on the Manly LEP 2013:

- Manly Cove Pavilion SHR number 01433 & LEP Item number I249
- Manly Wharf SHR number 01434 & LEP Item number I145
- Harbour Foreshore LEP Item number I1
- All Stone Kerbs LEP Item number I2
- Residential Flat Building 'Hilder Lea' LEP Item number I98
- House LEP Item number I115
- Auckland Garage Building (former service station) LEP Item number I156
- Reserve Park LEP Item number I237
- Governor Phillip Monument LEP Item number I248
- Manly Cove Amenities block LEP item number I250
- Park LEP Item number I251
- Residential Flat Buildings LEP Item number I252
- House LEP item number I92
- House, "Loldis" LEP item number I235
- Uniting Church LEP item number I253

Based on Stage 1 works as outlined in this memo, the proposal works would result in the following heritage impacts:

- During the proposed works there would be temporary **minor adverse** physical impacts on the Manly LEP listed 'Park' and 'Harbour Foreshore'. Following construction and the remediation of damage incurred the impact after Stage 2 works, the impact has been assessed as **neutral**.
- During the proposed works there would be temporary **minor adverse** visual impacts on LEP listed 'Park' and 'Harbour Foreshore'. However, once construction is complete, the removal of the Manly Sea Life Building would have a **major positive** impact on the 'Park' and 'Harbour Foreshore' as a visually instructive element would have been removed.
    - Similarly, during the proposed works, views of Manly Cove Amenities block would be obscured from the rest of the Cove by the site compound, however the **minor adverse** visual impact would be temporary.
    - Physical impacts on Manly Pavilion has been assessed as being **neutral**, as measures would be put in place to mitigate potential damage incurred through vibrations, impacts to public access would be maintained during demolition works.

- During proposed works, the site compound would have a **minor adverse** visual impact on Manly Pavilion, however once demolition and construction are complete, the works would have a **major positive** impact, by restoring views of the Pavilion which had previously been blocked by the intrusive Manly Sea Life Building.

Approval pathway

The proposed Stage 1 works would be reviewed as part of a REF, which is an environmental assessment required under division 5.1 of the EP&A Act to assess the significance of the likely environmental impacts of the proposed works. This Memo should be submitted as part of the REF approval process to review the potential heritage impacts of the proposed works on the adjacent heritage items.

As the proposed works would have a temporary minor adverse physical and visual impact on the Manly Pavilion (#01433) and are outside the SHR curtilage, it is considered that the works do not require an approval under section 60 of the *NSW Heritage Act 1977.*

Recommendations and mitigation measures

Pre-Stage 1 Works

Prior to the commencement of construction, the following recommendations and mitigation measures should be implemented:

- Although the Manly Sea Life Building is not a listed local heritage item, it was a dominant landscape feature and popular tourist attraction from the 1960s onwards. Its final removal provides an opportunity to publicly recognise its importance in the local economy, culture and folklore of Manly and surrounds. Potential opportunities and initiatives should be explored collaboratively through Transport for NSW and Northern Beaches Council, involving Manly Art Gallery & Museum and the Northern Beaches Libraries local studies collections.
- Initiatives that recognise the social history of Manly Sea Life Aquarium also provide an opportunity to engage with the local community and stakeholders, including local artists, historians and cultural professionals through Manly Art Gallery & Museum as well as with the broader community who remember the site as part of visits to Manly. A range of activities and initiatives could be explored, many of which would enable permanent additions to the Manly Art Gallery & Museum and the local studies archive. Potential opportunities include an open call for personal photos and film footage, a pop-up exhibition, recording of memories/oral history or other activities to highlight the Aquarium's and Manly's history, and its role in recreation and sea life conservation.
    - The Construction Management Plan (CMP) for the project should include the following recommendations pertinent to heritage:
        - The proposed sediment control measures installed within the Manly Foreshore
        - Protection measures to safeguard the significant fabric of the Manly Cove Pavilion, Manly Cove Amenities, Park and Harbour Foreshore should be implemented. Protection measures could include:

        - Sensitive hoarding
        - Impact protection fabric
        - Tree root protection
    - Location of any required exclusion zones for any significant monuments or landscaping which might be impacted during the works. This should include a vehicular movement control plan to ensure minimal disturbance to the parkland zone.
    - The proposed noise and vibration monitoring
    - Unexpected finds protocol: any unexpected discovery of archaeological material will be managed in accordance with *Unexpected heritage items procedure* (Transport for NSW, July 2022)
- Heritage induction: All relevant construction staff, contractors and subcontractors must be made aware of their statutory obligations for heritage under the NSW *Heritage Act* 1977 and best practice as outlined in The Burra Charter (Australia ICOMOS 2013) to ensure no archaeological remains or heritage fabric are impacted during the proposed works without appropriate mitigation measures in place. This will be implemented through a heritage induction carried out prior to works commencing and throughout the works program.
- As part of the Contractor's dilapidation survey report, photographs of the Manly Sea Life Building should be taken prior to demolition and after demolition to record the site. These photographs should be provided to Northern Beaches Council or the Northern Beaches Libraries local studies collections as part of the record of the building and to inform future interpretation and research for the building and site.
- The Contractor is responsible for recording the condition of Manly Pavilion, beach reclamation area, Manly Cove Amenities and Park prior to the establishment of hoarding, site exclusion zones, reclamation area, haul road and compound area. This record should be used to assist in the 'make good' of disturbance and any damage which occurs as a result of the construction works.

During Stage 1 Works

For the duration of works, the CMP should be adhered to.

Post-Stage1 Works

- Upon completion of the works, any damage to the significant fabric of the Manly Pavilion, Harbour Foreshore, Park or Manly Cove Amenities Block should be repaired or replaced to match existing fabric and finish.
- The construction compound and laydown area must be completely removed at the completion of Stage 1 works, and the affected areas of the park and foreshore are to be made good in accordance with the Contractor's photos.

- The reclamation of the beach for the purpose of the project should be dismantled and returned to the beach on completion of the Stage 1 works.
- Prior to the commencement of Stage 2 works:
    - Consideration should be given to the provision of heritage interpretation as part of the project, which would outline the history, associations and significance of the site and the wider Manly Foreshore area. Interpretive measures could involve interpretive signage, panels or displays at entry/exit points to the station.

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Appendix E - Preliminary Site Investigation

Preliminary Site Investigation

Manly Cove West (Manly Sea Life)

27 April 2023

Prepared for:

BESIX Watpac on behalf of Transport for NSW

Prepared by:

Stantec Australia

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Revision	Description	Author		Quality Check	
A	Draft for client review	MK	27/1/23	MB	27/1/23
B	Draft for client review	MK	27/04/223	SL/CC	27/04/23

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Executive Summary

Stantec was engaged by BESIX Watpac to prepare a Preliminary Site Investigation (PSI) within the proposal area at a portion of the West Esplanade, Manly NSW 2095 (herein referred to as 'the site').

Purpose and objective

The purpose of this PSI was to gather preliminary contamination information for the site and to provide advice on potential construction constraints.

The objective of this assessment is to assess whether contamination has the potential to exist on the site and whether further investigation is required.

It is understood that the proposed redevelopment would include the following key design features:

- Demolition of the former Manly Sea Life building down to seabed level
- Retention of some former Manly Sea Life structural elements underneath the new proposed boardwalk
- Demolition of the timber jetty, including supporting piles
- Construction of a new 100 metre long pile-supported boardwalk that runs adjacent to Manly Pavilion, that allows sufficient space for walking and a dwell area with seating
- Construction of new stairs and access ramp to the beach
- Safety features on the boardwalk including handrails, tactile indicators, ladders into the water, and emergency life buoys.

Earthworks associated with the proposal would include establishment of a haul road, levelling of soil for the site compound and piling within the waterway. Fill material would be imported to site for the temporary reclamation of Manly Cove Beach and for re-profiling of the seabed.

Conclusions

Based on the findings of this assessment, the following conclusions were made:

- Based on the desktop review of available information, the site has appeared to undergo no significant changes since 1998 which included the construction of a walkway surrounding the building, construction of a jetty (extending south into Manly Cove) and extensions to the coverings of the building present. Prior to this, major construction activities included the construction of the Manly Sea Life building, and the construction and removal of the boardwalk located within close proximity to the southern boundary.
- Potential sources of contamination included:
  - Potential imported fill material within the northern, central and western portions of the site
  - Historical site activities including the potential storage and use of chemicals (Manly Sea Life)
  - Hazardous materials (asbestos) identified during the hazardous building materials assessment of Manly Sea Life
  - Sydney Harbour activities and waterways, specifically potential transportation of impacted sediments from historical industrial activities
  - Upon review of client provided reports (Tetra-Tech Coffey, 2023a), potential ASS is present below the site due to the presence of Chromium Reducible Sulfur (S_{cr}). Acid Neutralising Capacity (ANC) of all shallow sediment samples appear to indicate some self-neutralising capacity. As per the *National Acid Sulfate Soils Guidance: Identification and Laboratory Methods Manual* (DAWR, 2018) this

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  - cannot be considered in calculation of Net Acidity values as it has not been verified by methods which simulate oxidation under field conditions (i.e. incubation methodology NLM-8.1 or NLM-8.2).
  - Offsite sources and surrounding historical business activities (historical activities undertaken at dry-docks and boatyards, including but not limited to antifouling).
- The surrounding land uses currently and historically have generally been public open space/recreational activities and commercial industrial (Manly Wharf).

Currently it is not possible to make a statement on site suitability for the intended land-use and development. As outlined in the recommendations in Section 6.1, further investigation is necessary to determine the extent of potential contamination and the site suitability for the proposed development and future land use.

Recommendations

Based upon the findings of this PSI, the following recommendations are made:

- Undertake a targeted site contamination assessment in the locations identified as potential contamination sources such as potential uncontrolled filling areas and marine sediments
- The comparison of soil and sediment results obtained by Tetra Tech Coffey (2023a) to relevant National Environment Protection (Assessment of Site Contamination) Measure (NEPM) tier 1 screening criteria and ANZG 2018 to obtain a preliminary understanding of the suitability of soil and sediments within the site
- Consider further sampling to verify the ANC of site soils using appropriate methods as outlined in Appendix C *National Acid Sulfate Soils Guidance: Identification and Laboratory Methods Manual* (DAWR, 2018). Sampling should consider the proposed design and soils that may be disturbed or impacted by the proposed works
- Following completion of further sampling preparation of an Acid Sulfate Soil Management Plan (ASSMP) that outlines the appropriate and necessary management measures to be put in place including for stockpiling and treatment (e.g., liming) methodologies for the soils
- Sampling of stored water within tanks at Manly Sealife indicated that water quality differed from the receiver (North Harbour) as a result of elevated lead and phosphorus concentrations. Treatment of water prior to discharge or classification and appropriate removal of water to a licensed facility
- A Construction Environmental Management Plan should be implemented for the works and include reference to the actual and potential contamination identified as part of this assessment as well as appropriate mitigations. This should also include an Unexpected Finds Protocol to be implemented in the event contamination, not identified in this assessment, is revealed during construction
- All materials that are to leave the site intended for waste disposal or beneficial re-use must be classified in accordance with the *NSW EPA Wase Classification Guidelines*, (2014) and/or applicable *NSW EPA Resource Recovery Orders*
- If dredging of sediments is required for the redevelopment, an assessment of marine sediments that are likely to be disturbed should be undertaken in accordance with the *National Assessment Guidelines for Dredging, 2009*.

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Glossary

ACM	asbestos containing material
AFFF	Aqueous Film Forming Firefighting Foams
AHD	Australian Height Datum
ANC	Acid Neutralising Capacity
ASS	Acid Sulfate Soils
ASSMP	Acid Sulfate Soil Management Plan
ATC	Alcohol-Type Concentrate
BH	borehole
BOM	Bureau of Meteorology
BTEX	benzene, toluene, ethylbenzene and xylene
BYDA	Before You Dig Australia
CCO	chemical control orders
CLM Act	*Contaminated Land Management Act 1997*
Council	Northern Beaches Council
CSM	Conceptual Site Model
DAWR	Department of Agriculture and Water Resources
EPA	Environment Protection Authority
EQL	Estimated Quantitation Limit
GHD	GHD Group Pty Ltd
NEMP	National Environmental Management Plan
NEPM	National Environment Protection (Assessment of Site Contamination) Measure
OCP	organochlorine pesticides
OPP	organophosphorus pesticides
PAH	polycyclic aromatic hydrocarbon
PASS	Potential Acid Sulfate Soils
PCB	polychlorinated biphenyls
PFAS	per and poly fluoroalkyl substance
pHF	Field pH values
pHFOX)	Peroxide pH values
PoEO	*Protection of the Environment Operations Act 1997*
PSI	Preliminary Site Investigation
REF	Review of Environmental Factors
S_{cr}	Chromium Reducible Sulfur
SPR	Source – Pathway – Receptor
SVOCs	semi volatile organic compounds
TBT	tributyltin
TfNSW	Transport for NSW
TRH	Total recoverable hydrocarbons
TTC	Tetra Tech Coffey
VOCs	volatile organic compounds

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1.0 INTRODUCTION

BESIX Watpac has engaged Stantec to prepare a Preliminary Site Investigation (PSI) within the proposal area at a portion of the West Esplanade, Manly NSW 2095 (herein referred to as 'the site').

The site locality and layout are shown in Figure 1 and Figure 2 in Appendix A, respectively.

1.1 BACKGROUND

It is understood that the current Manly Sea Life building and surrounding infrastructure is vacant, disused and to be demolished and developed for public open space uses. Construction activities within the site area for the proposed open space development include demolition, boardwalk construction and bulk earthworks such as cutting and filling of soil, reprofiling of the seabed and piling.

A PSI was requested by Transport for NSW (TfNSW) to support the Review of Environmental Factors (REF) for the proposed development.

1.2 PURPOSE AND OBJECTIVES

The purpose of this PSI was to gather preliminary contamination information for the site and to provide advice on potential construction constraints.

The objective of this assessment is to assess whether contamination has the potential to exist on the site and whether further investigation is required.

At the time of preparing this report, the following documents were made available for review with information on the proposed development:

- Manly Sea Life, Concept Design Development (CHROFI, 2021)
- Manly Sea Life, Boardwalk and Wharf Construction – Preliminary (Tonkin, 2021)
- Former Manly Sea Life Site, Project Brief – Detail Design (TfNSW, 2022).

The documents provided indicate the following key design features (refer Figure 3 and Figure 4 in Appendix A):

- Demolition of the former Manly Sea Life building down to seabed level
- Retention of some former Manly Sea Life structural elements underneath the new proposed boardwalk
- Demolition of the timber jetty, including supporting piles
- Construction of a new 100 metre long pile-supported boardwalk that runs adjacent to Manly Pavilion, that allows sufficient space for walking and a dwell area with seating
- Construction of new stairs and access ramp to the beach
- Safety features on the boardwalk including handrails, tactile indicators, ladders into the water, and emergency life buoys.

Earthworks associated with the proposal would include:

- Establishment of a haul road
- The import of fill material on top of the existing sand north of the Manly Sea Life building to make ground level match with the current West Esplanade walkway. Depth and volume of imported fill is currently unknown
- Re-profiling of the seabed

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- The excavation of soils within the northern portion of the site to accommodate the site compound, within close proximity to the Manly Art Gallery and Museum. Excavation depths of soils would be up to one metre
- Installation of piles along the proposed boardwalk structure. Depths of piling are currently unknown.

Proposed use of the boardwalk is for public open space and recreation.

1.3 SCOPE OF WORKS

Stantec carried out the following scope of work:

- A review of desktop information for the site and surrounds, including:
  - Relevant maps for the site including geological, hydrogeological, topographical, landscape and acid sulfate soils
  - Historical aerial photographs regarding previous site and surrounding land use
  - Historical land titles
  - SafeWork Hazardous Chemicals on Premises records for the Site
  - Archived Northern Beaches Council (Council) records regarding site history and/or any environmental concerns
  - NSW EPA contaminated land records and *Protection of the Environment Operations Act 1997* (PoEO) Licenses
  - Underground utilities plans available from Before You Dig Australia (BYDA)
- A site walkover by an experienced contaminated lands professional and interview(s) with site owners and/or relevant site operators
- Preparation of this report detailing findings, conclusions, and recommendations.

1.4 APPLICABLE GUIDELINES AND LEGISLATION

The scope of this PSI has been developed in accordance with the following guidelines and legislation:

- *State Environmental Planning Policy (Resilience and Hazards) 2021*
- *Contaminated Land Management Act 1997* (CLM Act)
- PoEO Act
- National Environment Protection (Assessment of Site Contamination) Measure (NEPM)(NEPC, 2013)
- NSW Environment Protection Authority (EPA) Guidelines for the NSW Site Auditor Scheme, 3rd Edition (NSW EPA, 2017)
- NSW EPA Consultants reporting on contaminated land, Contaminated land guidelines (NSW EPA, 2020)
- *Guidelines on the Duty to Report Contamination under the Contamination Land Management Act 1997* (NSW EPA 2015).

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2.0 SITE DESCRIPTION AND SETTING

Site details are presented in Table 2-1, and a site plan is presented in Figure 2 in Appendix A, which details the boundary, surface contours and significant features.

Table 2-1 Site identification

Item	Details
Site Address	West Esplanade, Manly NSW, Australia
Approximate overall Site Area (ha)	Approximately 1.03 hectares
Title Details	The central portion of the site partially occupies one lot: 7340 DP1144101. The southern and northern portions of the site do not occupy a lot or site boundary. Therefore, noted as unincorporated.
Local Government Area	Northern Beaches Council
Current land use	Manly Sea Life building: Vacant and disused, and previously used as a public aquarium. Surrounding land-uses: Public open space including restaurant and bar (Manly Pavilion) and recreation (Manly Waterworks).
Current land zoning	Under the *Manly Local Environment Plan 2013* the northern portion of the site is currently zoned as RE1 – Public Recreation. The following objectives are identified for RE1: • 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 protect, manage and restore areas visually exposed to the waters of Middle Harbour, Manly Cove, Burnt Bridge Creek and the Pacific Ocean. • To ensure that the height and bulk of any proposed buildings or structures have regard to existing vegetation, topography and surrounding land uses. The remaining areas of the site located outside Northern Beaches Council land, are mapped as Zone 2 Environmental Protection under the *State Environmental Planning Policy (Biodiversity and Conservation) 2021*.

2.1 SITE DESCRIPTION

Site information from publicly available data sets and the Lotsearch Report (2022) is summarised in Table 2-2. The Lotsearch Report is attached in Appendix C.

Table 2-2 Site description and public datasets

Item	Information
Site topography and drainage features (NSW DFSI, Spatial Services)	Topography within the site boundary is relatively flat with steep embankments located within the northern portion of the site with an approximate elevation ranging between 0 – 8 metres Australian Height Datum (AHD). The site slopes upwards towards the northern portion of the site with an approximate grade of 3:1 (length to height ratio). Steep retaining walls are also located within the northern boundaries of the site approximately 4 metres high. Steep embankments/slopes are located outside the western boundary of the site. Surface run-off is expected to flow into stormwater grates/inlets that were observed throughout the entirety of the site. Excess surface water is expected to flow into Manly Cove and infiltrate exposed soils onsite.
Nearby water bodies (NSW DFSI, Spatial Services)	The site is located partially within in Manly Cove (marine environment), which is also the primary receiving water body for site run-off.

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Item	Information
Acid sulfate soil / rock risk (DLWC, 1998)	The northern and central portion of the site is located within a designation of 'Wa4' being Aeolian Sandplain with numbering referring to mAHD during the time of mapping (>4 mAHD). There is a low probability of Acid Sulfate Soils (ASS) being encountered at depths greater than three metres below ground surface. The central portion of the site (beach) is located within an area of no known occurrence of acid sulfate materials. The southern portion of the site is located within a designation of 'Em' being Estuarine bottom sediments. A high probability of ASS is noted for these areas and environmental risk is present if bottom sediments are disturbed (such as dredging). Under the *Manly Local Environment Plan 2013* the site is located within class 4, class 5 and unmapped areas.
Groundwater (BOM, 2022)	Nine registered groundwater monitoring wells were identified within 500 metres of the site. Further information is presented in Table 4-6.
Site soil landscapes (DPIE, 2022)	The site is located within two soil landscapes dividing the eastern and western portions of the site. Descriptions for each are as follows: • WOY WOY (Marine): Eastern portion of the site is level to gently undulating non-tidal beach ridges on marine sands. Local relief <3 metres, slopes <5%. Water table at a depth of <200 centimetres. Progressive beach ridges in sheltered bays. Extensively cleared closed-scrub and low eucalypt woodland. Limitations include permanently high-water tables, localised flooding, periodic water logging in depressions, very low to low soil fertility and localised areas of high soil erosion. • GYMEA (Erosional): Western portion of the site is undulating to rolling rises and low hills on Hawkesbury Sandstone. Local relief 20–80 metres, slopes 10–25%. Rock outcrop <25%. Broad convex crests, moderately inclined side slopes with wide benches, localised rock outcrop on low broken scarps. Extensively cleared open-forest (dry sclerophyll forest) and eucalypt woodland. Limitations include localised steep slopes, high soil erosion, rock outcrop, shallow highly permeable soil and very low soil fertility.
Site surface geology (DPIE, 2022)	The site is located within four geological landscapes. Descriptions for each are as follows: • Northern portion of the site is underlain by Coastal deposits – dune facies (QH_bd) which is noted as Holocene marine-deposited and aeolian-reworked coastal sand dunes • Southern portion of the site is underlain by Estuarine tidal delta flat (QH_etw) which is noted as Holocene Fine- to medium-grained lithic-carbonate-quartz sand (marine-deposited), silt, clay, shell material, polymictic gravel • Eastern portion of the site is underlain by 'sand' (undefined geology) • Western portion of the site is underlain by Hawkesbury Sandstone (Tuth), which is a medium to coarse-grained quartz sandstone with minor shale and laminite lenses.

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3.0 SITE WALKOVER AND OBSERVATIONS

Observations of the site were undertaken by an experienced environmental scientist and contaminated lands professional from Stantec on 29 November 2022. Relevant observations made during the site walk-over are provided in Table 3-1. Photographs taken during the inspection are contained in Appendix A The site boundary and features are shown on Figure 2 in Appendix A.

Table 3-1 Site walkover description

Item	
Weather condition	29 November 2022 – Sunny, temperature of approximately 25 degrees Celsius.
Site slope and drainage features	The general slope of the site was flat within the central, eastern and southern portions of the site. This flat slope was attributed to levelled concrete surfaces extending over Manly Cove. Steep embankments were observed within the northern/north-eastern portion of the site with an approximate grade of 3:1 (length to height ratio). Off-site along the western and north-western boundary, steep rock ledges and retaining walls were observed ranging between approximately 4 to 10 metres in height. Surface water is expected to flow into stormwater grates/inlets that were observed throughout the entirety of the site. Excess surface water is expected to flow overland or via penetration of site soils into Manly Cove.
Site surface coverings	Site surface coverings within Manly Sea Life building generally consisted of concrete hardstand with some timber flooring observed. Site surface coverings in surrounding areas were predominately hardstand surfaces (concrete surfaces and paving bricks). Grassed areas were observed within the northern portion of the proposed construction zone (West Esplanade).
Surface soils	Exposed surface soils generally consisted of silty gravelly sand and sand, dark grey/brown in colour.
Site cut and fill	Filling was observed within the western, central and northern portions of the site where retaining walls were visible. Fill is also expected to be present within elevated grassed areas within the northern portion of the site.
Buildings and structures	The existing Manly Sea Life building is present within the central portion of the site. The brick and concrete building is two storeys high with a basement level cut into the surrounding foreshore. The building is vacant and disused and interiors are dilapidated and vandalised. Structures observed within the Manly Sea Life building included: • A pumproom which was located within the below ground central/southern extents of the building • A sediment tank located within the central portion of the building • A main fish tank observed below ground that occupied with outer extents of the building • A penguin/seal pool was observed within the second storey central portion of the building • Bathrooms, storage rooms, electrical switchboards, playground equipment and general use rooms were also observed within the building. Two-storey buildings (Manly Pavilion) are located within the western extents of the site. Manly Waterworks is located outside the western boundary of the site and contains three waterslide structures. These structures/buildings are not proposed for demolition or alteration under the current design.
Potential asbestos in building materials	While not observed during site walkover and inspections, potential asbestos containing materials may be present within the Manly Sea Life building within electrical boxes and other areas not accessed.
Manufacturing, industrial or chemical processes and infrastructure	The site contains facilities and infrastructure previously used for pumping seawater from Manly Cove into the Manly Sea Life tanks using electric pumps. However, based on anecdotal evidence by the client, the pumping of seawater stopped approximately one year ago. Pumping between tanks within Manly Sea Life is noted to still function.
Fuel storage tanks (USTs/ASTs)	Not observed. Based on anecdotal evidence from the client during the site inspection, no known bulk storage of fuels has occurred onsite.

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Item	
Hazardous chemicals	Not observed.
Solid waste deposition	General waste and recycling bins were observed within the north-western portion of the site. Waste was observed throughout the interiors of the Manly Sea Life building including general waste (glass bottles, cans, plastics and paper) and building waste (timber, glass, metal, plasterboard and concrete rubble).
Liquid waste disposal features	Not observed.
Evidence of previous site contamination investigations	Not observed.
Evidence of land contamination (staining or odours)	Not observed.
Evidence of groundwater contamination	Not observed.
Groundwater use	Not observed. Seawater was previously pumped into tanks within the Manly Sea Life building whilst operational, however, this practice no longer occurs.
Vegetation	Vegetation included mature palms located within the northern side of the Manly Sea Life building with some small shrubs also observed. Potted juvenile trees (frangipanis) and shrubs/plants were observed within the southern side of the Manly Sea Life building. Mature palms, juvenile trees and shrubs were observed within surrounding areas of Manly Sea Life within the proposed construction zone.
Site fencing / enclosure	Ornamental concrete/metal fencing was observed along the boundaries of Manly Sea Life, approximately 1.3 metres high. With exception of structures, the site was open and accessible to the public.

3.1 SURROUNDING LAND USE

The surrounding land uses and potential sensitive receptors were determined based on observations during the site walkover and from a review of current Nearmap aerial imagery on 29 November 2022. The land uses and sensitive receptors are summarised in Table 3-2.

Table 3-2 Surrounding land uses

Direction from Site	Description	Sensitive Receptors	Distance / Direction to Sensitive Receptor
North	West Esplanade pedestrian/cycle pathway and road, Manly Art Gallery and Museum and residential houses	Low-density residential and public open space users	Onsite
South	Manly Cove, Manly Cove	Recreation users and ecological receptors	Onsite
East	Manly Cove, Manly Cove	Recreation users and ecological receptors	Onsite
West	Manly Pavilion and Manly Waterworks (water park) followed by Commonwealth Parade and residential dwellings	Public open space users and recreation users.	Onsite

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3.2 AREAS NOT ACCESSED

Due to access limitations the areas detailed in Table 3-3 were not visually assessed during the site walkover and should be considered in relation to the further data gaps detailed in Section 5.1.

Table 3-3 In-accessible areas during site walkover

Area	Justification / notes
Manly Sea Life	A locked room was located within the southern portion of the building on the ground floor. A void below the ground floor was also not able to be assessed.
Surfaces beneath hardstands and vegetation	Soils beneath hardstand surfaces and vegetated areas, as well as soils behind retaining walls, were unable to be observed and assessed.

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4.0 SITE HISTORY

A site history review was undertaken utilising publicly available and searchable registers and data sets to identify land uses and other information that may identify onsite or offsite sources of contaminations.

4.1 REGISTERS AND RECORDS

A search of the following databases was conducted (Lotsearch 2022) to identify properties within 1,000 metres of the site that may present a potential contaminant risk:

- List of NSW contaminated sites notified to NSW EPA
- NSW EPA Contaminated land records of notice
- NSW EPA locations of former gasworks sites
- NSW EPA per and poly fluoroalkyl substance (PFAS) Investigations program
- NSW EPA other sites with contamination issues
- NSW EPA Licensed activities under the PoEO Act
- NSW EPA Delicensed PoEO activities now revoked or surrendered
- Defence PFAS investigation & Management Program
- Airservices Australia National PFAS Management Program
- Geoscience Australia National Waste Management Facilities Database
- Geoscience Australia National Liquid Fuel Facilities.

Records identified within 1,000 metres of the site are summarised in Section 4.1, the full results of searches including records outside the 1,000 metres buffer and results for databases with no records identified are included in Appendix C.

4.1.1 PoEO public register

The PoEO Public Register under Section 308 of the PoEO Act contains Environment Protection Licences, applications and notices issued by the EPA. A search of the PoEO public register was undertaken on 7 December 2022 and results are summarised in Table 4-1. The full results and figures can be viewed in Appendix C.

Table 4-1 POEO public register

Licence Number	Licence Holder	Location	Activity	Status	Distance (m) / Direction
4653	Luhrmann Environment Management Pty Ltd	Waterways throughout NSW	Other Activities / Non-Scheduled - Activity - Application of Herbicides	Surrendered	0 / Onsite
4838	Robert Orchard	Various Waterways throughout NSW – 2000	Other Activities / Non-Scheduled - Activity - Application of Herbicides	Surrendered	0 / Onsite
6630	Sydney Weed & Pest Management Pty Ltd	Waterways throughout NSW – Prospect NSW, 2148	Other Activities / Non-Scheduled - Activity - Application of Herbicides	Surrendered	0 / Onsite
7170	Macquarie Hospital Services Pty Ltd.	Manly Water Private Hospital (17 Cove Avenue, Manly)	Hazardous, Industrial or Group A Waste Generation or Storage	Delicensed	654 / South-east

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4.1.2 List of NSW contaminated sites notified to the EPA

The list of notified sites contain land that has been notified to the EPA as being potentially contaminated. The list states whether the land is regulated under the CLM Act. If land is declared as 'significantly contaminated', it is regulated under the CLM Act and will receive notices relating to the management of this contamination. These notices are published on the record of notices for public view. A search of the List of NSW Contaminated Sites Notified to the EPA was undertaken by Lotsearch (2022) which identified one contaminated site within a 1,000 metres radius of the site. This site is summarised in Table 4-2.

Table 4-2 List of sites notified to the EPA

Site	Address	Activity	EPA Site Management Class	Distance (m) / Direction
Caltex Service Station	86 Pittwater Road, Manly	Service Station	Regulation under CLM Act not required.	664 / North-east

4.1.3 National waste management and liquid fuel facilities

A search of the Geoscience Australia, Waste Management and Liquid Fuel Facilities identified two National Liquid Fuel Facilities within the buffer. A summary of the search is provided in Table 4-2 and a copy of the search is provided in Appendix C.

Table 4-3 National liquid fuel facilities

Site	Location	Category	Status	Distance (m) / Direction
Caltex	88 – 92 Pittwater Road, Manly	Petrol Station	Operational	664 / North-east
BP	131-139 Pittwater Road, Manly	Petrol Station	Operational	908 / North

4.2 HISTORICAL AERIAL PHOTOGRAPHY REVIEW

Seventeen historical aerial photographs taken in the years 1930, 1943, 1951, 1955, 1961, 1965, 1970, 1978, 1982, 1986, 1991, 1998, 2000, 2005, 2011, 2017 and 2022 were reviewed to identify historical land uses that may present potential contaminant sources. The aerial photograph summary is provided in Table 4-4. Historical photographs are presented in Appendix C.

Table 4-4 Summary of aerial photograph review

Year	Onsite	Offsite
1930 (black and white (BW) – poor quality)	No buildings are present within the site area. The site area is occupied by water (Manly Cove) (central and southern portion) and what appears to be sand (northern portion).	North: A roadway borders the northern boundary of the site (surface unknown) with what appears to be residential houses north of the roadway. Further north, residential and open space (trees) are present.
		South: Manly Cove (waterway) occupies the southern portions.
		East: Manly Cove (waterway) and West Esplanade occupies the eastern portions of the buffer.

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Year	Onsite	Offsite
		West: Manly Cove (waterway) and what appears to be Manly Cove coastline. What appears to be residential houses are present further west.
1943 (BW)	No buildings are present within the site. The site is occupied by water (Manly Cove) (central and southern portion). A boardwalk and buildings / structures border the western and southern portion of the site. It appears a paved walkway and grass occupy the northern portion of the site.	North: High density residential apartments appear to have been constructed within close proximity to the northern portion of the site.
		South: A long boardwalk extending west towards the shoreline and east occupies the southern extent of the buffer.
		East: No visible changes observed.
		West: A boardwalk with four structures has been constructed bordering the westerns portion of the site. Further west, no visible changes observed.
1951 (BW – Poor Quality)	No visible changes observed.	North: No visible changes observed
		South: Further construction of the boardwalk south of the site appears to have occurred with the addition of two jetty arms extending south of the original boardwalk. An unknown structure extending south from the southern shoreline has been constructed.
		East: No visible changes observed.
		West: No visible changes observed.
1955 (BW)	No visible changes observed.	North: Further development/construction of high-density residential buildings.
		South: No visible changes observed.
		East: No visible changes observed.
		West: No visible changes observed.
1961 (BW)	No visible changes observed.	North: No visible changes observed.
		South: No visible changes observed.
		East: No visible changes observed.
		West: No visible changes observed.
1965 (BW)	Construction of a circular structure within the central portion of the site area has occurred, consistent with the shape and location of the Manly Sea Life building. No other visible changes were observed within the northern or southern portions.	North: Further development/construction of high-density residential buildings.
		South: Two jetty arms that were located along the southern boardwalk are no longer present.
		East: No visible changes observed.
		West: No visible changes observed.
1970 (BW)	No visible changes observed.	North: No visible changes observed.
		South: The unknown structure extending southward into Manly Cove is no longer present.
		East: No visible changes observed.
		West: No visible changes observed.
1978 (BW)	No visible changes observed with exception to the southern boundary where the southern boardwalk extends west, and eastward the boardwalk is no longer present.	North: No visible changes observed.
		South: Boardwalk no longer present.
		East: It appears a shark-net structure has been constructed within the far eastern portion of the buffer.
		West: A structure which appears to be a walkway has now been constructed extending west towards

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Year	Onsite	Offsite
		the roadway as an addition to the existing western buildings.
1982 (Colour)	No visible changes observed.	North: No visible changes observed.
		South: No visible changes observed.
		East: What appeared to be a shark net structure located in the far eastern portion of the buffer is no longer present.
		West: Removal/demolition of buildings and the construction of a water park (waterslides present – likely to be Manly Waterworks)
1986 (Colour)	Blue sheeting appears to be covering the roofing of the Manly Sea Life building, indicating potential construction activities and/or refurbishment has been undertaken.	North: No visible changes observed.
		South: No visible changes observed.
		East: No visible changes observed.
		West: No visible changes observed.
1991 (Colour)	Major construction activities have occurred within the central portion of the site (Manly Sea Life building) including the construction of a walkway surrounding the building, construction of a jetty (extending south into Manly Cove), extensions to the coverings of the building and what appears to be new roofing (orange tiling) present.	North: No visible changes observed.
		South: No visible changes observed.
		East: No visible changes observed.
		West: Construction of two structures that border the western portion of the site. Likely associated to the construction activities of Manly Sea Life.
1998 (Colour)	No visible changes observed.	North: No visible changes observed.
		South: No visible changes observed.
		East: No visible changes observed.
		West: No visible changes observed.
2000 (Colour)	No visible changes observed.	North: No visible changes observed.
		South: No visible changes observed.
		East: No visible changes observed.
		West: No visible changes observed.
2005 (Colour – High Quality)	It appears bollards have been constructed surrounding the perimeter walkway of Manly Sea Life. Pipes and unknown structures are now present along the southern jetty within the site area.	North: No visible changes observed.
		South: No visible changes observed.
		East: What appears to be a shark net is now present within the eastern portion of the buffer.
		West: No visible changes observed.
2011 (Colour – High Quality)	No visible changes observed.	North: No visible changes observed.
		South: No visible changes observed.
		East: No visible changes observed.
		West: It appears the building bordering the south-western boundary of the site is currently under construction.
2017 (Colour – High Quality)	No visible changes observed.	North: No visible changes observed.
		South: No visible changes observed.
		East: No visible changes observed.
		West: It appears construction completed. Demolition of a portion of the southern building structure and addition of an outdoor area/balcony is now present.

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Year	Onsite	Offsite
2022 (Colour – High Quality)	No visible changes observed.	North: No visible changes observed.
		South: No visible changes observed.
		East: No visible changes observed.
		West: No visible changes observed.

4.3 HISTORICAL BUSINESS DIRECTORY RECORDS

Historical Business Directory Records Search for Dry Cleaners, Motor Garages and Service Station between years 1948 to 1993 were searched to identify historical land uses at or surrounding the site that could present potential contaminant sources. A copy of the search is provided in Appendix C and a summary of identified sites that could present a potential contaminant risk within a 250 metre buffer is provided in Table 4-5.

Table 4-5 Historical business directories (dry cleaners, motor garages and service stations)

Business Activity	Address	Year Activate	Distance (m) / Direction (m)
Dry Cleaners, Pressers and/or Dyers.	Esquire Dry Cleaners, 71 West Esplanade, Manly 2095.	1975 – 1976	124 / East
Dry Cleaners, Pressers and/or Dyers.	Tudor Industries Pty Ltd., 60 West Esplanade, Manly.	1948 – 1952	128 / East
Motor Garages and/or Engineers.	Auckland Garage, Gilbert St Manly.	1948 – 1985	143 / North-east

4.4 UTILITY PLANS

A Before You Dig Australia (BYDA) utility search for the site was undertaken on 7 December 2022 to determine of any potential use of asbestos piping etc. within the site area. No known asbestos containing materials was recorded on the plans provided. Utilities identified within the site area include gas mains (medium pressure), electricity (high and low voltage cable), Telstra communication cables, potable water and sewerage.

4.5 GROUNDWATER DATABASE

A review of the Bureau of Meteorology (BOM, 2022) Australian Groundwater Explorer identified nine registered groundwater bores within a 500 metre radius of the site. Groundwater bore information is shown in Table 4-6.

Table 4-6 Summary of registered groundwater bores

Well ID	Authorised Purpose	Completed Date	Final Depth (mBGL)	Groundwater Level (mTOC)	Distance (m) / Direction
GW110294	Other	22/05/2009	8.0	4.0	212 / East
GW109245	Other	20/08/2008	11.0	4.8	255 / East
GW109304	Other	08/09/2008	8.54	4.83	323 / East
GW116659	Monitoring	15/08/2017	13.2	-	343 / North-east
GW106341	Other	14/04/2004	42.5	18.3	344 / North
GW116140	Monitoring	14/08/2017	13.0	-	360 / North-east

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Well ID	Authorised Purpose	Completed Date	Final Depth (mBGL)	Groundwater Level (mTOC)	Distance (m) / Direction
GW116139	Monitoring	14/08/2017	12.6	-	361 / North-east
GW116139	Monitoring	14/08/2017	12.6	-	361 / North-east
GW116138	Monitoring	15/08/2017	13.2	-	364 / North-east

4.6 CONTROLLED CHEMICALS

The NSW EPA uses chemical control orders (CCO) as a primary legislative tool under the *Environmentally Hazardous Chemicals Act 1985* to manage chemicals of concern and limit their potential impact on the environment. A preliminary screening of the site history for the likelihood of chemicals of concern within the CCO framework is provided in Table 4-7.

Table 4-7 Preliminary controlled chemical screening

Chemical of concern	Likelihood of occurrence
Were aluminium smelter wastes used or stored on the site (CCO, 1986)?	Low. It is unlikely that aluminium smelter wastes containing fluoride and/or cyanide were stored onsite based on historical review of the site.
Do dioxin contaminated wastes (CCO, 1986) have the potential to impact the site?	Low to moderate due to Sydney Harbour/Sydney estuaries known elevated levels of dioxins in sediments. There is a possibility that contamination has impacted areas within Manly Cove.
Were organotin products (CCO 1989) used or stored on site?	Moderate. Use of products containing organotin (anti fouling) paints as a result of weathering anti-foul on ship hulls.
Were polychlorinated biphenyls (PCBs) used or PCB waste (CCO 1997) stored on site?	Low. PCBs may have been present in small quantities in fluorescent lighting ballasts where present in buildings.

4.7 PER AND POLY-FLUOROALKYL SUBSTANCES (PFAS)

A PFAS probability of occurrence qualitative desktop survey is provided in Table 4-7 and has been undertaken on the basis of information provided in the *PFAS National Environmental Management Plan* (NEMP 2020). PFAS are known to be present in Aqueous Film Forming Firefighting Foams (AFFF) and Alcohol-Type Concentrate (ATC).

The historic use of AFFF is reported as being used by Fire and Rescue NSW between 1976 and 2007, while other agencies used AFFF during training exercises as late as 2010 (Source: Fire and Rescue NSW, Information Sheet, Firefighting Foam and PFAS, reference D16/82523).

Table 4-8 PFAS desktop survey

Preliminary Screening Questions	Likelihood of Occurrence [1,2,3]
Is the past or present site activity listed in the NEMP 2020 as being an activity with risk of fire. If so, list activity:	Low – no listed activities identified within or within close proximity to the site.
Is the past or present off-site activity up-gradient or adjacent to the site listed in the NEMP 2020 as being an activity with risk of fire. If so list activity:	Low. No activities identified.
Did fire training involving the use of suppressants occur on-site between 1970 and 2010?	Low. No firefighting activities identified.
Did fire training occur up-gradient of or adjacent to the site between 1970 and 2010?	Low. No firefighting activities identified.

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Preliminary Screening Questions	Likelihood of Occurrence [1,2,3]
Have "fuel" fires ever occurred on site between 1970 and 2010? (i.e. ignition of fuel storage tanks - solvent, petrol diesel, kerosene, other)?	Low. No history if fire identified.
Have PFAS been used in manufacturing or stored on-site?	Low. No chemical manufacturing or storage noted onsite.
Could PFAS have been imported to the site in fill materials from a site with activity listed in NEMP 2020 and subject to exposure to PFAS from 1970 to 2010?	Low. Fill volumes are not considered to be substantial.
Could PFAS-contaminated groundwater or run-off have migrated beneath or on to the site?	Low. No upgradient sources for PFAS identified.
Is the site or adjacent sites listed in the NSW EPA PFAS Investigation program [4]?	Low. No sites identified in the report.
Does the site analytical suite need to be optimised to include preliminary sampling and testing for PFAS in soil and waters (incl. ASLP or TCLP)? Provide rationale.	No, based on the above survey.

Notes:
1 - Likelihood: Low – All necessary documentation has been reviewed and there is no recorded instance of potential PFAS use or exposure
2 - Medium - All necessary documentation has been reviewed and there is potential evidence of a recorded instance of potential PFAS use or exposure
3 - High - All necessary documentation has been reviewed and there is evidence of a recorded instance of potential PFAS use or exposure
4 - https://www.epa.nsw.gov.au/your-environment/contaminated-land/pfas-investigation-program

4.8 SAFEWORK HAZARDOUS CHEMICALS ON PREMISES

A site Search for Schedule 11 Hazardous Chemicals on premises was undertaken for the site defined as Manly Sea Life, West Esplanade, Manly NSW 2095. A search of the records held by SafeWork NSW has not located any records pertaining to the above-mentioned premises. A copy of the search is presented in Appendix D.

4.9 PREVIOUS REPORTS

The following reports were reviewed as part of this assessment:

- GHD (2021a) Manly Wharf 3 Upgrade Contamination Desktop Review. 14 May 2021
- GHD (2021b) Manly Wharf 3 Upgrade – Geotechnical and contamination assessment report. 23 November 2021
- Prensa (2022) Targeted Destructive Hazardous Building Materials Assessment – Manly Sea Life Sanctuary. November 2022
- Stantec (2023) Manly Sealife Aquarium – Water Quality Assessment. 24 January 2023
- Tetra Tech Coffey (2023) Many Cove West Redevelopment – Contamination Investigation. 10 February 2023
- Tetra Tech Coffey (2023) Manly Cove West Redevelopment – Geotechnical Site Investigation. 10 February 2023

The property/area that the first two GHD reports relate to is not within the site but is located within close proximity to the east (approximately 200 metres from the nearest site boundary). Due to the close proximity to the site area, offsite conditions may reflect what may be present within and surrounding areas onsite and has been provided for context.

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4.9.1 GHD (2021a) Manly Wharf 3 Upgrade - Contamination Desktop Review

GHD (2021a) was commissioned by Transport for NSW (TfNSW) to provide a Contamination Desktop Review for the Manly Wharf 3 upgrade project. The memorandum included a review of aerial photography, existing provided information from Transport, EPA contaminated site database and PoEO Public Register.

Based on review of the above the following findings and conclusions were made or relevance to the potential contamination status of the site:

- The site had historically been used for marine transport and vessel infrastructure since 1941
- Surrounding land-use was predominately residential and industrial uses
- The following potential on-site contamination sources were identified:
  - Contaminated sediment from Sydney Harbour particularly heavy metal and dioxin transported onsite due to the nature of surrounding estuarine systems
  - Hazardous materials within aging wharf structure
  - Indication of ASS onsite.

4.9.2 GHD (2021b) Manly Wharf 3 Upgrade – Geotechnical and Contamination Assessment

GHD (2021b) was commissioned by TfNSW to provide a Geotechnical and Contamination Assessment for the Manly Wharf 3 upgrade project. The purpose of the report was to present the factual data obtained during the concept phase geotechnical and contamination investigation.

The contamination purposes of the investigation also included:

- Preliminary waste classification for marine sediment for on shore disposal to landfill
- Preliminary assessment of potential for off-shore ocean disposal
- Consideration of the potential suitability of material for emplacement at the site of the current Manly Sea Life following demolition of the facility which is being completed as part of a separate project
- Assessment of potential health risk to wharf construction workers from a contamination perspective.

The report also discussed the implications of the findings obtained on the concept design.

GHD undertook additional desk-based studies prior to and during the contamination. Findings from the additional desktop study are summarised as follows:

- Dioxin analysis was not undertaken on sediments at Manly Wharf based on the following findings and relation to the investigation:
  - Manly Wharf is located a significant distance from known historical industrial areas along Parramatta River where dioxins have been reported in sediments as a result of legacy industrial activities
  - Manly Gasworks (contamination source) was approximately 800 metres to the east in the adjacent bay and has been subject to several stages of remediation. Dioxins were noted to not be associated with the site.

Following field observation and analysis of two sediment samples obtained during the geotechnical investigation, the following findings and recommendations were made:

- The current indicative waste classification of the materials for onshore waste disposal was provisionally classified as ‘Restricted Solid Waste’. Due to the presence of tributyltin (TBT) at sampling location borehole (BH)2. GHD recommended that further sampling and analysis be undertaken to obtain a larger dataset for statistical analysis so the material for onshore disposal can be appropriately determined. It

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was also noted that although ASS is considered low, testing is recommended at the time of additional waste classification sampling
- Marine sediment at sampling location BH2 and immediate surrounds are not suitable for reuse due to the presence of TBT at concentrations exceeding sediment investigation levels.

4.9.3 Prensa (2022) Manly Sea Life Sanctuary - Targeted Destructive Hazardous Building Materials Assessment

Prensa (2022) was commissioned by BESIX Watpac to conduct a Targeted Destructive Hazardous Building Materials Assessment of Manly Sea Life Sanctuary, West Esplanade, Manly NSW 2095.

The objective of the assessment was to identify and assess the exposure risk posed by asbestos and hazardous materials that may be encountered during demolition works in nominated areas of the site. Specific areas included:

- Main building down to sea level
- Adjacent garden beds
- Surrounding pavement back to the Manly Pavilion.

The following significant findings included the presence of low risk, non-friable asbestos containing material (ACM) to be present in the form of bituminous backing board material to the electrical switchboards within the level one filter room and exterior, west elevation.

Prensa provided the following site-specific recommendations for the management of hazardous building materials:

- Further investigation of areas that could not be accessed (void beneath building pier, water tanks throughout the site and two inaccessible rooms)
- Asbestos removal works are undertaken by an appropriately licensed asbestos contractor and conducted under a controlled asbestos removal conditions. It was also recommended that an independent asbestos contractor be engaged to undertake airborne asbestos fibre monitoring within and surrounding the site
- Hazardous building materials disturbed during demolition works be removed by an appropriately licensed contractor prior to commencement of works
- Works cease and a hygienist/asbestos assessor be notified if any suspected hazardous materials that are not noted within the assessment are encountered
- If ozone depleting substances are identified onsite and require removal, they should be appropriately disposed of in accordance with the appropriate regulations and measures as noted within the assessment.

4.9.4 Stantec (2023) Manly Sealife Aquarium – Water Quality Assessment

Stantec (2023) was commissioned by BESIX Watpac to assess the quality of water remaining in the former Manly Sealife Aquarium Shark tanks, sedimentation tanks and penguin tank.

The purpose of the assessment was to establish the quality of water in tanks throughout Manly Sea Life and to compare relevant guideline levels and to the adjacent North Harbour as a potential receiver site. A total of 12water samples were obtained throughout the water quality assessment. Following targeted analysis of the water samples, the following conclusions were made:

- Results indicate water quality was largely consistent at all locations within the Manly Sea Life tanks

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- Water is comparable to that of North Harbour with exception of elevated levels of lead and phosphorus (filtered) for samples recorded in Manly Sea Life
  - Average lead levels within the Shark Tank (sump excluded) were 0.099 mg/L, 22 times higher than guideline value of 0.0044 mg/L and 17 times higher than recorded in North Harbour
  - Phosphorous (filtered) in the Shark Tank was also approximately four times higher (0.019 mg/L average) than outside Manly Sea Life where it was below the Estimated Quantitation Limit (EQL).

4.9.5 Tetra Tech Coffey (2023a) Manly Cove West Redevelopment – Contamination Investigation

Tetra Tech Coffey (TTC, 2023a) was commissioned by BESIX Watpac to provide factual information regarding the contamination status of the soil and sediment at the site. To provide factual information on the contamination status of the site, TTC undertook a historical desktop review of the site including a site walkover and intrusive investigations which included the following:

- Collection of soil samples from one borehole being undertaken for geotechnical investigations (BH2)
- Collection of five sediment samples surrounding Manly Sea Life
- Collection of surface and deeper sediment samples from one borehole (BH1).

Stantec undertook a comparison of tested soil and sediment concentrations to the applicable guidelines for current and future land-uses (NEPM, 2013 recreation/public open-space for soil and *Australian and New Zealand Guidelines Default Guidelines Values* (DGVs) for toxicants in sediment for sediments). Results were reported below the adopted criteria for all samples tested.

ASS testing was undertaken on select sediment and soil samples which returned the following results:

- Field pH values (pHF) ranged between 7.8 (moderately alkaline) and 8.4 (moderately alkaline)
- Peroxide pH values (pHFOX) ranged between 5.9 (moderately acidic) and 6.5 (slightly acidic)
- pHF - pHFOX differential (>1) was observed in all analysed samples
- Chromium Reducible Sulfur ($S_{cr)}$ (%S) concentrations ranged between 0.012 – 0.080
- Acid Neutralising Capacity (ANC) (%S) concentrations ranged between <0.02 – 0.08.

Potential for impact to site works from ASS is considered further in section 6.0.

4.9.6 Tetra Tech Coffey (2023b) Manly Cove West Redevelopment – Geotechnical Site Investigation

Tetra Tech Coffey (TTC, 2023b) was commissioned by BESIX Watpac to provide a Geotechnical Site Investigation. The purpose of the geotechnical investigation was to obtain geotechnical information on subsurface conditions and to provide comments and recommendations to assist demolition of Manly Sea Life.

Upon review of the report, Stantec understand that:

- Fill material was not encountered in all five boreholes advanced
- Natural material generally consisted of sand, medium to coarse grained, dark brown and yellow, trace fine organic matter, sandstone cobbles and low plasticity clay
- Rock was encountered at depths ranging from 4.2 – 9.0 mBGL in boreholes BH01 and BH02.

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4.10 SUITABILITY OF SITE HISTORY RECORDS

The site history information collected during this investigation is considered of a suitable quality for the purposes of a preliminary site assessment of contamination. Not all historical reports relate to the site, however, due to the close proximity to the site the findings are relevant for determining the risk of contamination.

4.11 SITE HISTORY SUMMARY

Historical land uses and potential activities occurring at the site are summarised as follows:

- The site and surrounds were historically vacant/unused until approximately 1943 when the construction of wharfs, building structures and boardwalks was completed. The construction of Manly Sea Life was undertaken between 1961 to 1965
- There is potential for uncontrolled filling along the northern, central and western portions of the site due to historical filling activities
- Sydney Harbour/Sydney estuaries are known to contain elevated levels of dioxins in sediments dispersing into surrounding areas. Whilst a considerable distance from Manly Cover there is potential for contaminant migration onto the site
- The presence of TBT in surrounding sediments was identified in previous reports at Manly Wharf, which is within close proximity to the site. The presence of TBT suggests that the Manly Wharf and surrounds may have been historically used for dry-docks or boat yards where antifouling practices were undertaken
- Soil and sediment sampling to date has not identified any contaminants of concern above relevant land-use criteria
- The potential presence of bonded ACM and other hazardous materials in the existing building and site structures associated with Manly Sea Life
- Bioaccumulation of metals (and metalloids) within surrounding biota attached to structures (concrete sea well and timber jetty). Biotas include bivalves (oysters) and/or crustaceans (barnacles) that ‘filter feed’
- Water contained onsite within Manly Sea Life are noted to have elevated concentrations of lead and phosphorus (filtered) compared to the adopted guideline values and/or the potential receiving water body (North Harbour).

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5.0 CONCEPTUAL SITE MODEL

Potential contamination sources have been identified during this PSI and are presented in Table 5-1.

Table 5-1 Summary of potential contaminating sources

Source	Description	Contaminants of concern	Onsite or Offsite
Demolition and construction of buildings on and off site	Demolition of buildings containing hazardous materials including ACM, lead based paints and polychlorinated biphenyls (PCBs) not identified. Hazardous materials have been identified onsite by Prensa (2022).	Asbestos, metals and PCBs	Onsite
Hazardous building materials contained within former and existing site structures	Potential for ACM within the Manly Sea Life building (electrical boxes). As noted in Prensa (2022) and following Stantec site inspection.	Asbestos.	Onsite
Cutting and fill materials on site	Historical uncontrolled filling activities within the northern, central and western portions of the site. Evidence of mounding within the central and northern portions of the site. Sampling has been undertaken by Tetra Tech Coffey (2023a), however, sampling was limited and did not meet sampling design guidelines (EPA, 2022).	Total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbon (PAH), metals, organochlorine pesticides (OCP), organophosphorus pesticides (OPP), PCB, phenols, asbestos, volatile organic compounds (VOCs), and semi volatile organic compounds (SVOCs).	Onsite
Off-site current and historical activities	Impacted marine sediments from offsite/upstream sources such as dry-docks or boatyards where antifouling activities were undertaken. Impacted sediments were identified within GHD (2021b) located approximately 250 metres east of the site boundary. Sediment sampling by Tetra Tech Coffey (2023a) identified TBT in sediments surrounding the building below applicable criteria.	Metals, organotin compounds, TRH, PAH and PFAS.	Onsite and Offsite
Stored tank water within the Manly Sea Life building	Stagnant sea water present within the Manly Sea Life building as a result of sea water pumps malfunctioning. Preventing circulation of seawater within the tanks from 2020 onwards.	Lead and phosphorus	Onsite
Potential ASS (PASS)	Bottom sediments within Sydney Harbour noted as high risk of ASS. Sediment sampled by Tetra Tech Coffey (2023a) indicating the potential for PASS to be present based on S_{Cr} concentrations.	Acidic leachate and subsequent metal leachate.	Onsite

A Conceptual Site Model (CSM) provides the framework for identifying sources of contamination, contaminant migration pathways, human and ecological receptors and exposure mechanisms. Risk to human health and the environment is identified through complete Source – Pathway – Receptor (SPR) linkages. In order to identify SPR linkages the CSM considers site specific factors, including:

- Source(s) of contamination

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- Identification of contaminants of concern associated with past (and present) source(s)
- Site specific information including soil type(s), depth to groundwater, inferred groundwater flow direction and surface water bodies and interactions
- Location of any identified sources relative to the proposed site development
- Actual or potential receptors considering both current and future land use both for the site, adjacent properties and any sensitive ecological receptors.

Based on a review of the desktop site history information and site walkover observations, the following preliminary CSM has been developed showing potential SPR linkages considered to be potentially complete or incomplete under our understanding of the current and future land use.

The preliminary CSM for the site is summarised in Table 5-2 and applies to the current and future land use as a residential/commercial building.

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Table 5-2 Preliminary CSM

Potential Contaminant Source	Potential Impacted Media	Contaminants of Concern	Potential Exposure Pathways	Receptors	Likelihood of complete exposure pathway
Demolition and construction of buildings on and off site Hazardous building materials contained within former and existing site structures Cutting and fill materials on site Commercial operations within the Manly Sea Life building (potential storage and use of chemicals)	• Surficial soils and fill materials surrounding Manly Sea Life and West Esplanade. • Groundwater.	• TRH • BTEX • PAH • Metals • OCP • OPP • PCB • Phenols • Asbestos • VOCs • SVOCs.	• Direct contact • Incidental ingestion • Incidental inhalation of asbestos fibres	Human: • Current and future site users and residents • Site workers – demolition and construction Ecological: • Site vegetation and biota	Low to moderate: The risk of exposure through a completed SPR linkage for human site occupants is considered low under the current land use. However, potentially hazardous building materials could be present as observed in the site walkover. Future construction workers would be involved with potential greater exposure to soil and groundwater as well as hazardous building materials during construction activities such as demolition, landscaping and cutting (disturbance of soils); however, these works should be undertaken with the appropriate controls. A low to moderate risk of exposure is present for ecological receptors as a result of interaction with potentially impacted soils or groundwater. Low to moderate risk of a complete SPR linkage associated with potential uncontrolled releases of chemical products.
Off-site current and historical activities such as dry-docks or boatyards where antifouling activities	• Marine sediments and water. • Surrounding biota (oysters/barnacles)	• TRH • PAH • Phenols • Metals	• Direct contact (dermal absorption during swimming in waters and contact during	Human: • Current and future site users (recreation).	Low to moderate: the risk of exposure through a completed source receptor pathway for human and

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Potential Contaminant Source	Potential Impacted Media	Contaminants of Concern	Potential Exposure Pathways	Receptors	Likelihood of complete exposure pathway
were undertaken as well as general surrounding marine activities including boat uses (petrol/oil spills). Transportation of contaminated sediments/suspended particles and groundwater impacts.	attached to existing structures (concrete seawall/retaining wall and timber jetty.	• Organotin compounds • PFAS.	handling of sediments) • Incidental ingestion (eating fish and other marine organisms) • Biotic uptake of impacted sediments/suspended particles.	• Site workers – demolition and construction. Ecological: • Surrounding marine and terrestrial biota and vegetation.	ecological receptors is considered low to moderate where disturbance of potentially impacted materials is uncontrolled. However, if management controls are in place such as silt curtains or measures to ensure suspended sediments are retained within the construction zone, risk of exposure can be reduced. The risk of a complete SPR linkage by direct contact including dermal absorption during swimming in waters and/or contact during handling of sediments or incidental ingestion via eating fish and other marine organisms is currently considered low risk.
Stored tank water within the Manly Sea Life building	• Stored water (stagnant).	• Lead • Phosphorus			Low to moderate: the risk of exposure is currently low due to the containment of water onsite. However, if waters are discharged prior to characterisation and treatment, risk of exposure is considered moderate for surrounding receptors, particularly ecological receptors.
Potential ASS	• Sediments.	• Acidic leachate and subsequent metal leachate.	• Direct contact with leachate.	Ecological: • Surrounding marine and terrestrial biota and vegetation. Engineered structures.	Low to moderate: the risk of exposure would only occur if sediments are disturbed with no appropriate acid sulfate management controls in place.

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5.1 DATA GAPS

Based on the assessment of the site historical information, which included a historical review and inspection, the following data gaps were identified:

- Depth of disturbance for potentially impacted fill areas is currently unknown. Areas include the proposed widening of the existing driveway and proposed demountable office areas located within the northern portions of the site
- Limited opportunistic sampling of soil was undertaken by Tetra Tech Coffey (2023a), therefore, areas potentially impacted by historical filling activities have not yet been completely assessed
- Soils beneath pavement and vegetation, and behind retaining walls, was not visible for inspection
- For the assessment of ASS undertaken by Tetra Tech Coffey (2023a). ANC cannot be considered in calculation of net acidity values as it has not been verified by methods which simulate oxidation under field conditions (i.e. incubation methodology NLM-8.1 or NLM-8.2).

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6.0 CONCLUSIONS AND RECOMMENDATIONS

Stantec has completed a PSI at the Manly Sea Life building and surrounds (proposed area), Manly as presented in Figure 2, Appendix A. The purpose of the investigation was to gather preliminary contamination information for the site and to provide advice on potential construction constraints. It is understood that the proposed redevelopment would include the following key design features:

- Demolition of the former Manly Sea Life building down to seabed level
- Retention of some former Manly Sea Life structural elements underneath the new proposed boardwalk
- Demolition of the timber jetty, including supporting piles
- Construction of a new 100 metre long pile-supported boardwalk that runs adjacent to Manly Pavilion, that allows sufficient space for walking and a dwell area with seating
- Construction of new stairs and access ramp to the beach
- Safety features on the boardwalk including handrails, tactile indicators, ladders into the water, and emergency life buoys.

Earthworks associated with the proposal would include establishment of a haul road, levelling of soil for the site compound and piling. Fill material would be imported to site for the temporary reclamation of Manly Cove Beach and for re-profiling of the seabed.

From the current understanding of site history and observations made during the site walkover, the following conclusions have been made:

- Based on the desktop review of available information, the site has appeared to undergo no significant changes since 1998 which included the construction of a walkway surrounding the building, construction of a jetty (extending south into Manly Cove) and extensions to the coverings of the building present. Prior to this, major construction activities included the construction of the Manly Sea Life building, and the construction and removal of the boardwalk located within close proximity to the southern boundary
- Potential sources of contamination included:
  - Potential imported fill material within the northern, central and western portions of the site
  - Historical site activities including the potential storage and use of chemicals (Manly Sea Life)
  - Hazardous materials (asbestos) identified during the hazardous building materials assessment of Manly Sea Life
  - Sydney Harbour activities and waterways, specifically potential transportation of impacted sediments from historical industrial activities
  - Upon review of client provided reports (Tetra-Tech Coffey, 2023a), potential ASS is present below the site due to the presence of S_{cr}. ANC of all shallow sediment samples appear to indicate some self-neutralising capacity. As per the *National Acid Sulfate Soils Guidance: National Acid Sulfate Soils Identification and Laboratory Methods Manual* (DAWR, 2018) this cannot be considered in calculation of net acidity values as it has not been verified by methods which simulate oxidation under field conditions (i.e. incubation methodology NLM-8.1 or NLM-8.2)
  - Offsite sources and surrounding historical business activities (historical activities undertaken at dry-docks and boatyards, including but not limited to antifouling)
- The surrounding land uses currently and historically have generally been public open space/recreational activities and commercial industrial (Manly Wharf).

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Currently it is not possible to make a statement on site suitability for the intended land-use and development. As outlined in the recommendations in Section 6.1, further investigation is necessary to determine the extent of potential contamination and the site suitability for the proposed development and future land use.

6.1 RECOMMENDATIONS

Based on the findings of this PSI, the following recommendations are made:

- Undertake a targeted site contamination assessment in the locations identified as potential contamination sources such as potential uncontrolled filling areas and marine sediments
- The comparison of soil and sediment results obtained by Tetra Tech Coffey (2023a) to relevant NEPM tier 1 screening criteria and ANZG 2018 to obtain a preliminary understanding of the suitability of soil and sediments within the site
- Consider further sampling to verify the ANC of site soils using appropriate methods as outlined in Appendix C *National Acid Sulfate Soils Guidance: National Acid Sulfate Soils Identification and Laboratory Methods Manual* (DAWR, 2018). Sampling should consider the proposed design and soils that may be disturbed or impacted by the proposed works
- Following completion of further sampling preparation of an Acid Sulfate Soil Management Plan (ASSMP) that outlines the appropriate and necessary management measures to be put in place including for stockpiling and treatment (e.g., liming) methodologies for the soils
- Sampling of stored water within tanks at Manly Sealife indicated that water quality differed from the North Harbour as a result of elevated lead and phosphorus concentrations. Further specialist advice from a risk assessor will be sought to determine the risk and the appropriate method of disposal of water from the shark tank.
- A Construction Environmental Management Plan should be implemented for the works and include reference to the actual and potential contamination identified as part of this assessment as well as appropriate mitigations. This should also include an Unexpected Finds Protocol to be implemented in the event contamination, not identified in this assessment, is revealed during construction
- All materials that are to leave the site intended for waste disposal or beneficial re-use must be classified in accordance with the *NSW EPA Wase Classification Guidelines*, (November 2014) and/or applicable *NSW EPA Resource Recovery Orders*
- If dredging of sediments is required for the redevelopment, an assessment of marine sediments that are likely to be disturbed should be undertaken in accordance with the *National Assessment Guidelines for Dredging, 2009*.

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7.0 LIMITATIONS

This assessment has been undertaken in general accordance with the current "industry standards" for a PSI for the purpose and objectives and scope identified in this report. These standards are set out in:

- National Environment Protection (Assessment of Site Contamination) Measure (NEPM) *1999* (NEPC, 1999) as varied May 2013 (the 'NEPM 2013')
- AS4482.1- 2005: Guide to the sampling and investigation of potentially contaminated soil Part 1: Non-volatile and semi-volatile compounds. Standards Australia (2005).

The agreed scope of this assessment has been limited for the current purposes of the Client. The assessment may not identify contamination occurring in all areas of the site, or occurring after sampling was conducted. Subsurface conditions may vary considerably away from the sample locations where information has been obtained.

This document has been provided by Stantec subject to the following limitations:

- This Document has been prepared for the particular purpose outlined in Stantec's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose
- The scope and the period of Stantec's services are as described in Stantec's proposal, and are subject to restrictions and limitations. Stantec did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Stantec in regards to it
- Conditions may exist which were undetectable given the limited nature of the enquiry Stantec was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required
- In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Stantec's opinions are based upon information that existed at the time of the production of the Document. It is understood that the services provided allowed Stantec to form no more than an opinion of the actual conditions of the site at the time this Document was prepared and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations
- Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document
- Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Stantec for incomplete or inaccurate data supplied by other
- Stantec may have retained sub consultants affiliated with Stantec to provide services for the benefit of Stantec. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any direct legal recourse to, and waives any claim, demand, or cause of action against, Stantec's affiliated companies, and their employees, officers and directors.

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This assessment report is not any of the following:

- A Site Audit Report or Site Audit Statement as defined under the CLM Act
- A site investigation sufficient for an Site Auditor to be able to conclude a Site Audit Report and Site Audit Statement
- An assessment of soil, sediment, water or gas
- A geotechnical report
- A detailed hydrogeological assessment in conformance with NSW DEC (2007) *Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination*
- A hazardous building material survey that will identify any specific building materials on site, which may pose a risk to human health or the environment.

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8.0 REFERENCES

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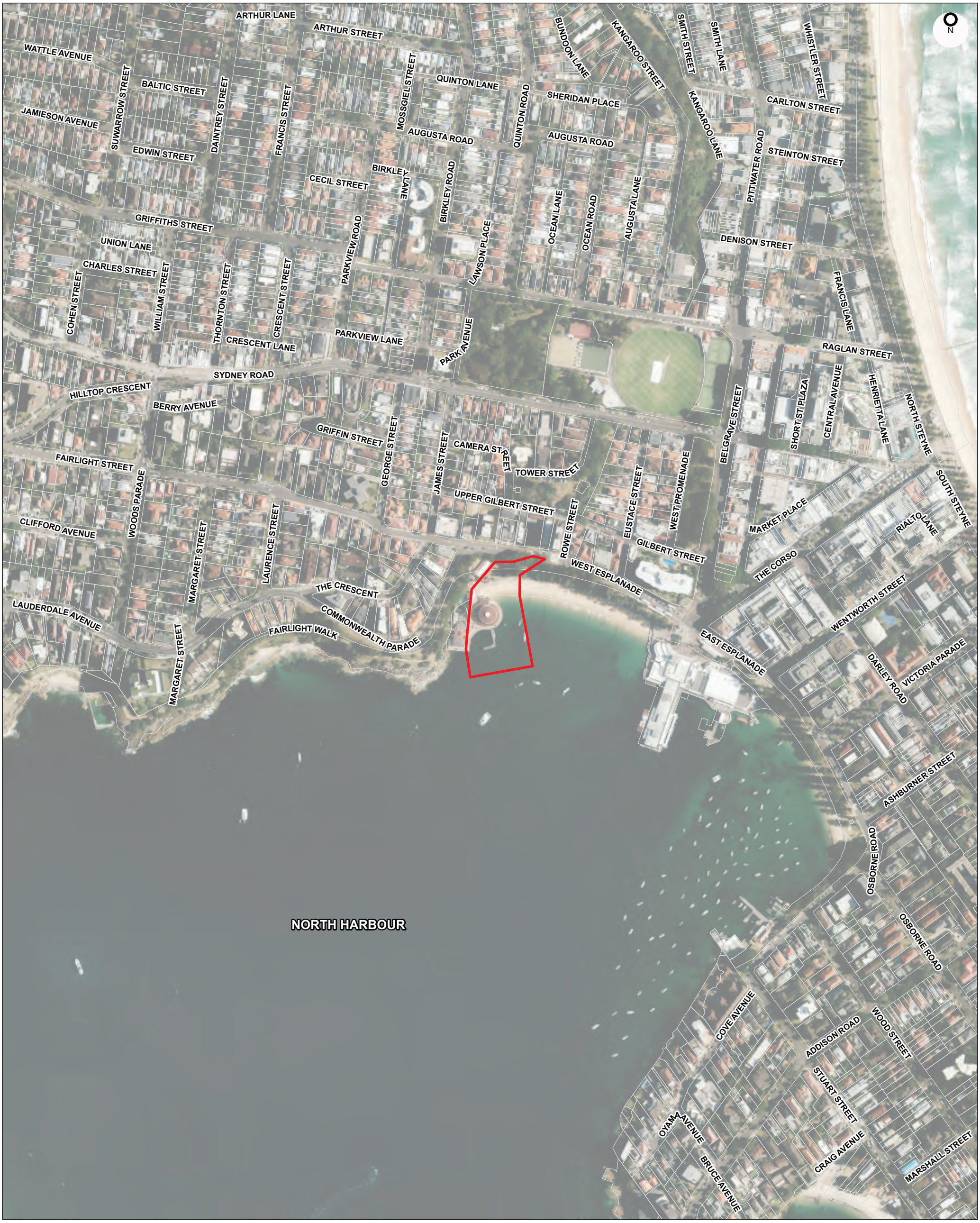
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Stantec (2023) *Manly Sealife Aquarium – Water Quality Assessment.* Stantec Australia Pty Ltd, 24 January 2023.

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APPENDIX A

Figures



Location Plan

Manly, NSW

Project Code: 304500787-GS-010
Drawn By: AC, Checked By: SM
Figure No: 1
Rev: 01
Date: 2023-01-17

Legend

- Proposal area
- Cadastre

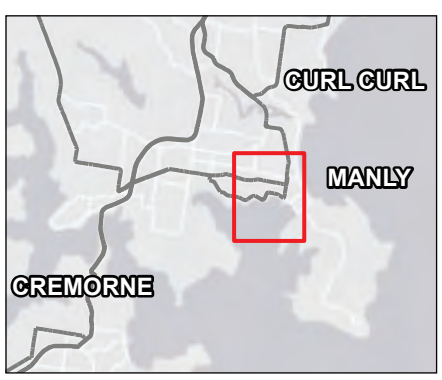
Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by MetroMap (December, 2022)
2. Cadastre supplied by NSW SS (2022)

NOT FOR CONSTRUCTION

0 100 200 Metres

Scale at A3: 1:5,000



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Site Plan

Manly, NSW

Project Code: 304500787-GS-011
Drawn By: AC, Checked By: SM
Figure No: 2
Rev: 01
Date: 2023-01-18

Legend

- Proposal area
- 2m Contours
- Potential Fill Area
- Cadastre

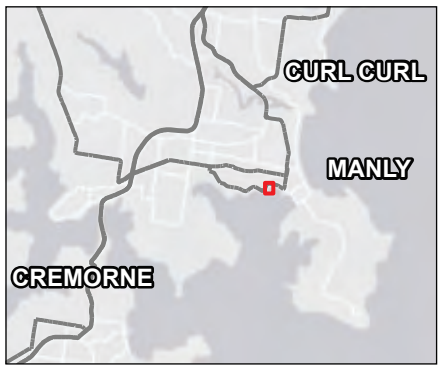
Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by MetroMap (December, 2022)
2. Cadastre supplied by NSW SS (2022)
3. Contours supplied by NSW LPI (2013)

NOT FOR CONSTRUCTION

0 10 20 30 Metres

Scale at A3: 1:600



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FAIRLIGHT STREET

COMMONWEALTH PARADE

WEST ESPLANADE

MANLY ART GALLERY AND MUSEUM

FAIRLIGHT WALK

FORMER MANLY SEA LIFE

MANLY WATERWORKS

MANLY PAVILION

N

Steps to beach

Dwell area

Access ramp to beach

Walkway

Viewing platform

Key Features

Manly, NSW

Project Code: 304500787-GS-002
Drawn By: TB, Checked By: SM
Rev: 06
Date: 2023-01-25
Figure No: 1-1

Stantec

Legend

- Bored pile
- Concrete column
- Driven pile
- Existing infrastructure to be removed (demolition area)
- New boardwalk infrastructure

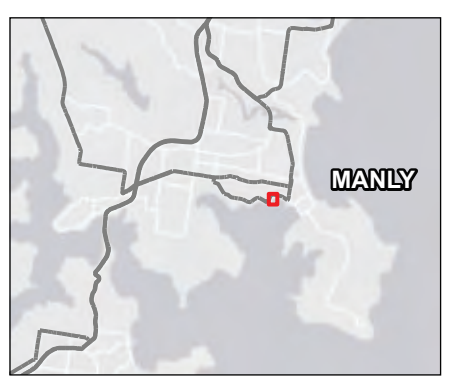
Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by MetroMap (December, 2022)

NOT FOR CONSTRUCTION

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Scale at A3: 1:600



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Proposal Areas

Manly, NSW

Project Code: 304500787-GS-003
Drawn By: TB, Checked By: AC
Rev: 06
Date: 2023-01-25
Figure No: 1-2

Stantec

Legend

- Proposal area
- Existing infrastructure to be removed (demolition area)
- Cadastre
- Material handling and load out area (beach reclamation area)
- Construction haul road
- Compound area
- New boardwalk infrastructure

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery supplied by MetroMap (December, 2022)
2. Cadastre supplied by NSW SS (2022)

NOT FOR CONSTRUCTION

0 10 20 30 Metres

Scale at A3: 1:600



This document has been prepared based on information provided by others as cited in the data sources. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

APPENDIX B
PHOTOGRAPHS



Photo 1: Manly Sealife and surrounding site area. Facing south



Photo 2: Manly Sealife eastern retaining sea wall. Facing south east towards North Harbour and Manly Wharf



Photo 3: West Esplanade, grassed areas and retaining walls. Facing North.



Photo 4: Manly Art Gallery and West Esplanade pedestrian/bicycle pathway. Facing north.



Photo 5: Eastern extent of the site (Manly Sealife). Facing north towards West Esplanade.



Photo 6: Western extent of the site (Manly Sealife and Manly Pavilion). Facing south.



Photo 7: Manly Sealife construction entranceway and Manly pavilion. Facing north.



Photo 8: Northern side of Manly Sealife. Jetty and Manly Sealife pumps. Facing north-east/east.



Photo 9: Northern portion of the site. Seawater pumps and jetty. Facing east/south-east.

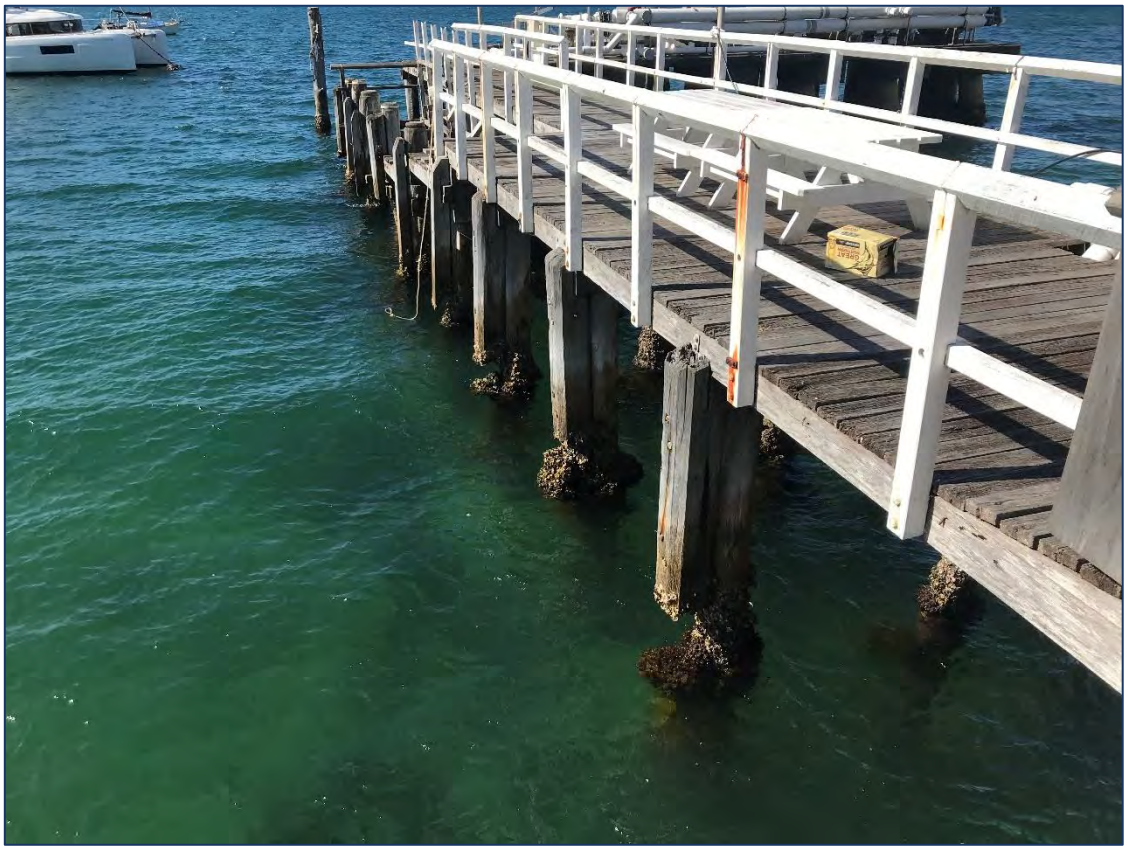


Photo 10: Northern portion of the site. Seawater pumps and jetty. Facing south.



Photo 11: Main fishtank walkthrough. Inside Manly Sealife (Base level – sealevel)



Photo 12: Manly Sealife ain fishtank walkthrough (Base level – sealevel).



Photo 13: Manly Sealife – pump room (Base level – sealevel). Located within the south eastern portion of the building.



Photo 14: Manly Sealife – pump room (Base level – sealevel). Located within the south eastern portion of the building.



Photo 15: Overlooking mainfish tank and walkway. Sediment tank located towards the left of the image (central portion of site)



Photo 16: Holding tank and lock that accesses North Harbour.Located within the southern portion of the building.

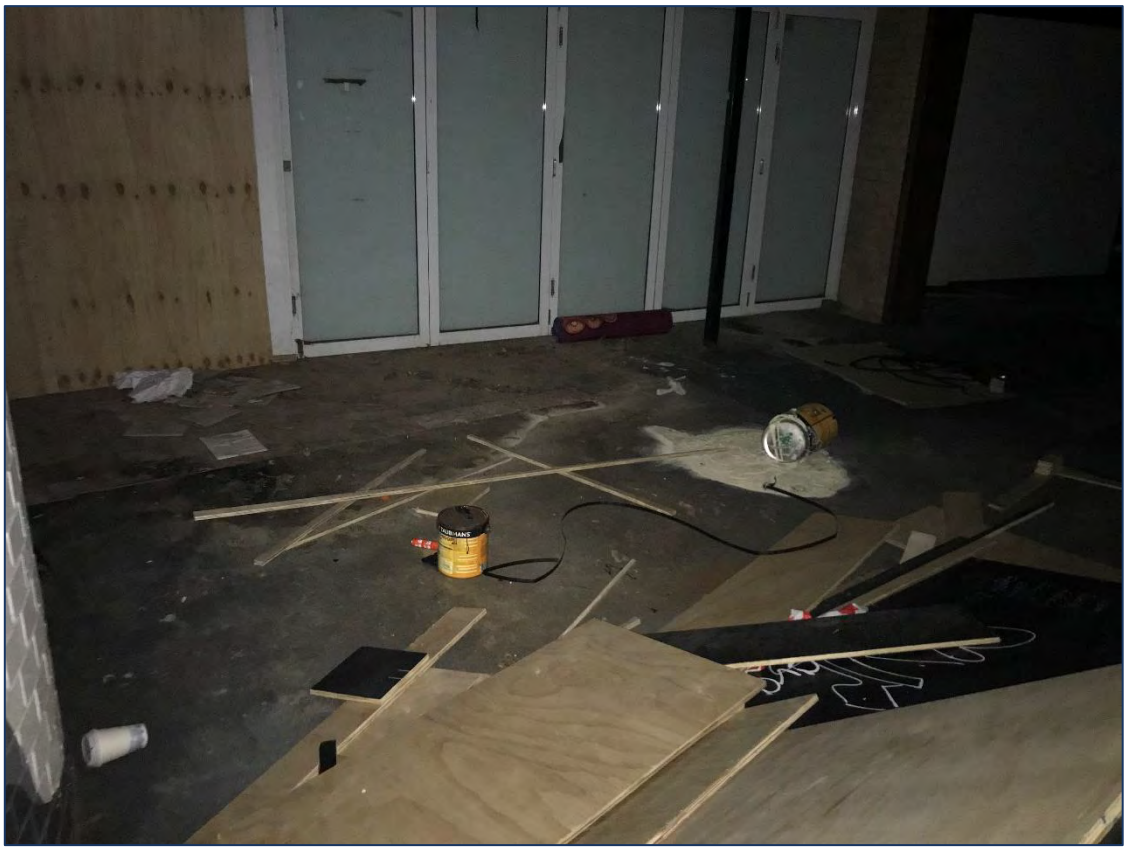


Photo 17: Main foyer. General waste and building waste observed. Western portion of building.



Photo 18: Degraded paintwork observed.



Photo 19: Seal/Penguin enclosure/viewing area. Water present with general waste observed.



Photo 20: Water/Pump tanks.

APPENDIX C
LOTSEARCH REPORT

LOTSEARCH

LOTSEARCH ENVIRO PROFESSIONAL

Date: 01 Dec 2022 13:13:43

Reference: LS038526 EP

Address: Manly Sea Life (West Esplanade), Manly, NSW 2095

Disclaimer:
The purpose of this report is to provide an overview of some of the site history, environmental risk and planning information available, affecting an individual address or geographical area in which the property is located. It is not a substitute for an on-site inspection or review of other available reports and records. It is not intended to be, and should not be taken to be, a rating or assessment of the desirability or market value of the property or its features.
You should obtain independent advice before you make any decision based on the information within the report.
The detailed terms applicable to use of this report are set out at the end of this report.

Dataset Listing

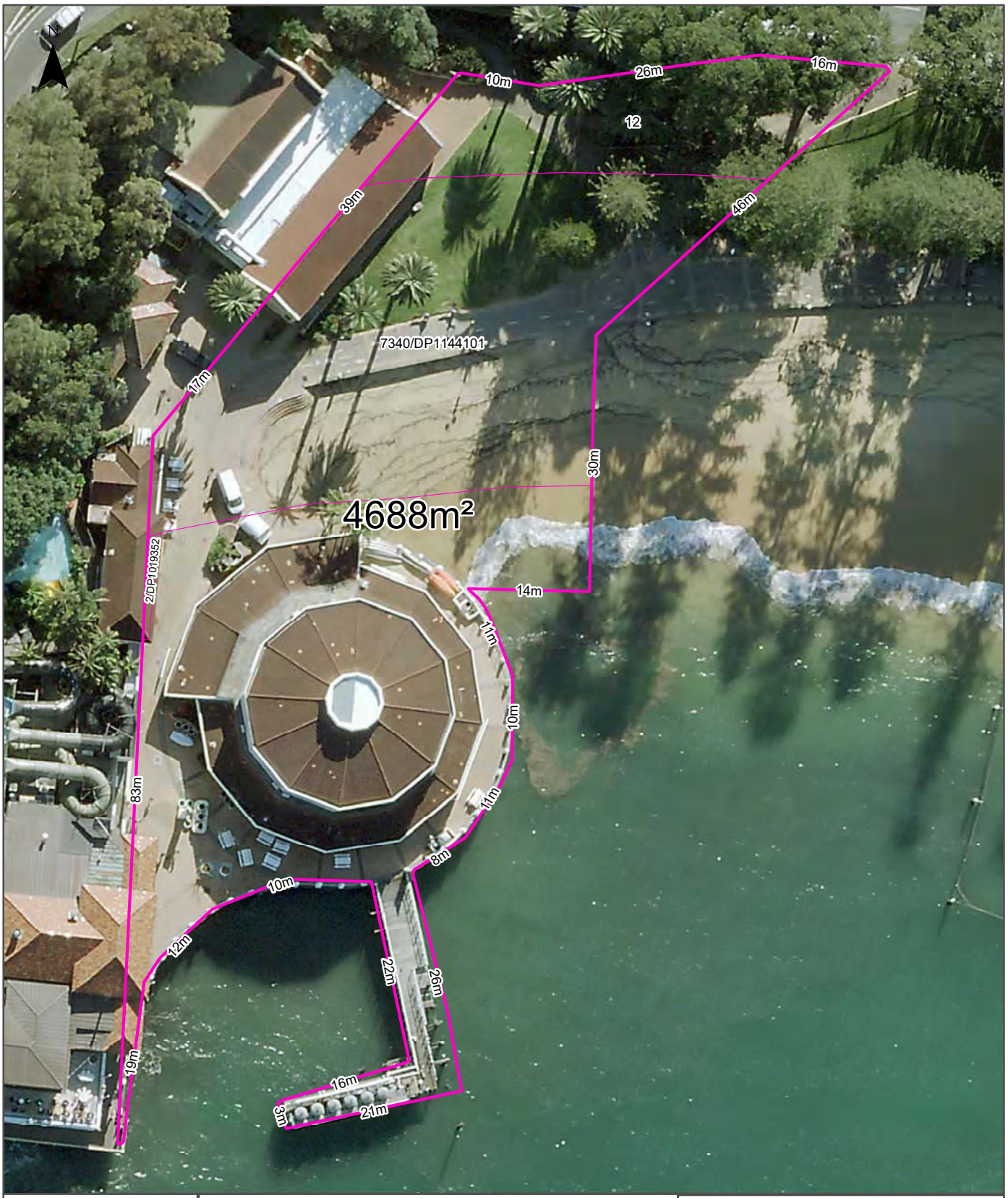
Datasets contained within this report, detailing their source and data currency:

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features On-site	No. Features within 100m	No. Features within Buffer
Cadastre Boundaries	NSW Department of Customer Service - Spatial Services	04/11/2022	04/11/2022	Quarterly	-	-	-	-
Topographic Data	NSW Department of Customer Service - Spatial Services	22/08/2022	22/08/2022	Annually	-	-	-	-
List of NSW contaminated sites notified to EPA	Environment Protection Authority	08/11/2022	14/10/2022	Monthly	1000m	0	0	1
Contaminated Land Records of Notice	Environment Protection Authority	31/10/2022	31/10/2022	Monthly	1000m	0	0	0
Former Gasworks	Environment Protection Authority	02/09/2022	14/07/2021	Quarterly	1000m	0	0	0
National Waste Management Facilities Database	Geoscience Australia	26/05/2022	07/03/2017	Annually	1000m	0	0	0
National Liquid Fuel Facilities	Geoscience Australia	23/08/2022	13/07/2012	Annually	1000m	0	0	3
EPA PFAS Investigation Program	Environment Protection Authority	08/11/2022	23/09/2022	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Investigation Sites	Department of Defence	09/11/2022	09/11/2022	Monthly	2000m	0	0	0
Defence PFAS Investigation & Management Program - Management Sites	Department of Defence	09/11/2022	09/11/2022	Monthly	2000m	0	0	0
Airservices Australia National PFAS Management Program	Airservices Australia	09/11/2022	09/11/2022	Monthly	2000m	0	0	0
Defence 3 Year Regional Contamination Investigation Program	Department of Defence	02/09/2022	02/09/2022	Quarterly	2000m	0	0	0
EPA Other Sites with Contamination Issues	Environment Protection Authority	16/02/2022	13/12/2018	Annually	1000m	0	0	0
Licensed Activities under the POEO Act 1997	Environment Protection Authority	31/10/2022	31/10/2022	Monthly	1000m	0	0	0
Delicensed POEO Activities still regulated by the EPA	Environment Protection Authority	31/10/2022	31/10/2022	Monthly	1000m	0	0	1
Former POEO Licensed Activities now revoked or surrendered	Environment Protection Authority	31/10/2022	31/10/2022	Monthly	1000m	3	3	3
UBD Business Directories (Premise & Intersection Matches)	Hardie Grant			Not required	150m	4	38	120
UBD Business Directories (Road & Area Matches)	Hardie Grant			Not required	150m	-	50	53
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Premise & Intersection Matches)	Hardie Grant			Not required	500m	0	0	303
UBD Business Directory Dry Cleaners & Motor Garages/Service Stations (Road & Area Matches)	Hardie Grant			Not required	500m	-	5	100
Points of Interest	NSW Department of Customer Service - Spatial Services	19/10/2022	19/10/2022	Quarterly	1000m	2	6	93
Tanks (Areas)	NSW Department of Customer Service - Spatial Services	19/10/2022	19/10/2022	Quarterly	1000m	0	0	0
Tanks (Points)	NSW Department of Customer Service - Spatial Services	19/10/2022	19/10/2022	Quarterly	1000m	0	0	0
Major Easements	NSW Department of Customer Service - Spatial Services	15/11/2022	15/11/2022	Quarterly	1000m	0	0	4
State Forest	Forestry Corporation of NSW	16/08/2022	14/08/2022	Annually	1000m	0	0	0
NSW National Parks and Wildlife Service Reserves	NSW Office of Environment & Heritage	10/02/2022	31/12/2021	Annually	1000m	0	0	0
Hydrogeology Map of Australia	Commonwealth of Australia (Geoscience Australia)	29/08/2022	19/08/2019	Annually	1000m	1	1	1
Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018	NSW Department of Planning, Industry and Environment	28/03/2022	23/02/2018	Annually	1000m	0	0	0
National Groundwater Information System (NGIS) Boreholes	Bureau of Meteorology; Water NSW	24/01/2022	24/01/2022	Annually	2000m	0	0	64

Dataset Name	Custodian	Supply Date	Currency Date	Update Frequency	Dataset Buffer (m)	No. Features On-site	No. Features within 100m	No. Features within Buffer
NSW Seamless Geology Single Layer: Rock Units	Department of Regional NSW	17/02/2022	01/05/2021	Annually	1000m	4	4	9
NSW Seamless Geology – Single Layer: Trendlines	Department of Regional NSW	17/02/2022	01/05/2021	Annually	1000m	0	0	0
NSW Seamless Geology – Single Layer: Geological Boundaries and Faults	Department of Regional NSW	17/02/2022	01/05/2021	Annually	1000m	0	0	0
Naturally Occurring Asbestos Potential	NSW Dept. of Industry, Resources & Energy	04/12/2015	24/09/2015	Unknown	1000m	0	0	0
Atlas of Australian Soils	Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES)	19/05/2017	17/02/2011	As required	1000m	0	0	2
Soil Landscapes of Central and Eastern NSW	NSW Department of Planning, Industry and Environment	18/08/2022	27/07/2020	Annually	1000m	2	3	7
Environmental Planning Instrument Acid Sulfate Soils	NSW Department of Planning, Industry and Environment	09/11/2022	28/10/2022	Monthly	500m	1	-	-
Atlas of Australian Acid Sulfate Soils	CSIRO	19/01/2017	21/02/2013	As required	1000m	3	3	3
Dryland Salinity - National Assessment	National Land and Water Resources Audit	18/07/2014	12/05/2013	None planned	1000m	0	0	0
Mining Subsidence Districts	NSW Department of Customer Service - Subsidence Advisory NSW	09/11/2022	09/11/2022	Quarterly	1000m	0	0	0
Current Mining Titles	NSW Department of Industry	09/11/2022	09/11/2022	Monthly	1000m	0	0	0
Mining Title Applications	NSW Department of Industry	09/11/2022	09/11/2022	Monthly	1000m	0	0	0
Historic Mining Titles	NSW Department of Industry	09/11/2022	09/11/2022	Monthly	1000m	10	11	11
Environmental Planning Instrument SEPP State Significant Precincts	NSW Department of Planning, Industry and Environment	15/11/2021	07/12/2018	Monthly	1000m	0	0	0
Environmental Planning Instrument Land Zoning	NSW Department of Planning, Industry and Environment	15/11/2021	05/11/2021	Monthly	1000m	1	3	72
Commonwealth Heritage List	Australian Government Department of the Agriculture, Water and the Environment	03/06/2022	13/04/2022	Annually	1000m	0	0	0
National Heritage List	Australian Government Department of the Agriculture, Water and the Environment	03/06/2022	13/04/2022	Annually	1000m	0	0	0
State Heritage Register - Curtilages	NSW Department of Planning, Industry and Environment	18/10/2022	01/07/2022	Quarterly	1000m	1	1	4
Environmental Planning Instrument Local Heritage	NSW Department of Planning, Industry and Environment	09/11/2022	28/10/2022	Monthly	1000m	4	16	285
Bush Fire Prone Land	NSW Rural Fire Service	28/11/2022	25/10/2022	Weekly	1000m	0	0	1
Native Vegetation of the Sydney Metropolitan Area	NSW Office of Environment & Heritage	01/03/2017	16/12/2016	Annually	1000m	2	2	6
Ramsar Wetlands of Australia	Australian Government Department of Agriculture, Water and the Environment	28/03/2022	19/03/2020	Annually	1000m	0	0	0
Groundwater Dependent Ecosystems	Bureau of Meteorology	28/10/2022	26/10/2022	Annually	1000m	0	0	0
Inflow Dependent Ecosystems Likelihood	Bureau of Meteorology	28/10/2022	26/10/2022	Annually	1000m	0	0	0
NSW BioNet Species Sightings	NSW Office of Environment & Heritage	30/11/2022	30/11/2022	Weekly	10000m	-	-	-

Site Diagram

Manly Sea Life (West Esplanade), Manly, NSW 2095



Legend

- Site Boundary
- Internal Parcel Boundaries

Total Area: 4688m²

Total Perimeter: 460m

Disclaimers:

Measurements are approximate only and may have been simplified or smaller lengths removed for readability.

Parcels that make up a small percentage of the total site area have not been labelled for increased legibility.

Scale: 0 — 15 Meters — 30

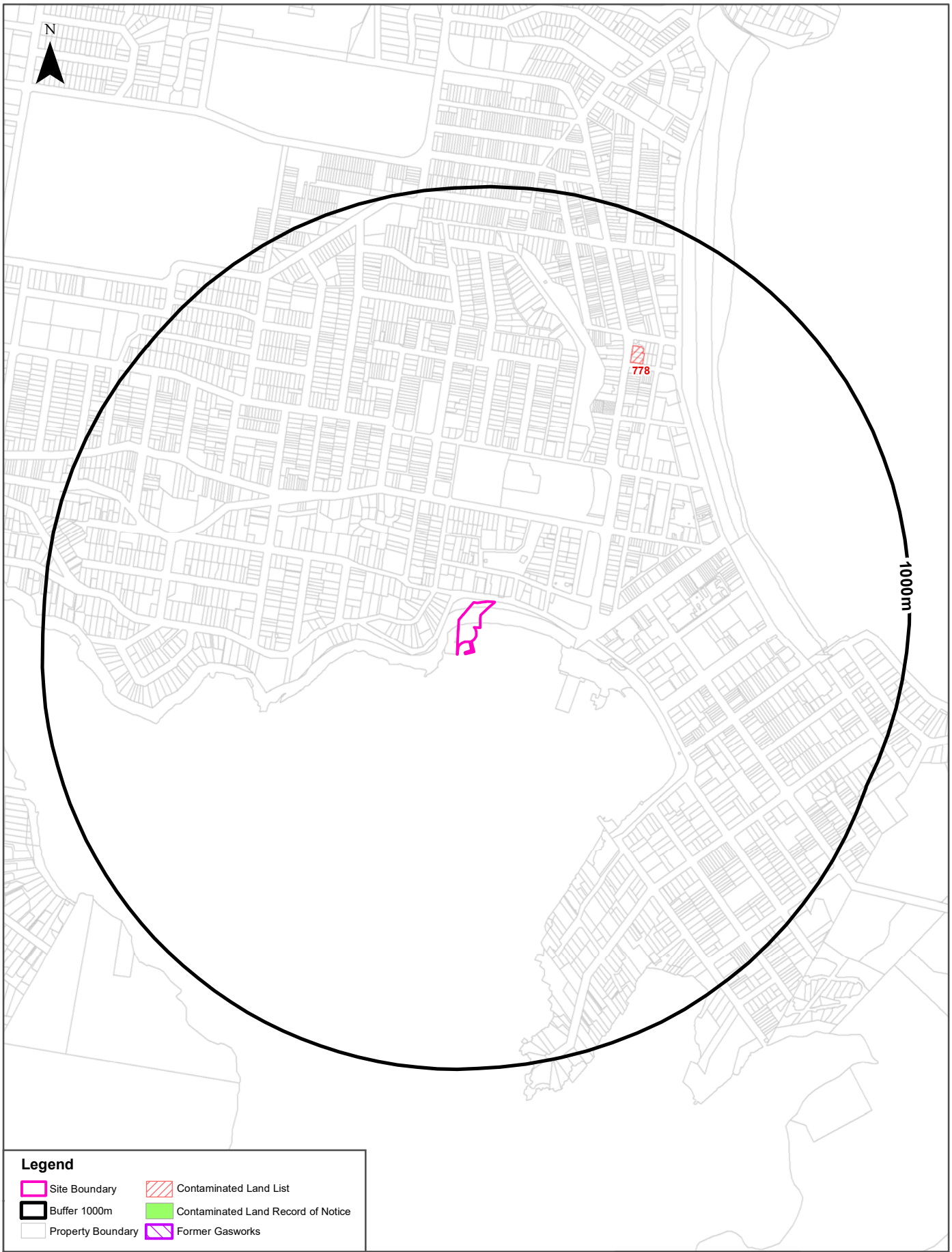
Data Source Aerial Imagery:
© Aerometrex Pty Ltd

Coordinate System:
GDA 1994 MGA Zone 56

Date: 30 November 2022

Contaminated Land

Manly Sea Life (West Esplanade), Manly, NSW 2095



Contaminated Land

Manly Sea Life (West Esplanade), Manly, NSW 2095

List of NSW contaminated sites notified to EPA

Records from the NSW EPA Contaminated Land list within the dataset buffer:

Map Id	Site	Address	Suburb	Activity	Management Class	Status	Location Confidence	Dist	Direction
778	Caltex Service Station	86 Pittwater Road	Manly	Service Station	Regulation under CLM Act not required	Current EPA List	Premise Match	664m	North East

The values within the EPA site management class in the table above, are given more detailed explanations in the table below:

EPA site management class	Explanation
Contamination being managed via the planning process (EP&A Act)	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. The contamination of this site is managed by the consent authority under the Environmental Planning and Assessment Act 1979 (EP&A Act) planning approval process, with EPA involvement as necessary to ensure significant contamination is adequately addressed. The consent authority is typically a local council or the Department of Planning and Environment.
Contamination currently regulated under CLM Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). Management of the contamination is regulated by the EPA under the CLM Act. Regulatory notices are available on the EPA's Contaminated Land Public Record of Notices.
Contamination currently regulated under POEO Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. Management of the contamination is regulated under the Protection of the Environment Operations Act 1997 (POEO Act). The EPA's regulatory actions under the POEO Act are available on the POEO public register.
Contamination formerly regulated under the CLM Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). The contamination was addressed under the CLM Act.
Contamination formerly regulated under the POEO Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed under the Protection of the Environment Operations Act 1997 (POEO Act).
Contamination was addressed via the planning process (EP&A Act)	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed by the appropriate consent authority via the planning process under the Environmental Planning and Assessment Act 1979 (EP&A Act).
Ongoing maintenance required to manage residual contamination (CLM Act)	The EPA has determined that ongoing maintenance, under the Contaminated Land Management Act 1997 (CLM Act), is required to manage the residual contamination. Regulatory notices under the CLM Act are available on the EPA's Contaminated Land Public Record of Notices.
Regulation being finalised	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997. A regulatory approach is being finalised.
Regulation under the CLM Act not required	The EPA has completed an assessment of the contamination and decided that regulation under the Contaminated Land Management Act 1997 is not required.
Under assessment	The contamination is being assessed by the EPA to determine whether regulation is required. The EPA may require further information to complete the assessment. For example, the completion of management actions regulated under the planning process or Protection of the Environment Operations Act 1997. Alternatively, the EPA may require information via a notice issued under s77 of the Contaminated Land Management Act 1997 or issue a Preliminary Investigation Order.

NSW EPA Contaminated Land List Data Source: Environment Protection Authority

© State of New South Wales through the Environment Protection Authority

Contaminated Land

Manly Sea Life (West Esplanade), Manly, NSW 2095

Contaminated Land: Records of Notice

Record of Notices within the dataset buffer:

Map Id	Name	Address	Suburb	Notices	Area No	Location Confidence	Distance	Direction
N/A	No records in buffer							

Contaminated Land Records of Notice Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority
Terms of use and disclaimer for Contaminated Land: Record of Notices, please visit http://www.epa.nsw.gov.au/clm/clmdisclaimer.htm

Former Gasworks

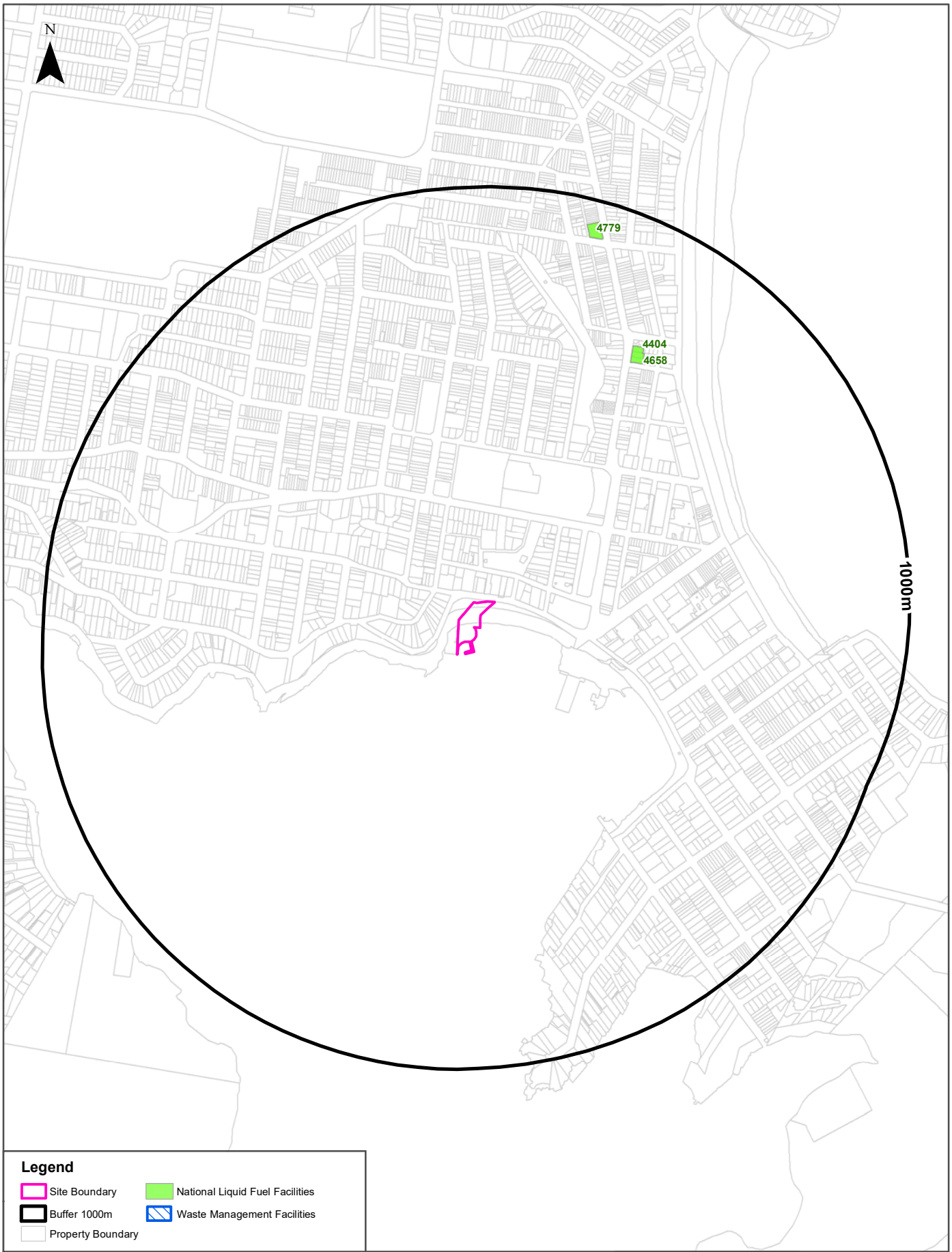
Former Gasworks within the dataset buffer:

Map Id	Location	Council	Further Info	Location Confidence	Distance	Direction
N/A	No records in buffer					

Former Gasworks Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Waste Management & Liquid Fuel Facilities

Manly Sea Life (West Esplanade), Manly, NSW 2095



Waste Management & Liquid Fuel Facilities

Manly Sea Life (West Esplanade), Manly, NSW 2095

National Waste Management Site Database

Sites on the National Waste Management Site Database within the dataset buffer:

Site Id	Owner	Name	Address	Suburb	Class	Landfill	Reprocess	Transfer	Comments	Loc Conf	Dist	Direction
N/A	No records in buffer											

Waste Management Facilities Data Source: Geoscience Australia
Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

National Liquid Fuel Facilities

National Liquid Fuel Facilties within the dataset buffer:

Map Id	Owner	Name	Address	Suburb	Class	Operational Status	Operator	Revision Date	Loc Conf	Dist	Direction
4404	Caltex	Caltex Manly	88-90 Pittwater Road	Manly	Petrol Station	Operational		25/07/2011	Premise Match	664m	North East
4658	Caltex	Caltex Manly	92 Pittwater Road	Manly	Petrol Station	Operational		25/07/2011	Premise Match	664m	North East
4779	BP	BP Manly	131-139 Pittwater Road	Manly	Petrol Station	Operational		25/07/2011	Premise Match	908m	North

National Liquid Fuel Facilities Data Source: Geoscience Australia
Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

PFAS Investigation & Management Programs

Manly Sea Life (West Esplanade), Manly, NSW 2095

EPA PFAS Investigation Program

Sites that are part of the EPA PFAS investigation program, within the dataset buffer:

Map ID	Site	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

EPA PFAS Investigation Program: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Defence PFAS Investigation Program

Sites being investigated by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Investigation Program Data Custodian: Department of Defence, Australian Government

Defence PFAS Management Program

Sites being managed by the Department of Defence for PFAS contamination within the dataset buffer:

Map ID	Base Name	Address	Loc Conf	Dist	Dir
N/A	No records in buffer				

Defence PFAS Management Program Data Custodian: Department of Defence, Australian Government

Airservices Australia National PFAS Management Program

Sites being investigated or managed by Airservices Australia for PFAS contamination within the dataset buffer:

Map ID	Site Name	Impacts	Loc Conf	Dist	Dir
N/A	No records in buffer				

Airservices Australia National PFAS Management Program Data Custodian: Airservices Australia

Defence Sites

Manly Sea Life (West Esplanade), Manly, NSW 2095

Defence 3 Year Regional Contamination Investigation Program

Sites which have been assessed as part of the Defence 3 Year Regional Contamination Investigation Program within the dataset buffer:

Property ID	Base Name	Address	Known Contamination	Loc Conf	Dist	Dir
N/A	No records in buffer					

Defence 3 Year Regional Contamination Investigation Program, Data Custodian: Department of Defence, Australian Government

EPA Other Sites with Contamination Issues

Manly Sea Life (West Esplanade), Manly, NSW 2095

EPA Other Sites with Contamination Issues

This dataset contains other sites identified on the EPA website as having contamination issues. This dataset currently includes:

- James Hardie asbestos manufacturing and waste disposal sites
- Radiological investigation sites in Hunter's Hill
- Pasminco Lead Abatement Strategy Area

Sites within the dataset buffer:

Site Id	Site Name	Site Address	Dataset	Comments	Location Confidence	Distance	Direction
N/A	No records in buffer						

EPA Other Sites with Contamination Issues: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

EPA Activities

Manly Sea Life (West Esplanade), Manly, NSW 2095

Licensed Activities under the POEO Act 1997

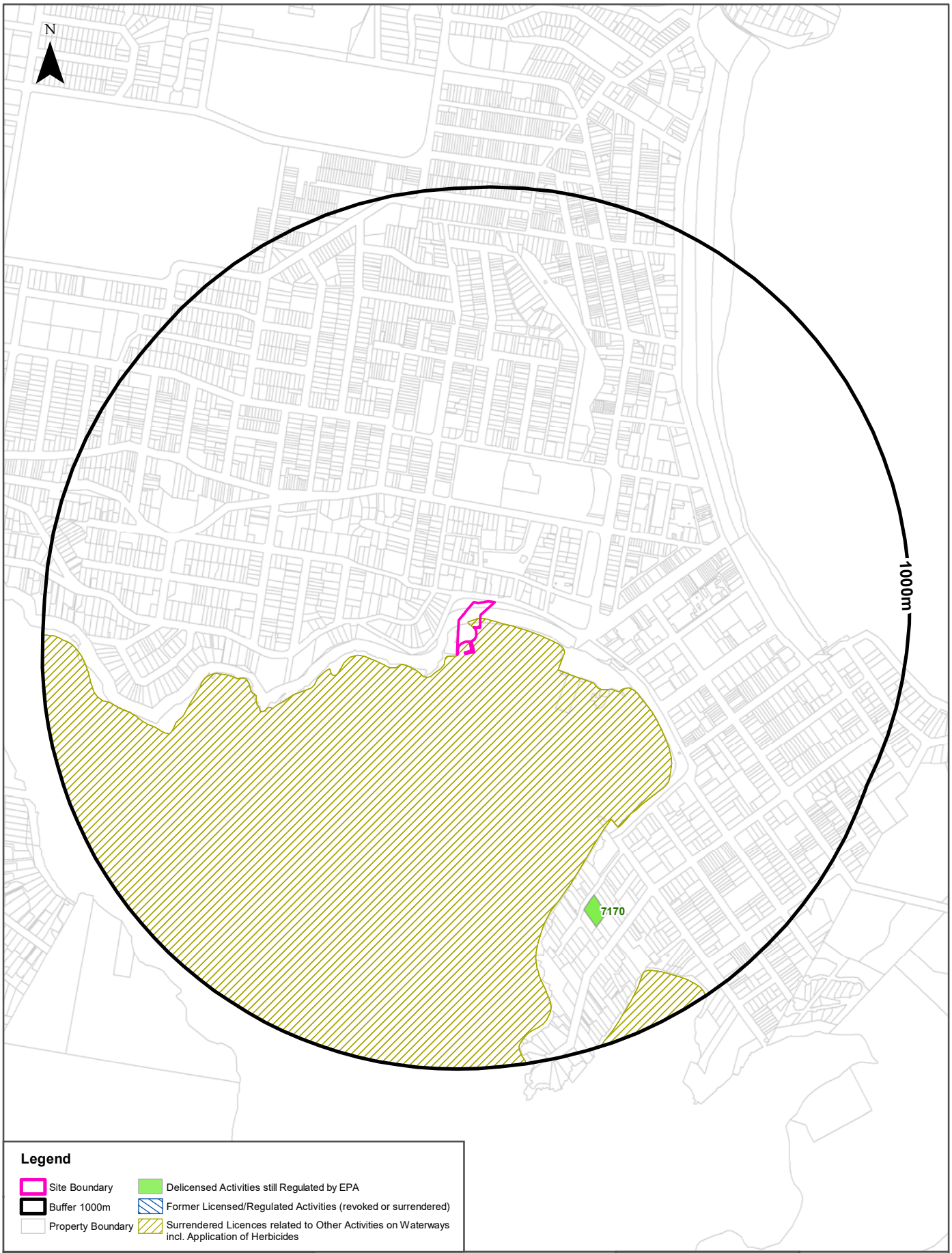
Licensed activities under the Protection of the Environment Operations Act 1997, within the dataset buffer:

EPL	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
N/A	No records in buffer							

POEO Licence Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Delicensed & Former Licensed EPA Activities

Manly Sea Life (West Esplanade), Manly, NSW 2095



EPA Activities

Manly Sea Life (West Esplanade), Manly, NSW 2095

Delicensed Activities still regulated by the EPA

Delicensed activities still regulated by the EPA, within the dataset buffer:

Licence No	Organisation	Name	Address	Suburb	Activity	Loc Conf	Distance	Direction
7170	MACQUARIE HOSPITAL SERVICES PTY. LIMITED	MANLY WATERS PRIVATE HOSPITAL	17 COVE AVENUE	MANLY	Hazardous, Industrial or Group A Waste Generation or Storage	Premise Match	654m	South East

Delicensed Activities Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Former Licensed Activities under the POEO Act 1997, now revoked or surrendered

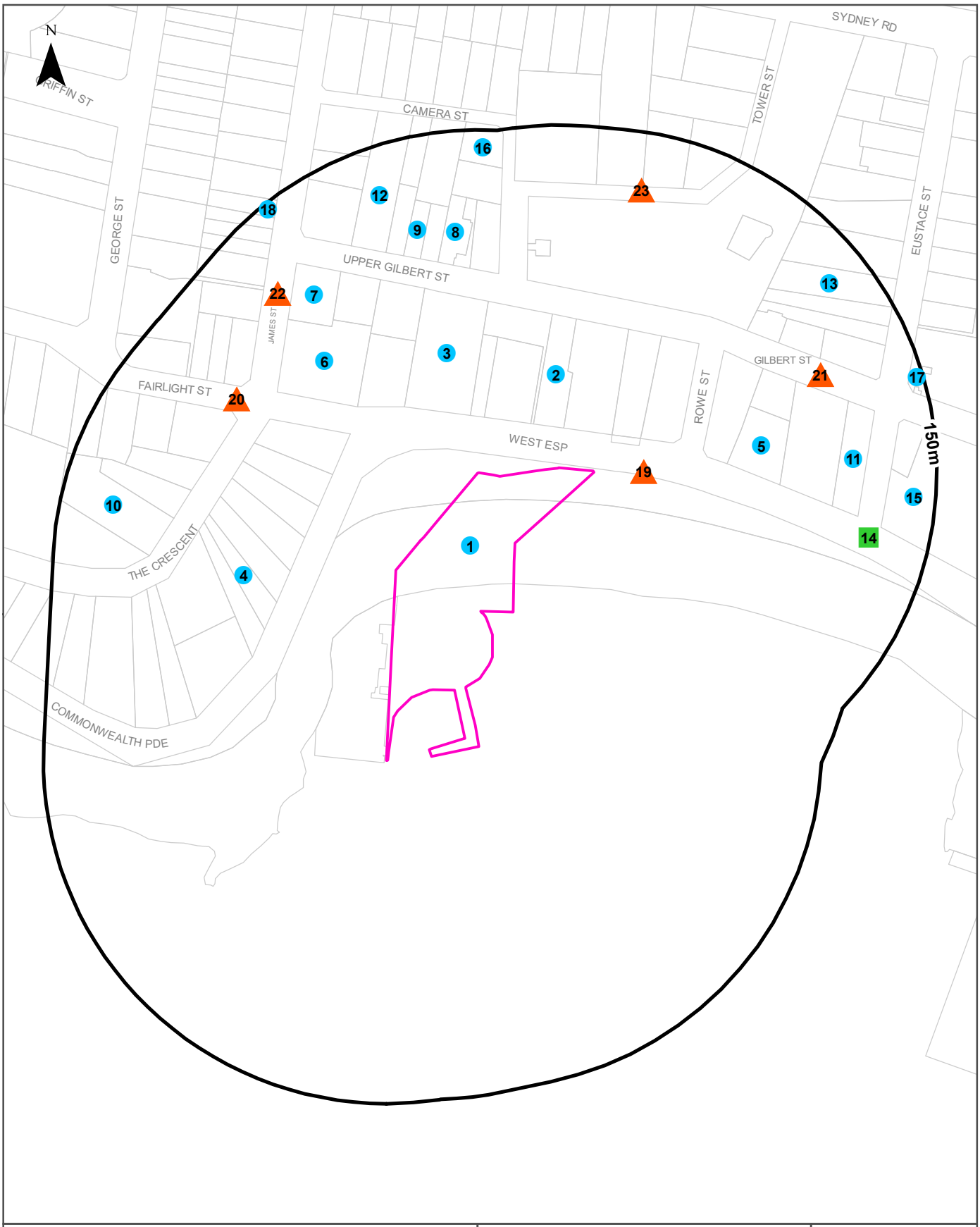
Former Licensed activities under the Protection of the Environment Operations Act 1997, now revoked or surrendered, within the dataset buffer:

Licence No	Organisation	Location	Status	Issued Date	Activity	Loc Conf	Distance	Direction
4653	LUHRMANN ENVIRONMENT MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW	Surrendered	06/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	On-site
4838	Robert Orchard	Various Waterways throughout New South Wales - SYDNEY NSW 2000	Surrendered	07/09/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	On-site
6630	SYDNEY WEED & PEST MANAGEMENT PTY LTD	WATERWAYS THROUGHOUT NSW - PROSPECT, NSW, 2148	Surrendered	09/11/2000	Other Activities / Non Scheduled Activity - Application of Herbicides	Network of Features	0m	On-site

Former Licensed Activities Data Source: Environment Protection Authority
© State of New South Wales through the Environment Protection Authority

Historical Business Directories

Manly Sea Life (West Esplanade), Manly, NSW 2095



Legend

- Site Boundary
- Buffer 150m
- Property Boundary
- Business directory records mapped to a specific premise
- Business directory records mapped to a road intersection
- Business directory records mapped to a road corridor
- Business directory records mapped to a general area

Scale: 0 30 60 90 120 Meters

Coordinate System: GDA 1994 MGA Zone 56

Date: 01 December 2022

Data Sources: Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Historical Business Directories

Manly Sea Life (West Esplanade), Manly, NSW 2095

Business Directory Records 1950-1991
Premise or Road Intersection Matches

Universal Business Directory records from years 1991, 1986, 1982, 1978, 1975, 1970, 1965, 1961 & 1950, mapped to a premise or road intersection within the dataset buffer:

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
1	ART GALLERIES &/OR MUSEUMS.	Manly Art Gallery, West Esplanade, Manly. 2095	2944	1975	Premise Match	0m	On-site
	ART GALLERIES & MUSEUMS (A475)	Manly Art Gallery., off West Esp., Manly	262323	1970	Premise Match	0m	On-site
	Art Galleries	Manly Art Gallery., off West Esp., Manly	46960	1965	Premise Match	0m	On-site
	ART GALLERIES	Manly Art Gallery, off Wert Esp., Manly	268718	1961	Premise Match	0m	On-site
2	MEDICAL PRACTITIONERS.	Auckland, I. H., 86 West Esplanade, Manly. 2095	42289	1978	Premise Match	18m	North East
	MEDICAL PRACTITIONERS.	Buckland, H., 86 West Esp., Manly. 2095.	49834	1975	Premise Match	18m	North East
	MEDICAL PRACTITIONERS.	Buckland, I. H., 86 West Esplanade., Manly. 2095.	49835	1975	Premise Match	18m	North East
	MEDICAL PRACTITIONERS.	Hobson. A. C., 86 West Esp., Manly. 2095.	50578	1975	Premise Match	18m	North East
	MEDICAL PRACTITIONERS.	Hobson. A. C., 86 West Esplanade., Manly. 2095.	50577	1975	Premise Match	18m	North East
	MEDICAL PRACTITIONERS (M216)	Barron, A. MoncrJeff., 86 West Esplanade., Manly	326139	1970	Premise Match	18m	North East
	MEDICAL PRACTITIONERS (M216)	Buckland, I. H., 86 West Esp., Manly	326326	1970	Premise Match	18m	North East
	MEDICAL PRACTITIONERS (M216)	Hobson, A. C., 86 West Esplanade., Manly	327164	1970	Premise Match	18m	North East
	MEDICAL PRACTITIONERS (M216)	Meyer, F. Graham., 86 West Esplanade., Manly	327681	1970	Premise Match	18m	North East
	Medical Practitioners	Barron, A. Moncrieff, 86 West Esplanade, Manly	110746	1965	Premise Match	18m	North East
	Medical Practitioners	Hobson, A. C., 86 West Esplanade, Manly	111682	1965	Premise Match	18m	North East
	Medical Practitioners	Meyer, F. Graham, 86 West Esplanade, Manly	112193	1965	Premise Match	18m	North East
	MEDICAL PRACTITIONERS	Barron, A. Moncrieff, 86 West Esplanade, Manly	334517	1961	Premise Match	18m	North East
	MEDICAL PRACTITIONERS	Meyer, F. Graham, 86 West Esplanade, Manly	335888	1961	Premise Match	18m	North East
	MEDICAL PRACTITIONERS	Phillips, W. J. E., 86 West Esplanade, Manly	336074	1961	Premise Match	18m	North East
3	HOTELS—PRIVATE	Park West Private Hotel, 91 West Esplanade, Manly	325906	1961	Premise Match	25m	North
4	BROKERS-GENERAL	Levy, L., 15a Commonwealth Pde., Manly	11409	1950	Premise Match	51m	West
5	MEDICAL PRACTITIONERS.	Norton, H. G., 78 West Esp., Manly. 2095	56745	1986	Premise Match	58m	North East
	MEDICAL PRACTITIONERS. (M2020)	Norton, H, G., 78 West Esp., Manly. 2095.	49623	1982	Premise Match	58m	North East
	MEDICAL PRACTITIONERS.	Norton. H. G., 78 West Esp., Manly. 2095	43805	1978	Premise Match	58m	North East
	MEDICAL PRACTITIONERS.	Norton, N. G., 78 West Esp., Manly. 2095.	51190	1975	Premise Match	58m	North East
	MEDICAL PRACTITIONERS (M216)	Norton, H. G., 78 West Esplanade., Seaforth	327820	1970	Premise Match	58m	North East

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
5	Medical Practitioners	Norton, H. G., 78 West Esplanade, Seaforth	112308	1965	Premise Match	58m	North East
	MEDICAL PRACTITIONERS	Norton, H. G., 78 West Esplanade, Seaforth	335994	1961	Premise Match	58m	North East
	MEDICAL PRACTITIONERS	Norton, H. G., 7 Wiyella Court, West Esp., Manly	73542	1950	Premise Match	58m	North East
	MEDICAL PRACTITIONERS	Welch, E. S., 7 Wiyella Court, West Esplanade, Manly	74048	1950	Premise Match	58m	North East
6	HOTELS-PRIVATE	Earl's Court., 95 West Esplanade., Manly. 2095	43256	1975	Premise Match	59m	North West
	HOTELS-PRIVATE (H700)	Earl's Court., 95 West Esplanade., Manly	656661	1970	Premise Match	59m	North West
	Hotels - Private	Earl's Court, 95 West Esplanade, Manly	102037	1965	Premise Match	59m	North West
	HOTELS—PRIVATE	Earl's Court, 95 West Esplanade, Manly	325843	1961	Premise Match	59m	North West
7	MEDICAL PRACTITIONERS	Ming, E. G., Flat 1, 19 Gilbert St., Manly	73466	1950	Premise Match	90m	North West
8	BUILDERS & CONTRACTORS-(M.M.B.A.)	Owen, S 8 Upper Gilbert St. MANLY	277491	1961	Premise Match	92m	North
9	Medical Practitioners	Butler, J. L., 10 Gilbert St. (Park), Manly	110951	1965	Premise Match	97m	North
10	BRICKLAYERS & BRICKLAYING CONTRACTORS	Gracie Sc Comber, 10 The Crescent, Manly	275834	1961	Premise Match	100m	West
11	MEDICAL PRACTITIONERS.	Williams. G. A., 1 Eustace St., Manly. 2095	51872	1975	Premise Match	105m	East
12	RADIO SALES &/OR SERVICEMEN	Holmes, E. R., 14 Gilbert St., Manly	97295	1950	Premise Match	105m	North
13	CHEMISTS-PHARMACEUTICAL	Manly United Friendley Societies Dispensary, 9 Eustace St., Manly. 2095	15571	1975	Premise Match	111m	North East
	CHEMISTS-PHARMACEUTICAL	Manly U.F.S. Dispensary., 9 Eustace St., Manly	280728	1970	Premise Match	111m	North East
	Chemists - Pharmaceutical	Manly U.F.S. Dispensary, 9 Eustace St., Manly	65315	1965	Premise Match	111m	North East
	CHEMISTS-PHARMACEUTICAL	Manly U.F.S. Dispensary, 9 Eustace St., Manly	287823	1961	Premise Match	111m	North East
14	MEDICAL PRACTITIONERS.	Ferry, J., 73 West Esp., Manly. 2095.	54814	1986	Road Intersection	124m	East
	TAKE-AWAY FOODS.	Furama, 71 West Esp., Manly. 2095.	90873	1986	Road Intersection	124m	East
	TAKE-AWAY FOODS. (T0235)	Furama, 71 West Esp., Manly. 2095.	78361	1982	Road Intersection	124m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Esquire Dry Cleaners, 71 West Esp., Manly. 2095	24023	1975	Road Intersection	124m	East
	MIXED BUSINESSES.	Roylen Flats Shop., 71 West Esplanade., Manly. 2095	55567	1975	Road Intersection	124m	East
	MEDICAL PRACTITIONERS (M216)	Connolly, E. P., Cnr. West Esplanade & Eustace St., Manly	326498	1970	Road Intersection	124m	East
	MEDICAL PRACTITIONERS (M216)	Fienberg, L. H., 73 West Esplanade Manly	326811	1970	Road Intersection	124m	East
	MIXED BUSINESSES (M408)	Roylen Flats Shop., 71 West Esp., Manly	333735	1970	Road Intersection	124m	East
	FRUITERERS/GREENGROCERS (F640)	Whitworth, W.H., 69 West Esplanade., Manly	308168	1970	Road Intersection	124m	East
	Medical Practitioners	Connolly, E. P., Cnr. West Esplanade & Eustace St., Manly	111085	1965	Road Intersection	124m	East
	Medical Practitioners	Fienberg, L. H., 73 West Esplanade Manly	111361	1965	Road Intersection	124m	East
	Frock & Coat Salons	Joy's Fashion Salon, 70 West Esplanade, Manly	89998	1965	Road Intersection	124m	East
	Mixed Businesses	Roylen Flats Shop, 71 West Esp., Manly	118529	1965	Road Intersection	124m	East
	Fruiterers & Greengrocers	Whitworth, W. H., 69 West Esplanade, Manly	92366	1965	Road Intersection	124m	East

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
14	MEDICAL PRACTITIONERS	Fienberg, L. H., 73 West Esplanade Manly	335102	1961	Road Intersection	124m	East
	FROCK & COAT SALONS	Joy's Fashion Salon, 70 West Esplanade, Manly	314253	1961	Road Intersection	124m	East
	MIXED BUSINESS	Roylen Flats Shop, 71 West Esp., Manly	342278	1961	Road Intersection	124m	East
	FRUITERERS/GREENGROCERS	Whitworth, W. H., 69 West Esp., Manly	316427	1961	Road Intersection	124m	East
	MEDICAL PRACTITIONERS	Barron, A. M., 74 West Esp., Manly	72396	1950	Road Intersection	124m	East
	CAFES, TEA ROOMS, COFFEE LOUNGES, Etc.	Cox, Mrs. J., 71 West Esp., Manly	15389	1950	Road Intersection	124m	East
	ARCHITECTS	Hassall, E. E., 74 West Esplanade, Manly	2163	1950	Road Intersection	124m	East
15	HOTELS-LICENSED.	Hotel Manly, The Corso, Manly. 2095	46787	1986	Premise Match	128m	East
	HOTELS - LICENSED. (H7150)	Hotel Manly, The Corso, Manly. 2095.	40828	1982	Premise Match	128m	East
	HOTELS-LICENSED.	Hotel Manly, The Corso, Belgrave St., Manly. 2095	36195	1978	Premise Match	128m	East
	CHEMISTS-PHARMACEUTICAL	Hart, A., 57 West Esp., Manly. 2095	15381	1975	Premise Match	128m	East
	CAFES, COFFEE LOUNGES, Etc. (C030)	George's Hamburgers., 61 West Esplanade, Manly	275641	1970	Premise Match	128m	East
	RESTAURANTS (R320)	Hotel Manly, The Corso, Manly	357038	1970	Premise Match	128m	East
	CABARETS, DANCE RESTAURANTS & ROAD HOUSES (C003)	Hotel Manly, The Corso., Manly	275072	1970	Premise Match	128m	East
	HOTELS-LICENSED (H690)	Hotel Manly., The Corso., Manly	317342	1970	Premise Match	128m	East
	DELICATESSENS (D080)	Mlchell, T., 60 West Esplanade., Manly	287713	1970	Premise Match	128m	East
	CAFES, COFFEE LOUNGES, Etc. (C030)	Morris Coffee Lounge., 56 West Esplanade, Manly	275885	1970	Premise Match	128m	East
	CHEMISTS-PHARMACEUTICAL	Pool Pharmacy., Hart's (The)., 57 West Esplanade., Manly	280981	1970	Premise Match	128m	East
	CAFES, COFFEE LOUNGES, Etc. (C030)	Rex (The)., 54 West Esp., Manly	276020	1970	Premise Match	128m	East
	Fish Merchants - Retail	Bus Stop Snack Bar, 63 West Esplanade, Manly	86713	1965	Premise Match	128m	East
	Auctioneers - Real Estate	Carter, G. G., 59 West Esplanade, Manly	48486	1965	Premise Match	128m	East
	Duplicating/Typing Specs.	Fairlight Copying Service, 60 West Esp., Manly	76495	1965	Premise Match	128m	East
	Cafes, Tea Rooms, Coffee Lounges, Etc.	George's Hamburgers., 61 West Esplanade, Manly	60382	1965	Premise Match	128m	East
	Caterers	Hotel Manly, The Corso, Manly	63560	1965	Premise Match	128m	East
	Hotels - Licensed	Hotel Manly, The Corso, Manly	101660	1965	Premise Match	128m	East
	Restaurants	Hotel Manly., The Corso, Manly	140461	1965	Premise Match	128m	East
	DELICATESSENS	Michell, T., 60 West Esplanade, Manly	72455	1965	Premise Match	128m	East
	Cafes, Tea Rooms, Coffee Lounges, Etc.	Morris Coffee Lounge, 56 West Esplanade, Manly	60611	1965	Premise Match	128m	East
	Chemists - Pharmaceutical	Pool Pharmacy, Hart's (The), 57 West Esplanade, Manly	65490	1965	Premise Match	128m	East
	Cafes, Tea Rooms, Coffee Lounges, Etc.	Rex (The), 54 West Esp., Manly	60746	1965	Premise Match	128m	East
	Mixed Businesses	Wilson, K. M., 53 West Esp., Manly	119050	1965	Premise Match	128m	East
	FISH MERCHANTS-RETAIL	Bus Stop Snack Bar, 63 West Esplanade, Manly	310907	1961	Premise Match	128m	East
	DUPLICATING/TYPING SPECS.	Fairlight Copying Service, 60 West Esp., Manly	299466	1961	Premise Match	128m	East

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
15	CAFES, TEA ROOMS, COFFEE LOUNGES, Etc.	Gem Cafe (The), 56 West Esplanade, Manly	282181	1961	Premise Match	128m	East
	CAFES, TEA ROOMS, COFFEE LOUNGES, Etc.	George's Hamburgers., 61 West Esplanade., Manly	282185	1961	Premise Match	128m	East
	DELICATESSENS	Michell, T., 60 West Esplanade, Manly	295055	1961	Premise Match	128m	East
	CAFES, TEA ROOMS, COFFEE LOUNGES, Etc.	Rex (The), 54 West Esp., Manly	282498	1961	Premise Match	128m	East
	CAFES, TEA ROOMS, COFFEE LOUNGES, Etc.	Rex Cafe (The), 62 West Esplanade, Manly	282499	1961	Premise Match	128m	East
	MIXED BUSINESS	Wilson, K. M., 53 West Esp., Manly	342799	1961	Premise Match	128m	East
	CAKE SHOPS & PASTRYCOOKS	Carter, L. S., 60 West Esp., Manly	16539	1950	Premise Match	128m	East
	DELICATESSENS & SMALLGOODS DEALERS	Carter, L. S., 60 West Esp., Manly	30306	1950	Premise Match	128m	East
	MIXED BUSINESSES & GENERAL STORES	Carter, L. S., 60 West Esp., Manly	79554	1950	Premise Match	128m	East
	FLORISTS-RETAIL	Gardiner, Miss B., Hotel Manly Bldg., Manly	45912	1950	Premise Match	128m	East
	HOTELS-LICENSED	Hotel Manly, Manly	63154	1950	Premise Match	128m	East
	REAL ESTATE AGENTS	King's Real Estate Agency, 53 West Esp., Manly	98452	1950	Premise Match	128m	East
	BUSINESS AGENTS &/OR BROKERS	King's Real Estate Agent, 53 The Esplanade, Manly	12833	1950	Premise Match	128m	East
	MILK BARS & CONFECTIONERS	Koutsos, L., 53 West Esp., Manly	76912	1950	Premise Match	128m	East
	CAFES, TEA ROOMS, COFFEE LOUNGES, Etc.	Rex (The), 54 West Esp., Manly	15945	1950	Premise Match	128m	East
	CAFES, TEA ROOMS, COFFEE LOUNGES, Etc.	Sapounakes, L. and P, and Korros, C., 54b West Esp., Manly	15991	1950	Premise Match	128m	East
	SEWING MACHINE DEALERS	Singer Sewing Machine Co., 60 West Esp., Manly	101447	1950	Premise Match	128m	East
	SEWING MACHINE REPAIRERS	Singer Sewing Machine Co., 60 West Esp., Manly	101510	1950	Premise Match	128m	East
	DRY CLEANERS, PRESSERS & DYERS	Tudor Industries Pty. Ltd., 60 West Esp., Manly	35801	1950	Premise Match	128m	East
	FRUITERERS & GREENGROCERS	Whitworth, W. H., 60 West Esp., Manly	51535	1950	Premise Match	128m	East
	MILK BARS & CONFECTIONERS	Whitworth, W. H., 60 West Esp., Manly	77546	1950	Premise Match	128m	East
16	ACCOUNTANTS & AUDITORS	Turner, R. J., 3 Camera St., Manly	265842	1961	Premise Match	133m	North
17	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS. (M6860)	Auckland Garage, 1 Gilbert St., Manly. 2095.	56056	1982	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Auckland Garage, 1 Gilbert St., Manly. 2095	49325	1978	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., 1 Gilbert St., Manly. 2095	58379	1975	Premise Match	143m	North East
	MOTOR GARAGES & ENGINEERS(M6S6)	Auckland Garage., 1 Gilbert St., MANLY	337220	1970	Premise Match	143m	North East
	CLUBS & SPORTING BODIES (C487)	Manly Civic Club., 2 West Promenade., Gilbert Park, Manly	284399	1970	Premise Match	143m	North East
	Clubs & Sporting Bodies	Manly Civic Club, 2 West Promenade, Gilbert Park, Manly	69070	1965	Premise Match	143m	North East
18	ARCHITECTS	Gilbert, W. B., 4 James St., North Manly	268247	1961	Premise Match	143m	North West

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Business Directory Records 1950-1991
Road or Area Matches

Universal Business Directory records from years 1991, 1986, 1982, 1978, 1975, 1970, 1965, 1961 & 1950, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published:

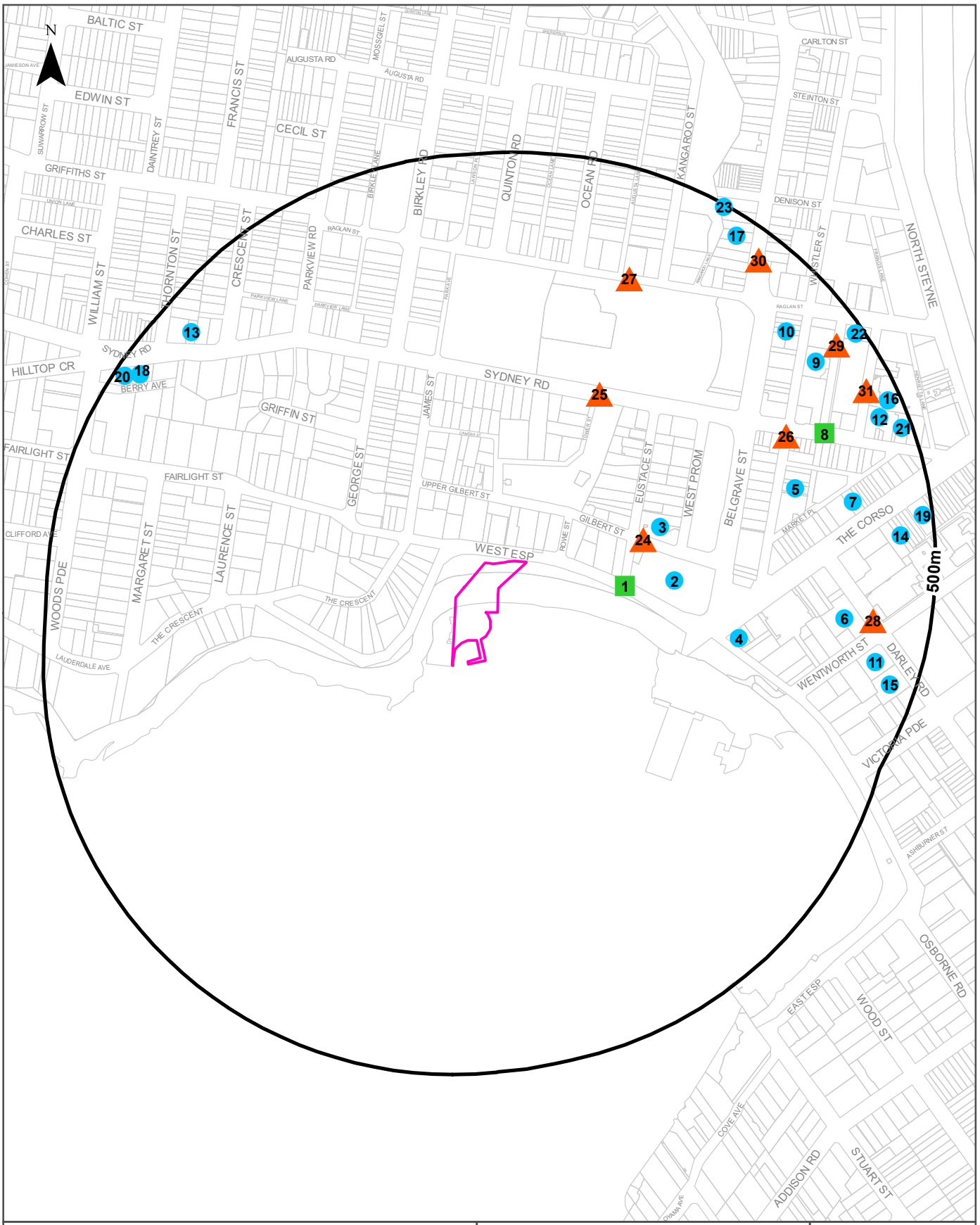
Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
19	AMUSEMENTS.	Manly Marineland, West Esplanade, Manly. 2095	2929	1986	Road Match	1m
	RESTAURANTS.	Manly Pier Restaurant, West Esp., Manly. 2095	82254	1986	Road Match	1m
	ROLLER SKATING RINKS.	Manly Skate City Pty. Ltd., West Esplanade, Manly. 2095	83567	1986	Road Match	1m
	AMUSEMENTS.	Marineland, West Esplanade, Manly. 2095	2931	1986	Road Match	1m
	AMUSEMENTS. (A5700)	Manly Fun Parlour, West Esplanade, Manly. 2095.	2595	1982	Road Match	1m
	AMUSEMENTS. (A5700)	Manly Marineland, West Esplanade, Manly. 2095.	2597	1982	Road Match	1m
	RESTAURANTS. (R5180)	Manly Pier Restaurant, West Esp., Manly. 2095.	71323	1982	Road Match	1m
	ROLLERSKATING RINKS. (R6320)	Manly Skate City Pty. Ltd., West Esp., Manly. 2095.	72299	1982	Road Match	1m
	AMUSEMENTS. (A5700)	Marineland, West Esplanade, Manly. 2095.	2599	1982	Road Match	1m
	AMUSEMENTS.	Manly Fun Parlour. West Esplanade, Manly. 2095	2438	1978	Road Match	1m
	AMUSEMENTS.	Manly Marineland, West Esplanade, Manly. 2095	2440	1978	Road Match	1m
	RESTAURANTS.	Manly Pier Restaurant, West Esp, Manly. 2095	63180	1978	Road Match	1m
	AMUSEMENTS.	Marineland, West Esplanade, Manly. 2095	2442	1978	Road Match	1m
	HOTELS-PRIVATE	Earl's Court Private Hotel., West Esp., Manly. 2095	43255	1975	Road Match	1m
	ART GALLERIES &/OR MUSEUMS.	Manly Art Gallery, West Esp., Manly. 2095	2943	1975	Road Match	1m
	AMUSEMENTS.	Manly Fun Prlour, West Esplanade, Manly. 2095	2265	1975	Road Match	1m
	AMUSEMENTS.	Manly Marineland West Esplanade, Manly 2095	2267	1975	Road Match	1m
	AMUSEMENTS.	Manly Marineland, West Esplanade, Manly. 2095	2266	1975	Road Match	1m
	AMUSEMENTS.	Manly Oceanarium, West Esplanade, Manly. 2095	2268	1975	Road Match	1m
	RESTAURANTS.	Manly Pier Restaurant, West Esp., Manly. 2095	73949	1975	Road Match	1m
	MILK, FRUIT JUICE BARS &/OR CONFECTIONERS.	Manly Pool Kiosk., West Esplanade., Manly. 2095	53555	1975	Road Match	1m
	AMUSEMENTS (A355)	Manly Oceanarium (Marineland Pty. Ltd.,), In pool (off West Esplanade), Manly	261387	1970	Road Match	1m
	BATHS-SWIMMING (B165)	Manly Pool (The)., West Esplanade, Manly	265146	1970	Road Match	1m
	MILK, FRUIT JUICE BARS/CONFECTIONERS	Manly Pool Kiosk., off West Esplanade., Manly	330854	1970	Road Match	1m
	AMUSEMENTS (A355)	Marineland Pty. Ltd., West Esp., Manly	261389	1970	Road Match	1m
	Amusements	Manly Oceanarium (Marineland Pty. Ltd.)., in pool (off West Esplanade), Manly	46143	1965	Road Match	1m
	Amusements	Manly Pool & Restaurant., Off West Esplanade, Manly	46144	1965	Road Match	1m
	Baths - Swimming	Manly Pool (The), West Esplanade, Manly	49976	1965	Road Match	1m
	Milk, Fruit Juice Bars/Confectioners	Manly Pool Kiosk, Off West Esplanade, Manly	115268	1965	Road Match	1m

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
19	Amusements	Marineland Pty. Ltd., West Esplanade, Manly	46146	1965	Road Match	1m
	MEDICAL PRACTITIONERS	Connolly, E. P., West Esp., Manly	334836	1961	Road Match	1m
	AMUSEMENTS	Manly Pool & Restaurant, Off West Esplanade, Manly	267775	1961	Road Match	1m
	BATHS-SWIMMING	Manly Pool (The), West Esplanade, Manly	271794	1961	Road Match	1m
	DENTISTS	Bertram, C. C., West Esp., Manly	31694	1950	Road Match	1m
	FRUITERERS & GREENGROCERS	Esplanade Fruit Kiosk (The), West Esp., Manly	50036	1950	Road Match	1m
	CAFES, TEA ROOMS, COFFEE LOUNGES, Etc.	Gem Cafe (The), 51 West Esp., Manly	15499	1950	Road Match	1m
	MIXED BUSINESSES & GENERAL STORES	Harris, P., West Esp., Manly	80125	1950	Road Match	1m
	CHEMISTS-PHARMACEUTICAL	Hart, A. S., 52 West Esp., Manly	21611	1950	Road Match	1m
	MILK BARS & CONFECTIONERS	Louis Milk Bar, 52 West Esp., Manly	76969	1950	Road Match	1m
	CHEMISTS-PHARMACEUTICAL	Pool Pharmacy, 52 West Esp., Manly	21940	1950	Road Match	1m
	DENTISTS	Warton, K. C., West Esp., Manly	32391	1950	Road Match	1m
20	ENGINEERS-REFRIGERATION	Hudson, J. F. Fairlight Cres., Manly	42089	1950	Road Match	54m
	TRANSPORT SERVICES-INTERSTATE	McColl Interstate Transport Co., Fairlight Cres., Manly	110263	1950	Road Match	54m
	CARRIERS & CARTAGE CONTRACTORS	McColl Interstate Transport Company, Fairlight Cres., Manly	19332	1950	Road Match	54m
21	MEDICAL PRACTITIONERS (M216)	Brett, A. S., Gilbert St. (Park)., Manly	326291	1970	Road Match	78m
	HOTELS-PRIVATE (H700)	Lansdowne House., Gilbert St., Manly	317790	1970	Road Match	78m
	Medical Practitioners	Brett, A. S., Gilbert St. (Park), Manly	110889	1965	Road Match	78m
	MOTOR GARAGES &/OR ENGINEERS	Auckland Garage, Gilbert St., Manly	83394	1950	Road Match	78m
	MOTOR SERVICE STATIONS-PETROL, Etc.	Auckland, Gilbert St., Manly	85760	1950	Road Match	78m
22	MEDICAL PRACTITIONERS	Tyrnms, A. O. V., 25 James St., Manly	73988	1950	Road Match	90m
23	Hotels - Private	Lansdowne House, Gilbert & Towers Sts., Manly	102071	1965	Road Match	118m
	HOTELS—PRIVATE	Lansdowne House, Gilbert & Towers Sts., Manly	325877	1961	Road Match	118m
	ENGINEERS-GENERAL &/OR MANUFACTURING &/OR MECHANICAL	Perrott, S. R. W., Tower St., Manly	41114	1950	Road Match	118m

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Dry Cleaners, Motor Garages & Service Stations

Manly Sea Life (West Esplanade), Manly, NSW 2095



Legend

- Site Boundary
- Buffer 500m
- Property Boundary
- Business directory records mapped to a specific premise
- Business directory records mapped to a road intersection
- Business directory records mapped to a road corridor
- Business directory records mapped to a general area

Scale: 0 90 180 270 360 Meters

Coordinate System: GDA 1994 MGA Zone 56

Date: 01 December 2022

Data Sources: Reproduced with permission of UBD and Hardie Grant Media Pty Ltd DD 01/08/2018

Historical Business Directories

Manly Sea Life (West Esplanade), Manly, NSW 2095

Dry Cleaners, Motor Garages & Service Stations 1948-1993 Premise or Road Intersection Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a premise or road intersection, within the dataset buffer.

Note: The Universal Business Directories were published between 1948 and 1993. Dry Cleaners, Motor Garages & Service Stations have been extracted from all of these directories except the following years 1951, 1955, 1957, 1960, 1963, 1973, 1974, 1977, 1987.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
1	DRY CLEANERS, PRESSERS &/OR DYERS.	Esquire Dry Cleaners., 71 West Esp., Manly 2095	23499	1976	Road Intersection	124m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Esquire Dry Cleaners, 71 West Esp., Manly. 2095	24023	1975	Road Intersection	124m	East
2	DRY CLEANERS, PRESSERS & DYERS.	Tudor Industries Pty Ltd., 60 West Esp., Manly	27322	1952	Premise Match	128m	East
	DRY CLEANERS, PRESSERS & DYERS	Tudor Industries Pty. Ltd., 60 West Esp., Manly	35801	1950	Premise Match	128m	East
	DRY CLEANERS, PRESSERS & DYERS.	Tudor Industries Pty. Ltd., 60 West Esp Manly	17568	1948-49	Premise Match	128m	East
3	MOTOR GARAGES & SERVICE STATIONS.	Auckland Garage, 1 Gilbert St., Manly. 2095	39006	1985	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Auckland Garage, 1 Gilbert St., Manly. 2095	27612	1984	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Auckland Garage., 1 Gilbert St., Manly 2095	8971	1983	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS. (M6860)	Auckland Garage, 1 Gilbert St., Manly. 2095.	56056	1982	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Auckland Garage., 1 Gilbert St., Manly. 2095	63725	1981	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Auckland Garage., 1 Gilbert St., Manly. 2095	50197	1980	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Auckland Garage., 1 Gilbert St., Manly. 2095.	40809	1979	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Auckland Garage, 1 Gilbert St., Manly. 2095	49325	1978	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Auckland Garage., 1 Gilbert St., Manly 2095	25039	1976	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., 1 Gilbert St., Manly. 2095	58379	1975	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., 1 Gilbert St Manly	12546	1972	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., 1 Gilbert St Manly	62230	1971	Premise Match	143m	North East

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
3	MOTOR GARAGES & ENGINEERS(M6S6)	Auckland Garage., 1 Gilbert St., MANLY	337220	1970	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., Cnr Gilbert St & West Prom Manly	57183	1956	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., Cnr Gilbert St & West Promenade Manly	57054	1956	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., Cnr Gilbert St & West Prom Manly	44752	1954	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., Cnr Gilbert St & West Promenade Manly	44588	1954	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., Cnr Gilbert St & West Prom Manly	36545	1953	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., Cnr Gilbert St & West Promenade Manly	36423	1953	Premise Match	143m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., Cnr Gilbert St & West Promenade Manly	27365	1952	Premise Match	143m	North East
4	DRY CLEANERS & PRESSERS.	Moncrieffs, 51 East Esp., Manly. 2095	53218	1988	Premise Match	261m	East
	DRY CLEANERS & PRESSERS.	Moncrieffs, 51 East Esp., Manly. 2095	25446	1986	Premise Match	261m	East
	DRY CLEANERS & PRESSERS.	Moncrieffs, 51 East Esp, Manly.2095	65808	1985	Premise Match	261m	East
	DRY CLEANERS & PRESSERS.	Moncrieffs, 51 East Esp, Manly. 2095	22115	1984	Premise Match	261m	East
	DRY CLEANERS & PRESSERS.	Moncrieffs Dry Cleaners., 2B The Corso, Manly 2095	8710	1983	Premise Match	261m	East
	DRY CLEANERS & PRESSERS.(D8500)	Moncrieffs Dry Cleaners, 2B The Corso, Manly. 2095.	23979	1982	Premise Match	261m	East
	DRY CLEANERS & PRESSERS.	Moncrieffs Dry Cleaners., 2B The Corso Manly. 2095	63465	1981	Premise Match	261m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Moncrieffs Dry Cleaners., 2B The Corso., Manly. 2095	49942	1980	Premise Match	261m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Muncrieffs Dry Cleaners., 2B The Corso., Manly. 2095.	35476	1979	Premise Match	261m	East
	DRY CLEANERS, PRESSERS &/OR DYERS	Moncrieffs Dry Cleaners, 2b The Corso, Manly. 2095.	20880	1978	Premise Match	261m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Jolly Frog Dry Cleaners., 2A The Corso, Manly 2095	23567	1976	Premise Match	261m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Jolly Frog Dry Cleaners, 2a The Corso, Manly. 2095	24092	1975	Premise Match	261m	East
5	Motor Garages & Engineers	Pearson Motors, 10 Whistler St. Manly	122963	1965	Premise Match	325m	East
	MOTOR GARAGES & ENGINEERS	Neale L., 8 Whistler St Manly	48237	1964	Premise Match	325m	East
	MOTOR GARAGES & ENGINEERS	Pearson Motors., 10 Whistler St Manly	48238	1964	Premise Match	325m	East
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Peerless Garage., 8 Whistler St Manly	52146	1964	Premise Match	325m	East
	MOTOR GARAGES & ENGINEERS.	Neale L., 8 Whistler St Manly	32893	1962	Premise Match	325m	East
	MOTOR GARAGES & ENGINEERS.	Pearson Motors., 10 Whistler St Manly	32895	1962	Premise Match	325m	East
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Peerless Garage., 8 Whistler St., Manly	65433	1962	Premise Match	325m	East
	MOTOR GARAGES & ENGINEERS	Neale, L., 8 Whistler St. MANLY	347772	1961	Premise Match	325m	East
	MOTOR SERVICE STATIONS—PETROL, OIL, Etc.	Peerless Garage, 8 Whistler St. MANLY	350952	1961	Premise Match	325m	East
	MOTOR GARAGES & ENGINEERS	Thompson's Service Station, 10 Whistler St., Manly	348282	1961	Premise Match	325m	East

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
5	MOTOR GARAGES & ENGINEERS.	G. & P. Motor Service., 10 Whistler St Manly	19482	1959	Premise Match	325m	East
	MOTOR GARAGES & ENGINEERS.	G. & P. Motor Services., 10 Whistler St Manly	19490	1959	Premise Match	325m	East
	MOTOR GARAGES & ENGINEERS.	Neale L., 8 Whistler St Manly	19492	1959	Premise Match	325m	East
	MOTOR SERVICE STATIONS-PETROL,. OIL, ETC.	Peerless Garage., 8 Whistler St Manly	24330	1959	Premise Match	325m	East
	MOTOR GARAGES & ENGINEERS.	Thompson's Service Station., 10 Whistler St Manly	19496	1959	Premise Match	325m	East
	MOTOR GARAGE/ENGINEERS.	Neale L., 8 Whistler St Manly	4639	1958	Premise Match	325m	East
	MOTOR SERVICE STATIONS-PETROL, ETC.	Peerless Garage., 8 Whistler St Manly	9746	1958	Premise Match	325m	East
	MOTOR GARAGE/ENGINEERS.	Thompson's Service Station., 10 Whistler St Manly	9154	1958	Premise Match	325m	East
	MOTOR GARAGES &/OR ENGINEERS.	Neale L., 8 Whistler St Manly	61182	1956	Premise Match	325m	East
	MOTOR SERVICE STATIONS-PETROL, ETC.	Peerless Garage., 8 Whistler St Manly	62102	1956	Premise Match	325m	East
	MOTOR GARAGES &/OR ENGINEERS.	Thompson's Service Station., 10 Whistler St Manly	61576	1956	Premise Match	325m	East
	MOTOR GARAGES &/OR ENGINEERS.	Neale L., 8 Whistler St Manly	49744	1954	Premise Match	325m	East
	MOTOR SERVICE STATIONS-PETROL, ETC.	Peerless Garage., 8 Whistler St Manly	54617	1954	Premise Match	325m	East
	MOTOR GARAGES &/OR ENGINEERS.	T. M. B. Motor Service Pty. Ltd.10 Whistler St. Manly	65287	1954	Premise Match	325m	East
	MOTOR GARAGES &/OR ENGINEERS.	Thompson's Service Station., 10 Whistler St., Manly	54210	1954	Premise Match	325m	East
	MOTOR GARAGES &/OR ENGINEERS.	Neale L., 8 Whistler St., Manly	40411	1953	Premise Match	325m	East
	MOTOR SERVICE STATIONS–PETROL, ETC.	Peerless Garage., 8 Whistler St Manly	44171	1953	Premise Match	325m	East
	MOTOR GARAGES &/OR ENGINEERS.	Thompson's Service Station., 10 Whistler St Manly	40779	1953	Premise Match	325m	East
	MOTOR GARAGES &/OR ENGINEERS.	Neale L., 8 Whistler St Manly	31990	1952	Premise Match	325m	East
	MOTOR SERVICE STATIONS–PETROL, ETC.	Peerless Garage., 8 Whistler St Manly	35954	1952	Premise Match	325m	East
	MOTOR GARAGES &/OR ENGINEERS	Neale, L., 8 Whistler St., Manly	84125	1950	Premise Match	325m	East
	MOTOR SERVICE STATIONS-PETROL, Etc.	Peerless Garage, 8 Whistler St., Manly	86280	1950	Premise Match	325m	East
	MOTOR GARAGES &/OR ENGINEERS.	Neale L., 8 Whistler St Manly	22665	1948-49	Premise Match	325m	East
	MOTOR SERVICE STATIONS-PETROL, ETC.	Peerless Garage., 8 Whistler St., Manly	26695	1948-49	Premise Match	325m	East
6	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Darley Road Service Station., 6 Darley Rd., Manly 2095	14547	1983	Premise Match	365m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS. (M6860)	Darley Road Service Station, 6 Darley Rd., Manly. 2095.	56610	1982	Premise Match	365m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Darley Road Service Station., 6 Darley Rd., Manly. 2095.	3163	1981	Premise Match	365m	East

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
6	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Darley Road Service Station., 6 Darley Rd., Manly. 2095	52805	1980	Premise Match	365m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Darley Road Service Station., 6 Darley Rd., Manly. 2095.	41352	1979	Premise Match	365m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Darley Road Service Station, 6 Darley Rd., Manly. 2095	49883	1978	Premise Match	365m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Darley Road Service Station., 6 Darley Rd., Manly 2095	29821	1976	Premise Match	365m	East
	MOTOR GARAGES &/OR ENGINEERS.	Darley Road Service Station., 6 Darley Rd., Manly. 2095	58744	1975	Premise Match	365m	East
	MOTOR GARAGES &/OR ENGINEERS.	Darley Road Service Station (Ampol)., 4 Darley Rd., Manly	12550	1972	Premise Match	365m	East
	MOTOR GARAGES &/OR ENGINEERS.	Darley Road Service Station (Ampol)., 4 Darley Rd Manly	62234	1971	Premise Match	365m	East
	MOTOR GARAGES & ENGINEERS(M6S6)	Darley Road Service Station (Ampol)., 4 Darley Rd., MANLY	337660	1970	Premise Match	365m	East
	MOTOR GARAGES & ENGINEERS.	Darley Road Service Station (Ampol)., 4 Darley Rd Manly	42582	1969	Premise Match	365m	East
	MOTOR GARAGES & ENGINEERS	Darley Road Service Station (Ampol)., 4 Darley Rd Manly	26066	1968	Premise Match	365m	East
	MOTOR GARAGES & ENGINEERS.	Darley Road Service Station (Ampol)., 4 Darley Rd Manly	10564	1967	Premise Match	365m	East
	Motor Garages & Engineers	Darley Road Service Station (Ampol)., 4 Darley Rd., Manly	122957	1965	Premise Match	365m	East
	MOTOR GARAGES & ENGINEERS	Darley Road Service Station (Ampol)., 4 DarLey Rd., Manly	48234	1964	Premise Match	365m	East
	MOTOR GARAGES & ENGINEERS.	Darley Road Service Station (Ampol)., 4 Darley Rd Manly	32890	1962	Premise Match	365m	East
	MOTOR GARAGES & ENGINEERS	Darley Road Service Station (Ampol), 4 Darley Rd. MANLY	347011	1961	Premise Match	365m	East
	MOTOR GARAGES & ENGINEERS.	Darley Road Service Station (Ampol)., 4 Darley Rd Manly	19487	1959	Premise Match	365m	East
7	DRY CLEANERS, PRESSERS/ DYERS	Tip Top Dry Cleaners., 37A The Corso Manly	37354	1969	Premise Match	393m	East
	DRY CLEANERS, PRESSERS/DYERS	Tip Top Dry Cleaners., 37A The Corso Manly	20809	1968	Premise Match	393m	East
	DRY CLEANERS, PRESSERS/ DYERS	Tip Top Dry Cleaners., 37A The Corso Manly	6364	1967	Premise Match	393m	East
8	DRY CLEANERS & PRESSERS.	Plaza's Automatic Laundrette., Sydney Rd., Manly. 2095	63499	1981	Road Intersection	397m	North East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Plaza's Automatic Laundrette., Sydney Rd & Short St., Manly. 2095	49978	1980	Road Intersection	397m	North East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Plaza's Automatic Laundrette., Sydney Rd & Short St., Manly. 2095.	35515	1979	Road Intersection	397m	North East
	DRY CLEANERS, PRESSERS &/OR DYERS	Plaza's Automatic Laundrette, Sydney Rd. & Short St., Manly. 2095	20918	1978	Road Intersection	397m	North East
9	DRY CLEANERS, PRESSERS &/OR DYERS.	Village Dry Cleaners & Garment Repair Service., 26A Whistler St., Manly 2095	23872	1976	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Village Dry Cleaners & Garment Repair Service, 26a Whistler St., Manly. 2095	24396	1975	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Village Dry Cleaners., 26A Whistler St Manly	7337	1972	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS &/OR DYERS	Village Dry Cleaners., 26A Whistler St Manly	55090	1971	Premise Match	408m	North East

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
9	DRY CLEANERS,PRESSERS /DYERS (D710)	Village Dry Cleaners., 26a Whistler St., Manly	292562	1970	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS/ DYERS	Village Dry Cleaners., 26A Whistler St Manly	37369	1969	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS/DYERS	Village Dry Cleaners., 26A Whistler St Manly	20822	1968	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS/ DYERS	Village Dry Cleaners., 26A Whistler St Manly	6380	1967	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS/ DYERS	Village Dry Cleaners., 26A Whistler St Manly	55427	1966	Premise Match	408m	North East
	Dry Cleaners, Pressers/Dyers	Village Dry Cleaners, 26a Whistler St., Manly	76376	1965	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS/ DYERS.	Village Dry Cleaners., 26A Whistler St Manly	43209	1964	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS/DYERS.	Village Dry Cleaners., 26A Whistler St Manly	24956	1962	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS / DYERS	Village Dry Cleaners, 26a Whistler St., Manly	299311	1961	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS/DYERS	Village Dry Cleaners., 26A Whistler St Manly	13300	1959	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS	Village Dry Cleaners., 26A Whistler St Manly	422	1958	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Village Dry Cleaners., 26A Whistler St Manly	55009	1956	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Johnson G., 26A Whistler St Manly	44402	1954	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Village Dry Cleaners., 26A Whistler St Manly	44569	1954	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Johnson G., 26A Whistler St Manly	36219	1953	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Village Dry Cleaners., 26A Whistler St Manly	36402	1953	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Johnson G., 26A Whistler St Manly	27109	1952	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Village Dry Cleaners., 26A Whistler St Manly	27334	1952	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS	Johnson, G., 26a Whistler St., Manly	35324	1950	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS	Village Dry Cleaners, 26a Whistler St., Manly	35816	1950	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Johnson G., 26A Whistler St Manly	17208	1948-49	Premise Match	408m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Village Dry Cleaners., 26A Whistler St Manly	17577	1948-49	Premise Match	408m	North East
10	DRY CLEANERS & PRESSERS.	Daisy Fresh Dry Cleaning Centre, 40 Belgrave St., Manly. 2095	53049	1988	Premise Match	413m	North East
	DRY CLEANERS & PRESSERS.	Daisy Fresh, 40 Belgrave St., Manly. 2095	25274	1986	Premise Match	413m	North East
	DRY CLEANERS & PRESSERS.	Daisy Fresh., 40 Belgrave St., Manly. 2095	34489	1985	Premise Match	413m	North East
	DRY CLEANERS & PRESSERS.	Daisy Fresh, 40 Belgrave St., Manly. 2095	21933	1984	Premise Match	413m	North East
	DRY CLEANERS & PRESSERS.	Daisy Fresh., 40 Belgrave St., Manly 2095	8524	1983	Premise Match	413m	North East
	DRY CLEANERS & PRESSERS.(D8500)	Daisy Fresh, 40 Belgrave St., Manly. 2095.	23802	1982	Premise Match	413m	North East
	DRY CLEANERS & PRESSERS.	Daisy Fresh., 40 Belgrave St., Manly. 2095	63287	1981	Premise Match	413m	North East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Daisy Fresh., 40 Belgrave St., Manly. 2095	46718	1980	Premise Match	413m	North East
11	MOTOR GARAGES & SERVICE STATIONS.	Esso Manly Service Station, 16 Darley Rd., Manly. 2095	18937	1993	Premise Match	420m	East
	MOTOR GARAGES & SERVICE STATIONS.	Esso Manly Service Station, 16 Darley Rd., Manly. 2095	11562	1990	Premise Match	420m	East

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11	MOTOR GARAGE & SERVICE STATIONS.	Esso Manly Service Station, 16 Darley Rd., Manly. 2095	65019	1989	Premise Match	420m	East
	MOTOR GARAGES & SERVICE STATIONS.	Esso Manly Service Station, 16 Darley Rd., Manly. 2095	59237	1988	Premise Match	420m	East
	MOTOR GARAGES & SERVICE STATIONS.	Esso Manly Service Station, 16 Darley Rd., Manly. 2095	64638	1986	Premise Match	420m	East
	MOTOR GARAGES & SERVICE STATIONS.	Esso Manly Service Station, 16 Darley Rd., Manly. 2095	39637	1985	Premise Match	420m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Esso Manly Service Station, 16 Darley Rd., Manly. 2095	28217	1984	Premise Match	420m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Esso Manly Service Station., 16 Darley Rd., Manly. 2095	14642	1983	Premise Match	420m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS. (M6860)	Esso Manly Service Station, 16 Darley Rd., Manly. 2095.	56707	1982	Premise Match	420m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Esso Manly Service Station., 16 Darley Rd., Manly. 2095	3260	1981	Premise Match	420m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Esso Manly Service Station., 16 Darley Rd., Manly. 2095	52908	1980	Premise Match	420m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Esso Servicenter., 16 Darley Rd., Manly. 2095.	41466	1979	Premise Match	420m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Esso Servicenter, 16 Darley Rd., Manly. 2095	50005	1978	Premise Match	420m	East
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Esso Servicenter., 16 Darley Rd., Manly 2095	29964	1976	Premise Match	420m	East
	MOTOR GARAGES &/OR ENGINEERS.	Esso Servicenter., 16 Darley Rd., Manly. 2095	58837	1975	Premise Match	420m	East
	Motor Service Stations - Petrol, Oil, Etc.	Esso Service Station., Cnr. Darley Rd. & Wentworth St., Manly	125874	1965	Premise Match	420m	East
12	DRY CLEANERS, PRESSERS &/OR DYERS.	Littles Dry Cleaners., 28 Sydney Rd., Manly 2095	23658	1976	Premise Match	440m	North East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Littles Dry Cleaners, 28 Sydney Rd., Manly. 2095	24183	1975	Premise Match	440m	North East
	DRY CLEANERS, PRESSERS & DYERS	Jones, Dry Cleaners Pty. Ltd. 12 Sydney Rd., Manly	35336	1950	Premise Match	440m	North East
	DRY CLEANERS, PRESSERS & DYERS	Littles Dry Cleaner 20 Sydney Rd., Manly	35423	1950	Premise Match	440m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Jones Dry Cleaners Pty. Ltd., 12 Sydney Rd., Manly	17231	1948-49	Premise Match	440m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Littles Dry Cleaner., 20 Sydney Rd., Manly	17282	1948-49	Premise Match	440m	North East
13	MOTOR GARAGES & SERVICE STATIONS.	Martens G., 126 Sydney Rd., Fairlight. 2094	45155	1985	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Martens G., 126 Sydney Rd., Fairlight2094	33734	1984	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Martens. G., 126 Sydney Rd., Fairlight 2094	15083	1983	Premise Match	444m	North West

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13	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS. (M6860)	Martens, G., 126 Sydney Rd., Fairlight. 2094.	57153	1982	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Martens G., 126 Sydney Rd., Fairlight 2094	3719	1981	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Martens, G., 126 Sydney Rd., Fairlight. 2094	58454	1980	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Martens G., 126 Sydney Rd., Fairlight. 2094.	45936	1979	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	Martens, G., 126 Sydney Rd., Fairlight.	50445	1978	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Martens G., 126 Sydney Rd Fairlight	8097	1972	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Martens G., 126 Sydney Rd Fairlight	56774	1971	Premise Match	444m	North West
	MOTOR GARAGES & ENGINEERS(M6S6)	Davidson, T. R., 126 Sydney Rd. FAIRLIGHT	337663	1970	Premise Match	444m	North West
	MOTOR GARAGES & ENGINEERS.	Davidson T. R., 126 Sydney Rd Fairlight	42186	1969	Premise Match	444m	North West
	MOTOR GARAGES & ENGINEERS	Davidson T. R., 126 Sydney Rd Fairlight	25715	1968	Premise Match	444m	North West
	MOTOR GARAGES & ENGINEERS.	Davidson T. R., 126 Sydney Rd Fairlight	10217	1967	Premise Match	444m	North West
	MOTOR GARAGES & ENGINEERS.	Davidson T. R., 126 Sydney Rd Fairlight	56106	1966	Premise Match	444m	North West
	Motor Garages & Engineers	Davidson, T. R., 126 Sydney Rd. Fairlight	122644	1965	Premise Match	444m	North West
	MOTOR GARAGES & ENGINEERS	Davidson T. R., 126 Sydney Rd Fairlight	47908	1964	Premise Match	444m	North West
	MOTOR GARAGES & ENGINEERS.	Davidson T. R., 126 Sydney Rd Fairlight	29421	1962	Premise Match	444m	North West
	MOTOR GARAGES & ENGINEERS	Davidson, T. R., 108 Sydney Rd. MANLY	347018	1961	Premise Match	444m	North West
	MOTOR GARAGES & ENGINEERS	Davidson, T. R., 126 Sydney Rd. FAIRLIGHT	346844	1961	Premise Match	444m	North West
	MOTOR GARAGES & ENGINEERS.	Davidson T. R. (Marfak)., 126 Sydney Rd Manly	19488	1959	Premise Match	444m	North West
	MOTOR GARAGES & ENGINEERS.	Davidson T. R., 126 Sydney Rd Fairlight	14092	1959	Premise Match	444m	North West
	MOTOR GARAGE/ENGINEERS.	Davidson T. R., 108 Sydney Rd Manly	940	1958	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Davidson T. R., 108 Sydney Rd Manly	57532	1956	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Davidson T. R., 108 Sydney Rd Manly	49153	1954	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Davidson T. R., 108 Sydney Rd., Manly	39902	1953	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Davidson T. R., 108 Sydney Rd Manly	31555	1952	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS	Davidson, T. R., 108 Sydney Rd., Manly	83668	1950	Premise Match	444m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Davidson T. R., 108 Sydney Rd Manly	17968	1948-49	Premise Match	444m	North West
14	DRY CLEANERS, PRESSERS/DYERS.	Littles Pty. Ltd., The Corso Manly	24815	1962	Premise Match	444m	East
	DRY CLEANERS, PRESSERS / DYERS	Littles Pty. Ltd., The Corso, Manly	299162	1961	Premise Match	444m	East
	DRY CLEANERS, PRESSERS & DYERS.	LittleS., 64-66 The Corso Manly	27147	1952	Premise Match	444m	East

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14	DRY CLEANERS, PRESSERS & DYERS	Little's, 64-66 The Corso, Manly	35420	1950	Premise Match	444m	East
15	DRY CLEANERS & PRESSERS.	Esquire Dry Cleaners, 20 Darley St., Manly. 2095	34515	1985	Premise Match	446m	East
	DRY CLEANERS & PRESSERS.	Esquire Dry Cleaners, 20 Darley St., Manly. 2095	21959	1984	Premise Match	446m	East
	DRY CLEANERS & PRESSERS.	Esquire Dry Cleaners., 20 Darley St., Manly 2095	8551	1983	Premise Match	446m	East
	DRY CLEANERS & PRESSERS.(D8500)	Esquire Dry Cleaners, 20 Darley St., Manly. 2095.	23827	1982	Premise Match	446m	East
	DRY CLEANERS & PRESSERS.	Esquire Dry Cleaners., 20 Darley St., Manly. 2095	63310	1981	Premise Match	446m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Esquire Dry Cleaners., 20 Darley St., Manly. 2095	46742	1980	Premise Match	446m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Esquire Dry Cleaners., 20 Darley St Manly. 2095	35337	1979	Premise Match	446m	East
	DRY CLEANERS, PRESSERS/ DYERS.	Esquire Valet Service., 22 Darley Rd Manly	65220	1964	Premise Match	446m	East
16	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Village Garage Parking & Service Station Pty. Ltd., 3 Henrletta La., Manly	16859	1972	Premise Match	451m	North East
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Village Garage Parking & Service Station Pty. Ltd., 3 Henrietta La Manly	2324	1971	Premise Match	451m	North East
	MOTOR GARAGES & ENGINEERS(M6S6)	The Village Motors Pty. Ltd., 5 Henrietta Lane., MANLY	338722	1970	Premise Match	451m	North East
	MOTOR SERVICE STATIONS-PETROL,OIL,Etc.	Village Garage, Parking A Service Station Pty. Ltd., 3 Henrietta La., MANLY	341600	1970	Premise Match	451m	North East
	MOTOR GARAGES & ENGINEERS.	The Village Motors Pty. Ltd., 5 Henrietta Lane Manly	42588	1969	Premise Match	451m	North East
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Village Garage Parking & Service Station Pty. Ltd., 3 Henrietta La Manly	50427	1969	Premise Match	451m	North East
	MOTOR GARAGES & ENGINEERS	The Village Motors Pty. Ltd., 5 Henrietta Lane Manly	26072	1968	Premise Match	451m	North East
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Village Garage Parking & Service Station Pty. Ltd., 3 Henrietta La Manly	32461	1968	Premise Match	451m	North East
	MOTOR GARAGES & ENGINEERS.	The Village Motors Pty. Ltd., 5 Henrietta Lane Manly	10570	1967	Premise Match	451m	North East
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Village Garage Parking & Service Station Pty. Ltd., 3 Henrietta La Manly	15921	1967	Premise Match	451m	North East
	MOTOR GARAGES & ENGINEERS.	The Village Motors Pty. Ltd., 5 Henrietta Lane Manly	60316	1966	Premise Match	451m	North East
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Village Garage Parking & Service Station., 5 Henrietta Lane Manly	1496	1966	Premise Match	451m	North East
	Motor Garages & Engineers	Manly Village Motors, 5 Henrietta St. Manly	122961	1965	Premise Match	451m	North East
	Motor Garages & Engineers	Village Garage, Parking & Service Station, 3 Henrietta La. Manly	122965	1965	Premise Match	451m	North East
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Village Garage & Service Station (The)., 3 Henrietta Lane Manly	52147	1964	Premise Match	451m	North East
	MOTOR GARAGES & ENGINEERS	Village Motors (The)., 5 Henrietta St Manly	48239	1964	Premise Match	451m	North East
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Village Garage & Service Station (The)., 3 Henrietta Lane., Manly	65434	1962	Premise Match	451m	North East
	MOTOR GARAGES & ENGINEERS.	Village Motors (The)., 5 Henrietta St Manly	32897	1962	Premise Match	451m	North East
	MOTOR SERVICE STATIONS—PETROL, OIL, Etc.	Village Garage & Service Station (The), 3 Henrietta Lane., MANLY	351247	1961	Premise Match	451m	North East

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
16	MOTOR GARAGES & ENGINEERS	Village Motors (The), 5 Henrietta St., MANLY	348366	1961	Premise Match	451m	North East
	MOTOR SERVICE STATIONS-PETROL,. OIL, ETC.	Village Garage & Service Station (The)., 3 Henrietta Lane Manly	24331	1959	Premise Match	451m	North East
	MOTOR GARAGES & ENGINEERS.	Village Motors (The)., 5 Henrietta St Manly	19497	1959	Premise Match	451m	North East
	MOTOR GARAGE/ENGINEERS.	Village Motors (The)., 5 Henrietta St Manly	9215	1958	Premise Match	451m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Village Motors (The)., 5 Henrietta St Manly	61629	1956	Premise Match	451m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Village Motors (The)., 5 Henrietta St Manly	54256	1954	Premise Match	451m	North East
17	DRY CLEANERS, PRESSERS & DYERS.	Alphine Dry Cleaning Service., 15A Belgrave St Manly	44276	1954	Premise Match	462m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Alphine Dry Cleaning Service., 15A Belgrave St Manly	36078	1953	Premise Match	462m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Alphine Dry Cleaning Service., 15A Belgrave St., Manly	26933	1952	Premise Match	462m	North East
	DRY CLEANERS, PRESSERS & DYERS	Alpine Dry Cleaners, 15a Belgrave St., Manly	35063	1950	Premise Match	462m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Alpine Dry Cleaners., 15a Belgrave St., Manly	17048	1948-49	Premise Match	462m	North East
18	DRY CLEANERS & PRESSERS.	Fairlight Dry Cleaners Pty. Ltd., 147 Sydney Rd., Fairlight. 2094	53074	1988	Premise Match	466m	North West
	DRY CLEANERS & PRESSERS.	Fairlight Dry Cleaners Pty. Ltd., 147 Sydney Rd., Fairlight. 2094	25299	1986	Premise Match	466m	North West
	DRY CLEANERS & PRESSERS.	Fairlight Dry Cleaners Pty. Ltd., 147 Sydney Rd., Fairlight. 2094	34518	1985	Premise Match	466m	North West
	DRY CLEANERS & PRESSERS.	Fairlight Dry Cleaners Pty. Ltd., 147 Sydney Rd., Fairlight. 2094	21963	1984	Premise Match	466m	North West
	DRY CLEANERS & PRESSERS.	Fairlight Dry Cleaners Pty. Ltd., 147 Sydney Rd., Fairlight 2094	8554	1983	Premise Match	466m	North West
	DRY CLEANERS & PRESSERS.(D8500)	Fairlight Dry Cleaners Pty. Ltd., 147 Sydney Rd., Fairlight. 2094.	23831	1982	Premise Match	466m	North West
	DRY CLEANERS & PRESSERS.	Fairlight Cleaners Pty. Ltd., 147 Sydney Rd, Fairlight. 2094	63314	1981	Premise Match	466m	North West
	DRY CLEANERS, PRESSERS &/OR DYERS.	Fairlight Dry Cleaners Pty. Ltd., 147 Sydney Rd., Fairlight. 2094	46746	1980	Premise Match	466m	North West
	DRY CLEANERS, PRESSERS &/OR DYERS.	Fairlight Dry Cleaners Pty. Ltd., 147 Sydney Rd., Fairlight. 2094.	35341	1979	Premise Match	466m	North West
	DRY CLEANERS, PRESSERS &/OR DYERS	Fairlight Dry Cleaners Pty. Ltd., 147 Sydney Rd., Fairlight.	20766	1978	Premise Match	466m	North West
	DRY CLEANERS, PRESSERS &/OR DYERS.	Fairlight Dry Cleaners., 147 Sydney Rd., Fairlight 2094	23504	1976	Premise Match	466m	North West
	DRY CLEANERS, PRESSERS &/OR DYERS.	Fairlight Dry Cleaners, 147 Sydney Rd., Fairlight.	24028	1975	Premise Match	466m	North West
19	DRY CLEANERS & PRESSERS.	Prestige Dry Cleaners., 74 The Corso., Manly. 2095	63505	1981	Premise Match	470m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Prestige Dry Cleaners., 74 The Corso., Manly. 2095	49983	1980	Premise Match	470m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Prestige Dry Cleaners., 74 The Corso., Manly. 2095.	35522	1979	Premise Match	470m	East
	DRY CLEANERS, PRESSERS &/OR DYERS	Prestige Dry Cleaners, 74 The Corso, Manly. 2095	20925	1978	Premise Match	470m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Prestige Dry Cleaners., 78 The Corso Manly 2095	23771	1976	Premise Match	470m	East

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
19	DRY CLEANERS, PRESSERS &/OR DYERS.	Prestige Dry Cleaners, 78 The Corso, Manly. 2095	24295	1975	Premise Match	470m	East
	DRY CLEANERS, PRESSERS &/OR DYERS.	Prestige Pty. Ltd., 78 The Corso Manly	7201	1972	Premise Match	470m	East
	DRY CLEANERS, PRESSERS &/OR DYERS	Prestige Pty. Ltd., 78 The Corso., Manly	51275	1971	Premise Match	470m	East
	DRY CLEANERS,PRESSERS /DYERS (D710)	Prestige Pty. Ltd., 78 The Corso, Manly	292462	1970	Premise Match	470m	East
	DRY CLEANERS, PRESSERS/ DYERS	Prestige Pty. Ltd., 78 The Corso, Manly	37273	1969	Premise Match	470m	East
	DRY CLEANERS, PRESSERS/DYERS	Prestige Pty. Ltd., 78 The Corso., Manly	20732	1968	Premise Match	470m	East
	DRY CLEANERS, PRESSERS/ DYERS	Prestige Pty. Ltd., 78 The Corso., Manly	6289	1967	Premise Match	470m	East
20	MOTOR GARAGES &/OR ENGINEERS.	Manly Motors., 153-157 Sydney Rd Fairlight	8096	1972	Premise Match	470m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Manly Motors., 153-157 Sydney Rd Fairlight	56773	1971	Premise Match	470m	North West
	MOTOR GARAGES & ENGINEERS(M6S6)	Manly Motors, 153-157 Sydney Rd. FAIRLIGHT	338197	1970	Premise Match	470m	North West
	MOTOR GARAGES & ENGINEERS.	Manly Motors., 153-157 Sydney Rd Fairlight	42187	1969	Premise Match	470m	North West
	MOTOR GARAGES & ENGINEERS	Manly Motors., 153-157 Sydney Rd Fairlight	25716	1968	Premise Match	470m	North West
	MOTOR GARAGES & ENGINEERS.	Manly Motors., 153-157 Sydney Rd Fairlight	10218	1967	Premise Match	470m	North West
	MOTOR GARAGES & ENGINEERS.	Manly Motors., 153-157 Sydney Rd Fairlight	56107	1966	Premise Match	470m	North West
	Motor Garages & Engineers	Manly Motors, 153-157 Sydney Rd. Fairlight	122645	1965	Premise Match	470m	North West
	MOTOR GARAGES & ENGINEERS	Manly Motors., 153-157 Sydney Rd Fairlight	47909	1964	Premise Match	470m	North West
	MOTOR GARAGES & ENGINEERS.	Manly Motors., 153-157 Sydney Rd Fairlight	29422	1962	Premise Match	470m	North West
	MOTOR GARAGES & ENGINEERS	Manly Motors, 153-157 Sydney Rd. FAIRLIGHT	347630	1961	Premise Match	470m	North West
	MOTOR GARAGES & ENGINEERS.	Manly Motors., 153-157 Sydney Rd Fairlight	14093	1959	Premise Match	470m	North West
	MOTOR GARAGE/ENGINEERS.	Manly Motors., 153-157 Sydney Rd Fairlight	4544	1958	Premise Match	470m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Manly Motors., 113 Sydney Rd., Fairlight	58050	1956	Premise Match	470m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Manly Motors., 113 Sydney Rd Fairlight	49659	1954	Premise Match	470m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Manly Motors, 113 Sydney Rd., Fairlight	40338	1953	Premise Match	470m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Manly Motors., 113 Sydney Rd Fairlight	31931	1952	Premise Match	470m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Manly Motors., 113 Sydney Rd Fairlight	27391	1952	Premise Match	470m	North West
	MOTOR SERVICE STATIONS–PETROL, ETC.	Manly Motors., 113 Sydney Rd, Manly	35913	1952	Premise Match	470m	North West
	MOTOR GARAGES &/OR ENGINEERS	Manly Motors, 113 Sydney Rd., Manly	84040	1950	Premise Match	470m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Hampton J And N. (Manly Motors), 113 Sydney Rd Manly	22417	1948-49	Premise Match	470m	North West
	MOTOR GARAGES &/OR ENGINEERS.	Manly Motors., 113 Sydney Rd Manly	22602	1948-49	Premise Match	470m	North West
21	DRY CLEANERS, PRESSERS/DYERS	Alpine Dry Cleaners., 6 Sydney Rd., Manly	65374	1959	Premise Match	473m	North East
	DRY CLEANERS, PRESSERS & DYERS	Alpine Dry Cleaners., 6 Sydney Rd Manly	167	1958	Premise Match	473m	North East

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Property Boundary or Road Intersection	Direction
21	DRY CLEANERS, PRESSERS & DYERS.	Alpine Dry Cleaners., 6 Sydney Rd Manly	54770	1956	Premise Match	473m	North East
	DRY CLEANERS, PRESSERS & DYERS	Alpine Dry Cleaners, 6 Sydney Rd., Manly	35061	1950	Premise Match	473m	North East
	DRY CLEANERS, PRESSERS & DYERS.	Alpine Dry Cleaners., 6 Sydney Rd., Manly	17051	1948-49	Premise Match	473m	North East
22	MOTOR GARAGES &/OR ENGINEERS.	Pacific Service Station., Cnr Raglan & Short Sts Manly	62237	1971	Premise Match	476m	North East
	MOTOR GARAGES & ENGINEERS(M6S6)	Pacific Service Station., Cnr. Raglan & Short Sts., MANLY	338369	1970	Premise Match	476m	North East
	MOTOR GARAGES & ENGINEERS.	Pacific Service Station., Cnr Raglan & Short Sts Manly	42586	1969	Premise Match	476m	North East
	MOTOR GARAGES & ENGINEERS	Pacific Service Station., Cnr Raglan & Short Sts Manly	26070	1968	Premise Match	476m	North East
	MOTOR GARAGES & ENGINEERS.	Pacific Service Station., Cnr Raglan & Short Sts Manly	10568	1967	Premise Match	476m	North East
	MOTOR GARAGES & ENGINEERS.	Pacific Service Station., Cnr Raglan & Short Sts Manly	60314	1966	Premise Match	476m	North East
	Motor Garages & Engineers	Pacific Service Station, Cnr. Raglan & Short Sts. Manly	122962	1965	Premise Match	476m	North East
23	MOTOR GARAGES & ENGINEERS.	Royal Garage., 31 Pittwater Rd, Manly	32896	1962	Premise Match	493m	North East
	MOTOR GARAGES & ENGINEERS	Chidgey, C., 21 Belgrave St. MANLY	346878	1961	Premise Match	493m	North East
	MOTOR GARAGES & ENGINEERS	Royal Garage, 31 Pittwater Rd. MANLY	348075	1961	Premise Match	493m	North East
	MOTOR GARAGES & ENGINEERS.	Chidgey C., 21 Belgrave St Manly	19485	1959	Premise Match	493m	North East
	MOTOR GARAGES & ENGINEERS.	Royale Garage., 31 Pittwater Rd Manly	19495	1959	Premise Match	493m	North East
	MOTOR GARAGE/ENGINEERS.	Chidgey C., 21 Belgrave St Manly	831	1958	Premise Match	493m	North East
	MOTOR GARAGE/ENGINEERS.	Royal Garage., 21 Belgrave St Manly	4906	1958	Premise Match	493m	North East
	MOTOR GARAGE/ENGINEERS.	Royal Garage., 31 Pittwater Rd Manly	4907	1958	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Chidgey C., 21 Belgrave St., Manly	57428	1956	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Royal Garage., 21 Belgrave St Manly	61432	1956	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Royal Garage., 31 Pittwater Rd Manly	61433	1956	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Chidgey C., 21 Belgrave St Manly	49052	1954	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Royal Garage., 21 Belgrave St Manly	54048	1954	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Chidgey C., 21 Belgrave St., Manly	39809	1953	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Royal Garage., 23 Bel Grave St Manly	40630	1953	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Chidgey C., 21 Belgrave St Manly	31475	1952	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Royal Garage., 23 Bel Grave St Manly	32196	1952	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS	Chldgey, C., 21 Belgrave St., Manly	83586	1950	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS	Royal Garage, 23 Belgrave St., Manly	84327	1950	Premise Match	493m	North East
	MOTOR SERVICE STATIONS-PETROL, Etc.	Royal Garage, 23 Belgrave St., Manly	86365	1950	Premise Match	493m	North East
	MOTOR GARAGES &/OR ENGINEERS.	Chidgey C., 21 Belgrave St Manly	17894	1948-49	Premise Match	493m	North East

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Dry Cleaners, Motor Garages & Service Stations 1948-1993 Road or Area Matches

Dry Cleaners, Motor Garages & Service Stations from UBD Business Directories, mapped to a road or an area, within the dataset buffer. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published.

Note: The Universal Business Directories were published between 1948 and 1993. Dry Cleaners, Motor Garages & Service Stations have been extracted from all of these directories except the following years 1951, 1955, 1957, 1960, 1963, 1973, 1974, 1977, 1987.

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
24	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., Gilbert St Manly	27463	1952	Road Match	78m
	MOTOR GARAGES &/OR ENGINEERS	Auckland Garage, Gilbert St., Manly	83394	1950	Road Match	78m
	MOTOR SERVICE STATIONS-PETROL, Etc.	Auckland, Gilbert St., Manly	85760	1950	Road Match	78m
	MOTOR GARAGES &/OR ENGINEERS.	Auckland Garage., Gilbert St Manly	17730	1948-49	Road Match	78m
	MOTOR SERVICE STATIONS-PETROL, ETC.	Auckland., Gilbert St Manly	23102	1948-49	Road Match	78m
25	DRY CLEANERS & PRESSERS.	Plaza's Automatic Laundrette., Sydney Rd., Manly 2095	8743	1983	Road Match	209m
	DRY CLEANERS & PRESSERS.(D8500)	Plaza's Automatic Laundrette, Sydney Rd., Manly. 2095.	24012	1982	Road Match	209m
	DRY CLEANERS, PRESSERS &/OR DYERS.	Plaza's Automatic Laundrette., Sydney Rd., Manly 2095	23764	1976	Road Match	209m
	DRY CLEANERS, PRESSERS &/OR DYERS.	Plaza's Automatic Laundrette, Sydney Rd., Manly. 2095	24288	1975	Road Match	209m
26	MOTOR GARAGES & ENGINEERS	Coughlan Chas. M., Whistler St Manly	48233	1964	Road Match	281m
	MOTOR GARAGES & ENGINEERS.	Coughlan Chas. M., Whistler St Manly	32889	1962	Road Match	281m
	MOTOR GARAGES & ENGINEERS	Coughlan, Chas. M., Whistler St. MANLY	346963	1961	Road Match	281m
	MOTOR GARAGES & ENGINEERS.	Coughlan Chas. M., Whistler St Manly	19486	1959	Road Match	281m
	MOTOR GARAGE/ENGINEERS.	Coughlan, Chas. M., Whistler St., Manly	896	1958	Road Match	281m
	MOTOR GARAGE/ENGINEERS.	G. & P. Motor Service., Whistler St Manly	4193	1958	Road Match	281m
	MOTOR GARAGE/ENGINEERS.	G.P. Motor Service., Whistler St Manly	458	1958	Road Match	281m
	MOTOR GARAGES &/OR ENGINEERS.	Coughlan, Chas. M. Whistler St., Manly	57493	1956	Road Match	281m
	MOTOR GARAGES &/OR ENGINEERS.	G & P Motor Service., Whistler St Manly	57079	1956	Road Match	281m
	MOTOR GARAGES &/OR ENGINEERS.	G. & P. Motor Service., Whistler St Manly	57724	1956	Road Match	281m
	MOTOR GARAGES &/OR ENGINEERS.	Coughlan Chas. M., Whistler St	49115	1954	Road Match	281m
	DRY CLEANERS, PRESSERS & DYERS.	Modern Way Laundrette., Whistler St Manly	44450	1954	Road Match	281m
	MOTOR GARAGES &/OR ENGINEERS.	Coughlan Chas. M., Whistler St Manly	39864	1953	Road Match	281m
	DRY CLEANERS, PRESSERS & DYERS.	Modern Way Laundrette., Whistler St Manly	36275	1953	Road Match	281m
	MOTOR GARAGES &/OR ENGINEERS.	Coughlan Chas. M., Whistler St., Manly	31524	1952	Road Match	281m
	DRY CLEANERS, PRESSERS & DYERS.	Modern Way Laundrette., Whistler St Manly	27186	1952	Road Match	281m
	MOTOR GARAGES &/OR ENGINEERS	Coughlan, Chas. M., Whistler St., Manly	83633	1950	Road Match	281m

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
26	MOTOR SERVICE STATIONS-PETROL, Etc.	Coughlan, Chas. M., Whistler St., Manly	85897	1950	Road Match	281m
	DRY CLEANERS, PRESSERS & DYERS	Modern Way Laundrette, Whistler St., Manly	35535	1950	Road Match	281m
27	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	BP Pacific Service Station, Raglan St., Manly. 2095	27810	1984	Road Match	358m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	BP Pacific Service Station., Raglan St., Manly 2095	14246	1983	Road Match	358m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS. (M6860)	BP Pacific Service Station, Raglan St., Manly 2095.	56274	1982	Road Match	358m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	BP Pacific Service Station., Raglan St., Manly. 2095	63952	1981	Road Match	358m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	BP Pacific Service Station., Raglan St., Manly. 2095	51452	1980	Road Match	358m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	BP Pacific Service Station., Raglan St., Manly. 2095.	41053	1979	Road Match	358m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	BP Pacific Service Station, Raglan St., Manly. 2095	49592	1978	Road Match	358m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	BP Pacific Service Station., Raglan St., Manly 2095	25306	1976	Road Match	358m
	MOTOR GARAGES &/OR ENGINEERS.	BP Pacific Service Station., Raglan St., Manly. 2095	58546	1975	Road Match	358m
	MOTOR GARAGES &/OR ENGINEERS.	BP Pacific Service Station., Raglan St, Manly 2095	12547	1972	Road Match	358m
	MOTOR GARAGES & ENGINEERS.	Grimes Parking Stations Pty. Ltd., Raglan St Manly	32891	1962	Road Match	358m
	MOTOR GARAGES & ENGINEERS	Grimes Parking Stations Pty Ltd Raglan St., MANLY	347285	1961	Road Match	358m
	MOTOR GARAGES & ENGINEERS	Grimes Parking Stations Pty. Ltd., Raglan St. MANLY	347287	1961	Road Match	358m
	MOTOR SERVICE STATIONS-PETROL, Etc.	Pacific Garage (The), Raglan St., Manly	86256	1950	Road Match	358m
	MOTOR SERVICE STATIONS-PETROL, ETC.	Pacific Garage (The)., Raglan St., Manly	26678	1948-49	Road Match	358m
28	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Esso Service Centre., Darley Rd Manly	16857	1972	Road Match	365m
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Esso Service Centre., Darley Rd Manly	2322	1971	Road Match	365m
	MOTOR SERVICE STATIONS-PETROL,OIL,Etc.	Esso Service Centre., Darley Rd., Manly	341041	1970	Road Match	365m
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Esso Service Centre., Darley Rd Manly	50424	1969	Road Match	365m
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Esso Service Centre., Darley Rd., Manly	32458	1968	Road Match	365m
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Esso Service Centre., Darley Rd Manly	15918	1967	Road Match	365m
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Esso Service Centre., Darley Rd Manly	1493	1966	Road Match	365m
	MOTOR GARAGE/ENGINEERS.	South Steyne Service Station., Darley Rd Manly	4995	1958	Road Match	365m
	MOTOR GARAGES &/OR ENGINEERS.	South Steyne Service Station., Darley Rd., Manly	61517	1956	Road Match	365m
	MOTOR GARAGES &/OR ENGINEERS.	South Steyne Service Station., Darley Rd Manly	54132	1954	Road Match	365m
	MOTOR GARAGES &/OR ENGINEERS.	South Steyne Service Station., Darley Rd Manly	40708	1953	Road Match	365m

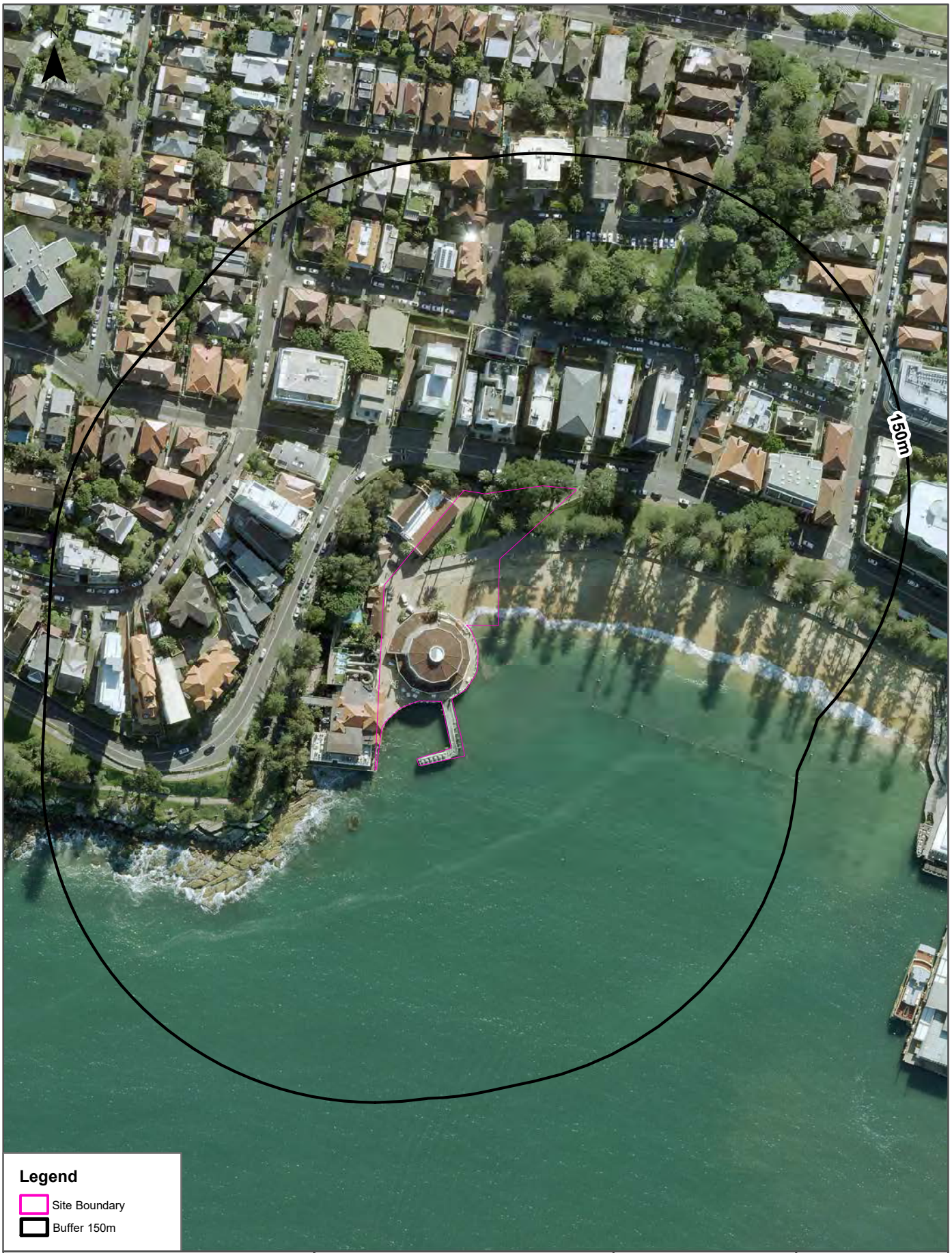
Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
28	MOTOR GARAGES &/OR ENGINEERS.	South Steyne Service Station., Darley Rd Manly	32263	1952	Road Match	365m
	MOTOR GARAGES &/OR ENGINEERS	South Steyne Service Station, Darley Rd., Manly	84394	1950	Road Match	365m
	MOTOR SERVICE STATIONS-PETROL, Etc.	South Steyne Service Station, Darley Rd., Manly	86406	1950	Road Match	365m
	MOTOR GARAGES &/OR ENGINEERS.	South Steyne Service Station., Darley Rd., Manly	22884	1948-49	Road Match	365m
	MOTOR SERVICE STATIONS-PETROL, ETC.	South Steyne Service Station., Darley Rd., Manly	26793	1948-49	Road Match	365m
29	DRY CLEANERS & PRESSERS.	Plaza's Automatic Laundrette., Short St., Manly. 2095	65692	1981	Road Match	423m
	DRY CLEANERS, PRESSERS / DYERS	Same Day Dry Cleaners, 6 Short St., Manly	299254	1961	Road Match	423m
	DRY CLEANERS, PRESSERS/DYERS	Same Day Dry Cleaners., 6 Short St Manly	13247	1959	Road Match	423m
30	MOTOR GARAGES & SERVICE STATIONS.	Caltex (I & A Gowci), 280 Pittwater Rd., Manly. 2095	18779	1993	Road Match	430m
	MOTOR GARAGES & SERVICE STATIONS.	Caltex (I & A. Gowci), 280 Pittwater Rd., Manly. 2095	11317	1990	Road Match	430m
	MOTOR GARAGE & SERVICE STATIONS.	Caltex (I & A. Gowci), 280 Pittwater Rd., Manly. 2095	64757	1989	Road Match	430m
	MOTOR GARAGES & SERVICE STATIONS.	Caltex (I & A. Gowci), 280 Pittwater Rd., Manly. 2095	53876	1988	Road Match	430m
	MOTOR GARAGES & SERVICE STATIONS.	Caltex, (I & A. Gowci), 280 Pittwater Rd., Manly. 2095	64346	1986	Road Match	430m
	MOTOR GARAGES & SERVICE STATIONS.	O'Bensaul, 280 Pittwater Rd., Manly. 2095	45306	1985	Road Match	430m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	O'Bensaul, 280 Pittwater Rd., Manly. 2095	33883	1984	Road Match	430m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	O'Bensaul., 280 Pittwater Rd., Manly 2095	15236	1983	Road Match	430m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS. (M6860)	O'Bensaul, 280 Pittwater Rd., Manly. 2095.	57315	1982	Road Match	430m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	O'Bensaul., 280 Pittwater Rd., Manly 2095	3867	1981	Road Match	430m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	O'Bensaul., 280 Pittwater Rd., Manly. 2095	58611	1980	Road Match	430m
	MOTOR GARAGES &/OR ENGINEERS &/OR SERVICE STATIONS.	O'Bensaul., 280 Pittwater Rd., Manly. 2095.	46117	1979	Road Match	430m
	MOTOR GARAGES &/OR ENGINEERS.	Bensaul O., 280 Pittwater Rd., Manly	12548	1972	Road Match	430m
	MOTOR GARAGES &/OR ENGINEERS.	Bensaul O., 280 Pittwater Rd., Manly	62231	1971	Road Match	430m
	MOTOR GARAGES & ENGINEERS(M6S6)	Bensaul, O., 280 Pittwater Rd., Manly	337296	1970	Road Match	430m
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Freshwater Motors., Pittwater Rd Manly	50425	1969	Road Match	430m
	MOTOR GARAGES & ENGINEERS.	Golden Fleece Service Station., 280 Pittwater Rd Manly	42584	1969	Road Match	430m
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Freshwater Motors., Pittwater Rd Manly	32459	1968	Road Match	430m
	MOTOR GARAGES & ENGINEERS	Golden Fleece Service Station., 280 Pittwater Rd Manly	26068	1968	Road Match	430m
	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Freshwater Motors., Pittwater Rd Manly	15919	1967	Road Match	430m
	MOTOR GARAGES & ENGINEERS.	Golden Fleece Service Station., 280 Pittwater Rd Manly	10566	1967	Road Match	430m

Map Id	Business Activity	Premise	Ref No.	Year	Location Confidence	Distance to Road Corridor or Area
30	MOTOR SERVICE STATIONS-PETROL, OIL, ETC.	Freshwater Motors., Pittwater Rd Manly	1494	1966	Road Match	430m
	MOTOR GARAGES & ENGINEERS.	Golden Fleece Service Station., 280 Pittwater Rd Manly	60312	1966	Road Match	430m
	Motor Garages & Engineers	Golden Fleece Service Station., 280 Pittwater Rd., Manly	122959	1965	Road Match	430m
	MOTOR GARAGES & ENGINEERS	Golden Fleece Service Station., 280 Pittwater Rd Manly	48235	1964	Road Match	430m
	MOTOR GARAGES & ENGINEERS.	Parkway Service Station (Manly)., 280 Pittwater Rd Manly	32894	1962	Road Match	430m
	MOTOR GARAGES & ENGINEERS	Parkway Service Station (Manly), 280 Pittwater Rd. MANLY	347860	1961	Road Match	430m
	MOTOR GARAGES & ENGINEERS.	Parkway Service Station (Manly)., 280 Pittwater Rd Manly	19494	1959	Road Match	430m
	MOTOR SERVICE STATIONS-PETROL,. OIL, ETC.	Parkway Service Station., 280 Pittwater Rd Manly	24329	1959	Road Match	430m
	MOTOR GARAGE/ENGINEERS.	Parkway Service Station., 280 Pittwater Rd Manly	4716	1958	Road Match	430m
	MOTOR SERVICE STATIONS-PETROL, ETC.	Parkway Service Station., 280 Pittwater Rd Manly	9739	1958	Road Match	430m
	MOTOR SERVICE STATIONS-PETROL, ETC.	Parkway Service Station., 280 Pittwater Rd Manly	62089	1956	Road Match	430m
	MOTOR GARAGES &/OR ENGINEERS.	Parmal Service Station., 280 Pittwater Rd Manly	61254	1956	Road Match	430m
	DRY CLEANERS, PRESSERS & DYERS.	Tudor Dry Cleaners Pittwater Rd Manly	44559	1954	Road Match	430m
	DRY CLEANERS, PRESSERS & DYERS.	Tudor Dry Cleaners., Pittwater Rd Manly	36391	1953	Road Match	430m
	DRY CLEANERS, PRESSERS & DYERS	Village Dry Cleaners, 50 Belgrave St., Manly	35814	1950	Road Match	430m
	DRY CLEANERS, PRESSERS & DYERS.	Village Dry Cleaners., 50 Belgrave St Manly	17578	1948-49	Road Match	430m
31	DRY CLEANERS, PRESSERS & DYERS	Rite-Way Dry Cleaners, 1 Central Ave., Manly	35653	1950	Road Match	431m

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Aerial Imagery 2022

Manly Sea Life (West Esplanade), Manly, NSW 2095



Aerial Imagery 2017

Manly Sea Life (West Esplanade), Manly, NSW 2095



Aerial Imagery 2011

Manly Sea Life (West Esplanade), Manly, NSW 2095



Scale: 0 25 50 75 100 Meters	Data Source Aerial Imagery: © Aerometrex Pty Ltd	Coordinate System: GDA 1994 MGA Zone 56	Date: 30 November 2022

Aerial Imagery 2005

Manly Sea Life (West Esplanade), Manly, NSW 2095



Scale: 0 25 50 75 100 Meters	Data Source Aerial Imagery: © Aerometrex Pty Ltd	Coordinate System: GDA 1994 MGA Zone 56	Date: 30 November 2022

Aerial Imagery 2000

Manly Sea Life (West Esplanade), Manly, NSW 2095



Aerial Imagery 1998

Manly Sea Life (West Esplanade), Manly, NSW 2095



Aerial Imagery 1991

Manly Sea Life (West Esplanade), Manly, NSW 2095



Aerial Imagery 1986

Manly Sea Life (West Esplanade), Manly, NSW 2095



Aerial Imagery 1982

Manly Sea Life (West Esplanade), Manly, NSW 2095



Aerial Imagery 1978

Manly Sea Life (West Esplanade), Manly, NSW 2095



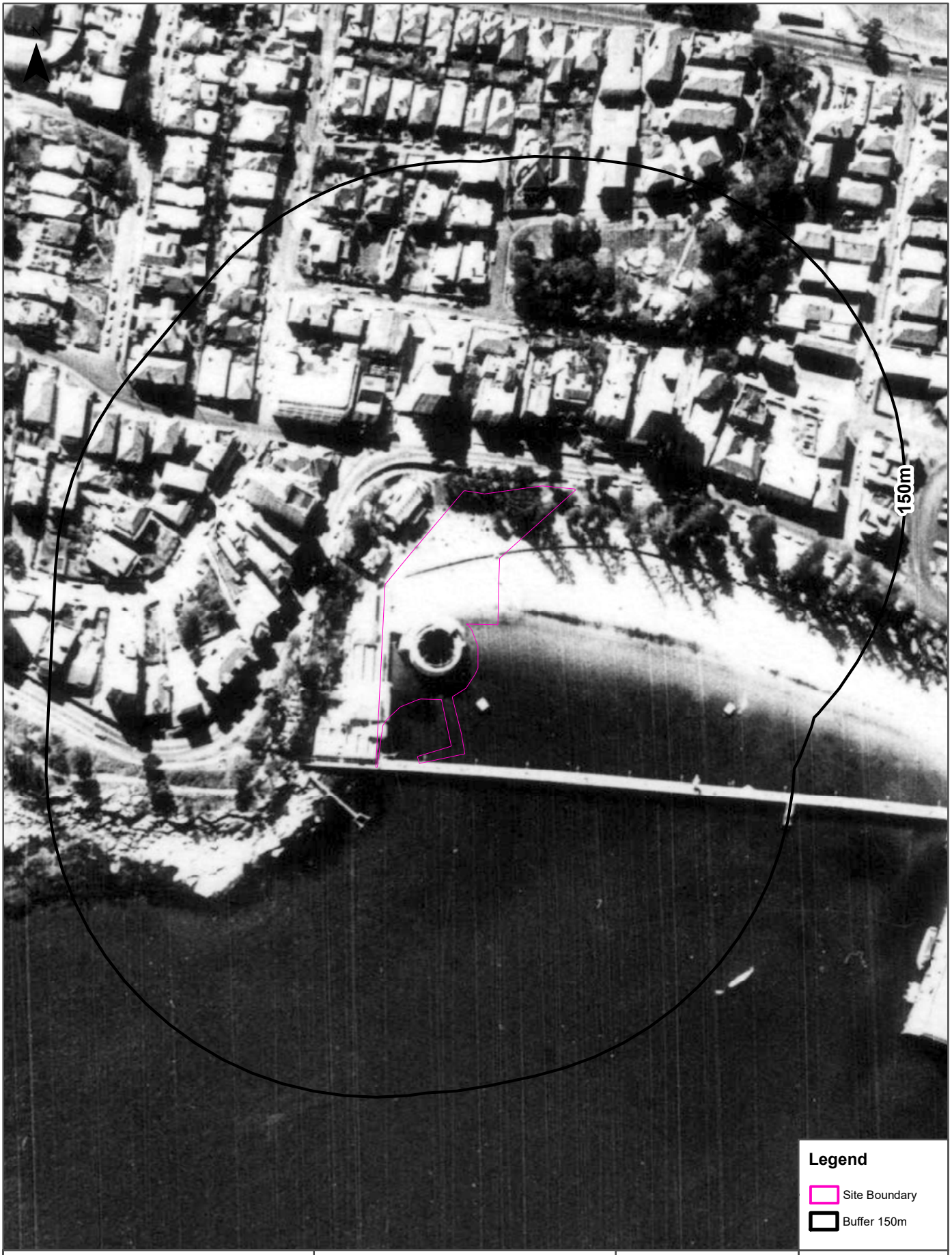
Aerial Imagery 1970

Manly Sea Life (West Esplanade), Manly, NSW 2095



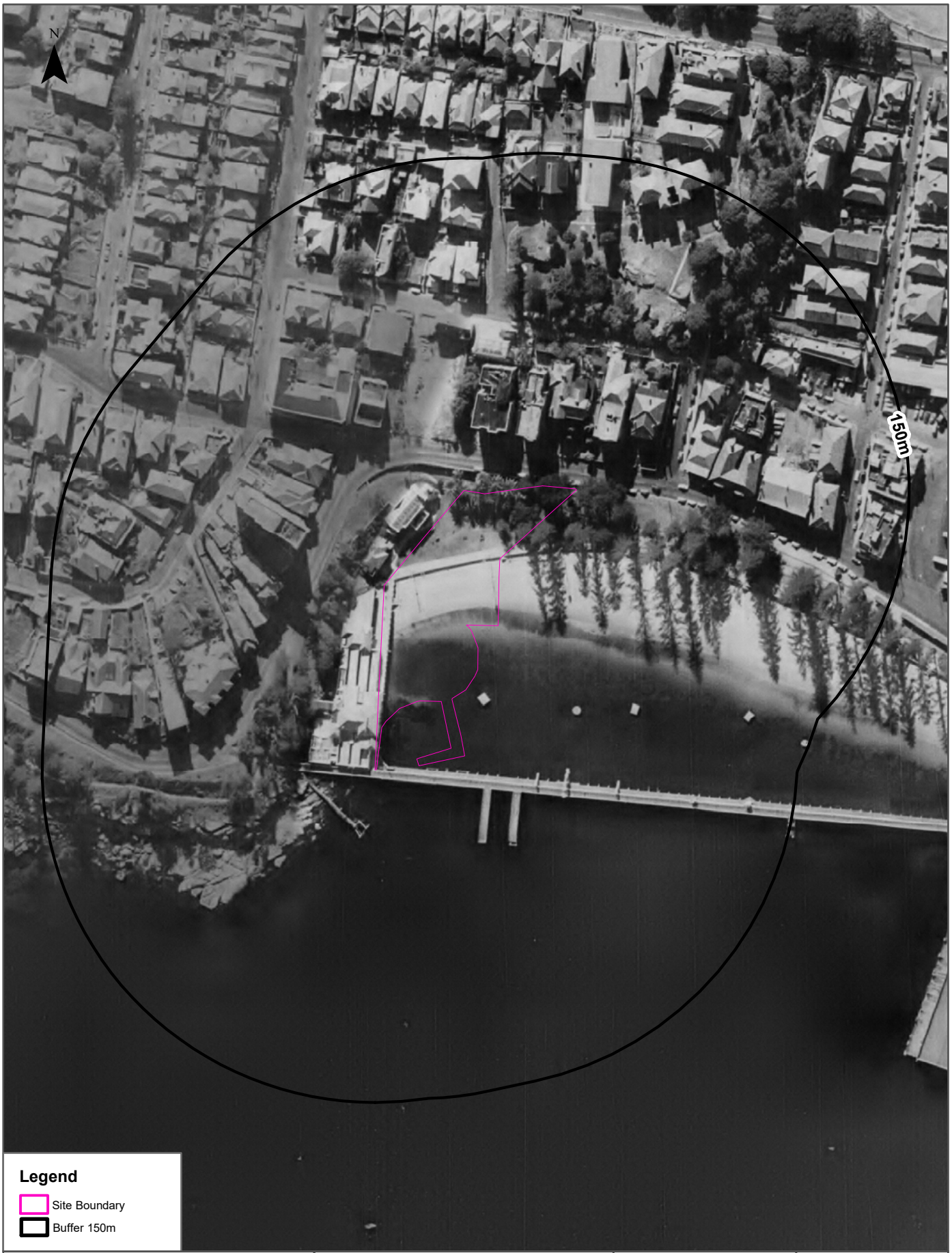
Aerial Imagery 1965

Manly Sea Life (West Esplanade), Manly, NSW 2095



Aerial Imagery 1961

Manly Sea Life (West Esplanade), Manly, NSW 2095



Aerial Imagery 1955, 1956

Manly Sea Life (West Esplanade), Manly, NSW 2095



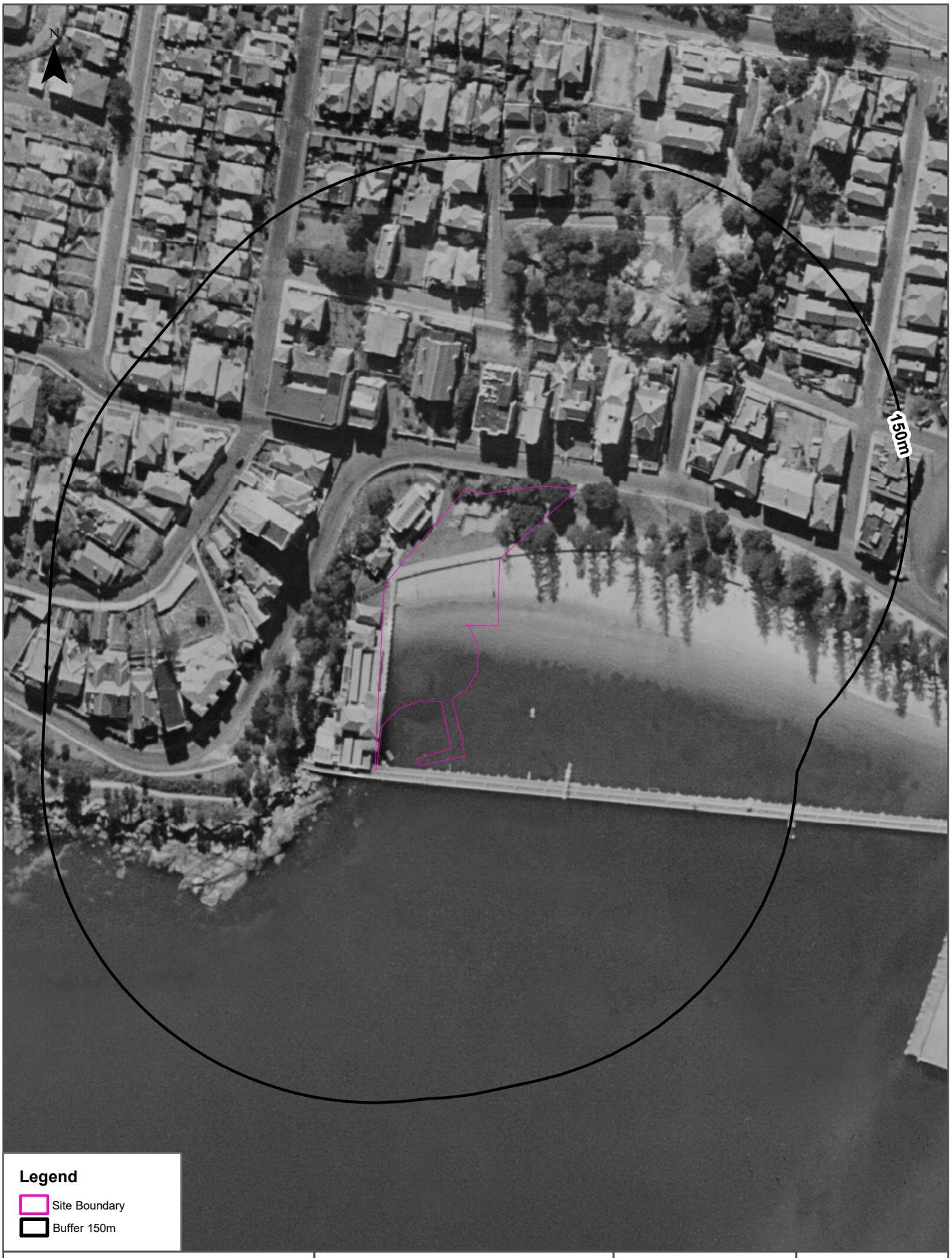
Aerial Imagery 1951

Manly Sea Life (West Esplanade), Manly, NSW 2095



Aerial Imagery 1943

Manly Sea Life (West Esplanade), Manly, NSW 2095



Aerial Imagery 1930

Manly Sea Life (West Esplanade), Manly, NSW 2095



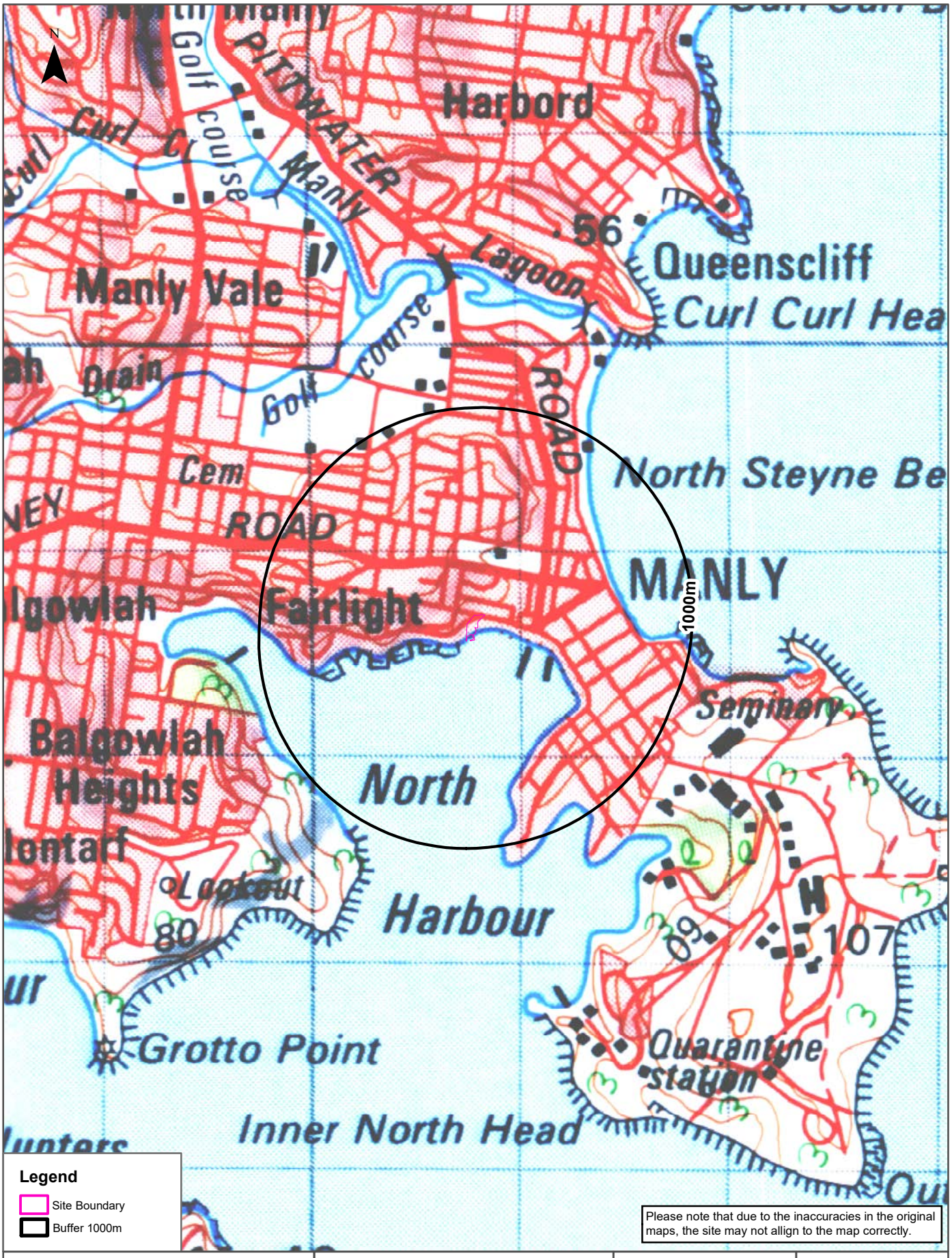
Topographic Map 2015

Manly Sea Life (West Esplanade), Manly, NSW 2095



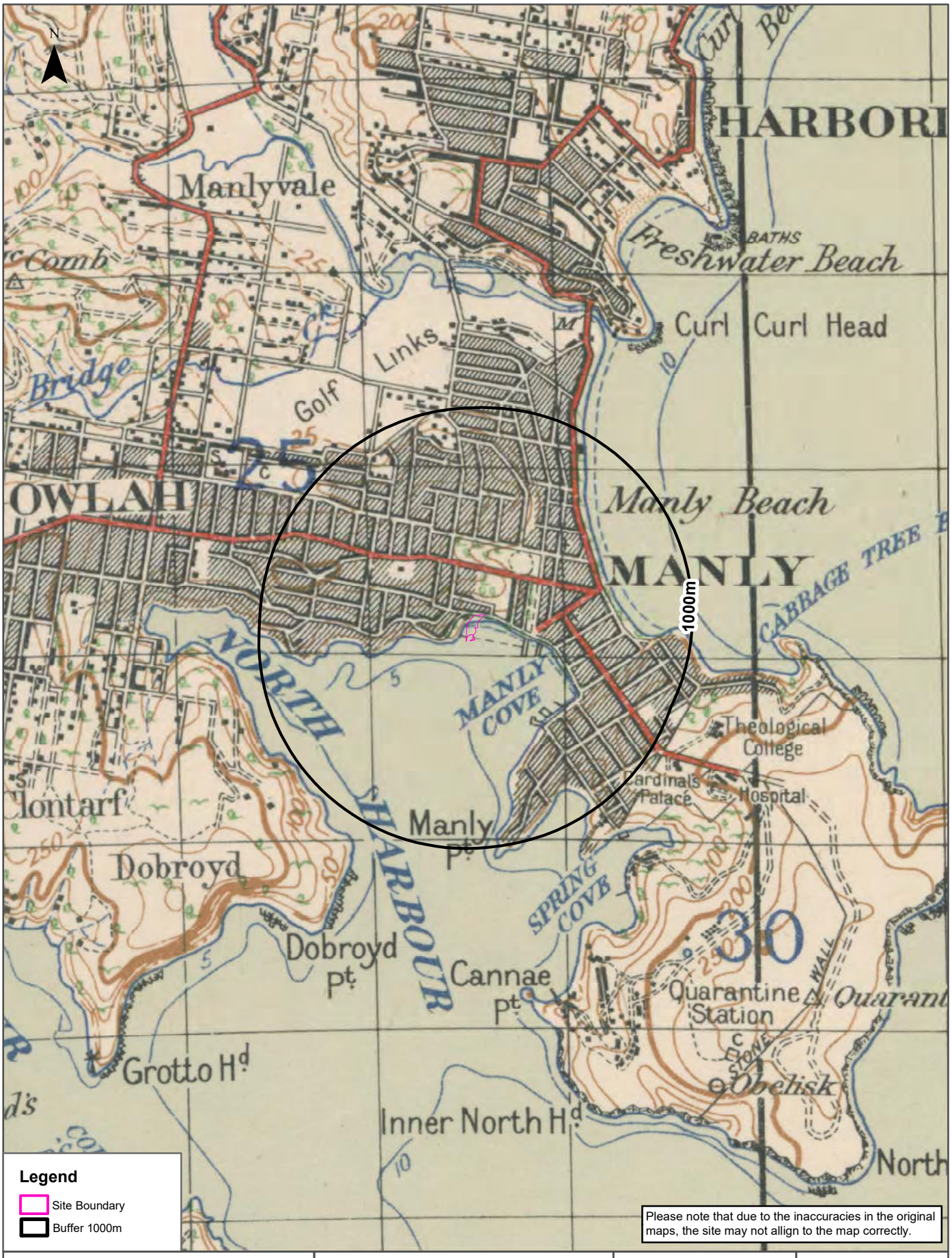
Historical Map 1975

Manly Sea Life (West Esplanade), Manly, NSW 2095



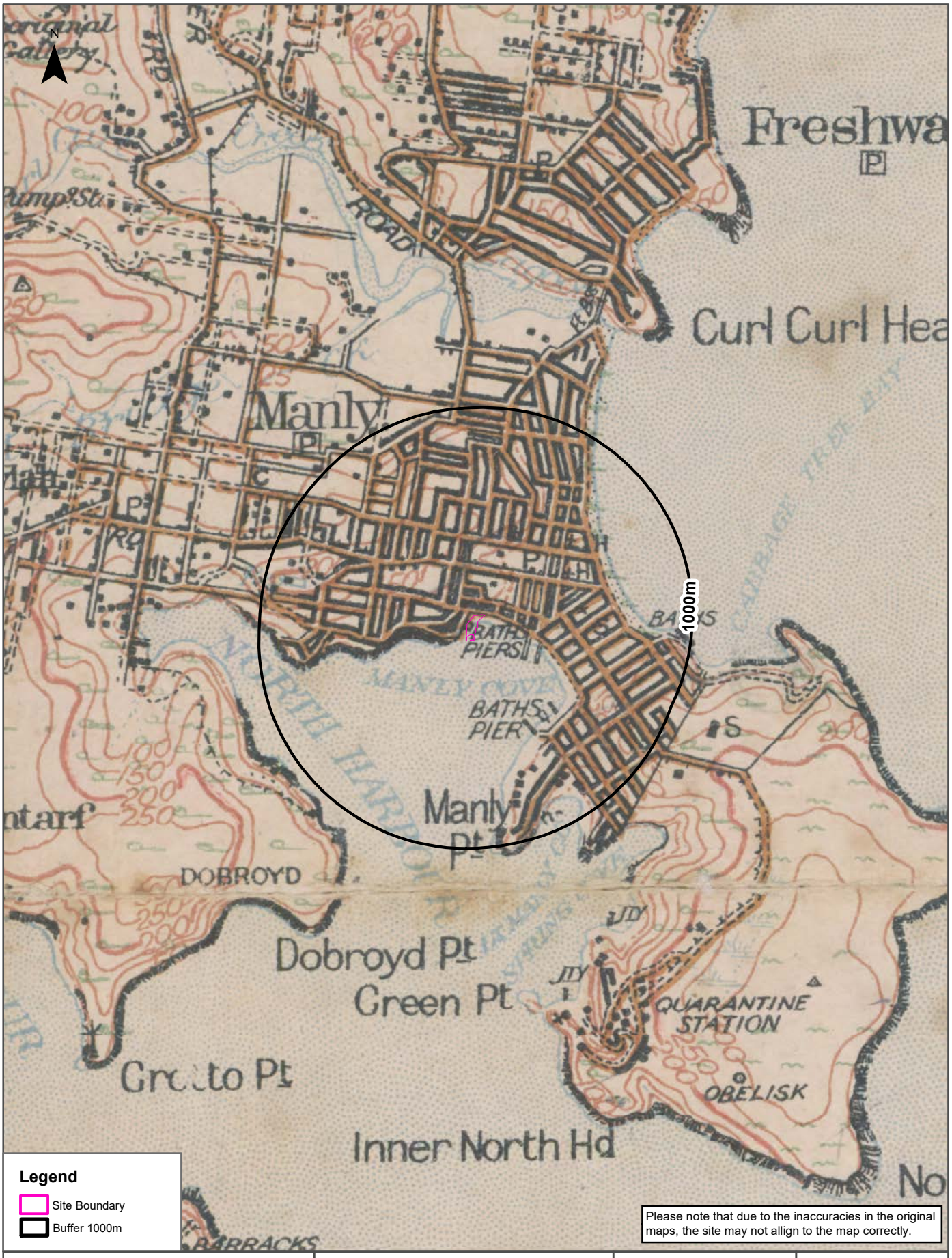
Historical Map c.1936

Manly Sea Life (West Esplanade), Manly, NSW 2095



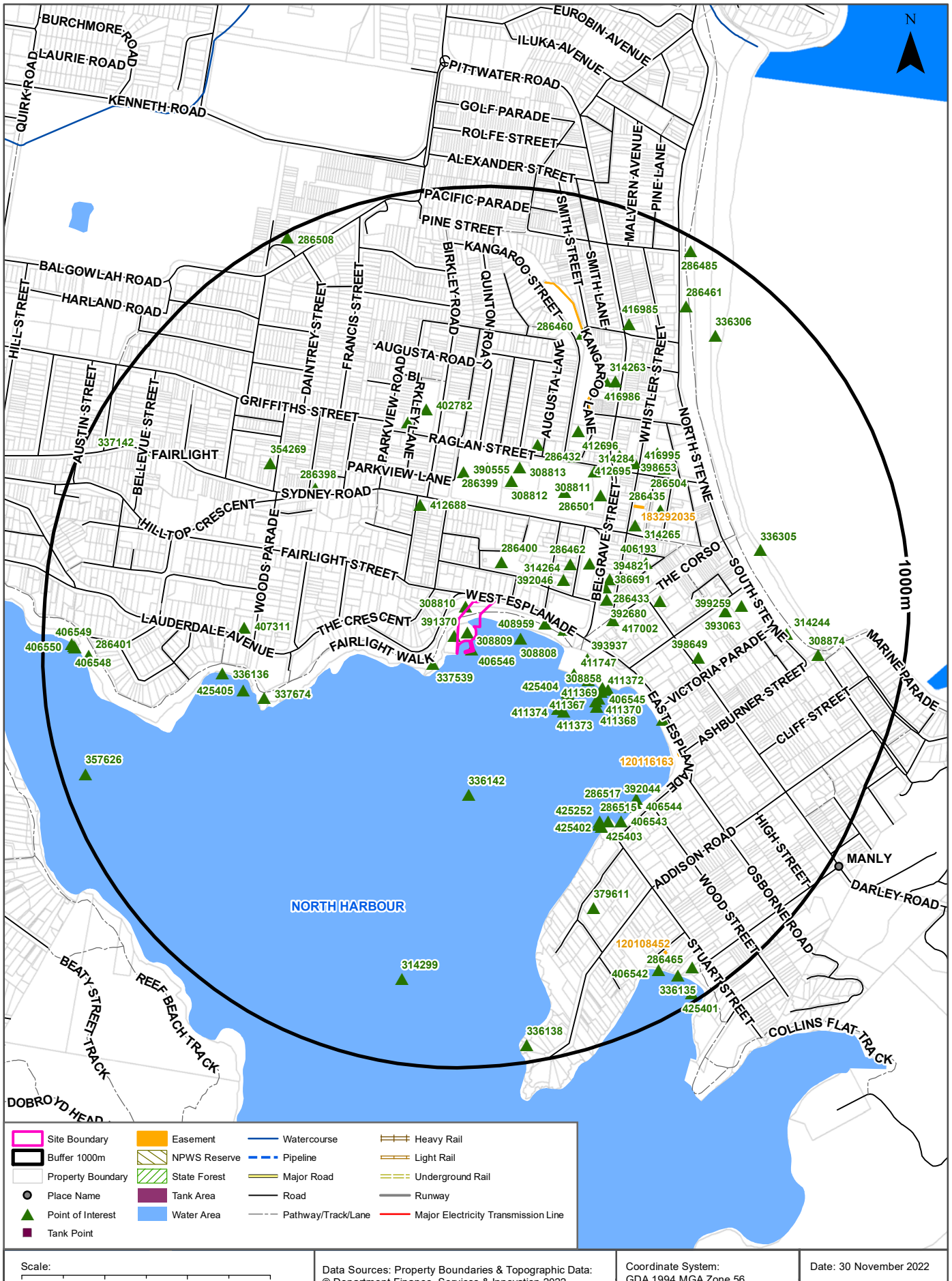
Historical Map c.1917

Manly Sea Life (West Esplanade), Manly, NSW 2095



Topographic Features

Manly Sea Life (West Esplanade), Manly, NSW 2095



Site Boundary
Buffer 1000m
Property Boundary
Place Name
Point of Interest
Tank Point
Easement
NPWS Reserve
State Forest
Tank Area
Water Area
Watercourse
Pipeline
Major Road
Road
Pathway/Track/Lane
Heavy Rail
Light Rail
Underground Rail
Runway
Major Electricity Transmission Line

Scale: 0 100 200 400 600 Meters

Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2022

Coordinate System: GDA 1994 MGA Zone 56

Date: 30 November 2022

Topographic Features

Manly Sea Life (West Esplanade), Manly, NSW 2095

Points of Interest

What Points of Interest exist within the dataset buffer?

Map Id	Feature Type	Label	Distance	Direction
308809	Tourist Attraction	OCEANWORLD MANLY	0m	On-site
406546	Wharf	Wharf	0m	On-site
308810	Art Gallery	MANLY ART GALLERY AND MUSEUM	7m	North
391370	Tourist Attraction	MANLY WATERWORKS	9m	South West
337539	Headland	FEDERATION POINT	63m	South West
286400	Park	DALLEY PARK	96m	North East
308808	Swimming Pool	BATHS	102m	East
408959	Picnic Area	Picnic Area	133m	East
392046	Club	MANLY CIVIC CLUB	174m	North East
407565	Transport Interchange	MANLY BUS INTERCHANGE	181m	East
314264	Place Of Worship	UNITING CHURCH	204m	North East
308858	Wharf	MANLY WHARF	247m	South East
411374	Wharf	MANLY WHARF	247m	South East
286462	Park	GILBERT PARK	247m	North East
411747	Wharf	MANLY WHARF	248m	South East
425404	Historic Site	MANLY WHARF	251m	South East
411373	Wharf	MANLY WHARF	262m	South East
393937	Tourist Information Centre	MANLY VISITOR INFORMATION CENTRE	264m	East
412688	Community Medical Centre	SYDNEY ROAD COMMUNITY HEALTH CENTRE	268m	North West
386691	Police Station	MANLY POLICE STATION	270m	East
392680	Local Government Chambers	MANLY COUNCIL	271m	East
394821	Court House	MANLY COURT HOUSE	283m	East
411371	Wharf	Wharf	286m	South East
417002	Monument	MANLY ANZAC WAR MEMORIAL	289m	East
308812	Sports Field	BOWLING GREENS	294m	North
390555	Park	IVANHOE PARK BOTANIC GARDEN	312m	North
286501	Sports Field	MANLY OVAL	314m	North East
411367	Wharf	Wharf	318m	South East
286399	Park	IVANHOE PARK	320m	North
406545	Wharf	Wharf	322m	South East
411372	Wharf	Wharf	322m	South East

Map Id	Feature Type	Label	Distance	Direction
411370	Wharf	Wharf	323m	South East
411368	Wharf	Wharf	325m	South East
308813	Club	MANLY BOWLING CLUB	329m	North
411369	Wharf	Wharf	337m	South East
336142	Bay / Inlet / Basin	MANLY COVE	342m	South
308811	Sports Court	TENNIS COURTS	362m	North East
406193	Library	MANLY LIBRARY	377m	East
314265	Place Of Worship	CONGREGATIONAL CHURCH	385m	North East
286432	Place Of Worship	PRESBYTERIAN CHURCH	391m	North
314284	Community Facility	MANLY LAWN TENNIS CLUB	396m	North East
286433	Place Of Worship	ANGLICAN CHURCH	399m	East
314285	Club	MANLY RUGBY UNION CLUB	399m	North East
286435	Post Office	MANLY POST OFFICE	457m	North East
412696	Community Medical Centre	MANLY EARLY CHILDHOOD CENTRE	458m	North East
415162	Retirement Village	WESLEY HEIGHTS MANLY	460m	North
412695	Community Medical Centre	PITTWATER ROAD COMMUNITY HEALTH CENTRE	463m	North East
286398	Fire Station	MANLY FIRE STATION	467m	North West
416995	Crematorium	Crematorium	476m	North East
402782	Nursing Home	UNITING WESLEY HEIGHTS MANLY	477m	North
337674	Headland	KAY-YE-MY POINT	477m	West
408936	Picnic Area	Picnic Area	485m	South East
398649	Primary School	MANLY VILLAGE PUBLIC SCHOOL	511m	East
425252	Wharf	SITE AND REMAINS OF BRIGHTSIDE CARGO WHARF	512m	South East
407311	Embassy	CONSULATE OF COOK ISLANDS	516m	West
425403	Historic Site	REMAINS OF MANLY PUBLIC BATHS	517m	South East
286504	Place Of Worship	CATHOLIC CHURCH	520m	North East
286515	Wharf	Wharf	523m	South East
425405	Historic Site	FAIRLIGHT POOL	523m	West
425402	Historic Site	SITE AND REMAINS OF BRIGHTSIDE CARGO WHARF	524m	South East
286517	Wharf	Wharf	524m	South East
406544	Wharf	Wharf	530m	South East
398653	Primary School	ST MARY'S CATHOLIC PRIMARY SCHOOL	532m	North East
392044	Club	MANLY 16FT SKIFF SAILING CLUB	535m	South East
406543	Wharf	Wharf	544m	South East
393063	Community Facility	DRUMMOND HOUSE	558m	East
336136	Beach	FAIRLIGHT BEACH	568m	West
354269	Community Facility	WILLIAM STREET STUDIOS	590m	North West

Map Id	Feature Type	Label	Distance	Direction
399259	Special School	ROYAL FAR WEST SCHOOL	596m	East
314263	Place Of Worship	SALVATION ARMY CHURCH	597m	North East
416986	Art Gallery	RAGLAN GALLERY	605m	North East
336305	Beach	MANLY BEACH	654m	East
286460	Park	KANGAROO PARK	679m	North
379611	General Hospital	MANLY WATERS PRIVATE HOSPITAL	685m	South East
314244	Park	SOUTH STEYNE PARK	709m	East
416985	Grave	Grave	745m	North East
308874	Community Facility	MANLY SLSC	791m	East
314299	Natural Waterbody	NORTH HARBOUR	797m	South
336306	Beach	NORTH STEYNE BEACH	834m	North East
286461	Park	NORTH STEYNE PARK	850m	North East
337142	Suburb	FAIRLIGHT	864m	North West
286401	Park	ESPLANADE PARK	889m	West
406542	Boat Ramp	Boat Ramp	890m	South East
406548	Slipway	Slipway	922m	West
336135	Beach	LITTLE MANLY BEACH	925m	South East
406549	Slipway	Slipway	925m	West
286465	Park	LITTLE MANLY RESERVE	928m	South East
406550	Slipway	Slipway	931m	West
357626	Bay Like	JILLING COVE	942m	West
336138	Headland	SMEDLEYS POINT	959m	South
286485	Community Facility	NORTH STEYNE SLSC	969m	North East
425401	Historic Site	LITTLE MANLY COVE POOL	980m	South East
286508	Sports Court	TENNIS COURTS	987m	North West

Topographic Data Source: © Land and Property Information (2015)
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Topographic Features

Manly Sea Life (West Esplanade), Manly, NSW 2095

Tanks (Areas)

What are the Tank Areas located within the dataset buffer?
Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
N/A	No records in buffer					

Tanks (Points)

What are the Tank Points located within the dataset buffer?
Note. The large majority of tank features provided by LPI are derived from aerial imagery & are therefore primarily above ground tanks.

Map Id	Tank Type	Status	Name	Feature Currency	Distance	Direction
N/A	No records in buffer					

Tanks Data Source: © Land and Property Information (2015)
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Major Easements

What Major Easements exist within the dataset buffer?
Note. Easements provided by LPI are not at the detail of local governments. They are limited to major easements such as Right of Carriageway, Electrical Lines (66kVa etc.), Easement to drain water & Significant subterranean pipelines (gas, water etc.).

Map Id	Easement Class	Easement Type	Easement Width	Distance	Direction
183292035	Primary	Right of way	3 Wide	408m	North East
120116188	Primary	Undefined		512m	North
120116163	Primary	Undefined		552m	South East
120108452	Primary	Undefined		860m	South East

Easements Data Source: © Land and Property Information (2015)
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Topographic Features

Manly Sea Life (West Esplanade), Manly, NSW 2095

State Forest

What State Forest exist within the dataset buffer?

State Forest Number	State Forest Name	Distance	Direction
N/A	No records in buffer		

State Forest Data Source: © NSW Department of Finance, Services & Innovation (2018)
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National Parks and Wildlife Service Reserves

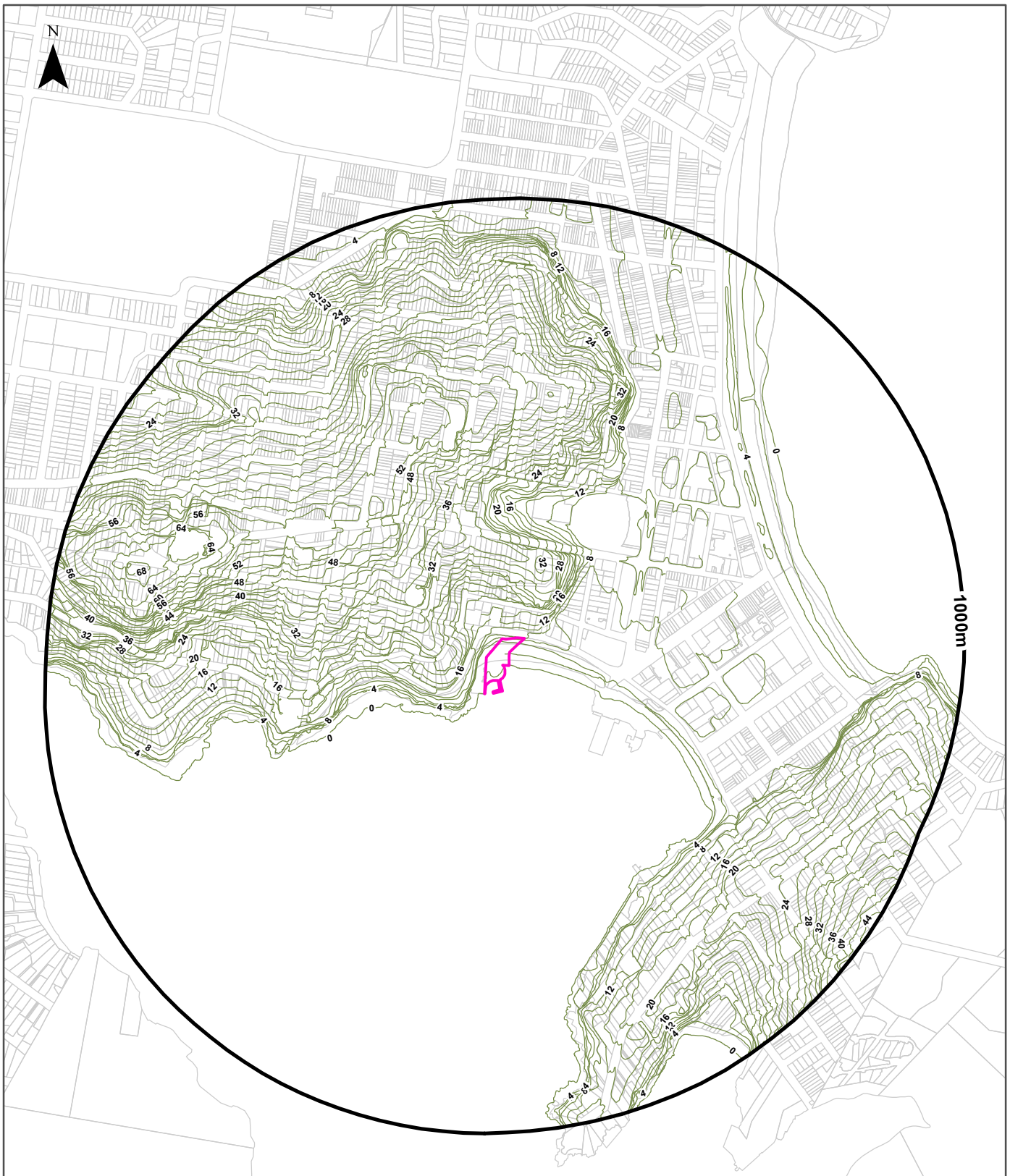
What NPWS Reserves exist within the dataset buffer?

Reserve Number	Reserve Type	Reserve Name	Gazetted Date	Distance	Direction
N/A	No records in buffer				

NPWS Data Source: © NSW Department of Finance, Services & Innovation (2018)
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Elevation Contours (m AHD)

Manly Sea Life (West Esplanade), Manly, NSW 2095



Legend

- Elevation Contour (m AHD)
- Site Boundary
- Buffer 1000m
- Property Boundary

Accuracy & Currency: This contour data can be up to 0.4 of the contour interval out in height and must therefore not be used for any design or engineering works, but only as a general guide to topography. Gaps may occur along contour lines due to vertical topography, obscured topography in the source photography such as buildings, dense vegetation or dead ground, or the fact that original buildings have been replaced in the intervening thirty years since the original contour capture.

Scale: 0 100 200 400 Meters	Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2022	Coordinate System: GDA 1994 MGA Zone 56	Date: 30 November 2022

Hydrogeology & Groundwater

Manly Sea Life (West Esplanade), Manly, NSW 2095

Hydrogeology

Description of aquifers within the dataset buffer:

Description	Distance	Direction
Porous, extensive aquifers of low to moderate productivity	0m	On-site

Hydrogeology Map of Australia : Commonwealth of Australia (Geoscience Australia)
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Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018

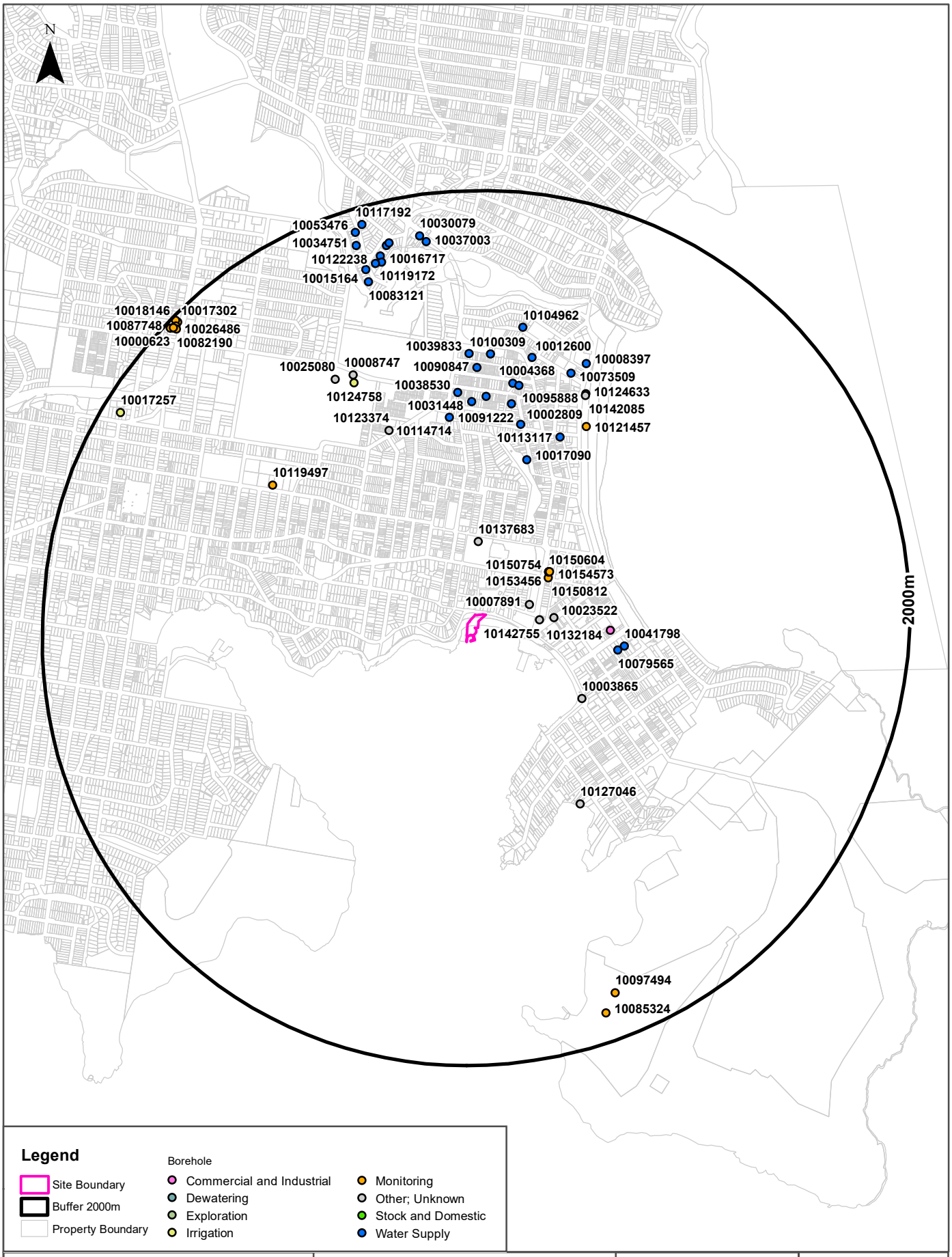
Temporary water restrictions relating to the Botany Sands aquifer within the dataset buffer:

Prohibition Area No.	Prohibition	Distance	Direction
N/A	No records in buffer		

Temporary Water Restriction (Botany Sands Groundwater Source) Order 2018 Data Source : NSW Department of Primary Industries

Groundwater Boreholes

Manly Sea Life (West Esplanade), Manly, NSW 2095



Hydrogeology & Groundwater

Manly Sea Life (West Esplanade), Manly, NSW 2095

Groundwater Boreholes

Boreholes within the dataset buffer:

NGIS Bore ID	NSW Bore ID	Bore Type	Status	Drill Date	Bore Depth (m)	Reference Elevation	Height Datum	Salinity (mg/L)	Yield (L/s)	SWL (mbgl)	Distance	Direction
10007891	GW110294	Other	Unknown	22/05/2009	8.00		AHD		1.000	4.00	212m	East
10142755	GW109245	Other	Proposed	20/08/2008	11.00		AHD	140	1.000	4.80	255m	East
10023522	GW109304	Other	Unknown	08/09/2008	8.54		AHD	Good	1.000	4.83	323m	East
10150812	GW116659	Monitoring	Functioning	15/08/2017	13.20		AHD				343m	North East
10137683	GW106341	Other	Unknown	14/04/2004	42.50		AHD	374	3.100	18.30	344m	North
10153456	GW116140	Monitoring	Functional	14/08/2017	13.00		AHD				360m	North East
10150604	GW116139	Monitoring	Functional	14/08/2017	12.60		AHD				361m	North East
10150754	GW116139	Monitoring	Functional	14/08/2017	12.60		AHD				361m	North East
10154573	GW116138	Monitoring	Functional	15/08/2017	13.20		AHD				364m	North East
10003865	GW109306	Other	Unknown	08/09/2008	5.79		AHD	Good	1.000	5.80	575m	South East
10132184	GW102856	Commercial and Industrial	Unknown	01/01/1994	28.70		AHD	37	0.180	4.30	593m	East
10079565	GW108552	Water Supply	Functioning	19/02/2007	6.00		AHD	Good	0.500	4.00	645m	East
10041798	GW105988	Water Supply	Functioning	28/02/2004	6.00		AHD	Good	0.500	3.00	670m	East
10017090	GW108919	Water Supply	Unknown	17/06/2008	6.10		AHD	250	0.900	4.00	756m	North
10113117	GW108848	Water Supply	Unknown	18/05/2007	12.00		AHD				909m	North East
10002809	GW108941	Water Supply	Unknown	19/06/2008	10.00		AHD				912m	North
10127046	GW108707	Other	Functioning	25/05/2004	4.70		AHD	128	1.000	3.20	918m	South East
10114714	GW110443	Water Supply	Unknown	12/03/2009	8.00		AHD				939m	North
10123374	GW106691	Other	Unknown	23/11/2004	30.50		AHD	440	7.800	4.20	958m	North West
10091222	GW111691	Water Supply	Functioning	04/10/2010	9.00		AHD				1002m	North
10031448	GW108845	Water Supply	Unknown	30/04/2007	12.00		AHD				1005m	North
10121457	GW109652	Monitoring	Unknown	27/07/2008	6.00		AHD	130		2.70	1007m	North East
10130088	GW110630	Water Supply	Unknown	04/01/2010	6.25		AHD	225	0.900	2.70	1028m	North
10038530	GW108530	Water Supply	Functioning	23/01/2007	4.00		AHD	Good	0.500	2.00	1053m	North
10095888	GW111499	Water Supply	Functioning	31/01/2011	2.50		AHD				1093m	North
10004368	GW108424	Water Supply	Unknown	04/02/2007	8.00		AHD				1100m	North
10119497	GW108323	Monitoring	Unknown	13/12/2005	162.50		AHD	248	0.400	8.00	1127m	North West
10142085	GW106339	Other	Unknown	02/04/2004	7.50		AHD	300	0.500	5.50	1135m	North East
10124633	GW109320	Other	Unknown	10/09/2008	7.50		AHD	300	0.500	5.50	1144m	North East
10090847	GW108289	Water Supply	Functioning	20/10/2006	4.00		AHD		0.500	2.00	1164m	North

NGIS Bore ID	NSW Bore ID	Bore Type	Status	Drill Date	Bore Depth (m)	Reference Elevation	Height Datum	Salinity (mg/L)	Yield (L/s)	SWL (mbgl)	Distance	Direction
10073509	GW108231	Water Supply	Functioning	18/10/2006	7.70		AHD		1.000	4.50	1208m	North
10100309	GW023992	Water Supply	Unknown	01/05/1966	4.20		AHD	Good			1228m	North
10039833	GW025701	Water Supply	Unknown	01/12/1965	2.70		AHD				1231m	North
10012600	GW106151	Water Supply	Functioning	18/06/2004	7.00		AHD		0.500	5.00	1232m	North
10124758	GW037353	Irrigation	Unknown	01/11/1973	13.70		AHD				1234m	North West
10008747	GW107823	Other	Unknown	20/01/1977	15.20		AHD		4.500	1.80	1268m	North West
10008397	GW106839	Water Supply	Functioning	05/02/2004	7.93		AHD	Good	1.000	5.49	1276m	North East
10025080	GW107822	Other	Unknown	01/01/1980			AHD				1291m	North West
10104962	GW017206	Water Supply	Functioning	01/01/1958	3.30		AHD	Good			1366m	North
10083121	GW108546	Water Supply	Functioning	29/01/2007	4.00		AHD	Good	0.500	2.00	1649m	North
10015164	GW109007	Water Supply	Unknown	09/07/2008	8.00		AHD				1707m	North
10119172	GW108714	Water Supply	Functioning	30/04/2007	5.20		AHD	280	1.000	2.10	1721m	North
10122238	GW111902	Water Supply	Functioning	04/09/2007	5.50		AHD	285	1.000	2.10	1723m	North
10112795	GW108968	Water Supply	Unknown	26/06/2008	8.00		AHD				1750m	North
10037003	GW106808	Water Supply	Functioning	08/12/2004	3.00		AHD	Good	0.500	1.00	1775m	North
10016717	GW108909	Water Supply	Unknown	12/06/2008	5.50		AHD	280	0.800	21.00	1790m	North
10097494	GW113313	Monitoring	Functional	28/02/2005	3.60		AHD				1790m	South
10123503	GW109644	Water Supply	Unknown	03/10/2008	5.20		AHD	249	0.900	2.40	1800m	North
10030079	GW110726	Water Supply	Unknown	06/03/2007	4.00		AHD	Good	0.500	2.00	1806m	North
10034751	GW107190	Water Supply	Functioning	07/07/2005	6.00		AHD		0.500	2.00	1829m	North
10085324	GW113314	Monitoring	Functional	28/02/2005	2.50		AHD				1864m	South
10053476	GW105760	Water Supply	Functioning	05/01/2004	3.66		AHD		1.000	1.52	1889m	North
10017257	GW016945	Irrigation	Unknown	01/12/1957	3.90		AHD	Good			1914m	North West
10117192	GW107619	Water Supply	Functioning	21/11/2005	6.10		AHD		1.000	2.50	1915m	North
10082190	GW112114	Monitoring	Functional	26/11/2002	6.20		AHD				1949m	North West
10026486	GW112113	Monitoring	Functional	25/03/2013	6.20		AHD				1958m	North West
10000623	GW103769	Monitoring	Unknown	07/04/1995	3.50		AHD				1964m	North West
10018988	GW103768	Monitoring	Unknown	07/04/1995	3.60		AHD				1964m	North West
10024847	GW103766	Monitoring	Unknown	03/09/1991	2.40		AHD				1964m	North West
10051408	GW103767	Monitoring	Unknown	03/09/1991	2.10		AHD				1964m	North West
10111661	GW103765	Monitoring	Unknown	03/09/1991	5.00		AHD				1964m	North West
10017302	GW112112	Monitoring	Functional	25/11/2002	6.20		AHD				1966m	North West
10087748	GW112111	Monitoring	Functional	27/11/2002	6.20		AHD				1973m	North West
10018146	GW112115	Monitoring	Functional	25/11/2002	6.00		AHD				1979m	North West

Borehole Data Source: Bureau of Meteorology; Water NSW. Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

Hydrogeology & Groundwater

Manly Sea Life (West Esplanade), Manly, NSW 2095

Driller's Logs

Drill log data relevant to the boreholes within the dataset buffer:

NGIS Bore ID	Drillers Log	Distance	Direction
10007891	0.00m-0.30m TOPSOIL 0.30m-0.60m RUBBLE 0.60m-0.70m DARK SOIL 0.70m-0.80m SANDSTONE/RUBBLE 0.80m-1.80m SAND GREY 1.80m-2.90m SAND WHITE 2.90m-3.60m SOIL DARK 3.60m-3.80m SAND BROWN 3.80m-4.00m SAND YELLOW 4.00m-8.00m SAND WHITE	212m	East
10142755	0.00m-0.20m TOPSOIL 0.20m-1.50m SANDSTONE,RUBBLE 1.50m-3.00m SAND GREY 3.00m-9.00m SAND YELLOW 9.00m-11.00m SAND GREY	255m	East
10023522	0.00m-8.54m UNCONSOLIDATED ALL SANDS	323m	East
10137683	0.00m-2.50m FILL AND ROCKS 2.50m-25.00m SANDSTONE L/BROWN,SOFT BANDS 25.00m-26.50m SANDSTONE FINE QUARTZ 26.50m-28.50m SANDSTONE QUARTZ 28.50m-29.00m SANDSTONE GREY 29.00m-29.50m QUARTZ 29.50m-36.00m SANDSTONE GREY 36.00m-36.20m SANDSTONE QUARTZ 36.20m-36.60m SANDSTONE GREY 36.60m-36.70m SANDSTONE FRACTURED 36.70m-40.00m SANDSTONE GREY 40.00m-42.50m SANDSTONE DARK GREY	344m	North
10003865	0.00m-5.79m UNCONSOLIDATED ALL SANDS	575m	South East
10132184	0.00m-4.20m SAND 4.20m-4.30m ROCK COFFEE 4.30m-8.40m SAND 8.40m-8.60m ROCK 8.60m-12.80m SAND 12.80m-12.90m SILT 12.90m-13.90m ROCK 13.90m-28.60m SAND 28.60m-28.70m ROCK	593m	East
10079565	0.00m-0.30m Topsoil 0.30m-2.50m Sand, yellow 2.50m-6.00m Sand, grey	645m	East
10041798	0.00m-0.50m topsoil 0.50m-3.00m sand, yellow with rock fill 3.00m-6.00m sand, good yellow	670m	East
10113117	0.00m-12.00m sand	909m	North East
10127046	0.00m-0.20m mud 0.20m-0.50m sand, yellw 0.50m-1.00m sand, grey 1.00m-2.10m sand, white 2.10m-3.20m sand, soil 3.20m-4.70m sand, grey	918m	South East
10114714	0.00m-5.00m SAND 5.00m-8.00m CLAY	939m	North

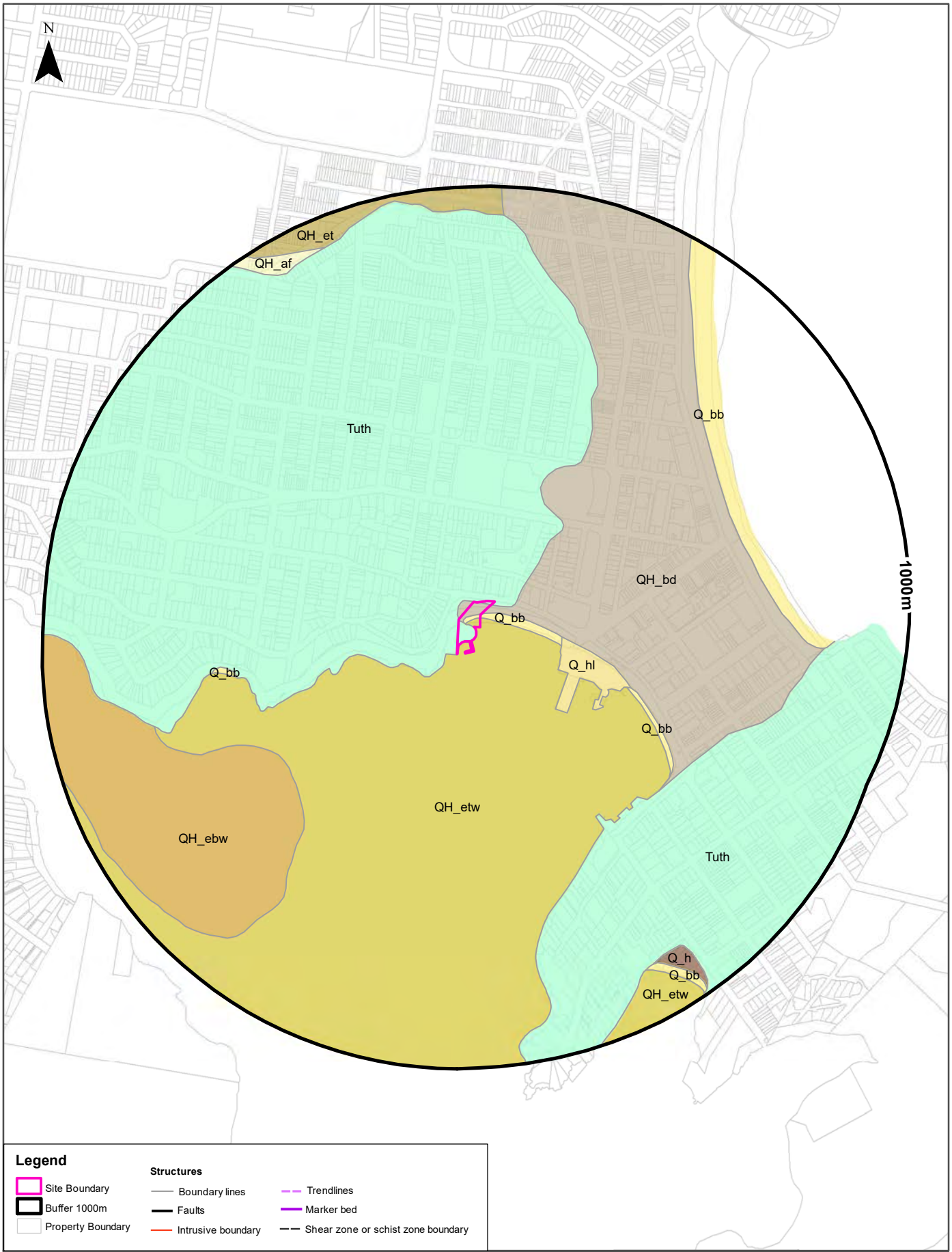
NGIS Bore ID	Drillers Log	Distance	Direction
10123374	0.00m-4.60m SAND L/GREY 4.60m-6.80m DARK SANDSTONE AND QUARTZ 6.80m-12.20m L/GREY SANDSTONE 12.20m-12.80m DARK SANDSTONE AND QUARTZ 12.80m-18.20m L/GREY SANDSTONE 18.20m-19.50m GREY SANDSTONE AND QUARTZ (W) 19.50m-20.30m GREY SANDSTONE 20.30m-22.00m BROWN SANDSTONE,COARSE 22.00m-27.30m L/GREY SANDSOTNE 27.30m-28.00m L/GREY SANDSTONE AND QUARTZ 28.00m-29.00m GREY SANDSTONE 29.00m-29.80m GREY SANDSONE COARSE GRAINED 29.80m-30.50m L/GREY SANDSTONE	958m	North West
10091222	0.00m-9.00m SAND	1002m	North
10031448	0.00m-12.00m sand	1005m	North
10121457	0.00m-4.00m SAND YELLOW 4.00m-6.00m SAND HARD	1007m	North East
10130088	0.00m-0.40m TOPSOIL 0.40m-0.60m SAND DARK 0.60m-1.00m WHITE SAND 1.00m-2.50m SAND MIXED 2.50m-2.70m DARK SOIL 2.70m-6.25m SAND MIXED	1028m	North
10038530	0.00m-0.30m Topsoil 0.30m-2.50m Sand, yellow 2.50m-4.00m Sand, brown	1053m	North
10004368	0.00m-8.00m Sand	1100m	North
10119497	0.00m-0.50m SAND 0.50m-2.50m CLAY 2.50m-11.00m SANDSTONE L/BROWN 11.00m-16.00m SANDSTONE GREY 16.00m-17.00m SANDSTONE BROWN 17.00m-18.00m SANDSTONE D/G 18.00m-27.00m SANDSTONE QUARTZ BANDS 27.00m-27.50m QUARTZ COURSE 27.50m-45.00m SANDSTONE GREY 45.00m-45.10m SANDSTONE FRACTURED 45.10m-68.00m SANDSTONE G.D/G 68.00m-76.00m SILTSTONE, D/G 76.00m-142.00m SANDSTONE GREY 142.00m-151.00m SANDSTONE D/G 151.00m-155.00m SANDSTONE GREY 155.00m-162.50m SANDSTONE D/G	1127m	North West
10142085	0.00m-1.00m BROWN SANDY LOAM 1.00m-5.50m SAND 5.50m-7.50m SAND	1135m	North East
10124633	0.00m-1.00m BROWN SANDY LOAM 1.00m-5.50m SAND 5.50m-7.50m SAND	1144m	North East
10090847	0.00m-0.30m topsoil 0.30m-3.20m sand, grey 3.20m-4.00m sand, brown	1164m	North
10073509	0.00m-1.00m topsoil 1.00m-7.70m sand, yellow	1208m	North
10100309	0.00m-0.91m Sand 0.91m-2.13m Clay White 2.13m-4.26m Sand Grey Black Water Supply	1228m	North
10039833	0.00m-1.82m Sand Grey 0.00m-1.82m Clay Grey 1.82m-2.74m Sand White Grey Water Supply	1231m	North
10012600	0.00m-0.30m topsoil 0.30m-5.00m sand, yellow 5.00m-7.00m sand, yellow with small shells	1232m	North
10124758	0.00m-0.91m Soil Black Sandy 0.91m-4.72m Sand Grey Water Supply 4.72m-5.49m Clay Grey 5.49m-9.45m Sand Grey Water Supply 9.45m-12.80m Sand Grey Some Peaty Fine Water Supply 12.80m-13.72m Sand Grey 12.80m-13.72m Clay Bands	1234m	North West

NGIS Bore ID	Drillers Log	Distance	Direction
10008747	0.00m-0.90m BLACK SANDY SOIL 0.90m-4.60m GREY SAND (W.B) 4.60m-5.50m GREY CLAY 5.50m-9.50m GREY AND BROWN SAND(W.B) 9.50m-12.80m GREY SAND WITH FINE PEATY SANDS 12.80m-15.20m GREY SAND WITH BANDS OF CLAY	1268m	North West
10008397	0.00m-7.93m Sand, unconsolidated	1276m	North East
10104962	0.00m-3.35m Sand Water Supply	1366m	North
10083121	0.00m-0.30m Topsoil 0.30m-1.50m Sand, yellow 1.50m-4.00m Sand, grey	1649m	North
10119172	0.00m-2.00m topsoil 2.00m-2.10m sand, grey 2.10m-5.20m sand, grey and shells	1721m	North
10122238	0.00m-0.20m TOPSOIL 0.20m-2.10m SAND GREY 2.10m-5.50m SAND GREY / SHELLS	1723m	North
10037003	0.00m-0.30m topsoil 0.30m-1.50m silty sand, brown 1.50m-3.00m sand, grey	1775m	North
10123503	0.00m-0.10m TOPSOIL 0.10m-0.25m RUBBLE 0.25m-0.50m WHITE SAND 0.50m-1.00m SAND 1.00m-2.50m SAND/TOPSOIL 2.50m-4.00m DARK SAND 4.00m-5.20m SAND/ SHELLS	1800m	North
10030079	0.00m-2.00m SAND YELLOW 2.00m-4.00m SAND LIGHT BROWN	1806m	North
10034751	0.00m-6.00m sand	1829m	North
10053476	0.00m-3.66m sand, fine unconsolidated	1889m	North
10017257	0.00m-2.74m Loam Water Supply 2.74m-3.96m Sand Water Supply	1914m	North West
10117192	0.00m-6.10m sand	1915m	North
10000623	0.00m-0.10m CONCRETE 0.10m-0.50m FILL,BROWN 0.50m-2.40m SAND ORANGE,BROWN,GREY,CLAYEY 2.40m-3.50m SANDSTONE,WHITE,FINE	1964m	North West
10018988	0.00m-0.10m CONCRETE/FILL BROWN 0.10m-1.00m SAND MUSTARD BROWN 1.00m-3.60m SAND WEATHERED PINKISH/GREY/GREY	1964m	North West
10024847	0.00m-1.20m SAND CLEAN NO ODOUR 1.20m-2.40m SAND STAINED, STRONG HYDROCARBON ODOUR	1964m	North West
10051408	0.00m-1.20m SAND TANK PIT BACKFILL 1.20m-2.10m CLAY/GREY/YELLOW/PLASTIC	1964m	North West
10111661	0.00m-1.00m CLAY,MEDIUM BROWN 1.00m-2.00m CLAY REDDISH BROWN 2.00m-2.30m CLAY GREY 2.30m-3.00m CLAY WEATHERED 3.00m-4.00m CLAY GREY FINE 4.00m-5.00m CLAY MOIST SEMIPLASTIC	1964m	North West

Drill Log Data Source: Bureau of Meteorology; Water NSW. Creative Commons 3.0 © Commonwealth of Australia http://creativecommons.org/licenses/by/3.0/au/deed.en

Geology

Manly Sea Life (West Esplanade), Manly, NSW 2095



Geology

Manly Sea Life (West Esplanade), Manly, NSW 2095

Geological Units

What are the Geological Units within the dataset buffer?

Unit Code	Unit Name	Description	Unit Stratigraphy	Age	Dominant Lithology	Distance
Tuth	Hawkesbury Sandstone	Medium- to coarse-grained quartz sandstone with minor shale and laminite lenses.	/Ungrouped Triassic units//Hawkesbury Sandstone//	Anisian (base) to Anisian (top)	Sandstone	0m
QH_bd	Coastal deposits - dune facies	Marine-deposited and aeolian-reworked coastal sand dunes.	/Coastal deposits//Coastal deposits - dune facies//	Holocene (base) to Now (top)	Sand	0m
QH_etw	Estuarine tidal delta flat (subaqueous)	Fine- to medium-grained lithic-carbonate-quartz sand (marine-deposited), silt, clay, shell material, polymictic gravel.	/Estuarine deposits//Estuarine tidal-delta flat/Estuarine tidal delta flat (subaqueous)/	Holocene (base) to Now (top)	Clastic sediment	0m
Q_bb	Coastal deposits - beach facies	Marine-deposited quartz-lithic fine- to medium-grained sand, shell and shell material, polymictic gravel.	/Coastal deposits//Coastal deposits - beach facies//	Quaternary (base) to Now (top)	Sand	0m
Q_hl	Anthropogenic breakwaters, embankments and artificial levees	Large concrete blocks and/or very large quarried boulders; unconsolidated conglomerate of either quarried or local cobbles to boulders with a clay to sandy matrix; sporadic sandy loam capping layers.	/Anthropogenic deposits//Anthropogenic breakwaters, embankments and artificial levees//	Quaternary (base) to Now (top)	Anthropogenic material	183m
QH_ebw	Estuarine basin and bay (subaqueous)	Clay, silt, shell, very fine- to fine-grained lithic-quartz (± carbonate) sand (fluvially- and/or marine-deposited).	/Estuarine deposits//Estuarine basin and bay/Estuarine basin and bay (subaqueous)/	Holocene (base) to Now (top)	Clastic sediment	490m
Q_h	Anthropogenic deposits	Anthropocene deposits varying from large man-made clasts (concrete blocks to building demolition rubble) to quarried natural boulders, with interstitial sand-sized to clay matrix.	/Anthropogenic deposits////	Quaternary (base) to Now (top)	Anthropogenic material	862m
QH_af	Alluvial floodplain deposits	Silt, very fine- to medium-grained lithic to quartz-rich sand, clay.	/Alluvium//Alluvial floodplain deposits//	Holocene (base) to Now (top)	Clastic sediment	911m
QH_et	Estuarine tidal-delta flat	Fine- to medium-grained lithic-carbonate-quartz sand (marine-deposited), silt, clay, shell material, polymictic gravel.	/Estuarine deposits//Estuarine tidal-delta flat//	Holocene (base) to Now (top)	Clastic sediment	927m

Linear Geological Structures

What are the Dyke, Sill, Fracture, Lineament and Vein trendlines within the dataset buffer?

Map ID	Feature Description	Map Sheet Name	Distance
No Features			

What are the Faults, Shear zones or Schist zones, Intrusive boundaries & Marker beds within the dataset buffer?

Map ID	Boundary Type	Description	Map Sheet Name	Distance
No Features				

Geological Data Source: Statewide Seamless Geology v2.1, Department of Regional NSW
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Naturally Occurring Asbestos Potential

Manly Sea Life (West Esplanade), Manly, NSW 2095

Naturally Occurring Asbestos Potential

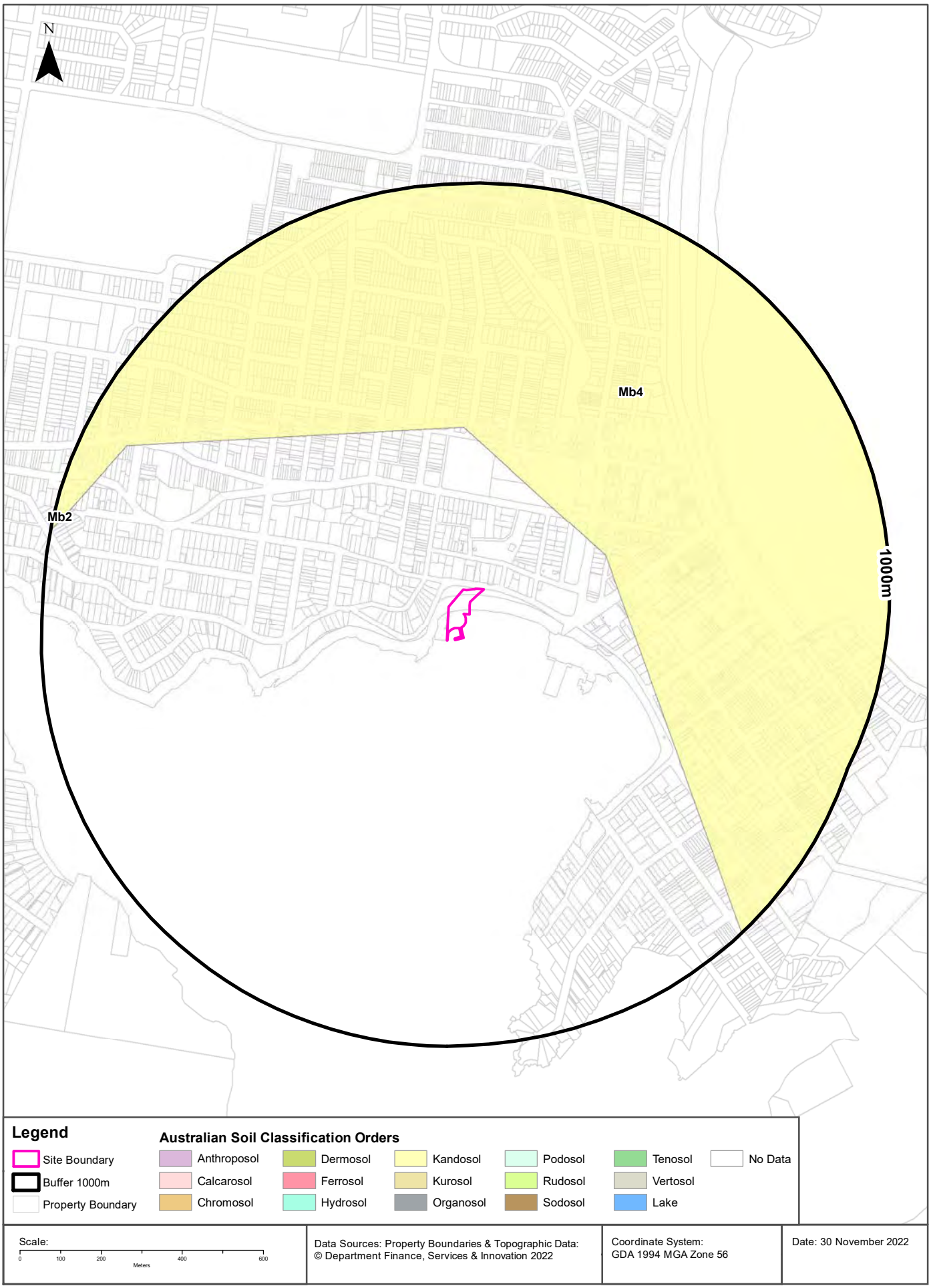
Naturally Occurring Asbestos Potential within the dataset buffer:

Potential	Sym	Strat Name	Group	Formation	Scale	Min Age	Max Age	Rock Type	Dom Lith	Description	Dist	Dir
No records in buffer												

Naturally Occurring Asbestos Potential Data Source: © State of New South Wales through NSW Department of Industry, Resources & Energy

Atlas of Australian Soils

Manly Sea Life (West Esplanade), Manly, NSW 2095



Soils

Manly Sea Life (West Esplanade), Manly, NSW 2095

Atlas of Australian Soils

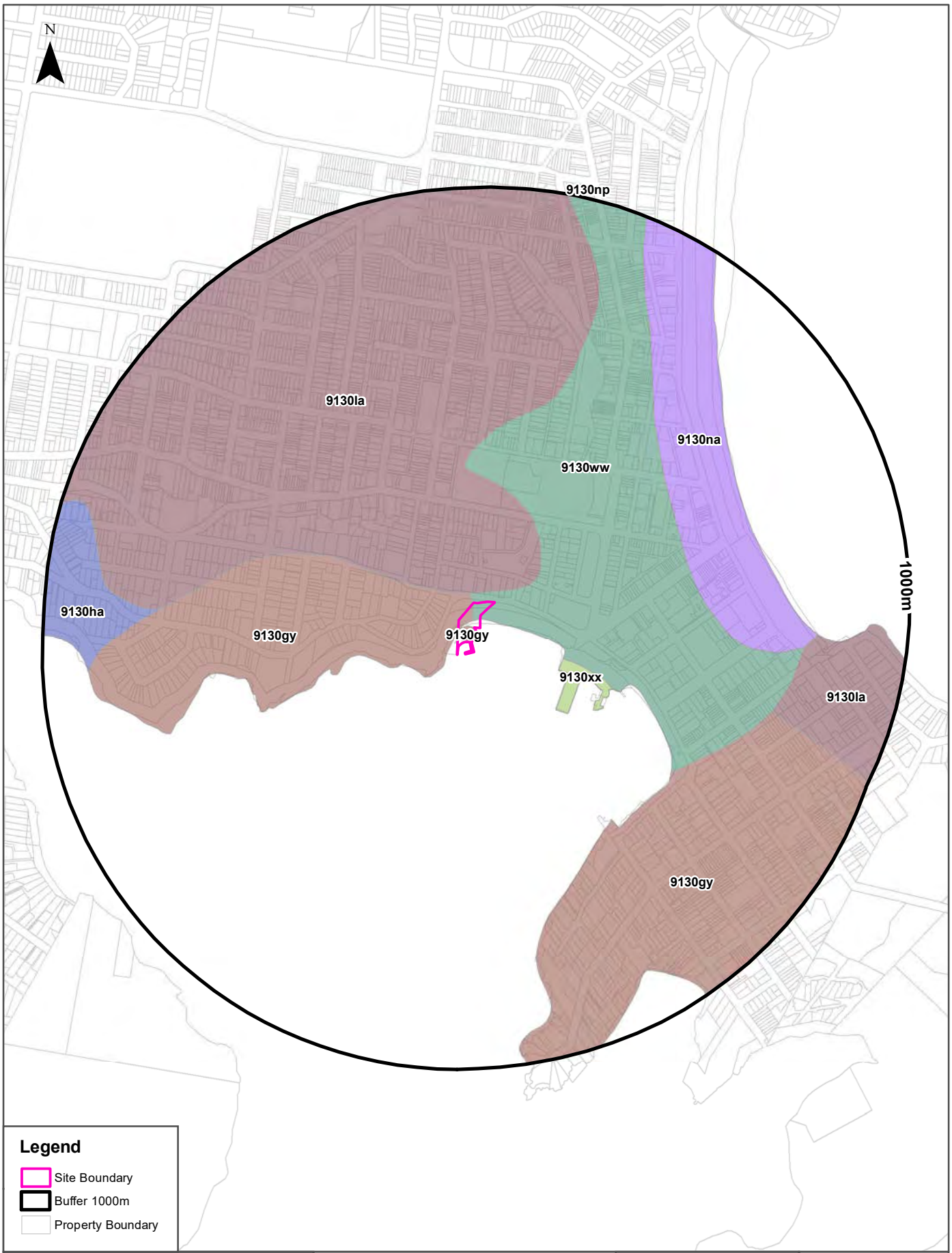
Soil mapping units and Australian Soil Classification orders within the dataset buffer:

Map Unit Code	Soil Order	Map Unit Description	Distance	Direction
Mb4	Kandosol	Coastal complex: chief soils are acid yellow leached earths (Gn2.74) and (Gn2.34), hard acidic yellow mottled soils (Dy3.41), and hard acidic red soils (Dr2.21). This unit includes headlands and rugged coastal areas of unit Mb2; ridges and slopes of unit Tb35; low-lying coastal areas of unit Cb27; and some swampy areas.	263m	North East
Mb2	Kandosol	Dissected sandstone plateau of moderate to strong relief with sandstone pillars, ledges, and slabs-- level to undulating ridges, irregularly benched slopes, steep ridges, cliffs, canyons, narrow sandy valleys: chief soils are (i) on areas of gentle to moderate relief, acid yellow leached earths (Gn2.74) and (Gn2.34) and acid leached yellow earths (Gn2.24)- sometimes these soils contain ironstone gravel; and (ii) on, or adjacent to, areas of strong relief, siliceous sands (Uc1.2), leached sands (Uc2.12) and (Uc2.2), and shallow forms of the above (Gn2) soils. Associated are: (i) on flat to gently undulating remnants of the original plateau surface, leached sands (Uc2.3), siliceous sands (Uc1.2), sandy earths (Uc5.22), and (Gn2) soils as for (i) above (these areas are in part comparable with unit Cb29); (ii) on flat ironstone gravelly remnants of the original plateau surface, (Gn2) soils as for unit Mb5(i); (iii) on gently undulating ridges where interbedded shales are exposed, shallow, often stony (Dy3.41), (Dr2.21), and related soils similar to unit Tb35; (iv) narrow valleys of (Uc2.3) soils flanked by moderate slopes of (Dy3.41) soils; (v) escarpments of steep hills with shallow (Dy) and (Dr) soils between sandstone pillars; and (vi) shallow (Um) soils, such as (Um6.21) on steep hills of basic rocks. As mapped, minor areas of units Mg20, Mm1, and Mw8 are included. Data are limited.	976m	West

Atlas of Australian Soils Data Source: CSIRO
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Soil Landscapes of Central and Eastern NSW

Manly Sea Life (West Esplanade), Manly, NSW 2095



Soils

Manly Sea Life (West Esplanade), Manly, NSW 2095

Soil Landscapes of Central and Eastern NSW

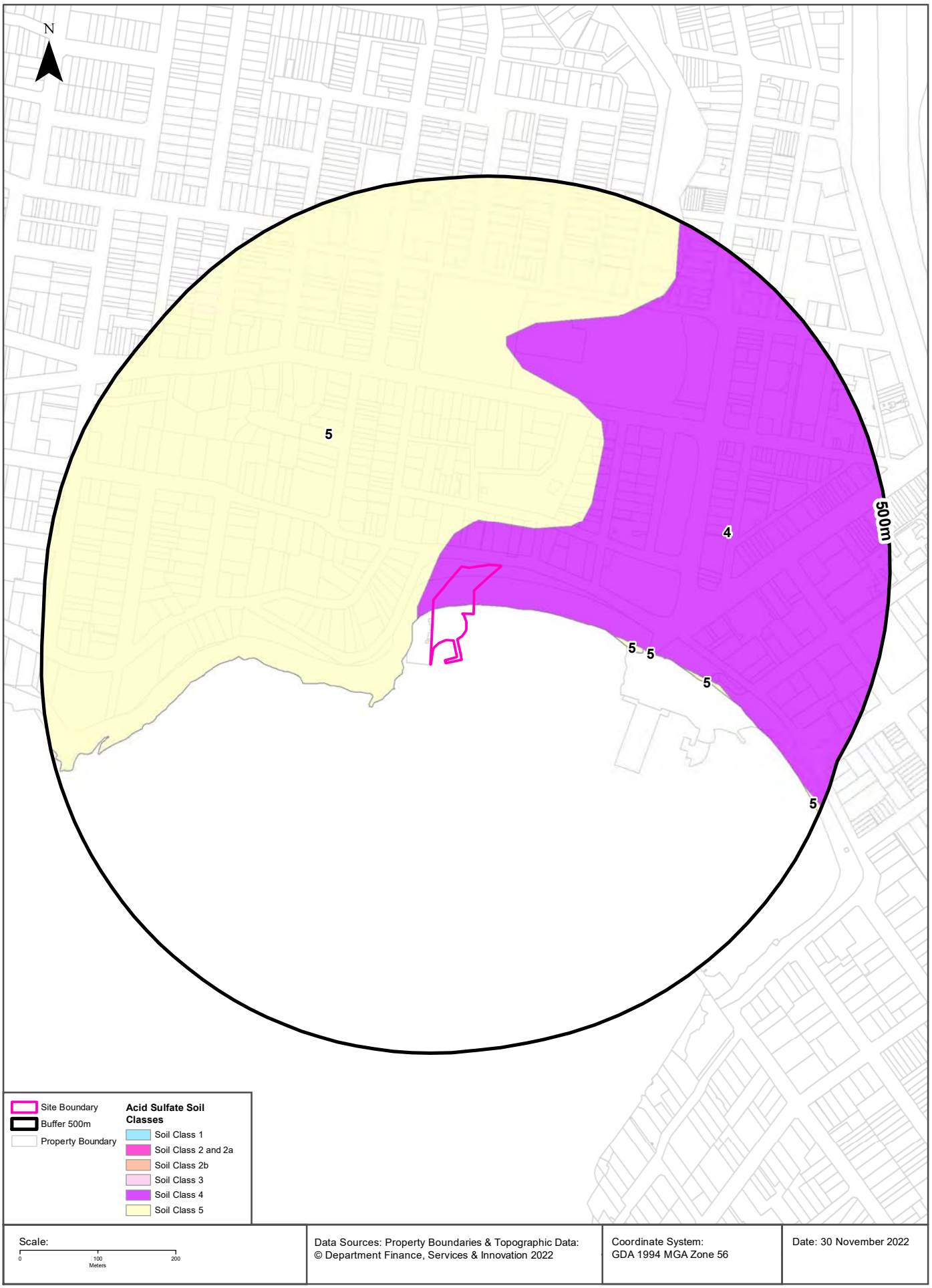
Soil Landscapes of Central and Eastern NSW within the dataset buffer:

Soil Code	Name	Distance	Direction
9130gy	Gymea	0m	On-site
9130ww	Woy Woy	0m	On-site
9130la	Lambert	24m	North West
9130xx	Disturbed Terrain	208m	South East
9130na	Narrabeen	470m	North East
9130ha	Hawkesbury	713m	West
9130np	Newport	997m	North

Soil Landscapes of Central and Eastern NSW: NSW Department of Planning, Industry and Environment
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Acid Sulfate Soils

Manly Sea Life (West Esplanade), Manly, NSW 2095



Acid Sulfate Soils

Manly Sea Life (West Esplanade), Manly, NSW 2095

Environmental Planning Instrument - Acid Sulfate Soils

What is the on-site Acid Sulfate Soil Plan Class that presents the largest environmental risk?

Soil Class	Description	EPI Name
4	Works more than 2 metres below natural ground surface present an environmental risk; Works by which the watertable is likely to be lowered more than 2 metres below natural ground surface, present an environmental risk	Manly Local Environmental Plan 2013

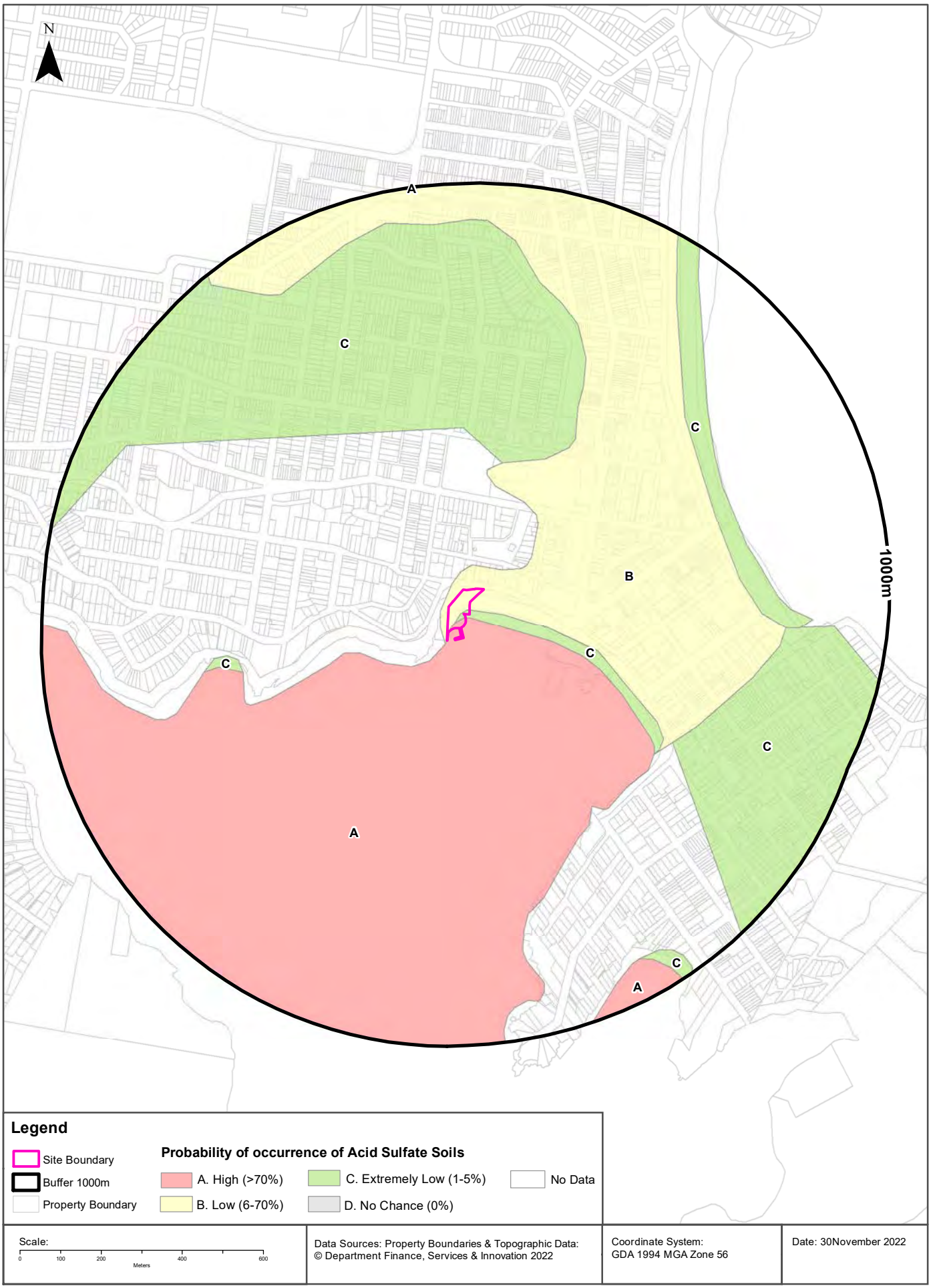
If the on-site Soil Class is 5, what other soil classes exist within 500m?

Soil Class	Description	EPI Name	Distance	Direction
N/A				

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Atlas of Australian Acid Sulfate Soils

Manly Sea Life (West Esplanade), Manly, NSW 2095



Acid Sulfate Soils

Manly Sea Life (West Esplanade), Manly, NSW 2095

Atlas of Australian Acid Sulfate Soils

Atlas of Australian Acid Sulfate Soil categories within the dataset buffer:

Class	Description	Distance	Direction
B	Low Probability of occurrence. 6-70% chance of occurrence.	0m	On-site
A	High Probability of occurrence. >70% chance of occurrence.	0m	On-site
C	Extremely low probability of occurrence. 1-5% chance of occurrence with occurrences in small localised areas.	0m	On-site

Atlas of Australian Acid Sulfate Soils Data Source: CSIRO
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Dryland Salinity

Manly Sea Life (West Esplanade), Manly, NSW 2095

Dryland Salinity - National Assessment

Is there Dryland Salinity - National Assessment data onsite?

No

Is there Dryland Salinity - National Assessment data within the dataset buffer?

No

What Dryland Salinity assessments are given?

Assessment 2000	Assessment 2020	Assessment 2050	Distance	Direction
N/A	N/A	N/A		

Dryland Salinity Data Source : National Land and Water Resources Audit
The Commonwealth and all suppliers of source data used to derive the maps of "Australia, Forecast Areas Containing Land of High Hazard or Risk of Dryland Salinity from 2000 to 2050" do not warrant the accuracy or completeness of information in this product. Any person using or relying upon such information does so on the basis that the Commonwealth and data suppliers shall bear no responsibility or liability whatsoever for any errors, faults, defects or omissions in the information. Any persons using this information do so at their own risk.
In many cases where a high risk is indicated, less than 100% of the area will have a high hazard or risk.

Mining

Manly Sea Life (West Esplanade), Manly, NSW 2095

Mining Subsidence Districts

Mining Subsidence Districts within the dataset buffer:

District	Distance	Direction
There are no Mining Subsidence Districts within the report buffer		

Mining Subsidence District Data Source: © Land and Property Information (2016)
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Mining & Exploration Titles

Manly Sea Life (West Esplanade), Manly, NSW 2095



Mining

Manly Sea Life (West Esplanade), Manly, NSW 2095

Current Mining & Exploration Titles

Current Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Grant Date	Expiry Date	Last Renewed	Operation	Resource	Minerals	Dist	Dir
N/A	No records in buffer								

Current Mining & Exploration Titles Data Source: © State of New South Wales through NSW Department of Industry

Current Mining & Exploration Title Applications

Current Mining & Exploration Title Applications within the dataset buffer:

Application Ref	Applicant	Application Date	Operation	Resource	Minerals	Dist	Dir
N/A	No records in buffer						

Current Mining & Exploration Title Applications Data Source: © State of New South Wales through NSW Department of Industry

Mining

Manly Sea Life (West Esplanade), Manly, NSW 2095

Historical Mining & Exploration Titles

Historical Mining & Exploration Titles within the dataset buffer:

Title Ref	Holder	Start Date	End Date	Resource	Minerals	Dist	Dir
EL0078	CONTINENTAL OIL CO OF AUSTRALIA LIMITED	19670201	19680201	MINERALS		0m	On-site
PEL0198	JOHN STREVENS (TERRIGAL) NL			PETROLEUM	Petroleum	0m	On-site
PEL463	DART ENERGY (APOLLO) PTY LTD			MINERALS		0m	On-site
PEL5	AGL UPSTREAM INVESTMENTS PTY LIMITED			MINERALS		0m	On-site
PEL0463	DART ENERGY (APOLLO) PTY LTD	20091010	20150603	PETROLEUM	Petroleum	0m	On-site
PEL0102	AUSTRALIAN OIL AND GAS CORPORATION LTD			PETROLEUM	Petroleum	0m	On-site
PSPAUTH17	MACQUARIE ENERGY PTY LTD	20070803	20080703	PETROLEUM	Petroleum	0m	On-site
PEL0279	THE ELECTRICITY COMMISSION OF NSW (TRADING AS PACIFIC POWER)	19910504	19931111	PETROLEUM	Petroleum	0m	On-site
PEL0210	THE AUSTRALIAN GAS LIGHT COMPANY (AGL), NORTH BULLI COLLIERIES PTY LTD			PETROLEUM	Petroleum	0m	On-site
PEL0260	NORTH BULLI COLLIERIES PTY LTD, AGL PETROLEUM OPERATIONS PTY LTD, THE AUSTRALIAN GAS LIGHT CO.	19810909	19930803	PETROLEUM	Petroleum	0m	On-site
PEP0002	LASKAN MINERALS LTD			PETROLEUM	Petroleum	30m	South

Historical Mining & Exploration Titles Data Source: © State of New South Wales through NSW Department of Industry

State Environmental Planning Policy

Manly Sea Life (West Esplanade), Manly, NSW 2095

State Significant Precincts

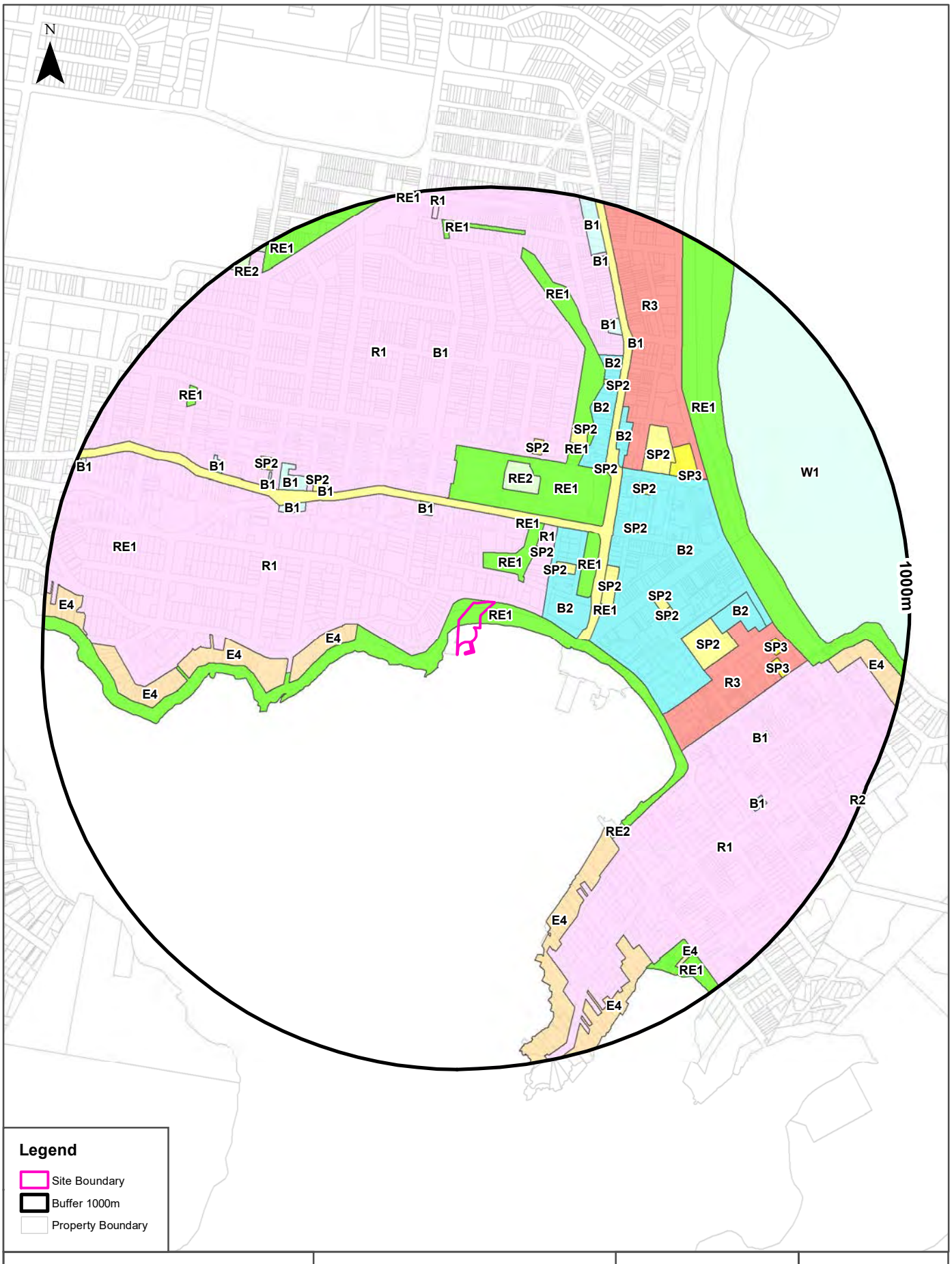
What SEPP State Significant Precincts exist within the dataset buffer?

Map Id	Precinct	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
N/A	No records in buffer							

State Environment Planning Policy Data Source: NSW Crown Copyright - Planning & Environment
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EPI Planning Zones

Manly Sea Life (West Esplanade), Manly, NSW 2095



Scale: 0 100 200 400 600 Meters	Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2022 Planning: NSW Crown Copyright - Planning & Environment	Coordinate System: GDA 1994 MGA Zone 56	Date: 30 November 2022

Environmental Planning Instrument

Manly Sea Life (West Esplanade), Manly, NSW 2095

Land Zoning

What EPI Land Zones exist within the dataset buffer?

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		0m	On-site
R1	General Residential		Manly Local Environmental Plan 2013	02/11/2018	02/11/2018	02/11/2018	Amendment No 14	1m	West
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		76m	North East
B2	Local Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		117m	East
SP2	Infrastructure	Sewerage System	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		153m	North East
SP2	Infrastructure	Place of Public Worship	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		162m	North East
R1	General Residential		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		167m	North East
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		195m	North East
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		197m	North East
SP2	Infrastructure	Classified Road	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		209m	North
RE1	Public Recreation		Manly Local Environmental Plan 2013	02/11/2018	02/11/2018	02/11/2018	Amendment No 14	228m	North East
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		233m	North
E4	Environmental Living		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		244m	West
B2	Local Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		245m	East
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		252m	East
SP2	Infrastructure	Public Administration Building	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		254m	East
R1	General Residential		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		261m	North
RE2	Private Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		274m	North
SP2	Infrastructure	Place of Public Worship	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		369m	North
SP2	Infrastructure	Place of Public Worship	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		370m	North East
SP2	Infrastructure	Place of Public Worship	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		380m	East
B2	Local Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		386m	North East
SP2	Infrastructure	Childcare Centre	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		403m	East
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		405m	North East
E4	Environmental Living		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		408m	West
SP2	Infrastructure	Community Facility	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		425m	North East
SP2	Infrastructure	Electricity Supply	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		434m	North East
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		439m	North

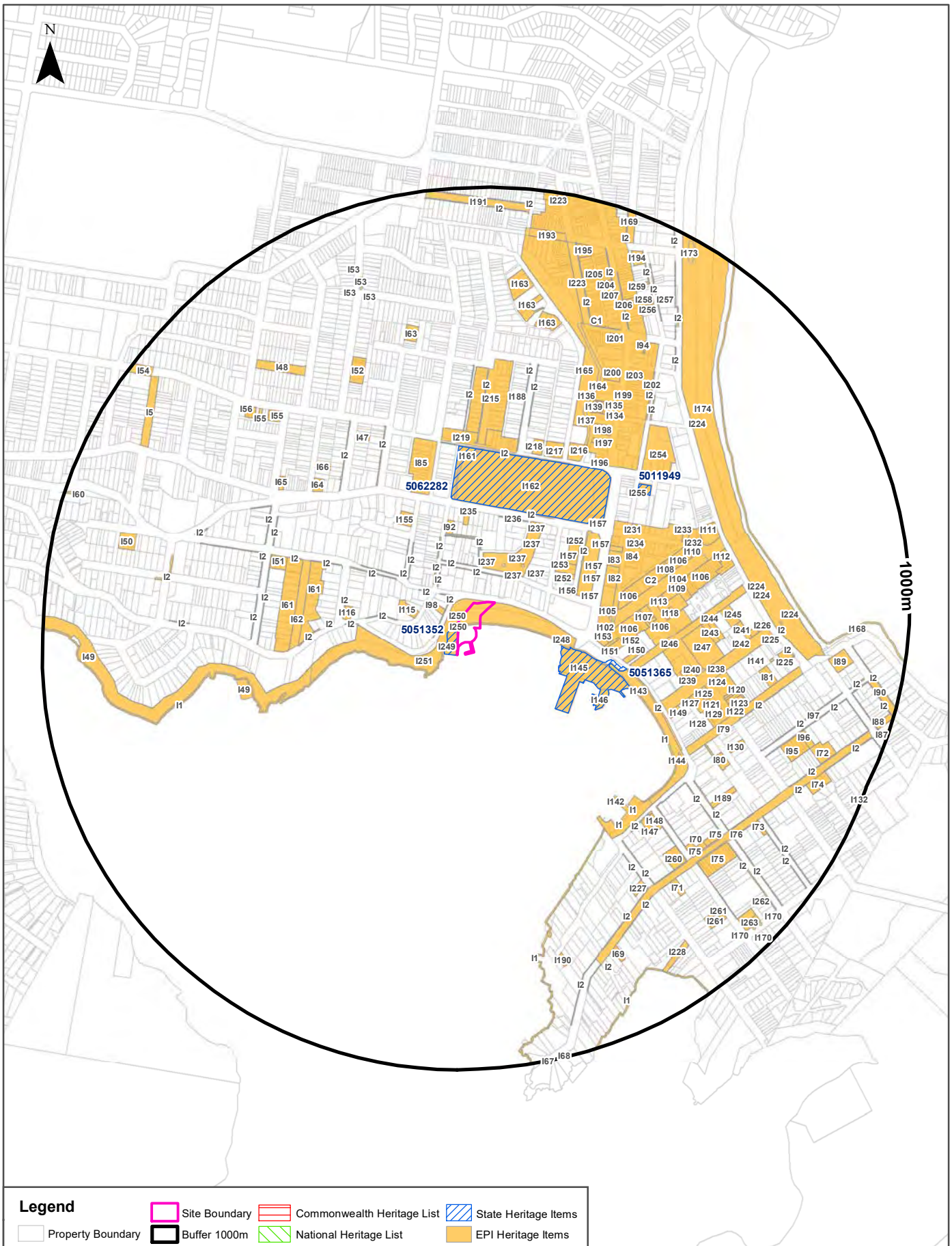
Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		444m	North West
B2	Local Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		444m	North East
R3	Medium Density Residential		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		446m	North East
SP2	Infrastructure	Emergency Services Facility	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		453m	North West
SP2	Infrastructure	Educational Establishment	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		455m	East
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		457m	North West
SP2	Infrastructure	Educational Establishment	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		475m	North East
R3	Medium Density Residential		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		477m	East
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		483m	North West
B2	Local Centre		Manly Local Environmental Plan 2013	12/09/2014	12/09/2014	02/11/2018	Amendment No 3	520m	East
SP3	Tourist		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		520m	North East
E4	Environmental Living		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		526m	South
RE2	Private Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		542m	South East
R1	General Residential		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		553m	South East
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		559m	North West
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		575m	North East
SP2	Infrastructure	Place of Public Worship	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		577m	North West
SP2	Infrastructure	Place of Public Worship	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		589m	North East
B2	Local Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		599m	North East
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		601m	North
W1	Natural Waterways		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		636m	North East
E4	Environmental Living		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		654m	West
SP3	Tourist		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		663m	East
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		673m	North West
SP3	Tourist		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		680m	East
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		702m	North East
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		704m	North East
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		707m	East
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		757m	South East
E4	Environmental Living		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		770m	South
RE1	Public Recreation		Manly Local Environmental Plan 2013	15/05/2015	15/05/2015	02/11/2018	Amendment No 5	806m	West
E4	Environmental Living		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		814m	East
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		823m	North West
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		847m	North

Zone	Description	Purpose	EPI Name	Published Date	Commenced Date	Currency Date	Amendment	Distance	Direction
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		855m	South East
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		867m	North
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		879m	North
E4	Environmental Living		Manly Local Environmental Plan 2013	21/03/2014	21/03/2014	02/11/2018	Amendment No 1	884m	South East
E4	Environmental Living		Manly Local Environmental Plan 2013	02/11/2018	02/11/2018	02/11/2018	Amendment No 14	894m	West
R1	General Residential	General Residential	Manly Local Environmental Plan 2013	02/05/2014	02/05/2014	02/11/2018	Amendment No 2	929m	North
RE1	Public Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		943m	North West
RE2	Private Recreation		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		966m	North West
B1	Neighbourhood Centre		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		973m	West
R2	Low Density Residential		Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018		986m	South East

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Heritage Items

Manly Sea Life (West Esplanade), Manly, NSW 2095



Legend

Property Boundary	Site Boundary	Commonwealth Heritage List	State Heritage Items
	Buffer 1000m	National Heritage List	EPI Heritage Items

Scale: 0 100 200 400 600 Meters

Data Sources: Property Boundaries & Topographic Data: © Department Finance, Services & Innovation 2022
Heritage - NSW Crown Copyright - Planning & Environment

Coordinate System: GDA 1994 MGA Zone 56

Date: 30 November 2022

Heritage

Manly Sea Life (West Esplanade), Manly, NSW 2095

Commonwealth Heritage List

What are the Commonwealth Heritage List Items located within the dataset buffer?

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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National Heritage List

What are the National Heritage List Items located within the dataset buffer?
Note. Please click on Place Id to activate a hyperlink to online website.

Place Id	Name	Address	Place File No	Class	Status	Register Date	Distance	Direction
N/A	No records in buffer							

Heritage Data Source: Australian Government Department of the Environment and Energy - Heritage Branch
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State Heritage Register - Curtilages

What are the State Heritage Register Items located within the dataset buffer?

Map Id	Name	Address	LGA	Listing Date	Listing No	Plan No	Distance	Direction
5051352	Manly Cove Pavilion	West Esplanade, Manly	NORTHERN BEACHES	18/04/2000	01433	2244	0m	On-site
5051365	Manly wharf	West Esplanade, Manly	NORTHERN BEACHES	18/04/2000	01434	2273	192m	South East
5062282	Ivanhoe Park (including Manly Oval) cultural landscape	Sydney Road, Manly	NORTHERN BEACHES	23/08/2019	02029	3225	228m	North East
5011949	Substation	34a-36 Whistler Street Manly	NORTHERN BEACHES	02/04/1999	00938	3080	433m	North East

Heritage Data Source: NSW Crown Copyright - Office of Environment & Heritage
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Environmental Planning Instrument - Heritage

What are the EPI Heritage Items located within the dataset buffer?

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
I250	Manly Cove amenities block	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	0m	On-site

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
I1	Harbour foreshores	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	0m	On-site
I251	Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	0m	On-site
I249	Manly Cove Pavilion	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	0m	On-site
I1	Harbour foreshores	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	5m	West
I250	Manly Cove amenities block	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	8m	North West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	40m	North West
I98	Residential flat building, 'Hilder Lea'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	42m	North West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	64m	North
I237	Reserve Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	76m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	85m	North
I237	Reserve Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	87m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	92m	North West
I237	Reserve Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	93m	North
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	98m	North West
I115	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	100m	West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	103m	North West
I237	Reserve Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	107m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	125m	North
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	138m	North West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	149m	West
I252	Residential flat buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	155m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	157m	North West
I253	Uniting Church	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	162m	North East
I237	Reserve Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	164m	North East

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
I156	Auckland Garage building (former service station)	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	167m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	172m	North West
I92	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	174m	North
I248	Governor Phillip Monument	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	179m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	180m	North West
I235	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	189m	North
I145		Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	192m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	195m	North East
I252	Residential flat buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	195m	North East
I157	Gilbert Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	197m	North East
I237	Reserve Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	203m	North East
I236	Dalley's Castle stone wall remnants	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	206m	North
I157	Gilbert Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	224m	East
I162	Ivanhoe Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	228m	North East
I157	Gilbert Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	229m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	230m	North East
I157	Gilbert Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	237m	East
I155	Houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	239m	North West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	242m	West
C2	Town Centre Conservation Area	Conservation Area - General	Local	Manly Local Environmental Plan 2013	09/10/2015	09/10/2015	02/11/2018	251m	East
I105	Unnamed triangular park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	252m	East
I82	Civic buildings, Council Town Hall Administration building, police station and court house	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	253m	East
I157	Gilbert Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	253m	North East

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
I161	The Ivanhoe Loop (former tram track route)	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	257m	North
I116	Residential flat building, 'Cumberland'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	260m	West
I153	Commercial and residential building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	261m	East
I102	2 cast iron pedestals (former street lights)	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	268m	East
I106	Group of commercial buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	272m	East
I114	Cast iron letter box	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	276m	East
I157	Gilbert Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	277m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	278m	West
I103	Monument, war memorial (cenotaph)	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	283m	East
I152	Commercial and residential building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	283m	East
I157	Gilbert Park	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	283m	North East
I85	Group of dwellings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	284m	North
I151	Terrace building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	289m	East
I104	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	290m	East
I83	Commercial and residential building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	290m	North East
I106	Group of commercial buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	295m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	301m	West
I146		Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	302m	South East
I84	Commercial and residential building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	303m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	308m	North West
I143	Park/Reserve	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	314m	South East
I61	Group of dwellings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	333m	West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	334m	West
I150	Two terrace houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	336m	East

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
I107	Commercial building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	343m	East
I106	Group of commercial buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	348m	East
I234	Group of 5 commercial buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	349m	North East
I49	Esplanade Park and Fairlight Pool	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	352m	West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	356m	South East
I246	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	357m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	358m	North
I219	Group of houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	363m	North
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	367m	North
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	367m	North West
I218	St Andrew's Presbyterian Church	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	369m	North
I231	Congregational Church	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	370m	North East
I119	Commercial and residential building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	370m	East
I217	St Andrew's Hall and manse	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	373m	North East
I62	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	374m	West
I215	Group of houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	377m	North
I113	St. Matthew's Church and church hall	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	380m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	383m	North
I216	Memorial Club	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	386m	North East
I61	Group of dwellings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	394m	West
I109	Group of commercial buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	401m	East
I108	Group of commercial buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	406m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	408m	West
I196	Baby health care centre building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	411m	North East

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
C1	The Pittwater Road Conservation Area	Conservation Area - General	Local	Manly Local Environmental Plan 2013	09/10/2015	09/10/2015	02/11/2018	411m	North
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	413m	North
I118	St. Matthew's Anglican Rectory	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	414m	East
I106	Group of commercial buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	419m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	422m	North West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	432m	North
I255	Electricity substation No 15009	Item - General	State	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	434m	North East
I51	Group of 3 houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	436m	West
I164	Natural escarpment	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	436m	North East
I106	Group of commercial buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	449m	East
I197	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	450m	North East
I64	Manly Fire Station	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	453m	North West
I247	Manly Village Public School	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	455m	East
I238	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	462m	East
I47	Semi-detached houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	465m	North West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	471m	West
I233	Commercial and residential building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	473m	North East
I66	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	473m	North West
I198	Pair of houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	474m	North East
I110	New Brighton Hotel	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	474m	East
I239	Residential flat building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	475m	East
I254	St Mary's Church, presbytery and school	Item - General	Local	Manly Local Environmental Plan 2013	12/09/2014	12/09/2014	02/11/2018	475m	North East
I240	Commercial and residential building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	480m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	481m	North West

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I142	Manly Rowing, Sailing, Yacht and Launch Club, group of buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	483m	South East
I232	Commercial and residential building (street facade only)	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	486m	East
I149	Residential building, 'Abbyleix'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	487m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	489m	West
I188	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	495m	North
I243	1920s school building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	499m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	501m	North West
I49	Esplanade Park and Fairlight Pool	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	503m	West
I244	Former School of Arts	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	509m	East
I140	Row house	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	514m	North East
I139	Row house	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	516m	North East
I138	Row house	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	517m	North East
I137	Row house	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	518m	North East
I111	Hotel Steyne	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	519m	East
I136	Row house	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	520m	North East
I135	Row house	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	521m	North East
I134	Row house	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	522m	North East
I117	Cast iron letter receiver (letter box)	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	523m	East
I199	Group of commercial and residential buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	524m	North East
I1	Harbour foreshores	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	525m	South
I65	2 commercial buildings, including the 'Rose Building'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	528m	North West
I125	Commercial and residential building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	532m	East
I1	Harbour foreshores	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	538m	South East
I124	Commercial and residential building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	538m	East

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I1	Harbour foreshores	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	539m	South East
I245	The Drummond far West Home	Item - General	Local	Manly Local Environmental Plan 2013	24/09/2015	24/09/2015	02/11/2018	541m	East
I112	Group of 4 commercial buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	541m	East
I126	Commercial and residential building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	547m	East
I144	Monument'memorial (broken fountain)	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	550m	South East
I127	Commercial and residential building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	552m	East
I79	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	559m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	569m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	570m	North East
I147	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	572m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	574m	South East
I148	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	575m	South East
I174	Beach Reserve, Merrett Park North Steyne and South Steyne	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	575m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	576m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	577m	North East
I128	One of a pair of semi-detached cottages	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	578m	East
I241	Residential flat building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	582m	East
I129	One of a pair of semi-detached cottages	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	583m	East
I52	Group of 6 houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	593m	North West
I120	One of a pair of semi-detached cottages	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	594m	East
I165	Kangaroo sculpture	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	597m	North East
I80	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	597m	South East
I121	One of a pair of semi-detached cottages	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	599m	East
I200	Salvation Army, private hotel	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	599m	North East

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I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	603m	South East
I122	Residential cottage	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	603m	East
I123	Residential flat building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	612m	East
I242	Residential flat building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	613m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	613m	South East
I224	Public shelters	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	627m	East
I226	House	Item - General	Local	Manly Local Environmental Plan 2013	12/09/2014	12/09/2014	02/11/2018	628m	East
I202	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	628m	North East
I203	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	633m	North East
I168	Ocean foreshores	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	634m	North East
I224	Public shelters	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	637m	East
I55	Group of 4 houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	641m	North West
I63	5 dwellings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	643m	North
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	645m	West
I224	Public shelters	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	649m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	649m	West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	651m	East
I130	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	653m	South East
I81	2 adjoining residential flat buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	655m	East
I225	Residential/ commercial buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	659m	East
I260	House, 'Merriwa'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	666m	South East
I163	Group of houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	668m	North
I189	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	675m	South East
I141	Electricity Substation No 16124	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	675m	East

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I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	675m	East
I55	Group of 4 houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	678m	North West
I227	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	679m	South East
I163	Group of houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	681m	North
I48	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	684m	North West
I224	Public shelters	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	686m	East
I201	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	687m	North East
I75	Group of dwellings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	690m	South East
I225	Residential/ commercial buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	691m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	692m	South East
I56	Stone terrace and adjoining house	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	692m	North West
I70	2 terrace houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	697m	South East
I94	Residential flat building, 'Kylemore'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	697m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	704m	West
I223	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	704m	North
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	706m	North
I76	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	706m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	706m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	707m	East
I75	Group of dwellings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	715m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	727m	South East
I71	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	728m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	729m	East
I163	Group of houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	729m	North

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I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	731m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	736m	South East
I75	Group of dwellings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	739m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	744m	East
I190	House, 'Trevitt House'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	753m	South
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	767m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	767m	North East
I95	Group of 6 semi-detached houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	769m	East
I206	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	782m	North East
I69	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	783m	South East
I256	Masonic Hall	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	784m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	785m	South
I207	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	787m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	788m	North East
I73	House, 'Wonga Binda'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	790m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	791m	South East
I257	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	794m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	794m	North
I96	House, 'Strathmore'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	796m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	797m	South East
I204	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	799m	North
I258	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	801m	North East
I50		Item - General	Local	Manly Local Environmental Plan 2013	25/09/2015	25/09/2015	02/11/2018	802m	West
I53	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	25/09/2015	25/09/2015	02/11/2018	803m	North

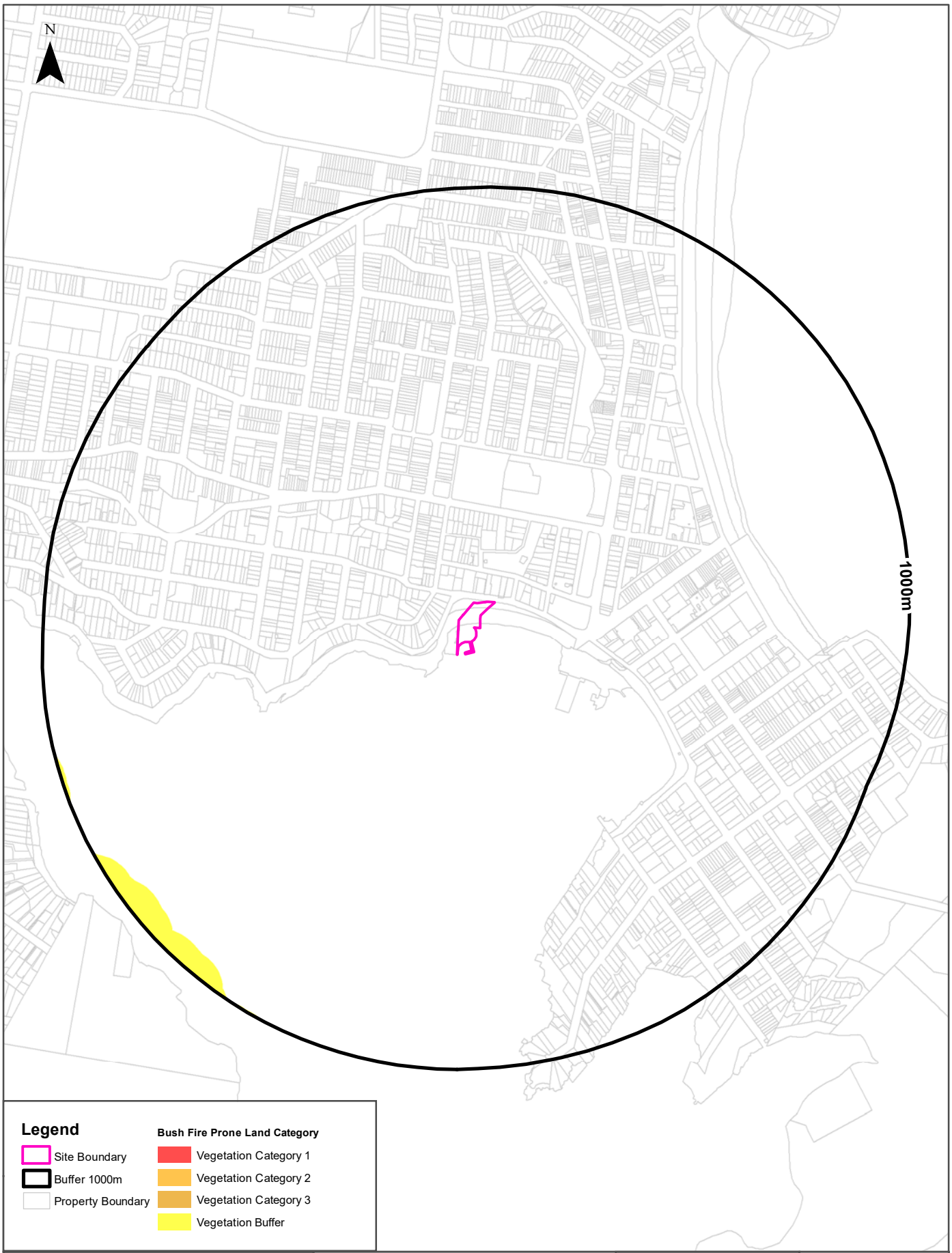
Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
I205	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	807m	North
I97	Port Jackson Fig (Ficus rubignosa)	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	810m	East
I53	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	25/09/2015	25/09/2015	02/11/2018	811m	North
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	811m	South
I89	Residential flat building, 'Borambil'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	814m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	814m	North East
I53	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	25/09/2015	25/09/2015	02/11/2018	817m	North
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	824m	South East
I53	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	25/09/2015	25/09/2015	02/11/2018	824m	North
I259	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	834m	North East
I72	Houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	836m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	840m	South East
I261	Houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	847m	South East
I195	Group of 5 houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	854m	North
I5	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	858m	North West
I74	Residential flat buildings	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	860m	South East
I228	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	860m	South East
I261	Houses	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	863m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	865m	East
I194	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	877m	North East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	878m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	885m	East
I193	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	886m	North
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	890m	East

Map Id	Name	Classification	Significance	EPI Name	Published Date	Commenced Date	Currency Date	Distance	Direction
I262	Residential flat building	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	901m	South East
I263	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	918m	South East
I90	Street trees (Acaucaria heterophylla)	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	919m	East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	920m	North
I169	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	923m	North
I170	Street trees, 1 Norfolk Island Pine tree (Araucaria heterophylla),1 Port Jackson Fig tree (Ficus ru*	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	932m	South East
I191	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	942m	North
I173	North Steyne Surf Club	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	942m	North East
I170	Street trees, 1 Norfolk Island Pine tree (Araucaria heterophylla),1 Port Jackson Fig tree (Ficus ru*	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	942m	South East
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	944m	North
I170	Street trees, 1 Norfolk Island Pine tree (Araucaria heterophylla),1 Port Jackson Fig tree (Ficus ru*	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	947m	South East
I54	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	25/09/2015	25/09/2015	02/11/2018	948m	North West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	957m	North East
I88	House	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	960m	East
I60	Electricity substation No 16453	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	961m	West
I2	All stone kerbs	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	964m	North
I223	Street trees	Item - Landscape	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	979m	North
I87	House, 'Bower Hall'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	984m	East
I132	St Patrick's Estate	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	986m	South East
I68	Mandalay (former private hospital and dwelling)	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	993m	South
I67	Residential flat building, 'Kilburn Towers'	Item - General	Local	Manly Local Environmental Plan 2013	05/04/2013	19/04/2013	02/11/2018	996m	South

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Natural Hazards - Bush Fire Prone Land

Manly Sea Life (West Esplanade), Manly, NSW 2095



Data Sources: Bush Fire Prone Land: © NSW Rural Fire Service 2022. Property Boundaries: © Department Finance, Services & Innovation 2022

Coordinate System: GDA 1994 MGA Zone 56

Date: 30 November 2022

Natural Hazards

Manly Sea Life (West Esplanade), Manly, NSW 2095

Bush Fire Prone Land

What are the nearest Bush Fire Prone Land Categories that exist within the dataset buffer?

Bush Fire Prone Land Category	Distance	Direction
Vegetation Buffer	933m	South West

NSW Bush Fire Prone Land - © NSW Rural Fire Service under Creative Commons 4.0 International Licence

Ecological Constraints - Vegetation & Ramsar Wetlands

Manly Sea Life (West Esplanade), Manly, NSW 2095



Ecological Constraints

Manly Sea Life (West Esplanade), Manly, NSW 2095

Native Vegetation

What native vegetation exists within the dataset buffer?

Map ID	Map Unit Name	Threatened Ecological Community NSW	Threatened Ecological Community EPBC Act	Understorey	Disturbance	Disturbance Index	Dominant Species	Dist	Dir
Urban_E/N	Urban_E/N: Urban Exotic/Native			00: Not assessed	00: Not assessed	0: Not assessed	Urban Exotic/Native	0m	On-site
S_SW03	S_SW03: Seagrass Meadows			00: Not assessed	00: Not assessed	0: Not assessed	Seagrass (DPI)	0m	On-site
Weed_Ex	Weed_Ex: Weeds and Exotics			00: Not assessed	00: Not assessed	0: Not assessed	Exotic Species >90%cover	225m	North
S_DSF06	S_DSF06: Coastal Sandstone Foreshores Forest			10: Mesic/rainforest	23: Plantings	4: Very high	C.gummifera/E.haemastoma/A.costataE.sieberi	461m	North East
Rock	Rock			00: Not assessed	00: Not assessed	0: Not assessed	Rock	913m	West
S_DSF06	S_DSF06: Coastal Sandstone Foreshores Forest			11: Semi sheltered dry/mesic	13: Weeds	3: High	A.costata/E.botryoides/C.gummiferaB.integrifolia/E.piperita	967m	South East

Native Vegetation of the Sydney Metropolitan Area : NSW Office of Environment and Heritage
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Ramsar Wetlands

What Ramsar Wetland areas exist within the dataset buffer?

Map Id	Ramsar Name	Wetland Name	Designation Date	Source	Distance	Direction
N/A	No records in buffer					

Ramsar Wetlands Data Source: © Commonwealth of Australia - Department of Agriculture, Water and the Environment

Ecological Constraints

Manly Sea Life (West Esplanade), Manly, NSW 2095

Groundwater Dependent Ecosystems Atlas

Type	GDE Potential	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
N/A	No records in buffer					

Groundwater Dependent Ecosystems Atlas Data Source: The Bureau of Meteorology
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Ecological Constraints

Manly Sea Life (West Esplanade), Manly, NSW 2095

Inflow Dependent Ecosystems Likelihood

Type	IDE Likelihood	Geomorphology	Ecosystem Type	Aquifer Geology	Distance	Direction
N/A	No records in buffer					

Inflow Dependent Ecosystems Likelihood Data Source: The Bureau of Meteorology
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Ecological Constraints

Manly Sea Life (West Esplanade), Manly, NSW 2095

NSW BioNet Atlas

Species on the NSW BioNet Atlas that have a NSW or federal conservation status, a NSW sensitivity status, or are listed under a migratory species agreement, and are within 10km of the site?

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Amphibia	Heleioporus australiacus	Giant Burrowing Frog	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Amphibia	Litoria aurea	Green and Golden Bell Frog	Endangered	Not Sensitive	Vulnerable	
Animalia	Amphibia	Pseudophryne australis	Red-crowned Toadlet	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Actitis hypoleucos	Common Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Anous stolidus	Common Noddy	Not Listed	Not Sensitive	Not Listed	CAMBA;JAMBA
Animalia	Aves	Anseranas semipalmata	Magpie Goose	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Not Sensitive	Critically Endangered	
Animalia	Aves	Apus pacificus	Fork-tailed Swift	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Ardenna carneipes	Flesh-footed Shearwater	Vulnerable	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Ardenna grisea	Sooty Shearwater	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Ardenna pacifica	Wedge-tailed Shearwater	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Ardenna tenuirostris	Short-tailed Shearwater	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Arenaria interpres	Ruddy Turnstone	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Botaurus poiciloptilus	Australasian Bittern	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Burhinus grallarius	Bush Stone-curlew	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Calidris acuminata	Sharp-tailed Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris alba	Sanderling	Vulnerable	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris canutus	Red Knot	Not Listed	Not Sensitive	Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris ferruginea	Curlew Sandpiper	Endangered	Not Sensitive	Critically Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris ruficollis	Red-necked Stint	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calidris tenuirostris	Great Knot	Vulnerable	Not Sensitive	Critically Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable	Category 3	Endangered	
Animalia	Aves	Calonectris leucomelas	Streaked Shearwater	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Calyptorhynchus banksii banksii	Red-tailed Black-Cockatoo (coastal subspecies)	Critically Endangered	Category 2	Not Listed	
Animalia	Aves	Calyptorhynchus banksii samueli	Red-tailed Black-Cockatoo (inland subspecies)	Vulnerable	Category 2	Not Listed	
Animalia	Aves	Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable	Category 2	Vulnerable	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	Charadrius leschenaultii	Greater Sand-plover	Vulnerable	Not Sensitive	Vulnerable	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Charadrius mongolus	Lesser Sand-plover	Vulnerable	Not Sensitive	Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Chlidonias leucopterus	White-winged Black Tern	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Chthonicola sagittata	Speckled Warbler	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Cuculus optatus	Oriental Cuckoo	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Daphoenositta chrysoptera	Varied Sittella	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Diomedea exulans	Wandering Albatross	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Esacus magnirostris	Beach Stone-curlew	Critically Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Eudyptula minor	Little Penguin	Endangered Population	Not Sensitive	Not Listed	
Animalia	Aves	Falco subniger	Black Falcon	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Fregata ariel	Lesser Frigatebird	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Gallinago hardwickii	Latham's Snipe	Not Listed	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Glossopsitta pusilla	Little Lorikeet	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Gygis alba	White Tern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Haematopus fuliginosus	Sooty Oystercatcher	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Haematopus longirostris	Pied Oystercatcher	Endangered	Not Sensitive	Not Listed	
Animalia	Aves	Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hieraaetus morphnoides	Little Eagle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Hirundapus caudacutus	White-throated Needletail	Not Listed	Not Sensitive	Vulnerable	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Hydroprogne caspia	Caspian Tern	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Ixobrychus flavicollis	Black Bittern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Lathamus discolor	Swift Parrot	Endangered	Not Sensitive	Critically Endangered	
Animalia	Aves	Limosa lapponica	Bar-tailed Godwit	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Lophoictinia isura	Square-tailed Kite	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Macronectes giganteus	Southern Giant Petrel	Endangered	Not Sensitive	Endangered	
Animalia	Aves	Macronectes halli	Northern Giant-Petrel	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Menura alberti	Albert's Lyrebird	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Neophema pulchella	Turquoise Parrot	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Ninox connivens	Barking Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Ninox strenua	Powerful Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Numenius madagascariensis	Eastern Curlew	Not Listed	Not Sensitive	Critically Endangered	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Numenius phaeopus	Whimbrel	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	Onychoprion fuscata	Sooty Tern	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Oxyura australis	Blue-billed Duck	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Pachycephala olivacea	Olive Whistler	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Pandion cristatus	Eastern Osprey	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Petroica boodang	Scarlet Robin	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Phaethon lepturus	White-tailed Tropicbird	Not Listed	Not Sensitive	Not Listed	CAMBA;JAMBA
Animalia	Aves	Phaethon rubricauda	Red-tailed Tropicbird	Vulnerable	Not Sensitive	Not Listed	CAMBA;JAMBA
Animalia	Aves	Philomachus pugnax	Ruff	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Phoebetria fusca	Sooty Albatross	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Pluvialis fulva	Pacific Golden Plover	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Pluvialis squatarola	Grey Plover	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Pterodroma leucoptera leucoptera	Gould's Petrel	Vulnerable	Not Sensitive	Endangered	
Animalia	Aves	Pterodroma solandri	Providence Petrel	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Ptilinopus magnificus	Wompoo Fruit-Dove	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Ptilinopus regina	Rose-crowned Fruit-Dove	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Ptilinopus superbus	Superb Fruit-Dove	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Puffinus assimilis	Little Shearwater	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Stagonopleura guttata	Diamond Firetail	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Stercorarius longicaudus	Long-tailed Jaeger	Not Listed	Not Sensitive	Not Listed	CAMBA;JAMBA
Animalia	Aves	Stercorarius maccormicki	South Polar Skua	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Stercorarius parasiticus	Arctic Jaeger	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Stercorarius pomarinus	Pomarine Jaeger	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Sterna hirundo	Common Tern	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Sternula albifrons	Little Tern	Endangered	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Sula dactylatra	Masked Booby	Vulnerable	Not Sensitive	Not Listed	ROKAMBA;JAMBA
Animalia	Aves	Sula leucogaster	Brown Booby	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Thalassarche bulleri	Buller's Albatross	Not Listed	Not Sensitive	Vulnerable	
Animalia	Aves	Thalassarche cauta	Shy Albatross	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Thalassarche chrysostoma	Grey-headed Albatross	Not Listed	Not Sensitive	Endangered	
Animalia	Aves	Thalassarche melanophris	Black-browed Albatross	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Aves	Thalasseus bergii	Crested Tern	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Thinornis cucullatus cucullatus	Eastern Hooded Dotterel	Critically Endangered	Not Sensitive	Vulnerable	
Animalia	Aves	Todiramphus chloris	Collared Kingfisher	Vulnerable	Not Sensitive	Not Listed	
Animalia	Aves	Tringa brevipes	Grey-tailed Tattler	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Aves	Tringa incana	Wandering Tattler	Not Listed	Not Sensitive	Not Listed	JAMBA
Animalia	Aves	Tringa nebularia	Common Greenshank	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Tringa stagnatilis	Marsh Sandpiper	Not Listed	Not Sensitive	Not Listed	ROKAMBA;CAMBA; JAMBA
Animalia	Aves	Tyto novaehollandiae	Masked Owl	Vulnerable	Category 3	Not Listed	
Animalia	Aves	Tyto tenebricosa	Sooty Owl	Vulnerable	Category 3	Not Listed	
Animalia	Mammalia	Aepyprymnus rufescens	Rufous Bettong	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Arctocephalus forsteri	New Zealand Fur-seal	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Arctocephalus pusillus doriferus	Australian Fur-seal	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Cercartetus nanus	Eastern Pygmy-possum	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Not Sensitive	Endangered	
Animalia	Mammalia	Dasyurus viverrinus	Eastern Quoll	Endangered	Not Sensitive	Endangered	
Animalia	Mammalia	Dugong dugon	Dugong	Endangered	Not Sensitive	Not Listed	
Animalia	Mammalia	Eubalaena australis	Southern Right Whale	Endangered	Not Sensitive	Endangered	
Animalia	Mammalia	Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Endangered	Not Sensitive	Endangered	
Animalia	Mammalia	Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Miniopterus australis	Little Bent-winged Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Myotis macropus	Southern Myotis	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Perameles nasuta	Long-nosed Bandicoot	Endangered Population	Not Sensitive	Not Listed	
Animalia	Mammalia	Petaurus norfolcensis	Squirrel Glider	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Phascolarctos cinereus	Koala	Endangered	Not Sensitive	Endangered	
Animalia	Mammalia	Physeter macrocephalus	Sperm Whale	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Pseudomys novaehollandiae	New Holland Mouse	Not Listed	Not Sensitive	Vulnerable	
Animalia	Mammalia	Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Mammalia	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Scoteanax rueppellii	Greater Broad-nosed Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Mammalia	Vespadelus troughtoni	Eastern Cave Bat	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	Caretta caretta	Loggerhead Turtle	Endangered	Not Sensitive	Endangered	
Animalia	Reptilia	Chelonia mydas	Green Turtle	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Reptilia	Dermochelys coriacea	Leatherback Turtle	Endangered	Not Sensitive	Endangered	
Animalia	Reptilia	Eretmochelys imbricata	Hawksbill Turtle	Not Listed	Not Sensitive	Vulnerable	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Animalia	Reptilia	Myuchelys bellii	Western Sawshelled Turtle, Bell's Turtle	Endangered	Not Sensitive	Vulnerable	
Animalia	Reptilia	Tiliqua occipitalis	Western Blue-tongued Lizard	Vulnerable	Not Sensitive	Not Listed	
Animalia	Reptilia	Uvidicolus sphyrurus	Border Thick-tailed Gecko	Vulnerable	Not Sensitive	Vulnerable	
Animalia	Reptilia	Varanus rosenbergi	Rosenberg's Goanna	Vulnerable	Not Sensitive	Not Listed	
Fungi	Flora	Hygrocybe collucera		Endangered	Not Sensitive	Not Listed	
Fungi	Flora	Hygrocybe griseoramosa		Endangered	Not Sensitive	Not Listed	
Fungi	Flora	Hygrocybe reesiae		Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	Acacia bynoeana	Bynoe's Wattle	Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	Acacia gordonii		Endangered	Not Sensitive	Endangered	
Plantae	Flora	Acacia terminalis subsp. Eastern Sydney	Sunshine wattle	Endangered	Not Sensitive	Endangered	
Plantae	Flora	Allocasuarina portuensis	Nielsen Park She-oak	Endangered	Category 3	Endangered	
Plantae	Flora	Amperea xiphoclada var. pedicellata		Extinct	Not Sensitive	Extinct	
Plantae	Flora	Asterolasia buxifolia		Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Baeckea kandos		Endangered	Category 3	Endangered	
Plantae	Flora	Caladenia tessellata	Thick Lip Spider Orchid	Endangered	Category 2	Vulnerable	
Plantae	Flora	Callistemon linearifolius	Netted Bottle Brush	Vulnerable	Category 3	Not Listed	
Plantae	Flora	Chamaesyce psammogeton	Sand Spurge	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Epacris purpurascens var. purpurascens		Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	Eucalyptus camfieldii	Camfield's Stringybark	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Eucalyptus nicholii	Narrow-leaved Black Peppermint	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Eucalyptus scoparia	Wallangarra White Gum	Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	Euphrasia collina subsp. muelleri	Mueller's Eyebright	Endangered	Not Sensitive	Endangered	
Plantae	Flora	Genoplesium baueri	Bauer's Midge Orchid	Endangered	Category 2	Endangered	
Plantae	Flora	Grammitis stenophylla	Narrow-leaf Finger Fern	Endangered	Category 3	Not Listed	
Plantae	Flora	Grevillea caleyi	Caley's Grevillea	Critically Endangered	Category 3	Critically Endangered	
Plantae	Flora	Hibbertia puberula		Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Hibbertia superans		Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Isotoma fluviatilis subsp. fluviatilis		Not Listed	Category 3	Extinct	
Plantae	Flora	Lasiopetalum joyceae		Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Macadamia integrifolia	Macadamia Nut	Not Listed	Not Sensitive	Vulnerable	
Plantae	Flora	Macadamia tetraphylla	Rough-shelled Bush Nut	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Melaleuca biconvexa	Biconvex Paperbark	Vulnerable	Not Sensitive	Vulnerable	

Kingdom	Class	Scientific	Common	NSW Conservation Status	NSW Sensitivity Class	Federal Conservation Status	Migratory Species Agreements
Plantae	Flora	Melaleuca deanei	Deane's Paperbark	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Microtis angusii	Angus's Onion Orchid	Endangered	Category 2	Endangered	
Plantae	Flora	Persoonia hirsuta	Hairy Geebung	Endangered	Category 3	Endangered	
Plantae	Flora	Persoonia laxa		Extinct	Not Sensitive	Extinct	
Plantae	Flora	Pimelea curviflora var. curviflora		Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Prasophyllum fuscum	Slaty Leek Orchid	Critically Endangered	Category 2	Vulnerable	
Plantae	Flora	Prostanthera densa	Villous Mint-bush	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Prostanthera marifolia	Seaforth Mintbush	Critically Endangered	Category 3	Critically Endangered	
Plantae	Flora	Rhodamnia rubescens	Scrub Turpentine	Critically Endangered	Not Sensitive	Critically Endangered	
Plantae	Flora	Sarcochilus hartmannii	Hartman's Sarcochilus	Vulnerable	Category 2	Vulnerable	
Plantae	Flora	Senecio spathulatus	Coast Groundsel	Endangered	Not Sensitive	Not Listed	
Plantae	Flora	Syzygium paniculatum	Magenta Lilly Pilly	Endangered	Not Sensitive	Vulnerable	
Plantae	Flora	Tetratheca glandulosa		Vulnerable	Not Sensitive	Not Listed	
Plantae	Flora	Tetratheca juncea	Black-eyed Susan	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Thesium australe	Austral Toadflax	Vulnerable	Not Sensitive	Vulnerable	
Plantae	Flora	Triplarina imbricata	Creek Triplarina	Endangered	Not Sensitive	Endangered	

Data does not include NSW category 1 sensitive species.
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APPENDIX D
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Dear Michael

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I refer to your application for a Site Search for Schedule 11 Hazardous Chemicals on premises, received by SafeWork NSW on 07/12/2022 for the following site: Manly Sealife, West Esplanande, MANLY NSW 2095.

A search of the records held by SafeWork NSW has not located any records pertaining to the above-mentioned premises.

If you have any further information or if you have any questions, please use one of the following options, quoting the SafeWork NSW enquiry reference number: 00783492

- Email: licensing@safework.nsw.gov.au
- Phone: 13 10 50

Kind regards

Danielle Wilson-Thomas
Licensing Representative
SafeWork NSW | Better Regulation Division
Department of Customer Service
p- 13 10 50
e- licensing@safework.nsw.gov.au | www.customerservice.nsw.gov.au
Level 3, 32 Mann Street, Gosford, NSW 2250

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Appendix F - Noise and Vibration Impact Assessment

Construction Noise and Vibration Impact Assessment

Manly Cove West (Manly Sea Life)

8 March 2023

Prepared for:

BESIX Watpac on behalf of Transport for NSW

Prepared by:

Stantec Australia

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Revision	Description	Author		Quality Check	
A	Draft for client review	Karen McMorrow	14/2/23	Julie McDonagh	14/2/23
B	Draft for client review	Karen McMorrow	08/3/23	Julie McDonagh	08/3/23

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Prepared by ___

(signature)

Karen McMorrow

Reviewed by ___

(signature)

Julie McDonagh

Approved by ___

(signature)

Belinda Crichton

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APPENDIX B PREDICTED CONSTRUCTION NOISE LEVELS – NOISE CONTOUR MAPS

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Executive summary

This noise and vibration impact assessment was conducted for BESIX Watpac on behalf of Transport for NSW (Transport), for inclusion in the Review of Environmental Factors prepared for the proposed former Manly Sea Life site upgrade. The project includes the removal of the former Manly Sea Life Aquarium building and development of the site and adjoining land to provide more open space, improved access to the harbour, and improve views of the State heritage listed Manly Pavilion buildings.

Key features of the proposal include:

- Demolition of the former Sea Life building down to seabed level
- Retention of some former Sea Life structural elements underneath the new proposed boardwalk
- Demolition of the timber jetty, including supporting piles
- Construction of a new pile supported boardwalk that runs adjacent Manly Pavilion
- Construction of a new access ramp to the beach
- Safety features to the boardwalk would include handrails, tactile indicators, ladders into the water, and emergency life buoys.

This assessment has been carried out to determine the predicted noise and vibration impacts associated with the construction of the proposed Manly Sea Life site upgrade. Noise modelling has been carried out to determine whether the proposed construction works associated with the assessed design are likely to impact nearby noise sensitive receivers. Potential vibration impacts have also been assessed to the nearest sensitive receivers to the works.

This assessment considers the following impacts on nearby sensitive receivers:

- Noise impacts from construction of the project in accordance with EPA (formerly the Department of Environment & Climate Change (DECC)) and Transport (formerly RMS) guidelines for the control of construction noise impacts
- Construction vibration from the project in accordance with EPA and Transport guidelines for assessing vibration.

Construction Noise and Vibration Guidelines

This assessment considers the following policies and guidelines:

- *Construction Noise and Vibration Guideline* (CNVG) (RMS, 2016)
- *Interim Construction Noise Guideline* (ICNG) (DECC 2009)
- *Assessing Vibration – A Technical Guideline* (AV:ATG) (DEC 2006).

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Assessment conclusions

The assessment identified the following conclusions:

- In accordance with the noise management levels stipulated in Section 5.1, dwellings exposed to levels of construction noise above 75 dB(A) are considered highly noise affected, with dwellings exposed to levels above the daytime RBL +10 dB(A) considered noise affected.
- Construction noise levels are predicted to exceed the ICNG noise management levels (NML) for "standard" construction hours at all noise catchment areas (NCAs) (1-3) for construction Scenarios 1 & 2.
- Construction noise levels are predicted to exceed the ICNG NML for "standard" construction hours at NCAs 1 & 3 for construction Scenario 6. The NML at NCA 2 is not predicted to be exceeded for construction Scenario 6 during "standard" work hours.
- Construction noise levels are predicted to exceed noise management levels for "non-standard" hours for Scenarios 2 & 4 in all NCAs, particularly for receivers located on The Crescent and West Esplanade in NCA 1, Wentworth Street and East Esplanade in NCA 2, and East Esplanade in NCA 3. This is due to the proximity of receivers to the construction works.
- Predicted levels are expected to be highly intrusive at a number of receivers in NCA 1 for all Scenarios for works during the out of hours work period 2 (OOHW2). Construction noise is likely to have the highest impact on and cause sleep disturbance at sensitive receivers located on The Crescent and West Esplanade in NCA 1, due to their proximity to the proposed work site.
- It should be noted that this assessment has endeavoured to carry out "worst case" noise modelling, and noise levels are predicted based on all modelled sources operating simultaneously. Should the work sites or plant and equipment be amended, the predicted noise levels would change accordingly.
- The predicted exceedances are generally a result of works being located in close proximity to the adjacent receivers. This modelling has been carried out to provide a worst-case scenario and it may be possible to reduce the number of plant operating simultaneously, particularly at night, once detailed construction schedules are known.
- Use of temporary noise barriers are recommended where practical. The height and location of these barriers will be determined during preparation of the Construction Noise and Vibration Management Plan (CNVMP) when more information regarding the proposed plant to be used for each construction scenario is available.
- Best practice mitigation measures are recommended in Section 8.0 of this report.
- It is generally expected that sleep disturbance criteria are likely to be exceeded unless the proposed number and type of plant are reduced for out of hours works. Only indicative predictions of expected L_{Amax} impact have been carried out for this assessment, as it is difficult to predict L_{Amax} for construction noise sources because L_{Amax} levels can vary considerably. The predicted levels in this assessment are based on previously measured relationships between L_{Aeq} and L_{Amax} of typical construction plant, and may vary from those predicted in practice.
- The minimum working distances indicated in Table 19 for cosmetic damage must be complied with at all times, unless otherwise approved by Transport for NSW or under the environmental license as relevant, as stipulated in the CNVG.
- A detailed CNVMP would be prepared for the project prior to construction commencement to incorporate the recommendations detailed in Section 8.0 and updated to reflect the proposed staging and plant to be adopted for the project.

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Glossary

Adverse Weather	Weather effects that enhance noise (that is, wind and rain) that occur at a site for a significant period of time (that is, wind exceeding 5 m/s and rain exceeding 0.5 mm per hour during any measurement period).
A-weighted Level	As per dB(A) defined below.
Ambient Sound	Of an environment: the all-encompassing sound associated with that environment, being a composite of sounds from many sources, near and far.
AV:ATG	*Assessing Vibration: A Technical Guide* (DEC 2006)
Background Sound Level	The average of the lowest levels of the sound levels measured in an affected area in the absence of noise from occupants and from unwanted external ambient noise sources.
CNVG	*Construction Noise & Vibration Guideline* (RMS 2016)
CNVMP	Construction Noise & Vibration Management Plan
CoRTN	Calculation of Road Traffic Noise (HMSO 1988)
dB(A)	Unit of acoustic measurement electronically weighted to approximate the sensitivity of human hearing to sound frequency.
DEC	Former NSW Department of Environment and Conservation, now known as NSW Office of Planning and Environment
DECC	Former NSW Department of Environment and Climate Change, now known as NSW Office of Planning and Environment
DECCW	Former NSW Department of Environment and Climate Change and Water, now known as NSW Office of Planning and Environment
Decibel, dB	Unit of acoustic measurement. Measurements of power, pressure and intensity may be expressed in dB relative to standard reference levels.
ECRTN	Superseded Environmental Criteria for Road Traffic Noise (EPA 1999)
ENMM	Environmental Noise Management Manual (RTA 2001)
EPA	NSW Environmental Protection Authority
ICNG	*Interim Construction Noise Guideline* (DECCW 1999)
NPfI	*Noise Policy for Industry* (EPA 2017)
L90, L10 etc.	A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, i.e. L90 is the level which is exceeded for 90 percent of an observation period. L90 is commonly referred to as a basis for measuring the background sound level.
L_{Abg}, T	The A-weighted background sound level measured over a time interval T.
L_{AMax}	The A-weighted maximum noise level measured during the measurement period.
L_{Aeq}, T	Equivalent continuous A-weighted sound pressure level. This is the value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval T, has the same A-weighted sound energy as the actual time-varying sound.
NSW	New South Wales
RBL	Rating Background Level
RNP	*Road Noise Policy* (DECCW 2011)
RTA	former NSW Roads and Traffic Authority
Roads and Maritime	former NSW Roads and Maritime Services (now known as Transport for NSW)

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SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound Pressure Level, Lp, dB, of a sound	A measurement obtained directly obtained using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 microPascals.
Sound Power Level, Lw, dB of a source	Sound power level is a measure of the sound energy emitted by a source, does not change with distance, and cannot be directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power level is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 picoWatt.
Transport	Transport for NSW

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1.0 INTRODUCTION

This construction noise and vibration impact assessment was conducted for BESIX Watpac on behalf of Transport for NSW (Transport), for inclusion in the Review of Environmental Factors prepared for the proposed former Manly Sea Life site upgrade. The Manly Sea Life Aquarium was purpose built to provide a sea life aquarium facility in Manly Cove. The property has been vacant for a number of years, is in very poor repair, and has reached the end of its serviceable life, with holding costs to maintain the facility excessive.

Transport is looking to revitalise Manly Cove by creating a place which respects the local cultural heritage, connects people to land and water and creates a prominent waterfront location in Manly. The proposal would improve views of the heritage listed Manly Pavilion buildings.

To this end, Transport is looking to demolish the former Manly Sea Life building and extend the boardwalk.

This assessment has been carried out to determine the predicted noise and vibration impacts associated with the demolition and refurbishment of the proposed former Manly Sea Life site. Noise modelling has been carried out to identify any potential noise impacts on nearby sensitive receivers as a result of proposed construction works associated with the assessed design. Potential vibration impacts have also been assessed at the nearest sensitive receivers to the works.

This assessment considers the following policies and guidelines:

- *Interim Construction Noise Guideline* (ICNG) (DECC 2009)
- *Construction Noise and Vibration Guideline* (CNVG) (RMS 2016)
- *Assessing Vibration – A Technical Guideline* (AV:ATG) (DEC 2006).

In undertaking the assessment, existing unattended noise monitoring was utilised to determine the ambient noise levels at various noise sensitive locations near the proposed former Manly Sea Life construction work site.

3D noise modelling software (SoundPLAN 8.2) was used to create a noise model of the existing scenario. The 3D model was then used to predict construction noise levels associated with the proposed works impacting on nearby noise sensitive receivers by adopting the appropriate construction staging scenarios.

1.1 ASSESSMENT OBJECTIVES

The assessment objectives are to determine the predicted levels of construction noise and vibration impact on sensitive receivers located near to the assessed design, and to determine the levels of mitigation that are likely to be required, if applicable, to enable compliance with the current NSW legislation.

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2.0 DESIGN ASSESSED

2.1 DESCRIPTION OF THE DESIGN ASSESSED

The proposal is to demolish the former Sea Life building to seabed level and extend the boardwalk in front of Manly Pavilion.

The key features of the assessed design include (refer Figure 1):

- Demolition of the former Sea Life building down to seabed level
- Retention of some former Sea Life structural elements underneath the new proposed boardwalk
- Demolition of the timber jetty, including supporting piles
- Construction of a new 100 metre long pile-supported boardwalk that runs adjacent to Manly Pavilion, that allows sufficient space for walking and a dwell area with seating
- Construction of new stairs and access ramp to the beach
- Safety features to the boardwalk would include handrails, tactile indicators, ladders into the water, and emergency life buoys.

Construction of the proposal shall be staged to ensure that work impacting the operation of the Manly Pavilion, the Manly Art Gallery and Museum, are minimised.

For the purposes of the REF, the proposal footprint, proposal area and compound area have been defined as follows (refer Figure 2):

- Proposal footprint – the area directly impacted by proposed work, including the removal of structures (demolition area), installation of new structures
- Proposal area – the area around the proposal footprint required for construction including the maritime works area, compound area and material handling and load out area
- Compound areas – the temporary facilities required for construction, including for example an office and amenities compound, construction compound and materials handling and load out area. The possible location of the compound and laydown areas are shown on Figure 2, however, the exact locations would be determined prior to construction.

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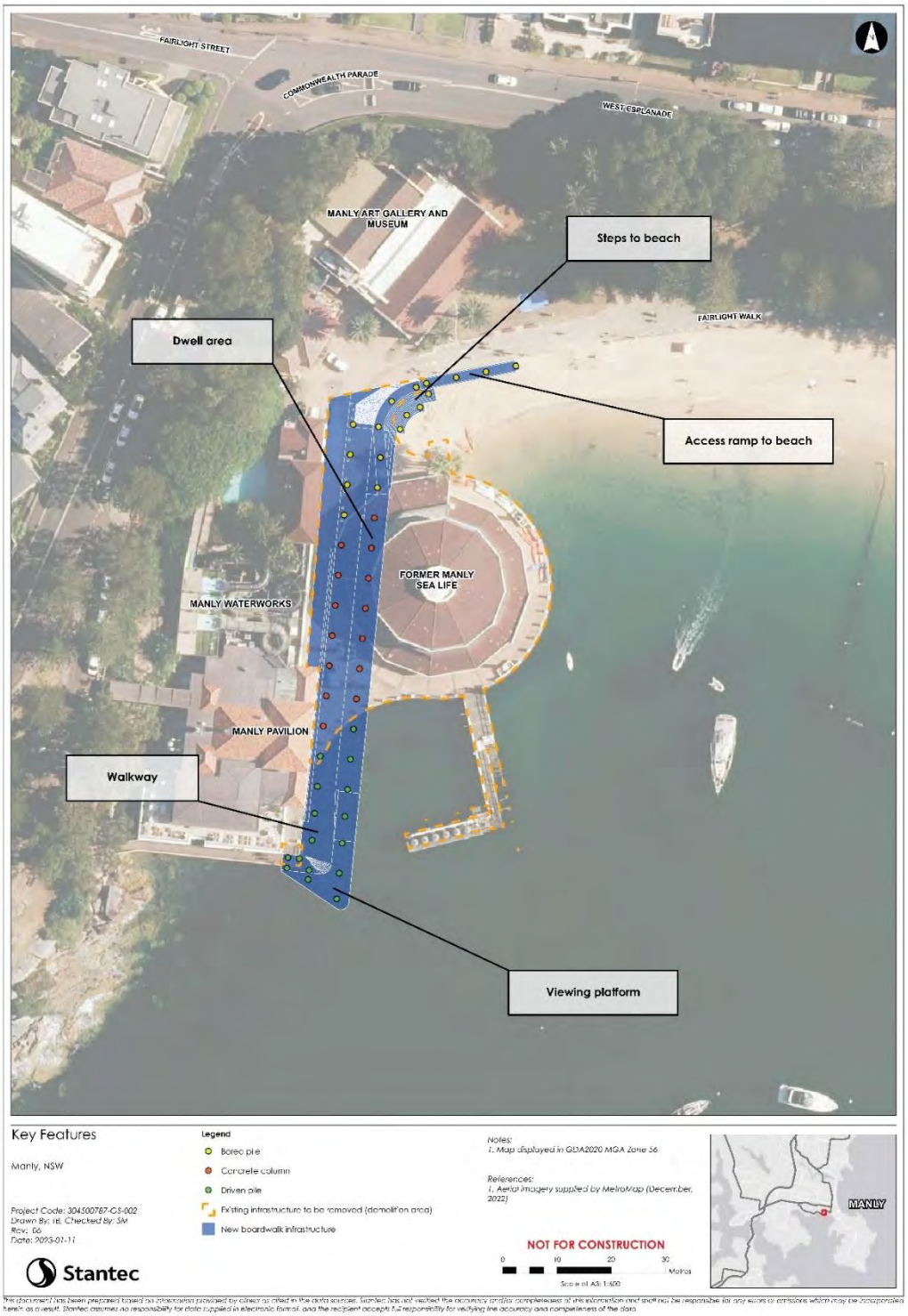


Figure 1 Key features of the proposal



Figure 2 Proposal areas

Figure 3 and Figure 4 show a visual perspective of the assessed design from a waterside perspective.



Figure 3: Aerial view (concept design)



Figure 4: Aerial oblique view (concept design)

2.2 EXISTING SITE DESCRIPTION

The former Manly Sea Life is located off West Esplanade, adjacent Manly Cove Beach, approximately 40 metres from residential properties located to the north-west on Commonwealth Parade. The existing site is surrounded by a range of noise sensitive receivers, mostly residential. Non-residential

receivers include areas such as Manly Pavilion, Manly Art Gallery & Museum, Manly Cove Beach, West Esplanade Park, and Manly Wharf.

The assessment area for the assessed design is shown in Figure 5 and includes the land uses listed in Table 1.

Table 1: Existing land uses

Label	Description	Land Use
1	Dobroyd Head/Forty Baskets Beach	Passive recreation
2	Residential south-west	Residential
3	Residential west and north	Residential
4	Manly Cove Beach/West Esplanade Park	Passive recreation
5	Tower Hill Park	Passive recreation
6	Gilbert Park	Passive recreation
7	Manly Wharf	Commercial
8	Manly Town Centre	Commercial/Residential
9	Manly Oval	Recreation
10	Manly Community Pre-school	Education
11	St Mary's Catholic College	Education
12	Residential east	Residential
13	East Manly Cove Beach	Passive recreation
14	Manly Yacht Club	Commercial
15	Manly Village Public School	Education
16	Manly Waters Private Hospital	Medical
17	Bear Cottage Children's Hospice	Medical
18	Boat House Kiosk and Manly Art Gallery & Museum	Commercial

The above locations are shown in Figure 5.

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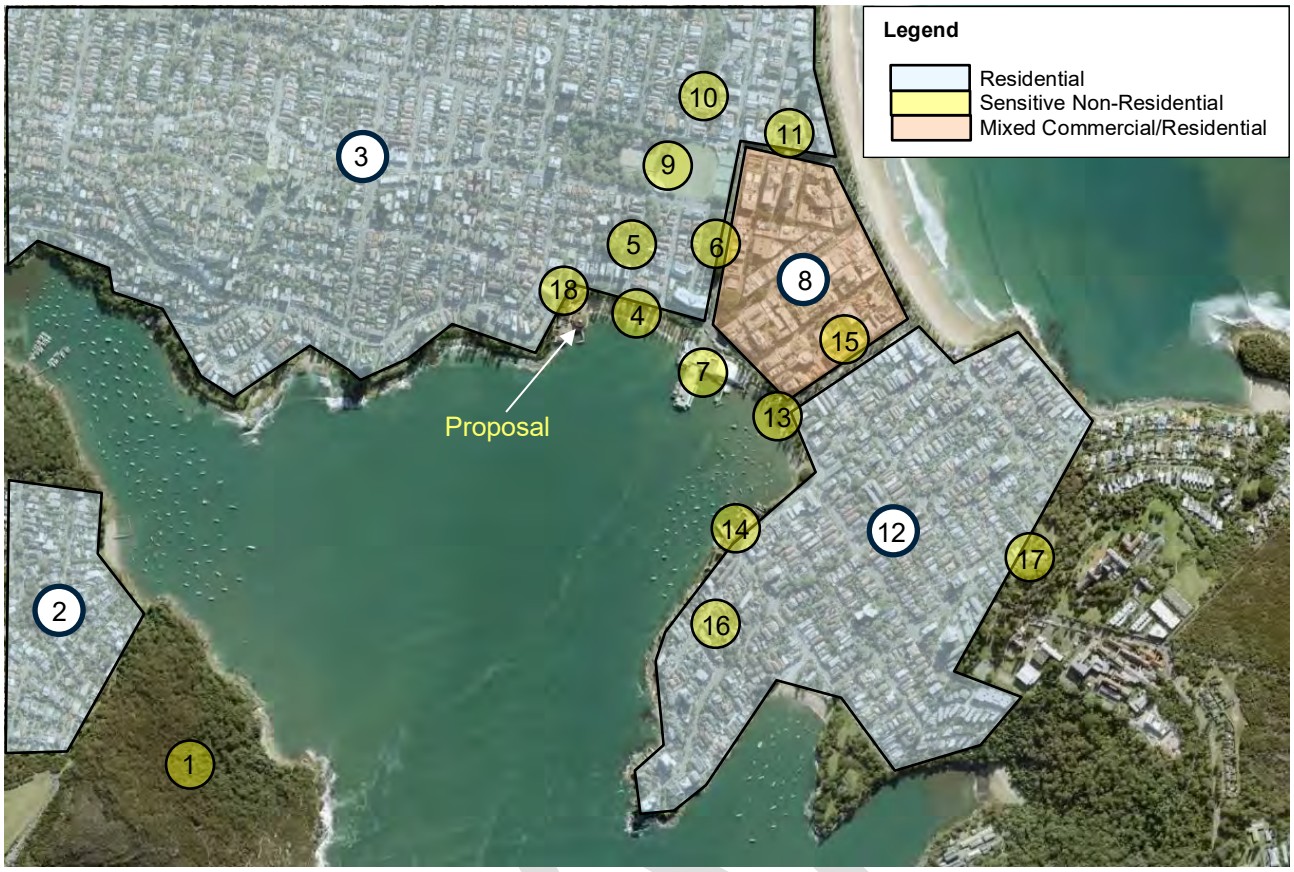


Figure 5: Site location and surrounding land uses

2.3 ASSESSED CONSTRUCTION METHODOLOGY

The assessed construction methodology generally comprises of the construction scenarios and onsite activities listed in Table 2.

Table 2: Construction scenarios

Activity	Duration	Associated Work
Scenario 1: Site establishment	17 days	Land-side works: • Establishment of a temporary site compound (erect site offices, amenities, and plant/material storage areas etc.) on the land. The site compound would be situated adjacent the Manly Art Gallery & Museum. • Temporary fencing, or hoarding would be constructed around the perimeter of the site to segregate the proposal construction areas from the public space. • Site entry and exit points, and haul roads would be established for the construction work site. • Traffic control measures (for pedestrians, and vehicles) would be established in accordance with traffic management plan. Appropriate wayfinding signage would be installed advising of alternative transport options where necessary. • A portion of Manly Cove Beach would be reclaimed to become a laydown area for construction vehicles and for material processing. • Environmental controls would be established in accordance with the CEMP.

Activity	Duration	Associated Work
		Water-side works: • Establishment of a marine works area (MWA) using floating booms to delineate this area. This would make allowance for the outward reach of construction. • Pre-clearance surveys would be conducted to identify and relocate any sensitive fauna in the proposal area including microbats, Black Rockcod, Whites Seahorses and Little Penguin, prior to waterside works. • Temporary piles may be installed to install a silt boom around the perimeter of the site and separate the work site from public areas.
Scenario 2: Demolition and removal of the former Manly Sea Life building and timber jetty	175 days	• The former Sea Life building would be demolished down to seabed level. Demolition would be conducted using a combination of excavators with attachments, road sawing, and wiring sawing. A crawler crane would be utilised for vertical material movements across the site. • Some sections of base slab and walls under the proposal would remain in place permanently. • The timber jetty on the southern side of Sea Life would also be demolished as part of the works. Tidal steps would be demolished, and timber piles extracted using a vibration method while pulling with a crane barge. Concrete headstocks would be removed using a wire saw. If concrete piles cannot be removed via the vibration method, then a water blaster would be used to clear rock to allow the piles to be then cut and capped at seabed level.
Scenario 3: Installation of concrete columns and piles	14 days	• Fourteen concrete columns and shear walls would be formed off existing slabs within the former Manly Sea Life pump room (located on the western edge of the building). These columns would support headstocks and the new boardwalk. • Installation of 17 bored concrete piles on fill (from the land). These would be installed via an excavator with boring attachment or a piling rig.
Scenario 4: Installation of steel piles within the waterway	11 days	• The installation of 16 steel piles for the boardwalk over water would likely be installed by a barge mounted piling rig. Piles would be pitched into position and then screwed into rock. The piles would be installed near to the existing Manly Pavilion but without impacting the Manly Pavilion. The boardwalk shall be an independent structure to the Manly Pavilion. • Typically pile foundation systems would be piled into bedrock as follows: – Teeth welded to bottom of piles – Positioning steel pile with crane mounted driving unit – Driving the steel pile casings into position. – Cutting the steel pile casings to length and backfilling with concrete. • Noise and vibration monitoring would be undertaken at sensitive receivers to ensure that adjacent neighbours and structures are not adversely affected during piling and demolition work.
Scenario 5: Reprofiling of seabed	14 days	• Sandstone boulders and sand would be imported into the site to 'backfill' the void left behind by the former Manly Sea Life building. • These materials would cap the existing structure that shall remain.
Scenario 6: Installation of boardwalk	30 days	• Concrete head stocks would be constructed offsite and delivered via Barge. A combination of crawler crane and crane barge would install headstocks. • Similarly, precast concrete slab panels would be constructed offsite and delivered via barge. • Finishing works that would include pavements, timber boardwalks, handrails, sleepers would be undertaken. • Services installation including lighting, power, hydraulics and potentially CCTV.

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Activity	Duration	Associated Work
Scenario 7: Installation of new or improved facilities	30 days	• Installation of signage • Relocation, if possible, of the eight palm trees currently located at the entrance to the former Manly Sea Life building. • Re-instatement of construction compound areas to pre-existing conditions.
Scenario 8: Site clean-up	10 days	• The site would be cleaned up and restored to its previous state. • Sedimentation controls and temporary structures would be removed.

2.3.1 Construction traffic

Construction vehicles would travel down Sydney Road, along Belgrave Street and then along West Esplanade to access the site. The maximum vehicle movements per day (inbound and outbound) would be approximately 20 and consist of demolition waste carting out (two trucks/per hour, assumption trucks from 7am - 3pm) and four light vehicles.

The following construction traffic volumes are anticipated for the construction stages:

- Stage 1 - Site Establishment: 5 vehicle movements per day.
- Stage 2 - Demolition of Former Sea Life building & timber jetty: 20 vehicle movements per day.
- Stage 3 - Installation of concrete columns and piles: 15 vehicle movements per day.
- Stage 4 - Installation of steel piles within water way: 5 vehicle movements per day.
- Stage 5 - Re-profiling of seabed: 20 vehicle movements per day.
- Stage 6 - Installation of boardwalk: 10 vehicle movements per day.
- Stage 7 - Installation of new or improved facilities: 5 vehicle movements per day.
- Stage 8 - Site clean-up: 5 vehicle movements per day.

The haulage route presented in Figure 6 is proposed for the project:

No existing daily traffic numbers are available for these routes.

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Figure 6: Construction haulage route

3.0 EXISTING NOISE ENVIRONMENT

The existing acoustic environment is generally dominated by traffic noise on local roads and noise from Manly Cove.

3.1 UNATTENDED NOISE MONITORING

GHD conducted previous unattended noise monitoring for a nearby site with the monitoring locations also representative of receivers potentially impacted by this proposal (GHD 2022).

GHD installed unattended noise monitors at four locations to measure ambient (i.e. background) noise levels for a period of ten days to determine the ambient background noise levels. The noise monitors were configured to measure 15-minute statistics between 18 and 27 July 2022.

The loggers used in this assessment were deployed at the following locations (refer Figure 7):

- **Logger 1** was located adjacent Manly Art Gallery & Museum at West Esplanade, Manly
- **Logger 2** was located at 39 East Esplanade, Manly
- **Logger 3** was located adjacent Manly Cove Launch Club at East Esplanade, Manly.

The fourth logger was placed at Tower Hill Park, approximately 270 metres to the northeast of Logger 1. It was found that the noise levels from both loggers were identical for the day and night time periods, with a difference of 2dB for the evening time period. Therefore, Logger 1 was adopted in lieu of the Tower Hill Park logger to provide a conservative assessment.

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Figure 7: Noise monitoring locations

3.2 MEASUREMENT PARAMETERS

As environmental noise varies with time, the use of statistical descriptors is necessary to understand and describe these variations. For road traffic noise these descriptors are further classified for day time (7am - 10pm) and night time (10pm - 7am).

For environmental noise, the assessment period for day time is further split into day (7am – 6pm) and evening (6pm – 10pm). A-weighted statistical levels are used to describe ambient noise levels. The common descriptors used to describe environmental noise are described as follows:

L_{Amax}: the A-weighted maximum noise level measured during the measurement period

L_{A1}: the A-weighted noise level exceeded for 1 per cent (%) of the measurement period

L_{A10}: the noise A-weighted level exceeded for 10 per cent (%) of the measurement period, generally referred to as the average maximum sound pressure level

L_{A90}: the A-weighted noise level exceeded for 90 per cent (%) of the measurement period, generally referred to as the background noise level (refer Australian Standard *AS 1055-2018 Acoustics – Description and measurement of environmental noise*)

L_{Aeq}: the equivalent continuous noise level over the measurement period, generally referred to as the energetical average sound pressure level over the measurement period.

RBL: Rating background level (RBL) — the overall single figure background level representing each assessment period (day / evening / night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). The RBL is the level used for assessment purposes. Where the rating background level is found to be less than 30 dB(A), then it is set to 30 dB(A).

3.3 MEASURED NOISE LEVELS

The Rating Background Level (RBL) for each site was determined in accordance with the *Noise Policy for Industry* (EPA, 2017) (NSW NPI). The RBL is defined as above (referenced from the NSW NPI):

The data collected by the noise loggers was downloaded and analysed to determine invalid data due to adverse weather conditions. Invalid data generally refers to periods of time where average wind speeds were greater than 5 m/s, or when rainfall occurred.

The RBL applicable to each site is detailed in Table 3. The measured RBLs from Table 3 have been used to formulate the noise objectives for construction noise impacts as detailed in Section 5.1.

Table 3: Rating Background Level

Logger	Measurement Location	Measured Rating Background Noise Level, dB(A)		
		07:00-18:00 (Day)	18:00-22:00 (Evening)	22:00-07:00 (Night)
1	Manly Art Gallery & Museum	46	42	38
2	39 East Esplanade	55	53	48
3	Manly Cove Launch Club	47	46	43

The measured RBLs from Table 3 have been used to formulate the noise objectives for construction noise impacts as detailed in Section 5.1.

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4.0 STATUTORY NOISE AND VIBRATION CRITERIA

4.1 NOISE CRITERIA

4.1.1 Construction Noise and Vibration Guideline

The *Construction Noise and Vibration Guideline* (CNVG) (RMS, 2016) provides a framework for the assessment of noise during the construction phase of the project. The CNVG references the following documents to provide the criteria for the assessment of construction noise and vibration impacts:

- *Interim Construction Noise Guideline* (ICNG) (DECC, 2009)
- *Assessing Vibration – Technical Guideline* (AVATG) (DECC, 2009)
- *Road Noise Policy* (RNP) (DECCW, 2011).

The CNVG provides recommended minimum separation distances between vibration intensive plant and sensitive receivers for minimising the risk of cosmetic damage. The CNVG further states that the minimum working distance for cosmetic damage must be complied with at all times, unless otherwise approved by Transport or under the environmental licence as relevant. The minimum working distances are summarised in Section 7.2.

4.1.2 Interim Construction Noise Guideline

4.1.2.1 Airborne construction noise – residential receivers

The *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) provides guidance for assessing construction noise impacts.

The level of noise impact and the requirement for mitigation measures is generally determined by the timing and duration of the noise emissions and the perceived impact of the noise above existing background noise levels.

It is important to note that the guideline distinguishes between qualitative and quantitative noise assessments based on the type and duration of construction activities. For example, a qualitative assessment is warranted for road maintenance type works of short duration, whereas a quantitative assessment is preferred for major infrastructure works.

Section 4 of the guideline outlines the quantitative assessment method, which establishes noise management levels and assessment requirements for proposed construction activities over three weeks duration.

The noise management level for potentially affected residential properties, as taken from Section 4.2 of the ICNG, is detailed in Table 4.

Table 4: Noise at residences using quantitative assessment (Source: DECC, 2009)

Time of day	Management level $L_{Aeq\ (15\ min)}$*	How to apply
Recommended standard hours:	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all

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Time of day	Management level $L_{Aeq\ (15\ min)}$*	How to apply
Monday to Friday: 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays		feasible and reasonable work practices to meet the noise affected level. 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 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: • Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences • If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. For guidance on negotiating agreements see Section 7.2.2 of the ICNG.

Notes:

(1) For residential receivers - noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5m above ground level. If the property boundary is more than 30 metre from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

(2) Other sensitive use receivers - internal noise levels are to be assessed at the centre of the occupied room. External noise levels are to be assessed at the most affected point within 50 m of the area boundary

A strong justification would typically be required for works outside the recommended standard hours (see Table 4). The proponent should apply all feasible and reasonable work practices to meet the noise affected level. The definition of feasible and reasonable work practices is outlined in Section 1.4 of the ICNG, with the following excerpts providing a brief description:

"A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements."

"Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure."

A number of factors may be considered in selecting reasonable measures, including the level of impact, the number of people affected, and the order of treatments applied to previous, similar projects. Where all feasible and reasonable practices have been applied and noise remains more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community on suitable mitigation measures. For guidance on negotiating agreements see Section 7.2.2 of the ICNG.

4.1.2.1 Airborne construction noise – Non-residential receivers

Non-residential sensitive land uses are also located within the study area. These include schools, hospitals, outdoor recreational areas, and commercial properties. The ICNG provides noise management levels (NMLs) for these receivers as shown in Table 5.

Table 5: Noise management levels for non-residential sensitive receivers (Source: DECC, 2009)

Non-Residential Receiver Type	Location	Noise Management Level (when in use)	
		Internal L_{Aeq} (15 min)*	External L_{Aeq} (15 min)*
Classrooms	St Mary's Catholic College Manly Village Public School	45	*55
Hospital wards and operating theatres	Manly Waters Private Hospital Bare Cottage Children's Hospice	45	*55
Childcare centres	Manly Community Pre-school	**40	*50
Active recreation	Manly Oval	-	65
Passive recreation	Dobroyd Head/Forty Baskets Beach Manly Cove Beach/West Esplanade Park Tower Hill Park Gilbert Park East Manly Cove Beach	-	60
Commercial	Manly Wharf Manly Town Centre Manly Yacht Club Boat House Kiosk Manly Art Gallery & Museum	-	70

**Based on an inside to outside nose reduction of 10 dB(A) where ICNG noise levels have been specfied as internal only.*

***Referenced for teaching spaces from Australian Standard AS 2107 - Acoustics – Recommended design sound levels and reverberation times for building interiors*

4.1.2.2 Sleep disturbance

Section 4.3 of the ICNG defines the assessment of sleep disturbance as follows:

"Where construction works are planned to extend over more than two consecutive nights, and a quantitative assessment method is used, the analysis should cover the maximum noise level, and the extent and the number of times that the maximum noise level exceeds the RBL. Some guidance indicating the potential for sleep disturbance is in the now superseded NSW Environmental Criteria for Road Traffic Noise (EPA 1999)."

The *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA, 1999) discusses a number of methodologies with respects to sleep disturbance. In general, the methodologies address sleep disturbance due to continuous noise (expressed in terms of a $L_{Aeq, T}$) and the affect multiple short duration noise events (expressed as a L_{AMax}).

In addition to the night time noise criteria specified in Table 4 (which addresses the continuous noise component generated by construction activities), the application of a noise criteria addressing the maximum noise level from construction activities is appropriate when works are planned to extend over more than two consecutive nights. The ECRTN draws the following conclusions with respects to noise limits for sleep disturbance:

"Considering all of the foregoing information the following conclusions can be drawn:

- *Maximum internal noise levels below 50–55 dB(A) are unlikely to cause awakening reactions.*
- *One or two noise events per night, with maximum internal noise levels of 65–70 dB(A), are not likely to affect health and wellbeing significantly."*

The EPA confirm that a sleep disturbance criterion of $L_{A1, 1min} \leq L_{A90,15min}$ + 15dB(A), is used for initial assessment for the purpose of an REF. It should only be used as a first step guide and where the criteria is not met, more detailed analysis is required to be incorporated into the detailed design and Construction Noise and Vibration Management Plan (CNVMP). The Application Notes of the *Industrial Noise Policy* (INP) (2010) note the detailed analysis should include:

- The extent to which the maximum noise level exceeds the background level
- The number of times this happens during the night-time period, and
- The time of day (normally between 10pm and 7am).

4.1.3 Road Noise Policy

The *Road Noise Policy* (RNP) (DECCW, 2011) is a guideline for use in planning approvals by local councils and licenses issued by the Environmental Protection Authority (EPA).

The RNP contains strategies to address the issue of (construction) road traffic noise from traffic-generating developments.

Quantitative criteria stated in the RNP associated with road traffic noise have now been superseded by those detailed in the *Noise Criteria Guideline* (RMS, 2014). However, Section 3.4.1 of the RNP does state the following in relation to the consideration of feasible and reasonable application of mitigation, relevant to assessment of this project:

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"Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria.

In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person."

4.2 VIBRATION LIMITS

4.2.1 Assessing Vibration: A Technical Guideline (Human Comfort)

Vibration from activities associated with the project could potentially impact on the amenity of the occupants of dwellings or buildings located close to the construction works. Generally, vibration impact can be summarised into two categories:

- Effect on human comfort
- Structural or cosmetic damage to buildings.

Human comfort vibration criteria is addressed in the ICNG and refers to Section 2.5 of the document *Assessing Vibration: A Technical Guideline* (AV:ATG) (DEC 2006).

The AV:ATG outlines vibration limits in relation to human comfort. Criteria in this guideline are based on the British Standard *BS6472-1992 Evaluation of human exposure to vibration in buildings (1-80Hz)*. A summary of these criteria is detailed in Table 8 in Section 5.2.

Vibration sources are defined as continuous, impulsive or intermittent. Table 6 provides a definition and examples of each type of vibration.

Table 6: Types of vibration

Type of Vibration	Definition	Examples
Continuous	Continues uninterrupted for a defined period (usually throughout the day-time and/or night-time).	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).
Impulsive	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). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds.	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	Can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude.	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.

The criteria are to be applied to a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

'Evidence from research suggests that there are summation effects for vibrations at different frequencies. Therefore, for evaluation of vibration in relation to annoyance and comfort, overall weighted rms acceleration values of the vibration in each orthogonal axis are preferred (BS 6472).'

When applying the criteria, it is important to note that vibration may enter the body along different orthogonal axes, i.e. x-axis (back to chest), y-axis (right side to left side) or z-axis (foot to head). The three axes are referenced to the human body. Thus, vibration measured in the horizontal plane should be compared with x- and y-axis criteria if the concern is for people in an upright position, or with the y and z- axis criteria if the concern is for people in the lateral position. Preferred and maximum values for continuous and impulsive vibration are defined in Table 2.2 of the guideline and are reproduced in Section 5.0 of this report.

4.2.2 German Standard DIN 4150 (building damage)

In relation to structural damage, there is currently no Australian Standard that provides criteria for the assessment of structural damage to buildings. However, the German Standard *DIN 4150-3: 1999-02 - Structural vibration - Effects of vibration on structures*, provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration. This standard also presents recommended maximum limits over a range of frequencies measured in any direction at the foundation or in the plane of the uppermost floor.

These criteria are summarised in Table 9 in Section 5.2.

4.2.3 Summary of minimum working distances for vibration intensive plant

Table 19 in Section 7.2 provides a summary of the minimum working distance for different types of sensitive receivers referenced from the standards described above.

The minimum working distances are indicative and will vary depending on the particular item of plant, local geotechnical conditions and the dominant frequency of the construction vibration levels. They apply to cosmetic damage of typical light-framed residential buildings and heritage/fragile buildings and assume that construction vibration could include low frequency content with associated increased risk of cosmetic damage. Vibration monitoring is recommended to confirm the minimum working distances at specific sites.

Additionally, further detailed analysis based on the frequency dependent guideline vibration levels in BS7385-2:1993 and DIN4150-3:2016 may be utilised in conjunction with site-specific measurements to derive alternative cosmetic damage objectives and minimum working distances. For heritage listed / fragile structures, specialist advice from an appropriately qualified structural engineer who is familiar with heritage structures is required to support any proposed relaxation of the initial cosmetic damage screening criterion. Any such relaxation shall be approved by Transport or under the environmental license as relevant.

4.2.4 Australian standards

The following Australian Standards provide criteria and methodologies that have been adopted in this assessment:

- Australian Standard *AS1055-2018: Acoustics – Description and measurement of environmental noise.*

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5.0 DESIGN BENCHMARKS

5.1 CONSTRUCTION NOISE

The assessed construction area has been divided into noise catchment areas (NCA) where ambient noise levels are likely to be similar to assess the potential construction noise impacts on surrounding receivers. These catchment areas are shown in Figure 8 in Section 6.4.

Works may be carried out outside of standard hours due to the nature of the proposal. For this reason, noise management levels (NMLs) have been calculated for both standard and non-standard hours. The NMLs are detailed in Table 7.

Taking into consideration the measured RBLs in Section 3.3 and the criteria from Section 4.1, the applicable construction noise management levels for standard and non-standard hours for the assessed construction methodology are shown in Table 7.

Table 7: Construction NMLs

Noise Catchment Area	Logger Label	Noise Management Level, dB(A)			*Sleep Disturbance $L_{A1,\ 1\ min}$
		Standard Hours (RBL + 10 dB(A))	Outside Standard Hours (RBL + 5 dB(A))		
		Day	Evening	Night	
1	1	56	47	43	60
2	2	65	58	53	60
3	3	57	51	48	60

**Sleep disturbance criteria has been calculated based on an assumed typical internal LAeq noise level of 35 dB(A) referenced from Australian Standard AS:2107 and corrected with a typical inside to outside noise reduction of 10 dB(A).*

5.2 CONSTRUCTION VIBRATION

5.2.1 Human comfort criteria

The vibration criteria for human comfort that apply to the assessed design are outlined in Table 8.

Table 8: Preferred and maximum levels for human comfort

Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x & y axis	z-axis	x & y axis
Continuous vibration[3] (Weighted RMS Acceleration, m/s2, 1-80Hz)					
Critical areas[2]	Day[1] or night-time[1]	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
Impulsive vibration[3] (Weighted RMS Acceleration, m/s2, 1-80Hz)					

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Location	Assessment period	Preferred Values		Maximum Values	
		z-axis	x & y axis	z-axis	x & y axis
Critical areas[2]	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92
Workshops	Day- or night-time	0.64	0.46	1.28	0.92
Intermittent vibration[4] (Vibration Dose Values, VDV, $m/s^{1.75}$, 1-80Hz)					
Critical areas[2]	Day- or night-time	0.10	0.20	-	-
Residences	Daytime	0.20	0.40	-	-
	Night-time	0.13	0.26	-	-
Offices, schools, educational institutions and places of worship	Day- or night-time	0.40	0.80	-	-

Notes: *1. Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am*

2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above.

3. Stipulation of such criteria is outside the scope of their policy and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472-2008

4. For continuous and impulsive vibration the preferred and maximum values are weighted acceleration rms values (m/s^2)

5. For intermittent vibration the preferred and maximum values are vibration dose values (VDVs), based on the weighted acceleration values ($m/s^{1.75}$)

5.2.2 Building damage criteria

The minimum 'safe limit' of vibration at low frequencies for commercial and industrial buildings are presented in DIN 4150.3 is provided in Table 9.

Table 9: DIN 4150-3 Structural damage criteria

Group	Type of Structure	Vibration Velocity, mm/s			
		At Foundation at Frequency of			Plane of floor uppermost storey
		1 to 10 Hz	10 to 50 Hz	50 to 100 Hz	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 - 40	40 - 50	40
2	Dwellings and buildings of similar design and/or use	5	5 - 15	15 - 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 or 2 and have intrinsic value (e.g. buildings under a preservation order)	3	3 - 8	8 - 10	8

Note: *At frequencies above 100 Hz, the values given in this column may be used as minimum values*

6.0 CONSTRUCTION NOISE IMPACT ASSESSMENT

6.1 CONSTRUCTION NOISE ASSESSMENT METHODOLOGY

An assessment of the potential level of construction noise impact has been carried out to determine whether mitigation would be required, and to determine appropriate management controls.

Details of proposed plant to be used for each construction scenarios were provided by BESIX Watpac. Sound power levels for various items of plant and equipment were adopted based upon construction plant noise data provided in Table F-1 of the CNVG. Plant sound power levels were also sourced from *AS2436 – Guide to Noise Control on Construction, Maintenance and Demolition Sites* and measured library data where applicable.

This assessment has been prepared based on construction staging provided by BESIX Watpac. A further assessment may be required to prepare a Construction Noise and Vibration Management Plan (CNVMP) once final construction staging detail becomes available during the next phase of the project.

The proposed works, with the potential to generate the most noise, are detailed in Section 6.6. To provide an indicative assessment of construction noise impact, a noise model was created for a selection of the construction scenarios (refer Table 11).

6.2 NOISE MODELLING INPUTS AND ASSUMPTIONS

6.2.1 General modelling input data

The modelling inputs and assumptions made for the modelling are shown in Table 10.

Table 10: Modelling assumptions

Modelling Element	Input / Assumption
Ground Elevation Geometry	Provided by NSW Spatial Services
Ground Absorption	50% absorption over soft ground 0% absorption over water
Assessment Standard	ISO 9613-2:1996 – Acoustics – Attenuation of Sound During Propagation Outdoors (Part 2: General Method of Calculation)
Weather Conditions	Receiver is downwind of the source, as per the assumptions of ISO 9613.
Receiver Height	1.5 m above ground for prediction models for ground floor. Subsequent floor level receiver heights have been modelled at + 2.8 m above the floor below.

6.3 MODELLED CONSTRUCTION SCENARIOS

The following selected worst case construction scenarios referenced from Table 2 have been modelled for the proposed former Manly Sea Life upgrade.

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Table 11: Modelled construction scenarios

Modelled Scenario (Ref: Table 2 for construction activities)	Construction Scenario Description
1	Site establishment – standard work hours
2	Demolition and removal of the former Manly Sea Life – standard work hours & outside of standard work hours
4	Installation of steel piles within the waterway – outside of standard work hours
6	Installation of boardwalk – standard work hours

To provide an indicative assessment of construction noise impact, a noise model was created for each of the above construction scenarios.

6.4 NOISE CATCHMENT AREAS

Noise modelling was conducted to determine the predicted level of noise impact at sensitive locations surrounding the proposal. Works associated with the modelled scenarios are likely to remain within a finite work area. Therefore, construction works have been modelled as a number of point sources operating simultaneously for each construction scenario to provide the worst case predicted noise levels at each sensitive location. Sensitive areas have been grouped into noise catchment areas as shown in Figure 8.

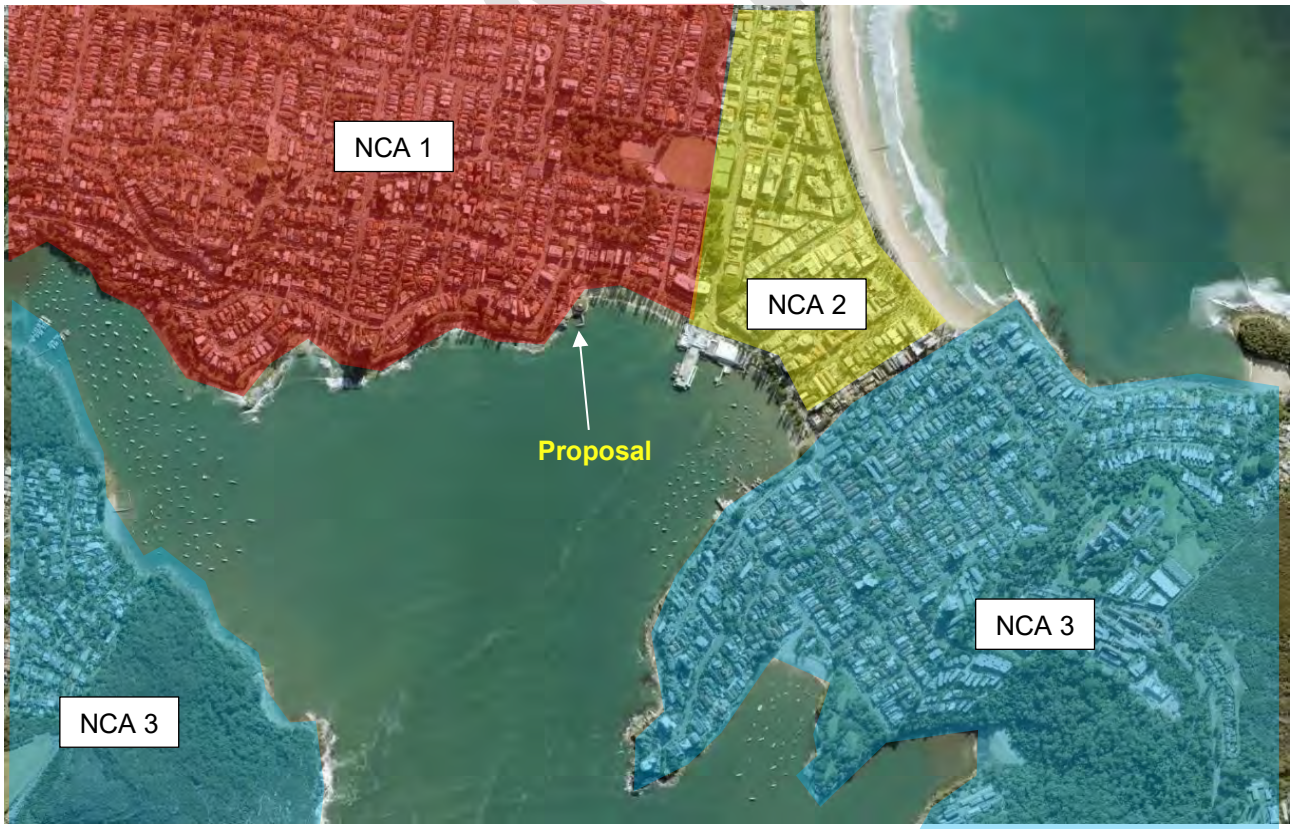


Figure 8: Noise catchment areas

Note: that Balgowlah Heights (across the water, south-west of the proposal) has been included in NCA3 as the background noise data from logger location 3 (Manly Cove Launch Club) has been adopted for this location.

6.5 CONSTRUCTION TIMING

It is understood that construction works are likely to occur during standard hours as well as outside of standard hours for traffic and water safety reasons. The CNVG outlines the following hours:

- Standard hours: Monday to Friday (7am-6pm), Saturday (8am-1pm), Sunday/Public holidays (nil)
- Out of hours work period 1 (OOHW1): Monday to Friday (6pm-10pm), Saturday (7am-8am & 1pm-10pm), Sunday/Public holidays (8am-6pm)
- Out of hours work period 2 (OOHW2): Monday to Friday (10pm-7am), Saturday (10pm-8am, Sunday/Public holidays (6pm-7am).

All night work would be undertaken in accordance with the CNVG where feasible, or in consultation with the adjacent community.

6.6 CONSTRUCTION PLANT AND EQUIPMENT

The construction plant included in the noise models are presented in Table 12. The equipment sound power levels were sourced from the CNVG, AS2436 and Stantec's measurement library.

Table 12: Construction plant sound power levels

Plant Item	Number of Plant	Sound Power Level, L_{Aeq},dB(A) (per item)
Scenario 1 – Site establishment – standard hours	Total L_{Aeq}	121
Barge mounted crane	1	108
Barge mounted impact piling rig / pneumatic piling hammer	1	116
Floating boom	1	108
Hand tools	2	94
Oxey Acet Cutting	1	96
Workboat	2	108
5t Excavator	1	108
Pavement profiler	1	117
Light vehicles	3	103
Franna crane	1	98
Bobcat	1	105
Scenario 2 – Demolition and removal of former the Sea Life – standard hours & outside of standard work hours	Total L_{Aeq}	127 (day works) 116 (night works)
Barge mounted crane	1	108
Concrete truck	3	109
Concrete pump	1	109

Plant Item	Number of Plant	Sound Power Level, L_{Aeq},dB(A) (per item)
Floating boom	1	108
Filter pump	1	106
Hand tools	10	94
Generator	1	98
Wire saw	2	114
Road saw	2	118
Oxey Acet Cutting	2	96
Workboat	1	108
Daymaker	2	98
Pneumatic drill / hammer	1	118
Rockbreaker (mounted)	1	121
Tugboat	1	108
40t Excavator	1	110
20t Excavator	1	110
5t Excavator	1	108
Jackhammer	2	115
90t crawler crane	1	113
Franna crane	1	98
EWP	2	98
Delivery trucks at night	2	110
Scenario 4 – Installation of steel piles within the waterway – outside of standard work hours	Total L_{Aeq}	121
Barge mounted crane	1	108
Barge mounted excavator	1	110
Barge mounted impact piling rig / pneumatic piling hammer	1	116
Concrete truck	3	109
Concrete pump	3	109
Floating boom	1	108
Hand tools	4	94
Generator	1	98
Oxey Acet Cutting	2	96
Workboat	2	108
Daymaker	2	98
Scenario 6 – Installation of boardwalk – standard hours	Total L_{Aeq}	120
Barge mounted crane	1	108
Concrete trucks	3	109
Concrete pump	1	109
Floating boom	1	108
Hand tools	10	94
Generator	1	98

Plant Item	Number of Plant	Sound Power Level, L_{Aeq},dB(A) (per item)
Daymaker	2	98
Pavement profiler	1	117
Light vehicles	3	103
Franna crane	1	98

6.7 PREDICTED CONSTRUCTION NOISE LEVELS

6.7.1 Construction noise

The predicted noise levels at all modelled receivers are included in Appendix A. The predicted reduction of expected construction noise impact with distance is shown on the noise contour maps in Appendix B.

The worst case predicted construction noise levels at the most affected residential receivers in each modelled NCA for each scenario are shown below in Table 13 to Table 17. Noise levels as a result of construction activities are predicted to be lower than these levels for the remaining receivers within each associated NCA. For non-residential sensitive receivers, the use with the highest exceedance of criteria for each NCA is shown.

Table 13: Predicted construction noise levels – Scenario 1 – site establishment – proposed for standard working hours

Most Affected Receivers	Obj No.	Floor	NCA	Predicted Construction Noise Level dB(A), $L_{Aeq,15min}$	ICNG Noise Management Levels (NMLs), dB(A) Standard Hours	Predicted Worst Case Exceedance of ICNG NMLs Day
Noticeable: RBL + 5 dB(A) to RBL + 10 dB(A)						
Clearly audible: RBL + 10 dB(A) to RBL + 20 dB(A)						
Moderately intrusive: RBL + 20 dB(A) to RBL + 30 dB(A)						
Highly intrusive / Highly noise affected: > RBL + 30 dB(A) or > 75 dB(A)						
Residential receivers						
7 The Crescent	21	L5	1	81	56	25
45 East Esplanade	218	L2	2	68	65	3
15 East Esplanade	158	L1	3	63	57	6
Non-residential sensitive receivers						
Manly Cove Beach / West Esplanade Park	1	GL	1	85	60	25
East Manly Cove Beach	15	GL	2	62	60	2
Manly Water Private Hospital	7	L4	3	57	55	2

The above results for Scenario 1 (standard hours) indicate highly intrusive and clearly audible noise levels, and exceedances of the ICNG NML for the standard hours for all NCAs to varying extents for residential receivers.

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The above predictions are based on all plant operating at once, which is unlikely to occur regularly. The above results should therefore be considered conservative on this basis.

It is understood that these works would only occur during standard hours. However, if night works are considered to be necessary for safety reasons, reduced operations are recommended, and careful planning would be required for proposed works for all time periods to manage potential impacts.

Table 14: Predicted construction noise levels – Scenario 2 – demolition and removal of former Manly Sea Life – proposed for standard working hours

Most Affected Receivers	Obj No.	Floor	NCA	Predicted Construction Noise Level dB(A), $L_{Aeq,15min}$	ICNG Noise Management Levels (NMLs), dB(A) Standard Hours	Predicted Worst Case Exceedance of ICNG NMLs Day
Noticeable: RBL + 5 dB(A) to RBL + 10 dB(A)						
Clearly audible: RBL + 10 dB(A) to RBL + 20 dB(A)						
Moderately intrusive: RBL + 20 dB(A) to RBL + 30 dB(A)						
Highly intrusive / Highly noise affected: > RBL + 30 dB(A) or > 75 dB(A)						
Residential receivers						
15 The Crescent	18	L2	1	83	56	27
13 Wentworth Street	219	L7	2	66	65	1
9 Stuart Street	176	L2	3	62	57	5
Non-residential sensitive receivers						
Boat House Kiosk	253	GL	1	93	70	23
East Manly Cove Beach	15	GL	2	61	60	1
Manly Water Private Hospital	7	L4	3	57	55	2

The above results for Scenario 2 (standard hours) indicate highly intrusive and clearly audible noise levels, and exceedances of the ICNG NML for the standard hours for all NCAs to varying extents for residential receivers.

The above predictions are based on all plant operating at once, which is unlikely to occur regularly. The above results should therefore be considered conservative on this basis.

It is understood that these works would only occur during standard hours. However, if night works are considered to be necessary for safety reasons, reduced operations are recommended, and careful planning would be required for proposed works for all time periods to manage potential impacts.

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Table 15: Predicted construction noise levels – Scenario 2 – demolition and removal of former Manly Sea Life – proposed for non-standard working hours (OOWH2)

Most Affected Receivers	Obj No.	Floor	NCA	Predicted Construction Noise Level dB(A), $L_{Aeq,15min}$	ICNG Noise Management Levels (NMLs), dB(A)		Predicted Worst Case Exceedance of ICNG NMLs	
					OOWH1 Hours	OOWH2 Hours	Evening	Night
Noticeable: RBL + 5 dB(A) to RBL + 10 dB(A)								
Clearly audible: RBL + 10 dB(A) to RBL + 20 dB(A)								
Moderately intrusive: RBL + 20 dB(A) to RBL + 30 dB(A)								
Highly intrusive / Highly noise affected: > RBL + 30 dB(A) or > 75 dB(A)								
OOHW1 (Evening) - Period 1 - Mon – Fri (6pm–10pm), Sat (7am–8am & 1pm–10pm), Sun/Pub Hol (8am–6pm) OOHW2 (Night) - Period 2: Mon – Fri (10pm–7am), Sat (10pm–8am), Sun/Pub Hol (6pm–7am)								
Residential receivers								
89 West Esplanade	26	L2	1	74	47	43	27	31
13 Wentworth Street	219	L5	2	54	58	53	0	1
18-19 East Esplanade	156	GF	3	50	51	48	0	2
Non-residential sensitive receivers								
Manly Cove Beach / West Esplanade Park	1	GL	1	75	60	60	15	15
East Manly Cove Beach	15	GL	2	51	60	60	0	0
Manly Water Private Hospital	7	L4	3	45	55	55	0	0

The above results for Scenario 2 (non-standard hours) indicate highly intrusive noise levels for non-standard hours for NCA 1 for residential receivers. For NCAs 2 and 3, the results indicate noticeable noise levels with minor exceedances of the ICNG NMLs predicted during non-standard work hours.

The above predictions are based on all plant operating at once, which is unlikely to occur regularly. The above results should therefore be considered conservative on this basis.

It is proposed that some Scenario 2 works would take place during outside of standard working hours within the OOHW2 time period for safety reasons, however predictions for OOHW1 have also been provided in Table 15 for information purposes. Reduced operations are recommended, and careful planning would be required for the proposed works to manage potential impacts on all NCAs.

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Table 16: Predicted Construction Noise Levels – Scenario 4 – installation of steel piles within the waterway – proposed for non-standard working hours (OOWH2)

Most Affected Receivers	Obj No.	Floor	NCA	Predicted Construction Noise Level dB(A), $L_{Aeq,15min}$	ICNG Noise Management Levels (NMLs), dB(A)		Predicted Worst Case Exceedance of ICNG NMLs	
					OOWH1 Hours	OOWH2 Hours	Evening	Night
Noticeable: RBL + 5 dB(A) to RBL + 10 dB(A)								
Clearly audible: RBL + 10 dB(A) to RBL + 20 dB(A)								
Moderately intrusive: RBL + 20 dB(A) to RBL + 30 dB(A)								
Highly intrusive / Highly noise affected: > RBL + 30 dB(A) or > 75 dB(A)								
OOHW1 (Evening) - Period 1 - Mon – Fri (6pm–10pm), Sat (7am–8am & 1pm–10pm), Sun/Pub Hol (8am–6pm) OOHW2 (Night) - Period 2: Mon – Fri (10pm–7am), Sat (10pm–8am), Sun/Pub Hol (6pm–7am)								
Residential receivers								
15 The Crescent	18	L2	1	83	47	43	36	40
13 Wentworth Street	219	L7	2	66	58	53	8	13
15 East Esplanade	158	GF	3	63	51	48	12	15
Non-residential sensitive receivers								
Boat House Kiosk	253	GL	1	91	70	70	21	21
East Manly Cove Beach	15	GL	2	61	60	60	1	1
Manly Water Private Hospital	7	L4	3	57	55	55	2	2

The above results for Scenario 4 (non-standard hours) indicate highly intrusive and clearly audible noise levels, and exceedances of the ICNG noise management levels for non-standard hours for all NCAs to varying extents for residential receivers.

The above predictions are based on all plant operating at once, which is unlikely to occur regularly. The above results should therefore be considered conservative on this basis.

It is proposed that some Scenario 4 works would take place during outside of standard working hours within the OOHW2 time period for safety reasons, however predictions for OOHW1 have also been provided in Table 16 for information purposes. Reduced operations are recommended, and careful planning would be required for the proposed works to manage potential impacts on all NCAs.

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Table 17: Predicted construction noise levels – Scenario 6 – installation of boardwalk – proposed for standard working hours

Most Affected Receivers	Obj No.	Floor	NCA	Predicted Construction Noise Level dB(A), $L_{Aeq,15min}$	ICNG Noise Management Levels (NMLs), dB(A) Standard Hours	Predicted Worst Case Exceedance of ICNG NMLs Day
Noticeable: RBL + 5 dB(A) to RBL + 10 dB(A)						
Clearly audible: RBL + 10 dB(A) to RBL + 20 dB(A)						
Moderately intrusive: RBL + 20 dB(A) to RBL + 30 dB(A)						
Highly intrusive / Highly noise affected: > RBL + 30 dB(A) or > 75 dB(A)						
11 The Crescent	19	L2	1	78	56	22
13 Wentworth Street	219	L7	2	58	65	0
9 Stuart Street	176	L2	3	54	57	3
Non-residential sensitive receivers						
Boat House Kiosk	253	GL	1	94	70	24
East Manly Cove Beach	15	GL	2	54	60	0
Manly Water Private Hospital	7	L4	3	49	55	0

The above results for Scenario 6 (standard hours) indicate highly intrusive noise levels and exceedance of the ICNG NML during standard work hours for NCA 1 for residential receivers. For NCA 2, the results indicate no exceedances of the ICNG NML are predicted during standard work hours. For NCA 3, the results indicate noticeable noise levels with minor exceedances of the ICNG NML predicted during standard work hours.

The above predictions are based on all plant operating at once, which is unlikely to occur regularly. The above results should therefore be considered conservative on this basis.

It is understood that these works would only occur during standard hours. However, if night works are considered to be necessary for safety reasons, reduced operations are recommended, and careful planning would be required for proposed works for all time periods to manage potential impacts.

6.7.2 Construction traffic noise

The number of construction vehicles is expected to be low, with the number of trucks estimated to be a maximum of 20 movements per day for the duration of the project (10 months).

Existing road traffic volumes were not available at the time of this assessment. However, this level of additional traffic is not likely to impact on the current environment given the current usage of these roads.

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6.8 CONSTRUCTION NOISE RESULTS SUMMARY

In accordance with the NML stipulated in Section 5.1, residential sensitive receivers exposed to levels of construction noise above 75 dB(A) are considered highly noise affected, with dwellings exposed to levels above the NML or daytime RBL +10 dB(A) considered noise affected. The numbers of each are detailed in Table 18 based on the modelling results. A modelled receiver point has been applied to each floor of the most exposed façade of each building expected to be affected by construction noise.

6.8.1 Predicted number of exceedances

The number of predicted exceedances for the worksite are detailed in Table 18.

Table 18: Predicted number of residenital receivers where NMLs are likely to be exceeded

Construction Scenario	Standard Hours	Evening (non-standard hours)	Night (non-standard hours)	Highly Noise Affected
Scenario 1	190	-	-	20
Scenario 2	134	-	127	19
Scenario 4	-	-	236	17
Scenario 6	63	-	-	8

Construction noise levels are predicted to exceed NMLs for “standard” and “non-standard” hours of operation for all construction scenarios at the nearest residential receivers. Some receivers are expected to be noise affected for all construction scenarios associated with the assessed design.

It should be noted that this assessment has endeavoured to carry out “worst case” noise modelling, and noise levels are predicted based on all sources operating simultaneously within the worksite. This is therefore likely to represent the worst-case scenario and construction noise levels would generally be less than those predicted.

6.8.2 Sleep disturbance (scenarios 2&4)

The most likely source of potential sleep disturbance from outside of construction hours works would be from impact piling which may need to be undertaken as early morning works for safety reasons.

Maximum noise levels have been predicted to the nearest affected residential receivers to allow a review of the potential for sleep disturbance from construction activities at night. In the absence of measurement data typical construction source L_{Amax} noise levels were assumed to be 10 dB(A) above the predicted L_{Aeq} noise levels, on the basis of measurements from previous projects. On this basis, the receivers where the sleep disturbance criteria is likely to be exceeded are summarised in Table 29 in Appendix A.

The predicted L_{Amax} results detailed Appendix A indicate that maximum construction noise levels are likely to exceed the sleep disturbance criteria for the “outside of standard hours” construction scenarios at some of the assessed receivers in all NCAs. For this reason, it is recommended that activities with potentially high maximum levels such as piling, use of pneumatic tools, and drilling are minimised at these locations during the quietest periods of the overall night-time period.

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7.0 CONSTRUCTION VIBRATION ASSESSMENT

7.1 VIBRATION ASSESSMENT

For the purposes of this assessment, the following proposed plant with the potential to generate the most vibration have been considered:

- Impact piling rig / pile hammer
- Jackhammer
- Rock breakers / rock saw
- Rock drill
- Truck movements.

Construction vibration levels vary depending on the distance from the equipment in use, the energy level imparted to the ground by the construction process, and the bedrock type. The highest vibration sources associated with the construction work would be pile hammers and impact piling rigs. It is anticipated that no blasting would be required as part of this proposal.

The *Transit Noise and Vibration Impact Assessment* (TNVIA) (US Federal Transit Administration (FTA), 2006) outlines calculation methods for construction equipment vibration levels. These levels are expressed in terms of Peak Particle Velocity (PPV, mm/s), with vibration levels provided for a number of plant items. The TNVIA specifies that:

"It should be noted that there is a considerable variation in reported ground vibration levels from construction sites. The data provides a reasonable estimate for a wide range of soil conditions."

Based on the methodology provided by the TNVIA and the predicted safe working distances in Table 19, the predicted vibration impact results compared to distance from the works are shown in Figure 9. Depending on the actual ground conditions (i.e. greater density of rock), vibration levels may increase and affect residents to a greater extent subjectively.

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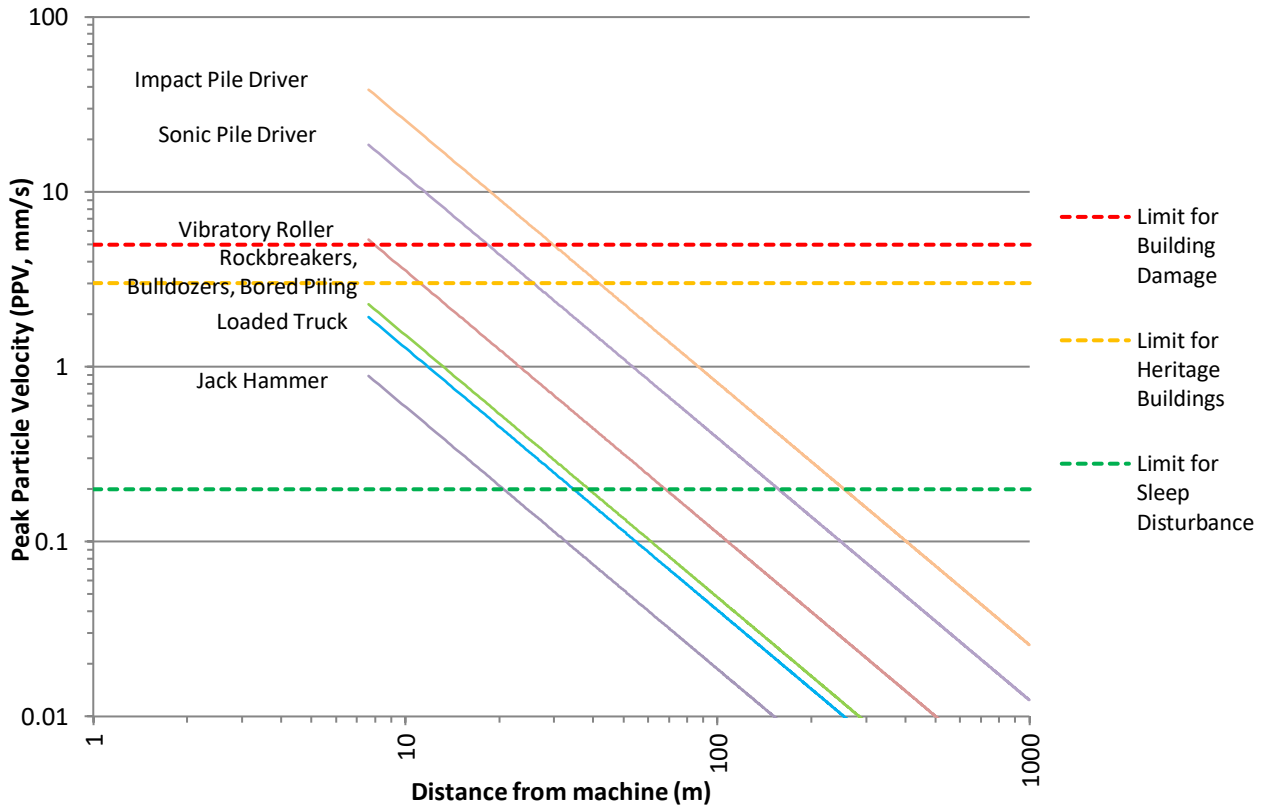


Figure 9: Estimates of vibration levels generated by common construction activities / equipment at various distances (Source: FTA 2006)

Note: The predicted vibration levels in the figure above include a safety margin for carrying ground types.

Based on the impact distances detailed in Figure 9, construction works including bored piling may be undertaken with a minimum separation distance of 4-5 metres from the nearest buildings to minimise building damage. According to the FTA methodology, where impacted buildings or structures are heritage listed or of similar more sensitive construction, the minimum separation distance should be increased to 10 metres. Where exsiting heritage structures are observed to be fragile or damaged, this distance should be increased to 40 metres as per the requirements of Table 19.

However for impact piling, rock hammers, piling hammers and vibratory rollers, the minimum required safe working distance between construction activities and sensitive receivers is increased, as detailed in Table 19, depending on their size, to reduce vibration to within levels unlikely to cause building damage.

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7.2 MINIMUM WORKING DISTANCE (CNVG)

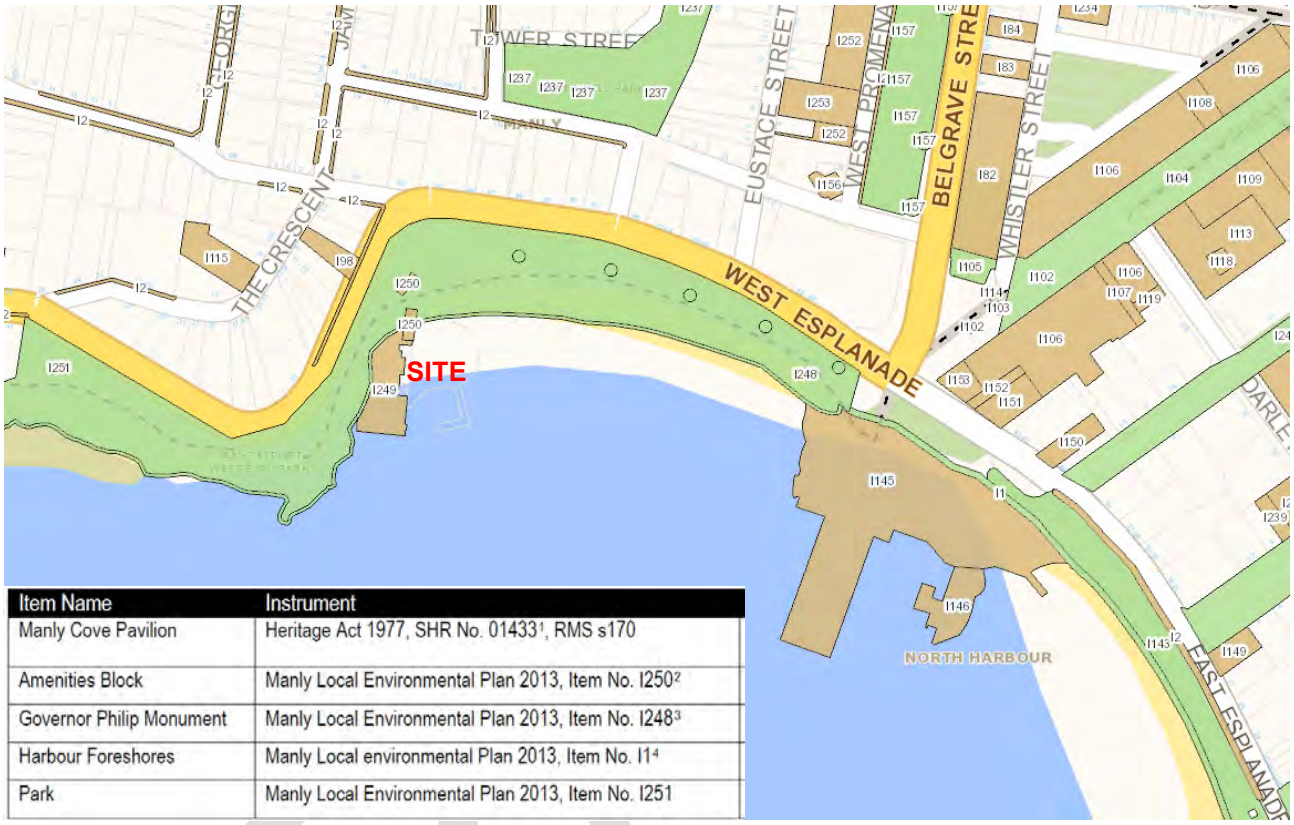
The minimum working distance for vibration intensive plant from sensitive receivers is listed in Table 2 of the CNVG. Table 19 presents these recommended minimum working distances for specific construction activities.

Table 19: Recommended minimum working distances for vibration intensive plant from sensitive receivers

Plant Item	Rating / Description	Minimum Working Distance		
		Cosmetic Damage (BS 7385)	Cosmetic damage (DIN 4150) Heritage and other sensitive structures	Human Response (OH&E Vibration Guideline)
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	14 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	16 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	33 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	41 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	54 m	100 m
	> 300 kN (> 18 tonnes)	25 m	68 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	5 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	19 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	60 m	73 m
Vibratory Pile Driver	Sheet Piles	2 m to 20 m	50 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	40 m	4 m
Jackhammer	Hand Held	1 m (nominal)	2 m	2 m

7.3 HERITAGE STRUCTURES

Heritage structures listed on the *Manly Local Environmental Plan* 2013 (Manly LEP) are located in proximity to the project as shown in Figure 10.



Item Name	Instrument
Manly Cove Pavilion	Heritage Act 1977, SHR No. 01433[1], RMS s170
Amenities Block	Manly Local Environmental Plan 2013, Item No. I250[2]
Governor Philip Monument	Manly Local Environmental Plan 2013, Item No. I248[3]
Harbour Foreshores	Manly Local environmental Plan 2013, Item No. I1[4]
Park	Manly Local Environmental Plan 2013, Item No. I251

Figure 10: Heritage listings within and in close proximity to the proposal

Part of the proposed boardwalk is located within the curtilage of the Manly Cove Pavilion (Lot 2 DP 1019352) listed on the State Heritage Register (SHR) as 'Manly Cove Pavilion' (SHR no. 01433), as well as under the Part 1 of Schedule 5 of the Manly LEP (item no. I249. The site is also located in the vicinity of items listed on Part 1 of Schedule 5 of the Manly LEP: 'Park' (item no. I251), 'Harbour foreshores' (item no. I1) and 'Manly Cove Amenities Block' (item no. I250).

The proposed works would involve piling and other vibration intensive plant. These works would be located at less than the minimum safe working distance for cosmetic damage, which is identified in the CNVG and Table 19 as 41 metres for 7.5 tonne rollers.

Based on the above, with the use of 7.5 tonne vibratory rollers, a predicted vibration level of > 5 mm/s could be experienced at the closest existing heritage structures described above, which exceeds the limits stated in DIN 4150.3, and occurs at a distance of less than the safe working distances stated in the CNVG. Therefore, where use of vibratory rollers is required, the smallest available size (<50kN) should be utilised. In addition, use of vibratory rollers within 15 metres of the heritage structures is not recommended.

Bored piling is also proposed for the assessed construction methodology. Based on Table 19, bored piling should not be carried out within 40 metres of heritage structures. However, at 10 metres,

predicted vibration levels (in accordance with the FTA Methodology) would be expected to be around 2 mm/s, which is lower than the limits stated in DIN 4150.3.

Similar results to those structures assessed above apply to the other heritage structures in proximity to the project to a lesser extent due to their larger separation distance.

In summary, the proposed works would be located at less than minimum safe working distance for cosmetic damage to heritage fabric, which is identified in the CNVG as being within 40-41 metres of vibration intensive plant. Therefore, due to the close proximity of the works, the vibrations associated with the piling and additional plant have the potential to cause impacts to the existing heritage buildings (Manly Cove Pavilion and Amenities Block).

However, only a small number of piles are required and the potential impacts could also be largely mitigated through control measures (see mitigation measures and recommendations in Section 8.0). As a result, it is expected that any potential direct impacts resulting from vibrations would be minimised.

Where works are proposed at less than safe working distances, specialist advice should be sought from an appropriately qualified structural engineer who is familiar with heritage structures to support any proposed relaxation of the initial cosmetic damage screening criterion. Any such relaxation shall be approved by Transport or under the environmental license as relevant.

In addition, and in conjunction with the above specialist advice from a structural engineer, test vibration measurements of piling and other vibration intensive plant at the work location closest to the structure should be carried out prior to works commencing to determine the level of vibration at the sensitive structure. If vibration levels exceed the Heritage Building limits detailed in Table 19, alternative work methods should be sought.

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8.0 RECOMMENDED MITIGATION MEASURES

8.1 ICNG & AS 2436 RECOMMENDED MITIGATION MEASURES

8.1.1 General mitigation measures

The following best practice construction noise and vibration mitigation measures are based on recommendations provided within the ICNG and Australian Standard *AS 2436-1981: Guide to Noise Control on Construction, Maintenance and Demolition Sites*. The best practice measures provided in Table 20 apply to the proposed construction activities.

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Table 20: Noise and vibration safeguards and management measures

ID	Impact	Environmental Safeguards	Responsibility	Timing
NV1	Noise and vibration	Preparation of a construction noise and vibration management plan (CNVMP) based on recommendations provided within the ICNG and Australian Standard *AS 2436-1981: Guide to Noise Control on Construction, Maintenance and Demolition Sites*. This is to include, but not be limited to: • Plant controls: – Use of noise attenuating controls at the source, such as mufflers, acoustic screens, etc. – Maintain plant and equipment in good working order to prevent excess noise generation. – Locate static sources of noise such as the generators as remotely as possible from noise sensitive receivers – Use of broadband reversing alarms, or “quackers”, on mobile equipment in accordance with the relevant health and safety regulations – Use of temporary noise barriers where practical. The height and location of these barriers will be determined during preparation of the CNVMP when more information regarding the proposed plant to be used for each construction stage is available. – Investigate whether “at plant” mitigation or muffled plant is available for plant with high source noise levels such as rock hammers and piling rigs, and plant emitting continuous noise such as generators. – Acoustic curtains (generally loaded vinyl based products), attached to wire construction fencing or laid over steel scaffold can also provide practical temporary noise barriers. Acoustic curtains will be investigated for stationery plant within the worksites once a detailed schedule of works and plant information is available. • Management and behavioural controls: – Ensure that managers effectively communicate acceptable and unacceptable work practices for the site, through staff site inductions, notice boards, and prestart meetings. – Avoid the need for reversing in the construction area by creating a loop road or similar. – Avoid dropping materials from height. – Workers will avoid shouting, minimise talking loudly, and avoid slamming vehicle doors. • Allowing construction to occur only during approved construction hours, unless otherwise required as a condition of Transport for NSW safety requirements • Conducting noise monitoring during all construction phases/scenarios considering the potential exceedances for the purposes of assisting in noise mitigation and to verify the findings of this noise assessment. • Implementing a procedure for dealing with complaints to ensure that all complaints are registered and dealt with appropriately. • Conducting additional monitoring if complaints are received or proposed activities and number of plant exceed those assumed in this assessment. • Modifying work activities where noise or vibration is found to cause unacceptable impact e.g. utilising lower intensity and quieter piling methodology where possible, such as bored piling which is significantly quieter and less vibration intensive than impact piling.	Contractor	Pre-construction

ID	Impact	Environmental Safeguards	Responsibility	Timing
		• Implementation of additional mitigation measures in accordance with the CNVG including notification, respite periods and alternate accommodation as reasonable and feasible.		
NV2	Noise and vibration	• Carrying out works within standard daytime hours as follows: – 7:00 am to 6:00 pm Monday to Friday – 8:00 am to 1:00 pm Saturdays, no work on Sundays or public holidays. • Do not carry out operations during evening or night-time hours, unless required for safety reasons when the water is calmer during the night period. • Should operations be required outside standard hours, an Out of Hours procedure detailing works schedule, approval process, communication requirements and management measures will be prepared. • All reasonable and feasible efforts will be undertaken to ensure noise levels will not exceed the ICNG noise management levels stated in Section 5.1 of this assessment by carrying out night-works with reduced numbers of plant for example.	Contractor	Construction
NV3	Noise and vibration	• Notification of potentially affected receivers detailing work activities, dates and hours, impacts and mitigation measures, indication of work schedule over the night time period, any operational noise benefits from the work (where applicable) and contact telephone number. • Notification should be a minimum of seven calendar days prior to the start of work. • A contact telephone number and email address will be available for community feedback	Transport for NSW / Contractor	Pre-construction
NV4	Vibration impact to heritage structures	Where works are proposed within the safe working limits, for the heritage structures, specialist advice will be sought from an appropriately qualified structural engineer who is familiar with heritage structures to assess if vibrations associated with the proposed works will potentially result in impacts to heritage structures. Vibration monitoring will be carried out to confirm vibration levels prior to construction commencement.	Contractor	Pre-construction
NV5	Vibration impact to heritage structures	Regular inspections of the construction activities and work areas will be undertaken by structural engineers and any other required specialist to monitor and review the construction methodology to confirm the integrity of the heritage items. Assessment and monitoring of vibration impacts will adhere to: • British Standard BS 7385: Part 2: Evaluation and Measurement for Vibrations in Buildings –Part 2 Guide to Damage Levels from Ground-Borne Vibration • German Standard DIN 4150, Part 3: Structural Vibration in Buildings: Effects on Structures.	Contractor	Pre-construction
NV6	Vibration	Where buildings are located within the safe working distance zone, pre and post dilapidation surveys will be carried out.	Contractor	Pre-construction / Post-Construction
NV7	Vibration	Where buildings are located within the safe work distance zones (non-heritage structures), vibration monitoring will be carried out to ensure compliance with the required criteria. If exceedances are recorded, works will be modified accordingly to reduce vibration levels.	Contractor	Pre-construction / Construction

8.2 CNVG NOISE MANAGEMENT RECOMMENDATIONS

The CNVG stipulates that additional noise management measures may be required where noise levels are predicted to exceed the noise management levels.

The range of additional mitigation measures include, but are not limited to:

- Notification via letterbox or phone call
- Respite periods
- Alternative accommodation.

Identification of where additional mitigation measures may be required is based on the information presented below in Table 21.

Table 21: Triggers for additional mitigation measures – airborne noise

Predicted airborne LAeq(15min) noise level at receiver				
Perception	**dB(A) above RBL**	**dB(A) above NML**	**Type of Additional Mitigation Measures**	**Mitigation Levels**
All hours				
75dBA or greater	-	-	N, V, PC, RO	HA
Standard Hours: Mon - Fri (7am - 6pm), Sat (8am - 1pm), Sun/Pub Hol (Nil)				
Noticeable	5 to 10	0	-	NML
Clearly audible	10 to 20	< 10	-	NML
Moderately intrusive	20 to 30	10 to 20	N, V	NML + 10
Highly intrusive	> 30	> 20	N, V	NML + 20
OOHW Period 1: Mon - Fri (6pm - 10pm), Sat (7am - 8am & 1pm - 10pm), Sun/Pub Hol (8am - 6pm)				
Noticeable	5 to 10	< 5	-	NML
Clearly audible	10 to 20	5 to 15	N, R1, DR	NML + 5
Moderately intrusive	20 to 30	15 to 25	V, N, R1, DR	NML + 15
Highly intrusive	> 30	> 25	V, IB, N, R1, DR, PC, SN	NML + 25
OOHW Period 2: Mon - Fri (10pm - 7am), Sat (10pm - 8am), Sun/Pub Hol (6am - 7am)				
Noticeable	5 to 10	< 5	N	NML
Clearly audible	10 to 20	5 to 15	V, N, R2, DR	NML + 5
Moderately intrusive	20 to 30	15 to 25	V, IB, N, PC, SN, R2, DR	NML + 15
Highly intrusive	> 30	> 25	AA, V, IB, N, PC, SN, R2, DR	NML + 25

Notes:	*AA = Alternative Accommodation*	*R1 = Respite Period 1*
	V = Verification	*R2 = Respite Period 2*
	IB = Individual Briefings	*DR = Duration Respite*
	N = Notification	*Perception = relates to level above RBL*
	PC = Phone Calls	*NML = Noise Management Level*
	SN = Specific Notifications	*HA = Highly Affected (> 75 dB(A) - applies to residences only)*

A detailed description of each additional mitigation measure is presented below.

Additional mitigation measures may be required where noise levels are predicted to exceed the noise management levels. Refer to Appendix A for areas where this is predicted to occur.

The range of additional mitigation measures are itemised below.

Notification (N)

Notification using letterbox drop or equivalent for advanced warning of works and potential disruptions can assist in reducing the impact on the community. The notification may consist of a letterbox drop (or equivalent) detailing work activities, time periods over which these will occur, impacts and mitigation measures. Notification should be a minimum of 5 working days prior to the start of works. The approval conditions for projects may also specify requirements for notification to the community about works that may impact on them.

Specific notifications (SN)

Specific notifications are letterbox dropped (or equivalent) to identified stakeholders no later than seven calendar days ahead of construction activities that are likely to exceed the noise objectives. The specific notification provides additional information when relevant and informative to more highly affected receivers than covered in general letterbox drops.

The exact conditions under which specific notifications would proceed are defined in Table 22 below. This form of communication is used to support periodic notifications, or to advertise unscheduled works.

Phone calls (PC)

Phone calls detailing relevant information made to identified/affected stakeholders within seven calendar days of proposed work. Phone calls provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs. Where the resident cannot be telephoned then an alternative form of engagement should be used.

Individual briefings (IB)

Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Project representatives would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project. Where the resident cannot be met with individually then an alternative form of engagement should be used.

Respite Offers (RO)

Respite Offers should be considered where there are high noise and vibration generating activities near receivers. As a guide work should be carried out in continuous blocks that do not exceed 3 hours each, with a minimum respite period of one hour between each block. The actual duration of each block of work and respite should be flexible to accommodate the usage of and amenity at nearby receivers.

The purpose of such an offer is to provide residents with respite from an ongoing impact. This measure is evaluated on a project-by-project basis and may not be applicable to all projects.

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Respite Period 1 (R1)

Out of hours construction noise in out of hours period 1 shall be limited to no more than three consecutive evenings per week except where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and no more than 6 evenings per month.

Respite Period 2 (R2)

Night time construction noise in out of hours period 2 shall be limited to two consecutive nights except for where there is a Duration Respite. For night work these periods of work should be separated by not less than one week and 6 nights per month. Where possible, high noise generating works shall be completed before 11pm.

Duration Respite (DR)

Respite offers and respite periods 1 and 2 may be counterproductive in reducing the impact on the community for longer duration projects. In this instance and where it can be strongly justified it may be beneficial to increase the work duration, number of evenings or nights worked through Duration Respite so that the project can be completed more quickly.

The project team should engage with the community where noise levels are expected to exceed the NML to demonstrate support for Duration Respite.

Where there are few receivers above the NML each of these receivers should be visited to discuss the project to gain support for Duration Respite.

Alternative Accommodation (AA)

Alternative accommodation options may be offered to residents living in close proximity to construction works that are likely to experience highly intrusive noise levels. The specifics of the offer will be identified on a project-by-project basis. Additional aspects for consideration shall include whether the highly intrusive activities occur throughout the night or before midnight.

Verification (V)

Routine checks of noise levels or following reasonable complaints. This verification should include measurement of the background noise level and construction noise. Note this is not required for projects less than three weeks unless to assist in managing complaints.

Table 22 identifies required additional mitigation measures that may be implemented where exceedances of the NML are predicted.

Table 22: Additional mitigation measures where exceedances of the NML are predicted

Construction Activity	Out of Hours Work	Type of Additional Mitigation Measures for Noise Catchment Area		
		NCA 1	NCA 2	NCA 3
Scenario 2 – Demolition and removal of former Sea Life	Period 1	V, IB, N, R1, DR, PC, SN	N, R1, DR	N, R1, DR
	Period 2	AA, V, IB, N, PC, SN, R2, DR	V, N, R2, DR	V, N, R2, DR

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Scenario 4 – Installation of steel piles within the waterway	Period 1	V, IB, N, R1, DR, PC, SN	N, R1, DR	N, R1, DR
	Period 2	AA, V, IB, N, PC, SN, R2, DR	V, N, R2, DR	V, N, R2, DR

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9.0 CONCLUSIONS

This assessment has determined the following conclusions:

- In accordance with the noise management levels stipulated in Section 5.1, dwellings exposed to levels of construction noise above 75 dB(A) are considered highly noise affected, with dwellings exposed to levels above the daytime RBL +10 dB(A) considered noise affected.
- Construction noise levels are predicted to exceed the ICNG NM) for “standard” construction hours at all NCAs (1-3) for construction Scenarios 1 & 2.
- Construction noise levels are predicted to exceed the ICNG NML for “standard” construction hours at NCAs 1 & 3 for construction Scenario 6. The NML at NCA 2 is not predicted to be exceeded for construction Scenario 6 during “standard” work hours.
- Construction noise levels are predicted to exceed noise management levels for “non-standard” hours for Scenarios 2 & 4 in all NCAs, particularly for receivers located on The Crescent and West Esplanade in NCA 1, Wentworth Street and East Esplanade in NCA 2, and East Esplanade in NCA 3. This is due to the proximity of receivers to the construction works.
- Predicted levels are expected to be highly intrusive at a number of receivers in NCA 1 for all Scenarios for works during the OOHW2 time period. Construction noise is likely to have the highest impact on and cause sleep disturbance at sensitive receivers located on The Crescent and West Esplanade in NCA 1, due to their proximity to the proposed work site.
- It should be noted that this assessment has endeavoured to carry out “worst case” noise modelling, and noise levels are predicted based on all modelled sources operating simultaneously. Should the work sites or plant and equipment be amended, the predicted noise levels would change accordingly.
- The predicted exceedances are generally a result of works being located in close proximity to the adjacent receivers. This modelling has been carried out to provide a worst case scenario and it may be possible to reduce the number of plant operating simultaneously, particularly at night, once detailed construction schedules are known.
- Use of temporary noise barriers are recommended where practical. The height and location of these barriers will be determined during preparation of the CNVMP when more information regarding the proposed plant to be used for each construction scenario is available.
- Best practice mitigation measures are recommended in Section 8.0 of this report.
- It is generally expected that sleep disturbance criteria are likely to be exceeded unless the proposed number and type of plant are reduced for out of hours works. Only indicative predictions of expected L_{Amax} impact have been carried out for this assessment, as it is difficult to predict L_{Amax} for construction noise sources because L_{Amax} levels can vary considerably. The predicted levels in this assessment, are based on previously measured relationships between L_{Aeq} and L_{Amax} of typical construction plant, and may vary from those predicted in practice.
- An indicative assessment only of expected L_{Amax} impact has been carried out for this assessment as it is difficult to predict L_{Amax} for construction noise sources. It is generally expected that sleep disturbance criteria are likely to be exceeded unless the proposed number and type of plant are reduced for out of hours works.
- The minimum working distances indicated in Table 19 for cosmetic damage must be complied with at all times, unless otherwise approved by Transport for NSW or under the environmental license as relevant, as stipulated in the CNVG.

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- A detailed CNVMP will be prepared for the project prior to construction commencement to incorporate the recommendations detailed in Section 8.0 and updated to reflect the proposed staging and plant to be adopted for the project.

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10.0 REFERENCES

Australian Standard *AS 1055-2018 Acoustics – Description and measurement of environmental noise. 2018*

Australian Standard AS 2436:1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites, 1981.*

British Standard BS 7385.2:1993 *Evaluation and Measurement for Vibrations in Buildings – Part 2 Guide to Damage Levels from Ground-Borne Vibration, 1993*

British Standard BS6472:1992 *Evaluation of human exposure to vibration in buildings (1-80Hz), 1992.*

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GHD (2022) Manly Wharf 3 Upgrade. Noise and vibration impact assessment. Prepared by GHD Pty Ltd, for Transport for NSW. Report ref: 12547220, dated 26/08/2022

RMS (2016) *Construction Noise and Vibration Guideline*. Roads and Maritime Services, August 2016.

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APPENDIX A

Predicted Construction Noise Levels

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Table 23: Predicted construction noise levels (LAeq) compared to CNVG daytime noise impact categories – NCA 1

Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 51-56 dB(A)					
Clearly audible: 56-66 dB(A)					
Moderately intrusive: 66-75 dB(A)					
Highly Intrusive: >75 dB(A)					
1 Eustace Street	1	F 1	73	72	66
1 Eustace Street	1	F 2	73	73	66
1 Eustace Street	1	F 3	74	72	65
1 Eustace Street	1	GF	73	72	66
1 Farlight Street	1	F 1	66	63	57
1 Farlight Street	1	GF	61	59	52
1 Lauderdale Avenue	1	F 1	58	53	42
1 Lauderdale Avenue	1	F 10	60	57	45
1 Lauderdale Avenue	1	F 11	60	58	45
1 Lauderdale Avenue	1	F 12	60	58	45
1 Lauderdale Avenue	1	F 13	61	58	45
1 Lauderdale Avenue	1	F 14	61	58	45
1 Lauderdale Avenue	1	F 15	61	59	45
1 Lauderdale Avenue	1	F 2	59	54	42
1 Lauderdale Avenue	1	F 3	59	54	43
1 Lauderdale Avenue	1	F 4	59	55	43
1 Lauderdale Avenue	1	F 5	60	55	43
1 Lauderdale Avenue	1	F 6	60	56	44
1 Lauderdale Avenue	1	F 7	60	56	44
1 Lauderdale Avenue	1	F 8	60	57	44
1 Lauderdale Avenue	1	F 9	60	57	44
1 Lauderdale Avenue	1	GF	57	52	40
1 Laurence Street	1	F 1	48	47	40
1 Laurence Street	1	GF	48	47	40
1 Margaret Street	1	F 1	41	41	34
1 Margaret Street	1	F 2	41	41	34
1 Margaret Street	1	F 3	43	42	35
1 Margaret Street	1	GF	44	42	34
1 Rowe Street	1	F 1	76	75	68
1 Rowe Street	1	GF	76	74	68
1 The Crescent	1	F 1	79	80	74
1 The Crescent	1	F 2	79	80	75
1 The Crescent	1	GF	78	79	73
10 Camera Street	1	F 1	60	66	61
10 Camera Street	1	GF	55	64	58
10 Eustace Street	1	F 1	54	50	43
10 Eustace Street	1	F 2	57	51	43
10 Eustace Street	1	F 3	59	54	44
10 Eustace Street	1	GF	52	49	43
10 Upper Gilbert Street	1	F 1	62	70	67
10 Upper Gilbert Street	1	GF	61	68	65
11 Camera Street	1	F 1	61	69	60
11 Camera Street	1	GF	67	66	55
11 Eustace Street	1	F 1	56	49	44
11 Eustace Street	1	F 2	58	51	45
11 Eustace Street	1	GF	54	49	43
11 Farlight Street	1	F 1	63	60	50
11 Farlight Street	1	GF	61	59	49
11 Gilbert Street	1	F 1	63	63	55
11 Gilbert Street	1	F 2	65	66	56
11 Gilbert Street	1	F 3	69	70	62
11 Gilbert Street	1	GF	59	59	52
11 The Crescent	1	F 1	80	82	77
11 The Crescent	1	F 2	81	83	78
11 The Crescent	1	GF	80	82	77

Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 51-56 dB(A)					
Clearly audible: 56-66 dB(A)					
Moderately intrusive: 66-75 dB(A)					
Highly Intrusive: >75 dB(A)					
12 Camera Street	1	F 1	60	68	59
12 Camera Street	1	GF	57	65	56
12 Eustace Street	1	F 1	52	48	41
12 Eustace Street	1	F 2	55	50	42
12 Eustace Street	1	F 3	57	51	42
12 Eustace Street	1	GF	50	48	41
12 The Crescent	1	F 1	58	56	49
12 The Crescent	1	GF	56	54	47
12 Upper Gilbert Street	1	F 1	71	71	63
12 Upper Gilbert Street	1	GF	69	69	60
13 Camera Street	1	F 1	68	67	59
13 Camera Street	1	GF	61	60	53
13 Eustace Street	1	F 1	50	48	44
13 Eustace Street	1	F 2	54	51	46
13 Eustace Street	1	GF	53	48	44
13a Upper Gilbert Street	1	F 1	71	70	64
13a Upper Gilbert Street	1	GF	70	70	63
14 Camera Street	1	F 1	68	67	59
14 Camera Street	1	GF	67	63	53
14 Upper Gilbert Street	1	F 1	70	69	61
14 Upper Gilbert Street	1	GF	67	67	61
15 Farlight Street	1	F 1	62	59	51
15 Farlight Street	1	GF	61	58	50
15 The Crescent	1	F 1	80	83	77
15 The Crescent	1	F 2	81	83	78
15 The Crescent	1	GF	79	81	74
15 Upper Gilbert Street	1	F 1	69	72	66
15 Upper Gilbert Street	1	GF	69	71	66
15a Eustace Street	1	F 1	57	54	51
15a Eustace Street	1	F 2	58	57	55
15a Eustace Street	1	GF	55	53	50
16 Upper Gilbert Street	1	F 1	67	66	56
16 Upper Gilbert Street	1	GF	61	61	53
17 Eustace Street	1	F 1	53	50	43
17 Eustace Street	1	F 2	55	50	44
17 Eustace Street	1	GF	51	50	44
17 Farlight Street	1	F 1	57	54	46
17 Farlight Street	1	GF	56	53	45
17 The Crescent	1	F 1	80	82	75
17 The Crescent	1	F 2	81	83	76
17 The Crescent	1	GF	80	81	75
17 Upper Gilbert Street	1	F 1	71	67	61
17 Upper Gilbert Street	1	GF	71	65	60
19 Eustace Street	1	F 1	46	46	40
19 Eustace Street	1	F 2	50	47	42
19 Eustace Street	1	GF	45	45	40
19 The Crescent	1	F 1	77	75	68
19 The Crescent	1	F 2	78	76	69
19 The Crescent	1	GF	76	75	68
19 Upper Gilbert Street	1	F 1	62	61	54
19 Upper Gilbert Street	1	GF	60	59	53
1a Farlight Street	1	F 1	68	66	61
1a Farlight Street	1	GF	65	65	60
2 Farlight Street	1	F 1	70	68	64
2 Farlight Street	1	GF	67	63	61
2 Gilbert Street	1	F 1	62	68	53
2 Gilbert Street	1	F 2	66	70	56
2 Gilbert Street	1	GF	59	66	51
2 Margaret Street	1	F 1	49	48	41

Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 51-56 dB(A)					
Clearly audible: 56-66 dB(A)					
Moderately intrusive: 66-75 dB(A)					
Highly Intrusive: >75 dB(A)					
2 Margaret Street	1	GF	48	48	42
2 Tower Street	1	F 1	72	72	65
2 Tower Street	1	F 2	71	72	65
2 Tower Street	1	F 3	72	73	66
2 Tower Street	1	GF	72	71	64
20 The Crescent	1	F 1	54	54	46
20 The Crescent	1	GF	54	54	46
21 Eustace Street	1	F 1	54	51	43
21 Eustace Street	1	F 2	57	53	45
21 Eustace Street	1	GF	53	50	43
21a Eustace Street	1	F 1	49	52	45
21a Eustace Street	1	F 2	50	54	47
21a Eustace Street	1	GF	49	51	44
22 The Crescent	1	F 1	54	53	46
22 The Crescent	1	GF	53	52	44
23 The Crescent	1	F 1	79	80	73
23 The Crescent	1	F 2	79	80	73
23 The Crescent	1	GF	78	79	72
24 The Crescent	1	F 1	52	54	45
24 The Crescent	1	GF	51	53	45
25 The Crescent	1	F 1	75	75	67
25 The Crescent	1	F 2	75	75	68
25 The Crescent	1	GF	74	75	66
26 The Crescent	1	F 1	58	52	43
26 The Crescent	1	F 2	59	52	43
26 The Crescent	1	F 3	58	52	43
26 The Crescent	1	GF	57	51	43
27 The Crescent	1	F 1	61	60	51
27 The Crescent	1	F 2	63	62	53
27 The Crescent	1	GF	59	58	50
28 The Crescent	1	F 1	47	49	41
28 The Crescent	1	F 2	48	50	41
28 The Crescent	1	F 3	49	50	41
28 The Crescent	1	GF	47	49	41
29 The Crescent	1	F 1	58	56	48
29 The Crescent	1	F 2	58	57	49
29 The Crescent	1	F 3	59	57	50
29 The Crescent	1	F 4	60	58	52
29 The Crescent	1	F 5	62	60	54
29 The Crescent	1	GF	55	55	46
2a Gilbert Street	1	F 1	61	61	56
2a Gilbert Street	1	F 2	63	65	59
2a Gilbert Street	1	GF	58	58	53
3 Camera Street	1	F 1	70	69	62
3 Camera Street	1	GF	67	69	61
3 Eustace Street	1	F 1	67	65	55
3 Eustace Street	1	F 2	68	67	57
3 Eustace Street	1	F 3	69	68	61
3 Eustace Street	1	GF	65	64	52
3 Farlight Street	1	F 1	62	60	54
3 Farlight Street	1	GF	61	59	52
3 Laurence Street	1	F 1	47	46	40
3 Laurence Street	1	GF	46	46	40
3 Margaret Street	1	F 1	41	41	34
3 Margaret Street	1	GF	41	41	34
3 Tower Street	1	F 1	71	69	63
3 Tower Street	1	F 2	72	70	64
3 Tower Street	1	F 3	73	71	64
3 Tower Street	1	GF	70	68	62

Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 51-56 dB(A)					
Clearly audible: 56-66 dB(A)					
Moderately intrusive: 66-75 dB(A)					
Highly Intrusive: >75 dB(A)					
3 West Promedade	1	F 1	47	48	43
3 West Promedade	1	F 2	48	47	42
3 West Promedade	1	F 3	51	51	44
3 West Promedade	1	GF	47	48	43
31 The Crescent	1	F 1	52	52	45
31 The Crescent	1	GF	52	51	45
32 The Crescent	1	F 1	45	46	40
32 The Crescent	1	F 2	46	46	40
32 The Crescent	1	F 3	47	46	40
32 The Crescent	1	GF	45	46	40
33 The Crescent	1	F 1	52	52	44
33 The Crescent	1	F 2	54	52	45
33 The Crescent	1	GF	52	52	44
34 The Crescent	1	F 1	48	46	40
34 The Crescent	1	F 2	48	47	40
34 The Crescent	1	F 3	49	47	40
34 The Crescent	1	GF	48	46	40
35 The Crescent	1	F 1	51	51	45
35 The Crescent	1	GF	51	51	44
36 The Crescent	1	F 1	49	51	42
36 The Crescent	1	F 2	50	52	43
36 The Crescent	1	F 3	49	47	40
36 The Crescent	1	GF	52	51	42
37 The Crescent	1	F 1	47	48	42
37 The Crescent	1	F 2	47	48	42
37 The Crescent	1	F 3	48	48	42
37 The Crescent	1	F 4	48	48	42
37 The Crescent	1	F 5	48	48	42
37 The Crescent	1	F 6	48	48	42
37 The Crescent	1	F 7	49	49	42
37 The Crescent	1	GF	47	48	42
38 The Crescent	1	F 1	48	47	39
38 The Crescent	1	F 2	49	48	40
38 The Crescent	1	F 3	50	49	40
38 The Crescent	1	GF	51	48	39
4 Camera Street	1	F 1	70	69	61
4 Camera Street	1	GF	70	67	60
4 Farlight Street	1	F 1	71	66	61
4 Farlight Street	1	GF	68	64	60
4 Gilbert Street	1	F 1	71	67	55
4 Gilbert Street	1	F 2	71	67	56
4 Gilbert Street	1	GF	71	66	55
4 Laurence Street	1	F 1	48	48	42
4 Laurence Street	1	F 2	49	49	43
4 Laurence Street	1	F 3	51	50	44
4 Laurence Street	1	GF	48	48	42
4 The Crescent	1	F 1	72	71	63
4 The Crescent	1	GF	68	69	62
4 Tower Street	1	F 1	69	68	59
4 Tower Street	1	F 2	70	69	60
4 Tower Street	1	F 3	69	69	61
4 Tower Street	1	GF	69	68	58
41 The Crescent	1	F 1	47	47	39
41 The Crescent	1	GF	46	46	40
43 The Crescent	1	F 1	49	49	41
43 The Crescent	1	GF	49	49	42
45 The Crescent	1	F 1	49	48	42
45 The Crescent	1	GF	48	48	41
47 The Crescent	1	F 1	48	48	42

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Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 51-56 dB(A)					
Clearly audible: 56-66 dB(A)					
Moderately intrusive: 66-75 dB(A)					
Highly Intrusive: >75 dB(A)					
47 The Crescent	1	GF	48	48	42
49 The Crescent	1	F 1	50	49	43
49 The Crescent	1	GF	50	49	42
4a Camera Street	1	F 1	68	67	63
4a Camera Street	1	GF	61	61	57
4a Eustace Street	1	F 1	59	58	50
4a Eustace Street	1	F 2	62	61	55
4a Eustace Street	1	F 3	67	67	61
4a Eustace Street	1	GF	56	55	47
4b Eustace Street	1	GF	57	54	47
5 Camera Street	1	F 1	65	69	63
5 Camera Street	1	GF	63	66	60
5 Eustace Street	1	F 1	59	59	52
5 Eustace Street	1	F 2	64	62	55
5 Eustace Street	1	GF	57	56	50
5 Farlight Street	1	F 1	60	62	54
5 Farlight Street	1	GF	58	60	53
5 Margaret Street	1	F 1	44	44	37
5 Margaret Street	1	GF	44	44	37
5 The Crescent	1	F 1	79	80	75
5 The Crescent	1	F 2	79	81	76
5 The Crescent	1	GF	79	80	74
5 Tower Street	1	F 1	50	50	42
5 Tower Street	1	F 2	52	51	43
5 Tower Street	1	F 3	55	54	45
5 Tower Street	1	GF	49	48	41
51 - 53 The Crescent	1	F 1	52	49	42
51 - 53 The Crescent	1	F 10	59	56	49
51 - 53 The Crescent	1	F 11	57	55	47
51 - 53 The Crescent	1	F 12	58	56	48
51 - 53 The Crescent	1	F 13	60	56	48
51 - 53 The Crescent	1	F 2	52	50	43
51 - 53 The Crescent	1	F 3	53	51	44
51 - 53 The Crescent	1	F 4	54	52	45
51 - 53 The Crescent	1	F 5	55	53	46
51 - 53 The Crescent	1	F 6	56	53	47
51 - 53 The Crescent	1	F 7	56	54	48
51 - 53 The Crescent	1	F 8	57	54	48
51 - 53 The Crescent	1	F 9	58	55	49
51 - 53 The Crescent	1	GF	51	49	42
54 - 66 West Esplanade Lower	1	F 1	71	70	63
54 - 66 West Esplanade Lower	1	F 2	72	70	63
54 - 66 West Esplanade Lower	1	GF	71	70	63
54 - 66 West Esplanade Upper	1	F 1	70	69	62
54 - 66 West Esplanade Upper	1	F 2	71	70	63
54 - 66 West Esplanade Upper	1	F 3	72	70	63
54 - 66 West Esplanade Upper	1	F 4	72	71	63
54 - 66 West Esplanade Upper	1	F 5	72	71	64
55 Margaret Street	1	F 1	61	54	44
55 Margaret Street	1	F 2	62	55	45
55 Margaret Street	1	F 3	63	56	46
55 Margaret Street	1	GF	59	53	44
6 Camera Street	1	F 1	63	61	57
6 Camera Street	1	GF	58	60	55
6 Eustace Street	1	F 1	56	52	42
6 Eustace Street	1	F 2	57	53	42
6 Eustace Street	1	F 3	57	56	44
6 Eustace Street	1	GF	54	51	43
6 Farlight Street	1	F 1	68	64	58

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Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 51-56 dB(A)					
Clearly audible: 56-66 dB(A)					
Moderately intrusive: 66-75 dB(A)					
Highly Intrusive: >75 dB(A)					
6 Farlight Street	1	GF	66	63	56
6 The Crescent	1	F 1	69	70	63
6 The Crescent	1	GF	67	68	62
6 Tower Street	1	F 1	47	46	40
6 Tower Street	1	F 2	49	48	41
6 Tower Street	1	F 3	52	51	44
6 Tower Street	1	GF	46	45	40
6 Upper Gilbert Street	1	F 1	71	73	66
6 Upper Gilbert Street	1	GF	69	72	66
6 West Promenade	1	F 1	50	50	41
6 West Promenade	1	F 2	47	51	42
6 West Promenade	1	F 3	51	51	44
6 West Promenade	1	GF	49	49	41
65 Sydney Road	1	F 1	56	50	38
65 Sydney Road	1	F 2	45	48	38
65 Sydney Road	1	GF	55	50	41
67 Sydney Road	1	F 1	47	49	42
67 Sydney Road	1	F 2	47	50	43
67 Sydney Road	1	GF	47	48	41
6b Farlight Street	1	F 1	64	61	57
6b Farlight Street	1	GF	63	60	56
7 Eustace Street	1	F 1	59	58	53
7 Eustace Street	1	F 2	63	62	56
7 Eustace Street	1	GF	57	57	51
7 Farlight Street	1	F 1	58	56	51
7 Farlight Street	1	GF	55	54	48
7 Margaret Street	1	F 1	45	44	37
7 Margaret Street	1	GF	44	44	37
7 The Crescent	1	F 1	80	82	78
7 The Crescent	1	F 2	80	83	78
7 The Crescent	1	F 3	81	83	78
7 The Crescent	1	F 4	81	83	78
7 The Crescent	1	F 5	81	83	77
7 The Crescent	1	F 6	81	83	77
7 The Crescent	1	GF	79	82	77
7 Tower Street	1	F 1	45	45	38
7 Tower Street	1	F 2	46	45	38
7 Tower Street	1	F 3	50	47	40
7 Tower Street	1	GF	45	45	38
73 Sydney Road	1	GF	52	56	54
75 - 76 West Esplanade	1	F 1	74	73	67
75 - 76 West Esplanade	1	F 2	74	73	67
75 - 76 West Esplanade	1	GF	74	73	66
75 Sydney Road	1	GF	53	60	54
77 Sydney Road	1	GF	55	55	48
78 West Esplanade	1	F 1	75	74	67
78 West Esplanade	1	F 2	76	74	67
78 West Esplanade	1	GF	75	73	67
79 Sydney Road	1	GF	57	56	48
8 Camera Street	1	F 1	58	64	62
8 Camera Street	1	GF	55	61	59
8 Eustace Street	1	F 1	52	52	43
8 Eustace Street	1	F 2	54	54	44
8 Eustace Street	1	F 3	58	57	46
8 Eustace Street	1	GF	51	50	42
8 The Crescent	1	F 1	70	67	58
8 The Crescent	1	GF	67	65	57
8 Upper Gilbert Street	1	F 1	70	68	60
8 Upper Gilbert Street	1	GF	70	66	58

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Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 51-56 dB(A)					
Clearly audible: 56-66 dB(A)					
Moderately intrusive: 66-75 dB(A)					
Highly Intrusive: >75 dB(A)					
8 West Promenade	1	F 1	53	49	42
8 West Promenade	1	F 2	54	50	42
8 West Promenade	1	F 3	56	52	44
8 West Promenade	1	GF	52	48	41
81 Sydney Road	1	GF	57	55	51
81 W Esplanade	1	F 1	78	76	70
81 W Esplanade	1	F 10	80	79	72
81 W Esplanade	1	F 11	80	79	72
81 W Esplanade	1	F 2	79	77	71
81 W Esplanade	1	F 3	79	77	71
81 W Esplanade	1	F 4	79	77	71
81 W Esplanade	1	F 5	80	78	72
81 W Esplanade	1	F 6	80	78	72
81 W Esplanade	1	F 7	80	78	72
81 W Esplanade	1	F 8	80	78	72
81 W Esplanade	1	F 9	80	79	72
81 W Esplanade	1	GF	78	76	70
83 Sydney Road	1	GF	54	55	52
83 W Esplanade	1	F 1	78	76	70
83 W Esplanade	1	F 2	79	77	71
83 W Esplanade	1	F 3	80	77	72
83 W Esplanade	1	GF	78	76	70
85 Sydney Road	1	GF	52	55	51
85 W Esplanade	1	F 1	79	77	72
85 W Esplanade	1	F 2	80	78	72
85 W Esplanade	1	F 3	80	78	73
85 W Esplanade	1	GF	78	77	71
86 W Esplanade	1	F 1	79	78	73
86 W Esplanade	1	F 2	80	79	74
86 W Esplanade	1	F 3	81	79	74
86 W Esplanade	1	F 4	81	79	74
86 W Esplanade	1	GF	79	77	72
87-88 W Esplanade	1	F 1	79	78	74
87-88 W Esplanade	1	F 2	80	79	74
87-88 W Esplanade	1	GF	78	78	73
87a Sydney Road	1	GF	52	57	49
89 Sydney Road	1	GF	52	55	47
89 W Esplanade	1	F 1	78	78	74
89 W Esplanade	1	F 2	79	79	74
89 W Esplanade	1	GF	78	78	73
9 Camera Street	1	F 1	62	68	63
9 Camera Street	1	GF	62	64	58
9 Eustace Street	1	F 1	61	57	45
9 Eustace Street	1	F 2	62	58	46
9 Eustace Street	1	GF	54	54	44
9 Farlight Street	1	F 1	59	58	49
9 Farlight Street	1	GF	57	56	48
9 Margaret Street	1	GF	44	44	37
9 The Cresecnt	1	F 1	79	82	77
9 The Cresecnt	1	F 2	80	82	78
9 The Cresecnt	1	GF	79	81	76
91 W Esplanade	1	F 1	78	78	74
91 W Esplanade	1	F 2	78	79	74
91 W Esplanade	1	F 3	79	79	75
91 W Esplanade	1	F 4	79	80	75
91 W Esplanade	1	F 5	79	80	75
91 W Esplanade	1	F 6	79	80	76
91 W Esplanade	1	F 7	80	80	75
91 W Esplanade	1	GF	77	78	73

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Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 51-56 dB(A)					
Clearly audible: 56-66 dB(A)					
Moderately intrusive: 66-75 dB(A)					
Highly Intrusive: >75 dB(A)					
93 W Esplanade	1	F 1	77	77	72
93 W Esplanade	1	F 2	77	78	73
93 W Esplanade	1	GF	76	77	72
Manly Club Gilbert Park	1	F 1	57	61	54
Manly Club Gilbert Park	1	F 2	62	64	57
Manly Club Gilbert Park	1	F 3	69	69	62
Manly Club Gilbert Park	1	GF	54	57	50
Manly Uniting Church	1	GF	54	52	45

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Table 24: Predicted construction noise levels (LAeq) compared to CNVG daytime noise impact categories – NCA 2

Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 60-65 dB(A)					
Clearly audible: 65-75 dB(A)					
Moderately intrusive: n/a					
Highly Intrusive: >75 dB(A)					
1 Ashburner Street	2	GF	59	59	50
1 Wentworth Street	2	F 1	54	54	46
1 Wentworth Street	2	F 2	57	57	49
1 Wentworth Street	2	F 3	62	61	53
1 Wentworth Street	2	F 4	63	62	55
1 Wentworth Street	2	F 5	63	63	55
1 Wentworth Street	2	F 6	64	63	55
1 Wentworth Street	2	GF	52	51	43
1 Whistler Street	2	F 1	64	64	57
1 Whistler Street	2	GF	64	64	57
13 Wentworth Street	2	F 1	55	53	45
13 Wentworth Street	2	F 2	56	55	48
13 Wentworth Street	2	F 3	60	60	54
13 Wentworth Street	2	F 4	66	65	57
13 Wentworth Street	2	F 5	66	65	58
13 Wentworth Street	2	F 6	67	66	58
13 Wentworth Street	2	F 7	67	66	58
13 Wentworth Street	2	GF	53	52	44
2 Victoria Parade	2	F 1	63	62	55
2 Victoria Parade	2	F 2	63	62	55
2 Victoria Parade	2	GF	63	62	55
20 - 23 East Esplanade	2	F 1	62	61	54
20 - 23 East Esplanade	2	GF	62	61	54
24 East Esplanade	2	F 1	63	62	55
24 East Esplanade	2	F 2	62	61	54
24 East Esplanade	2	F 3	62	61	54
24 East Esplanade	2	F 4	63	62	54
24 East Esplanade	2	F 5	63	62	54
24 East Esplanade	2	F 6	63	62	54
24 East Esplanade	2	GF	63	62	55
26 East Esplanade	2	F 1	62	62	54
26 East Esplanade	2	F 2	63	62	54
26 East Esplanade	2	GF	62	61	54
27 East Esplanade	2	F 1	63	62	54
27 East Esplanade	2	F 2	63	62	55
27 East Esplanade	2	F 3	60	59	52
27 East Esplanade	2	GF	62	62	54
3 Ashburner Street	2	GF	53	55	50
35-36 East Esplanade	2	F 1	64	63	56
35-36 East Esplanade	2	F 2	64	64	56
35-36 East Esplanade	2	F 3	64	64	56
35-36 East Esplanade	2	F 4	65	64	56
35-36 East Esplanade	2	F 5	65	64	56
35-36 East Esplanade	2	F 6	65	64	57
35-36 East Esplanade	2	F 7	65	64	57
35-36 East Esplanade	2	GF	64	63	56
37 East Esplanade	2	F 1	65	64	56
37 East Esplanade	2	F 2	65	64	57
37 East Esplanade	2	F 3	65	64	57
37 East Esplanade	2	F 4	65	64	57
37 East Esplanade	2	F 5	65	64	57
37 East Esplanade	2	F 6	65	64	57
37 East Esplanade	2	F 7	65	64	57
37 East Esplanade	2	GF	65	64	56
38 East Esplanade	2	F 1	48	49	41

Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 60-65 dB(A)					
Clearly audible: 65-75 dB(A)					
Moderately intrusive: n/a					
Highly Intrusive: >75 dB(A)					
38 East Esplanade	2	F 2	50	50	43
38 East Esplanade	2	F 3	52	52	45
38 East Esplanade	2	F 4	55	56	49
38 East Esplanade	2	F 5	60	61	54
38 East Esplanade	2	F 6	64	63	56
38 East Esplanade	2	F 7	64	64	57
38 East Esplanade	2	GF	48	48	40
39-40 East Esplanade	2	F 1	64	63	56
39-40 East Esplanade	2	F 2	64	63	56
39-40 East Esplanade	2	F 3	64	63	56
39-40 East Esplanade	2	F 4	64	63	56
39-40 East Esplanade	2	F 5	64	63	56
39-40 East Esplanade	2	F 6	64	63	56
39-40 East Esplanade	2	F 7	64	64	56
39-40 East Esplanade	2	GF	64	63	55
4 Darley Road	2	F 1	49	49	42
4 Darley Road	2	F 2	50	50	44
4 Darley Road	2	F 3	53	53	48
4 Darley Road	2	F 4	55	55	50
4 Darley Road	2	GF	48	48	41
45 East Esplanade	2	F 1	68	66	58
45 East Esplanade	2	F 2	68	66	58
45 East Esplanade	2	GF	67	65	58
5 Ashburner Street	2	F 1	60	59	51
5 Ashburner Street	2	GF	57	57	49
5 Victoria Parade	2	F 1	60	60	52
5 Victoria Parade	2	F 2	61	60	52
5 Victoria Parade	2	F 3	50	49	41
5 Victoria Parade	2	F 4	51	51	43
5 Victoria Parade	2	GF	60	60	52
6 Victoria Parade	2	F 1	62	62	54
6 Victoria Parade	2	F 2	62	62	54
6 Victoria Parade	2	F 3	62	62	54
6 Victoria Parade	2	GF	62	62	54
7 Wentworth Street	2	F 1	48	48	41
7 Wentworth Street	2	F 2	49	48	41
7 Wentworth Street	2	F 3	49	49	42
7 Wentworth Street	2	GF	48	47	40
8 Victoria Parade	2	F 1	49	48	40
8 Victoria Parade	2	F 2	51	50	42
8 Victoria Parade	2	GF	49	48	39
8-22 The Corso	2	F 1	62	61	53
8-22 The Corso	2	F 2	64	63	55
8-22 The Corso	2	F 3	65	65	57
8-22 The Corso	2	GF	59	58	51
East Manly Cove Beach	2	GF	60	59	51
Manly Court House	2	GF	50	55	49
Manly Police Station	2	F 1	58	56	48
Manly Police Station	2	GF	56	55	47
Manly Town Hall	2	F 1	56	56	50
Manly Town Hall	2	F 2	57	57	53
Manly Town Hall	2	F 3	59	59	56
Manly Town Hall	2	GF	54	54	48
Manly Village Public School	2	F 1	49	51	45
Manly Village Public School	2	F 2	52	53	48
Manly Village Public School	2	GF	48	49	44
Manly Village Public School	2	F 1	40	39	33
Manly Village Public School	2	F 2	40	40	34
Manly Village Public School	2	GF	40	39	33

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Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 60-65 dB(A)					
Clearly audible: 65-75 dB(A)					
Moderately intrusive: n/a					
Highly Intrusive: >75 dB(A)					
Manly Village Public School Hall	2	GF	47	46	40
Manly Village Public School Hall	2	GF	38	37	30

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Table 25: Predicted construction noise levels (LAeq) compared to CNVG daytime noise impact categories – NCA 3

Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 52-57 dB(A)					
Clearly audible: 57-67 dB(A)					
Moderately intrusive: 67-75 dB(A)					
Highly Intrusive: >75 dB(A)					
1 Cove Avenue	3	F 1	54	52	45
1 Cove Avenue	3	F 2	57	56	49
1 Cove Avenue	3	GF	52	50	42
1 East Esplanade	3	F 1	61	60	53
1 East Esplanade	3	GF	61	60	53
1 Osborne Road	3	F 1	61	59	52
1 Osborne Road	3	F 2	61	60	52
1 Osborne Road	3	F 3	61	60	52
1 Osborne Road	3	F 4	61	60	52
1 Osborne Road	3	F 5	61	60	52
1 Osborne Road	3	F 6	61	60	52
1 Osborne Road	3	F 7	61	60	52
1 Osborne Road	3	GF	60	59	52
10 Beatty Street	3	F 1	54	53	45
10 Beatty Street	3	GF	54	53	45
10 East Esplanade	3	F 1	61	60	53
10 East Esplanade	3	F 2	61	60	53
10 East Esplanade	3	F 3	61	61	53
10 East Esplanade	3	GF	61	60	53
10 Oyama Avenue	3	F 1	58	58	50
10 Oyama Avenue	3	GF	58	58	50
11 Cove Avenue	3	F 1	60	59	52
11 Cove Avenue	3	F 2	60	59	52
11 Cove Avenue	3	GF	60	59	52
11 Oyama Avenue	3	F 1	59	58	51
11 Oyama Avenue	3	GF	59	58	51
11a Oyama Avenue	3	F 1	61	61	53
11a Oyama Avenue	3	GF	61	59	52
12 Beatty Street	3	F 1	54	53	45
12 Beatty Street	3	GF	54	53	45
12 Cove Avenue	3	F 1	61	60	53
12 Cove Avenue	3	F 2	61	60	53
12 Cove Avenue	3	F 3	61	60	53
12 Cove Avenue	3	F 4	61	60	53
12 Cove Avenue	3	F 5	61	60	53
12 Cove Avenue	3	GF	61	60	53
12 Oyama Avenue	3	F 1	58	58	50
12 Oyama Avenue	3	GF	58	58	50
13 Cove Avenue	3	F 1	57	56	49
13 Cove Avenue	3	F 2	60	59	52
13 Cove Avenue	3	GF	53	52	44
13 East Esplanade	3	F 1	61	60	53
13 East Esplanade	3	F 2	61	60	53
13 East Esplanade	3	F 3	61	61	53
13 East Esplanade	3	F 4	61	61	53
13 East Esplanade	3	F 5	61	61	53
13 East Esplanade	3	F 6	62	61	53
13 East Esplanade	3	F 7	62	61	53
13 East Esplanade	3	F 8	62	61	54
13 East Esplanade	3	F 9	62	61	54
13 East Esplanade	3	GF	61	60	53
14 Beatty Street	3	F 1	54	53	45
14 Beatty Street	3	GF	54	53	45
14 Cove Avenue	3	F 1	61	60	53
14 Cove Avenue	3	F 2	61	60	53

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Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 52-57 dB(A)					
Clearly audible: 57-67 dB(A)					
Moderately intrusive: 67-75 dB(A)					
Highly Intrusive: >75 dB(A)					
14 Cove Avenue	3	GF	61	60	52
14 Oyama Avenue	3	F 1	59	58	51
14 Oyama Avenue	3	GF	58	58	50
14a Beatty Street	3	F 1	54	53	45
14a Beatty Street	3	GF	54	53	45
15 Cove Avenue	3	F 1	60	59	51
15 Cove Avenue	3	F 2	60	59	52
15 Cove Avenue	3	GF	60	59	52
15 East Esplanade	3	F 1	63	62	54
15 East Esplanade	3	F 2	61	60	53
15 East Esplanade	3	F 3	61	61	53
15 East Esplanade	3	GF	63	62	54
16 Beatty Street	3	F 1	53	53	45
16 Beatty Street	3	GF	53	53	45
16 Cove Avenue	3	F 1	60	60	52
16 Cove Avenue	3	GF	60	59	52
17 East Esplanade	3	F 1	63	62	54
17 East Esplanade	3	GF	62	61	53
18 Cove Avenue	3	F 1	60	60	52
18 Cove Avenue	3	GF	60	60	52
18-19 East Esplanade	3	F 1	62	61	54
18-19 East Esplanade	3	GF	62	61	54
19 Cove Avenue	3	F 1	59	59	51
19 Cove Avenue	3	F 2	60	59	52
19 Cove Avenue	3	GF	59	59	51
2 Beatty Street	3	F 1	54	53	45
2 Beatty Street	3	GF	54	53	45
2 East Esplanade	3	F 1	61	60	53
2 East Esplanade	3	F 2	61	61	53
2 East Esplanade	3	F 3	61	61	53
2 East Esplanade	3	GF	61	60	53
2 Osborn Road	3	F 1	60	59	52
2 Osborn Road	3	GF	56	56	49
2 Oyama Avenue	3	F 1	59	58	51
2 Oyama Avenue	3	GF	59	58	51
20 Cove Avenue	3	F 1	62	61	54
20 Cove Avenue	3	GF	56	55	48
22 Beatty Street	3	F 1	54	53	44
22 Beatty Street	3	GF	54	53	44
22 Cove Avenue	3	F 1	60	59	52
22 Cove Avenue	3	GF	60	59	52
22a Beatty Street	3	F 1	54	53	44
22a Beatty Street	3	GF	54	53	44
24 Beatty Street	3	F 1	54	53	44
24 Beatty Street	3	GF	54	53	44
24 Cove Avenue	3	F 1	60	59	52
24 Cove Avenue	3	GF	60	59	52
26 Beatty Street	3	F 1	52	51	43
26 Beatty Street	3	GF	52	52	44
26a Beatty Street	3	F 1	54	53	44
26a Beatty Street	3	GF	54	53	44
28 Beatty Street	3	F 1	56	55	46
28 Beatty Street	3	GF	56	55	45
2a Beatty Street	3	F 1	54	53	45
2a Beatty Street	3	GF	54	53	45
3 Cove Avenue	3	F 1	55	55	47
3 Cove Avenue	3	F 2	55	55	48
3 Cove Avenue	3	GF	52	51	44
3 East Esplanade	3	F 1	61	60	53

Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 52-57 dB(A)					
Clearly audible: 57-67 dB(A)					
Moderately intrusive: 67-75 dB(A)					
Highly Intrusive: >75 dB(A)					
3 East Esplanade	3	F 2	61	61	53
3 East Esplanade	3	F 3	61	61	53
3 East Esplanade	3	GF	61	60	53
3 Oyama Avenue	3	F 1	60	59	52
3 Oyama Avenue	3	GF	60	59	52
3 Wood Street	3	F 1	55	54	46
3 Wood Street	3	GF	54	53	45
30 Beatty Street	3	F 1	53	52	42
30 Beatty Street	3	GF	53	52	42
34 Beatty Street	3	F 1	53	52	41
34 Beatty Street	3	GF	53	52	41
36 Beatty Street	3	F 1	53	52	41
36 Beatty Street	3	GF	53	52	41
38 Beatty Street	3	F 1	53	52	41
38 Beatty Street	3	GF	53	52	41
4 East Esplanade	3	F 1	61	60	53
4 East Esplanade	3	F 2	61	61	53
4 East Esplanade	3	F 3	61	61	53
4 East Esplanade	3	GF	61	60	53
4 Oyama Avenue	3	F 1	59	58	51
4 Oyama Avenue	3	GF	58	58	50
4 Wood Street	3	F 1	59	58	51
4 Wood Street	3	F 2	62	61	54
4 Wood Street	3	GF	56	56	49
40 Beatty Street	3	F 1	53	52	40
40 Beatty Street	3	GF	53	52	39
42 Beatty Street	3	F 1	54	52	39
42 Beatty Street	3	GF	54	52	39
44 Beatty Street	3	F 1	54	52	39
44 Beatty Street	3	GF	54	52	39
46 Beatty Street	3	F 1	54	52	39
46 Beatty Street	3	GF	54	51	39
5 Cove Avenue	3	F 1	49	49	41
5 Cove Avenue	3	F 2	55	55	48
5 Cove Avenue	3	GF	45	45	38
5 East Esplanade	3	F 1	61	60	53
5 East Esplanade	3	F 2	61	61	53
5 East Esplanade	3	F 3	61	61	53
5 East Esplanade	3	GF	61	60	53
5 Osborne Road	3	F 1	60	60	52
5 Osborne Road	3	F 2	60	60	52
5 Osborne Road	3	F 3	61	60	52
5 Osborne Road	3	GF	60	60	52
5 Oyama Avenue	3	F 1	60	59	52
5 Oyama Avenue	3	GF	60	59	52
5 Wood Street	3	F 1	58	57	50
5 Wood Street	3	GF	58	57	50
6 Beatty Street	3	F 1	54	53	45
6 Beatty Street	3	GF	57	55	46
6 Oyama Avenue	3	F 1	59	58	50
6 Oyama Avenue	3	GF	58	58	50
6-18 Cove Avenue	3	F 1	61	61	53
6-18 Cove Avenue	3	F 2	61	61	53
6-18 Cove Avenue	3	F 3	61	61	53
6-18 Cove Avenue	3	F 4	62	61	53
6-18 Cove Avenue	3	GF	61	60	53
6-7 East Esplanade	3	F 1	61	60	53
6-7 East Esplanade	3	F 2	61	61	53
6-7 East Esplanade	3	F 3	61	61	53

Receiver	NCA	Floor	Scenario 1	Scenario 2	Scenario 6
Noticeable: 52-57 dB(A)					
Clearly audible: 57-67 dB(A)					
Moderately intrusive: 67-75 dB(A)					
Highly Intrusive: >75 dB(A)					
6-7 East Esplanade	3	GF	61	60	53
7 Cove Avenue	3	F 1	56	56	49
7 Cove Avenue	3	F 2	57	56	49
7 Cove Avenue	3	GF	53	53	46
7 Osborne Road	3	F 1	60	59	52
7 Osborne Road	3	F 2	60	59	52
7 Osborne Road	3	F 3	60	59	52
7 Osborne Road	3	GF	60	59	52
7 Oyama Avenue	3	F 1	59	59	51
7 Oyama Avenue	3	GF	59	59	51
8 Beatty Street	3	F 1	54	53	45
8 Beatty Street	3	GF	53	48	39
8 East Esplanade	3	F 1	61	61	53
8 East Esplanade	3	F 2	61	61	53
8 East Esplanade	3	F 3	61	61	53
8 East Esplanade	3	GF	61	60	53
8 Oyama Avenue	3	F 1	59	58	51
8 Oyama Avenue	3	GF	58	58	50
8a Beatty Street	3	F 1	54	53	45
8a Beatty Street	3	GF	54	53	45
8b Beatty Street	3	F 1	54	53	45
8b Beatty Street	3	GF	54	53	45
9 Cove Avenue	3	F 1	51	50	43
9 Cove Avenue	3	F 2	57	56	49
9 Cove Avenue	3	GF	47	47	39
9 East Esplanade	3	F 1	61	60	53
9 East Esplanade	3	F 2	61	61	53
9 East Esplanade	3	F 3	61	61	53
9 East Esplanade	3	GF	61	60	53
9 Oyama Avenue	3	F 1	59	58	51
9 Oyama Avenue	3	GF	59	58	51
9 Stuart Street	3	F 1	62	62	54
9 Stuart Street	3	F 2	63	62	55
9 Stuart Street	3	GF	62	62	54
Manly Waters Private Hospital	3	F 1	60	59	52
Manly Waters Private Hospital	3	F 2	60	59	52
Manly Waters Private Hospital	3	F 3	60	59	52
Manly Waters Private Hospital	3	F 4	60	59	52
Manly Waters Private Hospital	3	GF	60	59	51

Table 26: Predicted construction noise levels (LAeq) compared to CNVG night-time (OOHW2) noise impact categories – NCA 1

Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 43-48 dB(A)				
Clearly audible: 48-58 dB(A)				
Moderately intrusive: 58-68 dB(A)				
Highly Intrusive: >68 dB(A)				
1 Eustace Street	1	F 1	61	72
1 Eustace Street	1	F 2	61	72
1 Eustace Street	1	F 3	60	72
1 Eustace Street	1	GF	61	72
1 Farlight Street	1	F 1	61	63
1 Farlight Street	1	GF	55	59
1 Lauderdale Avenue	1	F 1	28	54
1 Lauderdale Avenue	1	F 10	29	59
1 Lauderdale Avenue	1	F 11	29	60

Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 43-48 dB(A)				
Clearly audible: 48-58 dB(A)				
Moderately intrusive: 58-68 dB(A)				
Highly Intrusive: >68 dB(A)				
1 Lauderdale Avenue	1	F 12	29	60
1 Lauderdale Avenue	1	F 13	29	60
1 Lauderdale Avenue	1	F 14	30	60
1 Lauderdale Avenue	1	F 15	31	60
1 Lauderdale Avenue	1	F 2	28	54
1 Lauderdale Avenue	1	F 3	28	55
1 Lauderdale Avenue	1	F 4	28	55
1 Lauderdale Avenue	1	F 5	28	56
1 Lauderdale Avenue	1	F 6	28	57
1 Lauderdale Avenue	1	F 7	28	58
1 Lauderdale Avenue	1	F 8	28	58
1 Lauderdale Avenue	1	F 9	29	59
1 Lauderdale Avenue	1	GF	28	53
1 Laurence Street	1	F 1	37	49
1 Laurence Street	1	GF	36	48
1 Margaret Street	1	F 1	29	41
1 Margaret Street	1	F 2	29	41
1 Margaret Street	1	F 3	29	42
1 Margaret Street	1	GF	29	43
1 Rowe Street	1	F 1	66	74
1 Rowe Street	1	GF	66	74
1 The Crescent	1	F 1	72	80
1 The Crescent	1	F 2	72	80
1 The Crescent	1	GF	71	79
10 Camera Street	1	F 1	57	69
10 Camera Street	1	GF	54	67
10 Eustace Street	1	F 1	40	48
10 Eustace Street	1	F 2	40	49
10 Eustace Street	1	F 3	41	50
10 Eustace Street	1	GF	39	48
10 Upper Gilbert Street	1	F 1	53	69
10 Upper Gilbert Street	1	GF	52	68
11 Camera Street	1	F 1	58	70
11 Camera Street	1	GF	56	65
11 Eustace Street	1	F 1	44	49
11 Eustace Street	1	F 2	45	51
11 Eustace Street	1	GF	41	49
11 Farlight Street	1	F 1	44	60
11 Farlight Street	1	GF	42	59
11 Gilbert Street	1	F 1	50	64
11 Gilbert Street	1	F 2	52	67
11 Gilbert Street	1	F 3	58	70
11 Gilbert Street	1	GF	48	59
11 The Crescent	1	F 1	73	82
11 The Crescent	1	F 2	73	83
11 The Crescent	1	GF	72	82
12 Camera Street	1	F 1	55	68
12 Camera Street	1	GF	51	64
12 Eustace Street	1	F 1	40	47
12 Eustace Street	1	F 2	41	48
12 Eustace Street	1	F 3	40	49
12 Eustace Street	1	GF	39	47
12 The Crescent	1	F 1	46	56
12 The Crescent	1	GF	42	55
12 Upper Gilbert Street	1	F 1	60	72
12 Upper Gilbert Street	1	GF	57	69
13 Camera Street	1	F 1	55	68
13 Camera Street	1	GF	52	61
13 Eustace Street	1	F 1	43	48

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Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 43-48 dB(A)				
Clearly audible: 48-58 dB(A)				
Moderately intrusive: 58-68 dB(A)				
Highly Intrusive: >68 dB(A)				
13 Eustace Street	1	F 2	45	53
13 Eustace Street	1	GF	42	47
13a Upper Gilbert Street	1	F 1	62	71
13a Upper Gilbert Street	1	GF	61	71
14 Camera Street	1	F 1	54	68
14 Camera Street	1	GF	48	63
14 Upper Gilbert Street	1	F 1	57	69
14 Upper Gilbert Street	1	GF	55	66
15 Farlight Street	1	F 1	44	59
15 Farlight Street	1	GF	43	58
15 The Crescent	1	F 1	70	83
15 The Crescent	1	F 2	71	83
15 The Crescent	1	GF	69	81
15 Upper Gilbert Street	1	F 1	64	74
15 Upper Gilbert Street	1	GF	63	74
15a Eustace Street	1	F 1	48	52
15a Eustace Street	1	F 2	51	54
15a Eustace Street	1	GF	48	51
16 Upper Gilbert Street	1	F 1	58	62
16 Upper Gilbert Street	1	GF	54	60
17 Eustace Street	1	F 1	42	49
17 Eustace Street	1	F 2	44	49
17 Eustace Street	1	GF	42	49
17 Farlight Street	1	F 1	46	55
17 Farlight Street	1	GF	45	54
17 The Crescent	1	F 1	67	83
17 The Crescent	1	F 2	67	83
17 The Crescent	1	GF	66	82
17 Upper Gilbert Street	1	F 1	61	68
17 Upper Gilbert Street	1	GF	60	63
19 Eustace Street	1	F 1	39	45
19 Eustace Street	1	F 2	41	46
19 Eustace Street	1	GF	38	45
19 The Crescent	1	F 1	53	78
19 The Crescent	1	F 2	61	79
19 The Crescent	1	GF	50	78
19 Upper Gilbert Street	1	F 1	51	60
19 Upper Gilbert Street	1	GF	49	58
1a Farlight Street	1	F 1	66	62
1a Farlight Street	1	GF	64	60
2 Farlight Street	1	F 1	62	68
2 Farlight Street	1	GF	61	63
2 Gilbert Street	1	F 1	42	68
2 Gilbert Street	1	F 2	44	71
2 Gilbert Street	1	GF	41	67
2 Margaret Street	1	F 1	38	48
2 Margaret Street	1	GF	39	49
2 Tower Street	1	F 1	61	73
2 Tower Street	1	F 2	62	73
2 Tower Street	1	F 3	63	72
2 Tower Street	1	GF	60	72
20 The Crescent	1	F 1	45	54
20 The Crescent	1	GF	43	53
21 Eustace Street	1	F 1	38	52
21 Eustace Street	1	F 2	38	54
21 Eustace Street	1	GF	39	51
21a Eustace Street	1	F 1	41	54
21a Eustace Street	1	F 2	43	56
21a Eustace Street	1	GF	40	52

Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 43-48 dB(A)				
Clearly audible: 48-58 dB(A)				
Moderately intrusive: 58-68 dB(A)				
Highly Intrusive: >68 dB(A)				
22 The Crescent	1	F 1	43	53
22 The Crescent	1	GF	42	52
23 The Crescent	1	F 1	66	81
23 The Crescent	1	F 2	67	81
23 The Crescent	1	GF	66	80
24 The Crescent	1	F 1	42	51
24 The Crescent	1	GF	41	51
25 The Crescent	1	F 1	57	76
25 The Crescent	1	F 2	58	77
25 The Crescent	1	GF	56	76
26 The Crescent	1	F 1	36	55
26 The Crescent	1	F 2	37	55
26 The Crescent	1	F 3	40	54
26 The Crescent	1	GF	37	52
27 The Crescent	1	F 1	43	61
27 The Crescent	1	F 2	47	64
27 The Crescent	1	GF	42	60
28 The Crescent	1	F 1	36	48
28 The Crescent	1	F 2	37	48
28 The Crescent	1	F 3	38	48
28 The Crescent	1	GF	36	48
29 The Crescent	1	F 1	39	59
29 The Crescent	1	F 2	40	59
29 The Crescent	1	F 3	40	60
29 The Crescent	1	F 4	40	61
29 The Crescent	1	F 5	43	63
29 The Crescent	1	GF	39	57
2a Gilbert Street	1	F 1	54	61
2a Gilbert Street	1	F 2	57	66
2a Gilbert Street	1	GF	51	58
3 Camera Street	1	F 1	61	68
3 Camera Street	1	GF	59	67
3 Eustace Street	1	F 1	50	66
3 Eustace Street	1	F 2	52	68
3 Eustace Street	1	F 3	58	68
3 Eustace Street	1	GF	47	64
3 Farlight Street	1	F 1	47	62
3 Farlight Street	1	GF	44	61
3 Laurence Street	1	F 1	37	47
3 Laurence Street	1	GF	37	46
3 Margaret Street	1	F 1	29	41
3 Margaret Street	1	GF	29	41
3 Tower Street	1	F 1	59	69
3 Tower Street	1	F 2	60	70
3 Tower Street	1	F 3	61	70
3 Tower Street	1	GF	58	68
3 West Promedade	1	F 1	42	47
3 West Promedade	1	F 2	42	47
3 West Promedade	1	F 3	43	51
3 West Promedade	1	GF	41	49
31 The Crescent	1	F 1	40	53
31 The Crescent	1	GF	40	53
32 The Crescent	1	F 1	36	45
32 The Crescent	1	F 2	37	46
32 The Crescent	1	F 3	37	46
32 The Crescent	1	GF	37	46
33 The Crescent	1	F 1	39	53
33 The Crescent	1	F 2	40	54
33 The Crescent	1	GF	39	53

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Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 43-48 dB(A)				
Clearly audible: 48-58 dB(A)				
Moderately intrusive: 58-68 dB(A)				
Highly Intrusive: >68 dB(A)				
34 The Crescent	1	F 1	38	48
34 The Crescent	1	F 2	38	49
34 The Crescent	1	F 3	39	50
34 The Crescent	1	GF	38	48
35 The Crescent	1	F 1	41	52
35 The Crescent	1	GF	40	52
36 The Crescent	1	F 1	36	51
36 The Crescent	1	F 2	37	51
36 The Crescent	1	F 3	38	50
36 The Crescent	1	GF	36	50
37 The Crescent	1	F 1	39	48
37 The Crescent	1	F 2	38	48
37 The Crescent	1	F 3	38	48
37 The Crescent	1	F 4	38	48
37 The Crescent	1	F 5	38	48
37 The Crescent	1	F 6	39	49
37 The Crescent	1	F 7	40	49
37 The Crescent	1	GF	39	48
38 The Crescent	1	F 1	34	48
38 The Crescent	1	F 2	35	49
38 The Crescent	1	F 3	35	50
38 The Crescent	1	GF	34	48
4 Camera Street	1	F 1	60	69
4 Camera Street	1	GF	57	66
4 Farlight Street	1	F 1	61	62
4 Farlight Street	1	GF	60	61
4 Gilbert Street	1	F 1	52	64
4 Gilbert Street	1	F 2	53	64
4 Gilbert Street	1	GF	48	61
4 Laurence Street	1	F 1	39	48
4 Laurence Street	1	F 2	40	49
4 Laurence Street	1	F 3	41	50
4 Laurence Street	1	GF	39	48
4 The Crescent	1	F 1	61	75
4 The Crescent	1	GF	60	74
4 Tower Street	1	F 1	56	69
4 Tower Street	1	F 2	56	69
4 Tower Street	1	F 3	57	69
4 Tower Street	1	GF	54	68
41 The Crescent	1	F 1	35	48
41 The Crescent	1	GF	35	47
43 The Crescent	1	F 1	36	50
43 The Crescent	1	GF	38	49
45 The Crescent	1	F 1	35	50
45 The Crescent	1	GF	34	49
47 The Crescent	1	F 1	34	49
47 The Crescent	1	GF	34	49
49 The Crescent	1	F 1	36	50
49 The Crescent	1	GF	35	49
4a Camera Street	1	F 1	56	60
4a Camera Street	1	GF	51	56
4a Eustace Street	1	F 1	45	57
4a Eustace Street	1	F 2	51	61
4a Eustace Street	1	F 3	56	67
4a Eustace Street	1	GF	42	55
4b Eustace Street	1	GF	39	54
5 Camera Street	1	F 1	58	70
5 Camera Street	1	GF	52	66
5 Eustace Street	1	F 1	49	59

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Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 43-48 dB(A)				
Clearly audible: 48-58 dB(A)				
Moderately intrusive: 58-68 dB(A)				
Highly Intrusive: >68 dB(A)				
5 Eustace Street	1	F 2	52	62
5 Eustace Street	1	GF	47	57
5 Farlight Street	1	F 1	45	58
5 Farlight Street	1	GF	45	58
5 Margaret Street	1	F 1	32	44
5 Margaret Street	1	GF	32	44
5 The Crescent	1	F 1	72	80
5 The Crescent	1	F 2	73	81
5 The Crescent	1	GF	71	80
5 Tower Street	1	F 1	39	50
5 Tower Street	1	F 2	40	51
5 Tower Street	1	F 3	42	54
5 Tower Street	1	GF	38	48
51 - 53 The Crescent	1	F 1	35	50
51 - 53 The Crescent	1	F 10	42	56
51 - 53 The Crescent	1	F 11	41	54
51 - 53 The Crescent	1	F 12	42	55
51 - 53 The Crescent	1	F 13	43	55
51 - 53 The Crescent	1	F 2	37	50
51 - 53 The Crescent	1	F 3	38	52
51 - 53 The Crescent	1	F 4	38	52
51 - 53 The Crescent	1	F 5	39	53
51 - 53 The Crescent	1	F 6	40	54
51 - 53 The Crescent	1	F 7	40	54
51 - 53 The Crescent	1	F 8	41	55
51 - 53 The Crescent	1	F 9	42	55
51 - 53 The Crescent	1	GF	35	49
54 - 66 West Esplanade Lower	1	F 1	60	70
54 - 66 West Esplanade Lower	1	F 2	60	71
54 - 66 West Esplanade Lower	1	GF	59	70
54 - 66 West Esplanade Upper	1	F 1	58	69
54 - 66 West Esplanade Upper	1	F 2	60	70
54 - 66 West Esplanade Upper	1	F 3	60	71
54 - 66 West Esplanade Upper	1	F 4	60	71
54 - 66 West Esplanade Upper	1	F 5	60	71
55 Margaret Street	1	F 1	35	55
55 Margaret Street	1	F 2	36	56
55 Margaret Street	1	F 3	36	57
55 Margaret Street	1	GF	35	55
6 Camera Street	1	F 1	56	59
6 Camera Street	1	GF	53	58
6 Eustace Street	1	F 1	39	51
6 Eustace Street	1	F 2	38	54
6 Eustace Street	1	F 3	39	57
6 Eustace Street	1	GF	40	51
6 Farlight Street	1	F 1	60	62
6 Farlight Street	1	GF	59	60
6 The Crescent	1	F 1	60	70
6 The Crescent	1	GF	59	68
6 Tower Street	1	F 1	37	46
6 Tower Street	1	F 2	38	48
6 Tower Street	1	F 3	41	51
6 Tower Street	1	GF	37	45
6 Upper Gilbert Street	1	F 1	63	73
6 Upper Gilbert Street	1	GF	62	73
6 West Promenade	1	F 1	43	50
6 West Promenade	1	F 2	44	51
6 West Promenade	1	F 3	46	50
6 West Promenade	1	GF	42	49

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Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 43-48 dB(A)				
Clearly audible: 48-58 dB(A)				
Moderately intrusive: 58-68 dB(A)				
Highly Intrusive: >68 dB(A)				
65 Sydney Road	1	F 1	34	46
65 Sydney Road	1	F 2	34	45
65 Sydney Road	1	GF	37	48
67 Sydney Road	1	F 1	38	50
67 Sydney Road	1	F 2	39	51
67 Sydney Road	1	GF	37	48
6b Farlight Street	1	F 1	57	61
6b Farlight Street	1	GF	55	60
7 Eustace Street	1	F 1	47	59
7 Eustace Street	1	F 2	50	62
7 Eustace Street	1	GF	45	57
7 Farlight Street	1	F 1	46	56
7 Farlight Street	1	GF	43	54
7 Margaret Street	1	F 1	33	44
7 Margaret Street	1	GF	33	44
7 The Crescent	1	F 1	73	82
7 The Crescent	1	F 2	74	83
7 The Crescent	1	F 3	74	83
7 The Crescent	1	F 4	73	83
7 The Crescent	1	F 5	73	83
7 The Crescent	1	F 6	73	83
7 The Crescent	1	GF	73	82
7 Tower Street	1	F 1	35	45
7 Tower Street	1	F 2	35	45
7 Tower Street	1	F 3	36	47
7 Tower Street	1	GF	35	45
73 Sydney Road	1	GF	42	54
75 - 76 West Esplanade	1	F 1	64	73
75 - 76 West Esplanade	1	F 2	64	73
75 - 76 West Esplanade	1	GF	64	72
75 Sydney Road	1	GF	54	61
77 Sydney Road	1	GF	45	56
78 West Esplanade	1	F 1	65	74
78 West Esplanade	1	F 2	65	74
78 West Esplanade	1	GF	64	73
79 Sydney Road	1	GF	45	53
8 Camera Street	1	F 1	54	62
8 Camera Street	1	GF	52	59
8 Eustace Street	1	F 1	40	53
8 Eustace Street	1	F 2	40	56
8 Eustace Street	1	F 3	41	59
8 Eustace Street	1	GF	40	51
8 The Crescent	1	F 1	57	67
8 The Crescent	1	GF	54	65
8 Upper Gilbert Street	1	F 1	59	61
8 Upper Gilbert Street	1	GF	58	60
8 West Promenade	1	F 1	37	47
8 West Promenade	1	F 2	38	47
8 West Promenade	1	F 3	39	50
8 West Promenade	1	GF	36	46
81 Sydney Road	1	GF	47	53
81 W Esplanade	1	F 1	69	76
81 W Esplanade	1	F 10	70	78
81 W Esplanade	1	F 11	70	78
81 W Esplanade	1	F 2	69	76
81 W Esplanade	1	F 3	70	77
81 W Esplanade	1	F 4	70	77
81 W Esplanade	1	F 5	70	77
81 W Esplanade	1	F 6	70	77

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Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 43-48 dB(A)				
Clearly audible: 48-58 dB(A)				
Moderately intrusive: 58-68 dB(A)				
Highly Intrusive: >68 dB(A)				
81 W Esplanade	1	F 7	71	78
81 W Esplanade	1	F 8	71	78
81 W Esplanade	1	F 9	70	78
81 W Esplanade	1	GF	68	75
83 Sydney Road	1	GF	47	53
83 W Esplanade	1	F 1	69	76
83 W Esplanade	1	F 2	70	76
83 W Esplanade	1	F 3	70	77
83 W Esplanade	1	GF	68	75
85 Sydney Road	1	GF	46	57
85 W Esplanade	1	F 1	71	77
85 W Esplanade	1	F 2	71	77
85 W Esplanade	1	F 3	72	77
85 W Esplanade	1	GF	70	76
86 W Esplanade	1	F 1	72	77
86 W Esplanade	1	F 2	73	78
86 W Esplanade	1	F 3	74	78
86 W Esplanade	1	F 4	74	78
86 W Esplanade	1	GF	71	77
87-88 W Esplanade	1	F 1	73	78
87-88 W Esplanade	1	F 2	74	78
87-88 W Esplanade	1	GF	72	77
87a Sydney Road	1	GF	44	58
89 Sydney Road	1	GF	44	55
89 W Esplanade	1	F 1	73	78
89 W Esplanade	1	F 2	74	78
89 W Esplanade	1	GF	72	77
9 Camera Street	1	F 1	47	70
9 Camera Street	1	GF	47	66
9 Eustace Street	1	F 1	41	55
9 Eustace Street	1	F 2	42	57
9 Eustace Street	1	GF	41	53
9 Farlight Street	1	F 1	43	57
9 Farlight Street	1	GF	41	55
9 Margaret Street	1	GF	34	44
9 The Crescent	1	F 1	72	82
9 The Crescent	1	F 2	73	82
9 The Crescent	1	GF	71	81
91 W Esplanade	1	F 1	72	79
91 W Esplanade	1	F 2	73	79
91 W Esplanade	1	F 3	74	80
91 W Esplanade	1	F 4	74	80
91 W Esplanade	1	F 5	73	80
91 W Esplanade	1	F 6	73	80
91 W Esplanade	1	F 7	73	80
91 W Esplanade	1	GF	71	78
93 W Esplanade	1	F 1	70	77
93 W Esplanade	1	F 2	71	78
93 W Esplanade	1	GF	70	77
Manly Club Gilbert Park	1	F 1	50	60
Manly Club Gilbert Park	1	F 2	53	64
Manly Club Gilbert Park	1	F 3	58	68
Manly Club Gilbert Park	1	GF	47	57
Manly Uniting Church	1	GF	44	52

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Table 27: Predicted construction noise levels (LAeq) compared to CNVG night-time (OOHW2) noise impact categories – NCA 2

Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 53-58 dB(A)				
Clearly audible: 58-68 dB(A)				
Moderately intrusive: 68-75 dB(A)				
Highly Intrusive: >75 dB(A)				
1 Ashburner Street	2	GF	44	59
1 Wentworth Street	2	F 1	38	54
1 Wentworth Street	2	F 2	40	57
1 Wentworth Street	2	F 3	48	61
1 Wentworth Street	2	F 4	51	63
1 Wentworth Street	2	F 5	51	63
1 Wentworth Street	2	F 6	51	63
1 Wentworth Street	2	GF	37	52
1 Whistler Street	2	F 1	50	64
1 Whistler Street	2	GF	47	64
13 Wentworth Street	2	F 1	39	55
13 Wentworth Street	2	F 2	43	56
13 Wentworth Street	2	F 3	50	60
13 Wentworth Street	2	F 4	54	65
13 Wentworth Street	2	F 5	54	65
13 Wentworth Street	2	F 6	55	66
13 Wentworth Street	2	F 7	55	66
13 Wentworth Street	2	GF	37	53
2 Victoria Parade	2	F 1	51	62
2 Victoria Parade	2	F 2	51	63
2 Victoria Parade	2	GF	51	62
20 - 23 East Esplanade	2	F 1	50	61
20 - 23 East Esplanade	2	GF	49	61
24 East Esplanade	2	F 1	52	63
24 East Esplanade	2	F 2	50	62
24 East Esplanade	2	F 3	50	62
24 East Esplanade	2	F 4	50	62
24 East Esplanade	2	F 5	51	62
24 East Esplanade	2	F 6	51	62
24 East Esplanade	2	GF	52	63
26 East Esplanade	2	F 1	50	62
26 East Esplanade	2	F 2	50	62
26 East Esplanade	2	GF	50	62
27 East Esplanade	2	F 1	50	62
27 East Esplanade	2	F 2	51	62
27 East Esplanade	2	F 3	48	60
27 East Esplanade	2	GF	50	62
3 Ashburner Street	2	GF	46	53
35-36 East Esplanade	2	F 1	52	64
35-36 East Esplanade	2	F 2	52	64
35-36 East Esplanade	2	F 3	52	64
35-36 East Esplanade	2	F 4	52	64
35-36 East Esplanade	2	F 5	52	64
35-36 East Esplanade	2	F 6	53	64
35-36 East Esplanade	2	F 7	53	64
35-36 East Esplanade	2	GF	52	64
37 East Esplanade	2	F 1	52	64
37 East Esplanade	2	F 2	53	64
37 East Esplanade	2	F 3	53	64
37 East Esplanade	2	F 4	53	64
37 East Esplanade	2	F 5	53	65
37 East Esplanade	2	F 6	53	65
37 East Esplanade	2	F 7	53	65
37 East Esplanade	2	GF	52	64
38 East Esplanade	2	F 1	38	49

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Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 53-58 dB(A)				
Clearly audible: 58-68 dB(A)				
Moderately intrusive: 68-75 dB(A)				
Highly Intrusive: >75 dB(A)				
38 East Esplanade	2	F 2	40	51
38 East Esplanade	2	F 3	42	53
38 East Esplanade	2	F 4	46	56
38 East Esplanade	2	F 5	51	61
38 East Esplanade	2	F 6	52	63
38 East Esplanade	2	F 7	53	64
38 East Esplanade	2	GF	37	48
39-40 East Esplanade	2	F 1	52	63
39-40 East Esplanade	2	F 2	52	63
39-40 East Esplanade	2	F 3	52	63
39-40 East Esplanade	2	F 4	52	64
39-40 East Esplanade	2	F 5	52	64
39-40 East Esplanade	2	F 6	52	64
39-40 East Esplanade	2	F 7	52	64
39-40 East Esplanade	2	GF	51	63
4 Darley Road	2	F 1	39	49
4 Darley Road	2	F 2	41	50
4 Darley Road	2	F 3	45	52
4 Darley Road	2	F 4	49	54
4 Darley Road	2	GF	38	48
45 East Esplanade	2	F 1	53	66
45 East Esplanade	2	F 2	53	66
45 East Esplanade	2	GF	53	66
5 Ashburner Street	2	F 1	48	59
5 Ashburner Street	2	GF	45	57
5 Victoria Parade	2	F 1	44	60
5 Victoria Parade	2	F 2	44	61
5 Victoria Parade	2	F 3	37	50
5 Victoria Parade	2	F 4	38	51
5 Victoria Parade	2	GF	43	60
6 Victoria Parade	2	F 1	49	62
6 Victoria Parade	2	F 2	49	62
6 Victoria Parade	2	F 3	49	62
6 Victoria Parade	2	GF	49	62
7 Wentworth Street	2	F 1	36	48
7 Wentworth Street	2	F 2	37	48
7 Wentworth Street	2	F 3	37	49
7 Wentworth Street	2	GF	36	47
8 Victoria Parade	2	F 1	36	49
8 Victoria Parade	2	F 2	38	51
8 Victoria Parade	2	GF	35	49
8-22 The Corso	2	F 1	44	61
8-22 The Corso	2	F 2	46	64
8-22 The Corso	2	F 3	48	65
8-22 The Corso	2	GF	41	58
East Manly Cove Beach	2	GF	48	59
Manly Court House	2	GF	45	55
Manly Police Station	2	F 1	44	58
Manly Police Station	2	GF	42	57
Manly Town Hall	2	F 1	46	56
Manly Town Hall	2	F 2	48	58
Manly Town Hall	2	F 3	52	59
Manly Town Hall	2	GF	43	54
Manly Village Public School	2	F 1	41	49
Manly Village Public School	2	F 2	43	52
Manly Village Public School	2	GF	38	47
Manly Village Public School	2	F 1	29	39
Manly Village Public School	2	F 2	30	40
Manly Village Public School	2	GF	29	39

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Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 53-58 dB(A)				
Clearly audible: 58-68 dB(A)				
Moderately intrusive: 68-75 dB(A)				
Highly Intrusive: >75 dB(A)				
Manly Village Public School Hall	2	GF	39	47
Manly Village Public School Hall	2	GF	27	38

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Table 28: Predicted construction noise levels (LAeq) compared to CNVG night-time (OOHW2) noise impact categories – NCA 3

Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 48-53 dB(A)				
Clearly audible: 53-63 dB(A)				
Moderately intrusive: 63-73 dB(A)				
Highly Intrusive: >73 dB(A)				
1 Cove Avenue	3	F 1	43	52
1 Cove Avenue	3	F 2	46	57
1 Cove Avenue	3	GF	41	50
1 East Esplanade	3	F 1	49	61
1 East Esplanade	3	GF	49	61
1 Osborne Road	3	F 1	46	60
1 Osborne Road	3	F 2	46	60
1 Osborne Road	3	F 3	46	60
1 Osborne Road	3	F 4	46	61
1 Osborne Road	3	F 5	46	61
1 Osborne Road	3	F 6	46	61
1 Osborne Road	3	F 7	46	61
1 Osborne Road	3	GF	46	60
10 Beatty Street	3	F 1	41	53
10 Beatty Street	3	GF	41	53
10 East Esplanade	3	F 1	49	61
10 East Esplanade	3	F 2	49	61
10 East Esplanade	3	F 3	49	61
10 East Esplanade	3	GF	49	61
10 Oyama Avenue	3	F 1	46	58
10 Oyama Avenue	3	GF	46	58
11 Cove Avenue	3	F 1	47	60
11 Cove Avenue	3	F 2	47	60
11 Cove Avenue	3	GF	46	60
11 Oyama Avenue	3	F 1	46	59
11 Oyama Avenue	3	GF	46	59
11a Oyama Avenue	3	F 1	49	61
11a Oyama Avenue	3	GF	48	60
12 Beatty Street	3	F 1	41	53
12 Beatty Street	3	GF	41	53
12 Cove Avenue	3	F 1	48	61
12 Cove Avenue	3	F 2	48	61
12 Cove Avenue	3	F 3	48	61
12 Cove Avenue	3	F 4	48	61
12 Cove Avenue	3	F 5	48	61
12 Cove Avenue	3	GF	48	60
12 Oyama Avenue	3	F 1	46	58
12 Oyama Avenue	3	GF	46	58
13 Cove Avenue	3	F 1	45	57
13 Cove Avenue	3	F 2	47	59
13 Cove Avenue	3	GF	41	52
13 East Esplanade	3	F 1	49	61
13 East Esplanade	3	F 2	49	61
13 East Esplanade	3	F 3	49	61
13 East Esplanade	3	F 4	49	61
13 East Esplanade	3	F 5	49	61
13 East Esplanade	3	F 6	49	61
13 East Esplanade	3	F 7	49	61
13 East Esplanade	3	F 8	49	61
13 East Esplanade	3	F 9	49	61
13 East Esplanade	3	GF	49	61
14 Beatty Street	3	F 1	41	53
14 Beatty Street	3	GF	41	53
14 Cove Avenue	3	F 1	48	60
14 Cove Avenue	3	F 2	48	61

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Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 48-53 dB(A)				
Clearly audible: 53-63 dB(A)				
Moderately intrusive: 63-73 dB(A)				
Highly Intrusive: >73 dB(A)				
14 Cove Avenue	3	GF	48	60
14 Oyama Avenue	3	F 1	46	59
14 Oyama Avenue	3	GF	46	58
14a Beatty Street	3	F 1	42	54
14a Beatty Street	3	GF	41	54
15 Cove Avenue	3	F 1	47	60
15 Cove Avenue	3	F 2	47	60
15 Cove Avenue	3	GF	47	60
15 East Esplanade	3	F 1	49	63
15 East Esplanade	3	F 2	49	61
15 East Esplanade	3	F 3	49	61
15 East Esplanade	3	GF	49	63
16 Beatty Street	3	F 1	41	53
16 Beatty Street	3	GF	41	53
16 Cove Avenue	3	F 1	48	60
16 Cove Avenue	3	GF	47	60
17 East Esplanade	3	F 1	50	62
17 East Esplanade	3	GF	49	62
18 Cove Avenue	3	F 1	48	60
18 Cove Avenue	3	GF	48	60
18-19 East Esplanade	3	F 1	51	61
18-19 East Esplanade	3	GF	50	61
19 Cove Avenue	3	F 1	47	59
19 Cove Avenue	3	F 2	47	59
19 Cove Avenue	3	GF	47	59
2 Beatty Street	3	F 1	42	54
2 Beatty Street	3	GF	42	54
2 East Esplanade	3	F 1	49	61
2 East Esplanade	3	F 2	49	61
2 East Esplanade	3	F 3	49	61
2 East Esplanade	3	GF	49	61
2 Osborn Road	3	F 1	48	60
2 Osborn Road	3	GF	46	56
2 Oyama Avenue	3	F 1	46	59
2 Oyama Avenue	3	GF	46	59
20 Cove Avenue	3	F 1	49	62
20 Cove Avenue	3	GF	44	56
22 Beatty Street	3	F 1	40	54
22 Beatty Street	3	GF	40	54
22 Cove Avenue	3	F 1	48	60
22 Cove Avenue	3	GF	48	60
22a Beatty Street	3	F 1	40	54
22a Beatty Street	3	GF	40	54
24 Beatty Street	3	F 1	39	54
24 Beatty Street	3	GF	37	54
24 Cove Avenue	3	F 1	48	60
24 Cove Avenue	3	GF	47	60
26 Beatty Street	3	F 1	36	51
26 Beatty Street	3	GF	38	52
26a Beatty Street	3	F 1	37	54
26a Beatty Street	3	GF	37	54
28 Beatty Street	3	F 1	38	56
28 Beatty Street	3	GF	38	56
2a Beatty Street	3	F 1	41	53
2a Beatty Street	3	GF	41	53
3 Cove Avenue	3	F 1	41	55
3 Cove Avenue	3	F 2	44	55
3 Cove Avenue	3	GF	37	52
3 East Esplanade	3	F 1	49	61

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Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 48-53 dB(A)				
Clearly audible: 53-63 dB(A)				
Moderately intrusive: 63-73 dB(A)				
Highly Intrusive: >73 dB(A)				
3 East Esplanade	3	F 2	49	61
3 East Esplanade	3	F 3	49	61
3 East Esplanade	3	GF	49	61
3 Oyama Avenue	3	F 1	47	60
3 Oyama Avenue	3	GF	47	60
3 Wood Street	3	F 1	41	55
3 Wood Street	3	GF	40	54
30 Beatty Street	3	F 1	34	53
30 Beatty Street	3	GF	34	53
34 Beatty Street	3	F 1	35	53
34 Beatty Street	3	GF	34	53
36 Beatty Street	3	F 1	34	53
36 Beatty Street	3	GF	34	53
38 Beatty Street	3	F 1	32	53
38 Beatty Street	3	GF	32	53
4 East Esplanade	3	F 1	49	61
4 East Esplanade	3	F 2	49	61
4 East Esplanade	3	F 3	49	61
4 East Esplanade	3	GF	49	61
4 Oyama Avenue	3	F 1	46	59
4 Oyama Avenue	3	GF	46	58
4 Wood Street	3	F 1	46	59
4 Wood Street	3	F 2	49	62
4 Wood Street	3	GF	44	56
40 Beatty Street	3	F 1	31	53
40 Beatty Street	3	GF	30	53
42 Beatty Street	3	F 1	30	53
42 Beatty Street	3	GF	30	52
44 Beatty Street	3	F 1	30	52
44 Beatty Street	3	GF	30	52
46 Beatty Street	3	F 1	30	52
46 Beatty Street	3	GF	30	52
5 Cove Avenue	3	F 1	37	49
5 Cove Avenue	3	F 2	44	55
5 Cove Avenue	3	GF	33	45
5 East Esplanade	3	F 1	49	61
5 East Esplanade	3	F 2	49	61
5 East Esplanade	3	F 3	49	61
5 East Esplanade	3	GF	49	61
5 Osborne Road	3	F 1	48	60
5 Osborne Road	3	F 2	48	60
5 Osborne Road	3	F 3	48	60
5 Osborne Road	3	GF	48	60
5 Oyama Avenue	3	F 1	47	59
5 Oyama Avenue	3	GF	47	59
5 Wood Street	3	F 1	46	58
5 Wood Street	3	GF	45	58
6 Beatty Street	3	F 1	41	53
6 Beatty Street	3	GF	42	56
6 Oyama Avenue	3	F 1	46	58
6 Oyama Avenue	3	GF	46	58
6-18 Cove Avenue	3	F 1	49	61
6-18 Cove Avenue	3	F 2	49	61
6-18 Cove Avenue	3	F 3	49	61
6-18 Cove Avenue	3	F 4	49	61
6-18 Cove Avenue	3	GF	49	61
6-7 East Esplanade	3	F 1	49	61
6-7 East Esplanade	3	F 2	49	61
6-7 East Esplanade	3	F 3	49	61

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Receiver	NCA	Floor	Scenario 2	Scenario 4
Noticeable: 48-53 dB(A)				
Clearly audible: 53-63 dB(A)				
Moderately intrusive: 63-73 dB(A)				
Highly Intrusive: >73 dB(A)				
6-7 East Esplanade	3	GF	49	61
7 Cove Avenue	3	F 1	45	58
7 Cove Avenue	3	F 2	45	57
7 Cove Avenue	3	GF	42	55
7 Osborne Road	3	F 1	46	60
7 Osborne Road	3	F 2	47	60
7 Osborne Road	3	F 3	48	60
7 Osborne Road	3	GF	45	60
7 Oyama Avenue	3	F 1	47	59
7 Oyama Avenue	3	GF	47	59
8 Beatty Street	3	F 1	41	53
8 Beatty Street	3	GF	36	48
8 East Esplanade	3	F 1	49	61
8 East Esplanade	3	F 2	49	61
8 East Esplanade	3	F 3	49	61
8 East Esplanade	3	GF	49	61
8 Oyama Avenue	3	F 1	46	58
8 Oyama Avenue	3	GF	46	58
8a Beatty Street	3	F 1	41	54
8a Beatty Street	3	GF	41	54
8b Beatty Street	3	F 1	42	54
8b Beatty Street	3	GF	42	54
9 Cove Avenue	3	F 1	39	51
9 Cove Avenue	3	F 2	45	57
9 Cove Avenue	3	GF	35	47
9 East Esplanade	3	F 1	49	61
9 East Esplanade	3	F 2	49	61
9 East Esplanade	3	F 3	49	61
9 East Esplanade	3	GF	49	61
9 Oyama Avenue	3	F 1	47	59
9 Oyama Avenue	3	GF	47	59
9 Stuart Street	3	F 1	49	62
9 Stuart Street	3	F 2	50	63
9 Stuart Street	3	GF	48	62
Manly Waters Private Hospital	3	F 1	47	60
Manly Waters Private Hospital	3	F 2	47	60
Manly Waters Private Hospital	3	F 3	47	60
Manly Waters Private Hospital	3	F 4	47	60
Manly Waters Private Hospital	3	GF	47	59

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Table 29: Predicted maximum construction noise levels (LAMax) compared to sleep disturbance criteria – NCAs 1-3

Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
1 Eustace Street	1	F 1	71	82	60
1 Eustace Street	1	F 2	71	82	60
1 Eustace Street	1	F 3	70	82	60
1 Eustace Street	1	GF	71	82	60
1 Farlight Street	1	F 1	71	73	60
1 Farlight Street	1	GF	65	69	60
1 Lauderdale Avenue	1	F 1	38	64	60
1 Lauderdale Avenue	1	F 10	39	69	60
1 Lauderdale Avenue	1	F 11	39	70	60
1 Lauderdale Avenue	1	F 12	39	70	60
1 Lauderdale Avenue	1	F 13	39	70	60
1 Lauderdale Avenue	1	F 14	40	70	60
1 Lauderdale Avenue	1	F 15	41	70	60
1 Lauderdale Avenue	1	F 2	38	64	60
1 Lauderdale Avenue	1	F 3	38	65	60
1 Lauderdale Avenue	1	F 4	38	65	60
1 Lauderdale Avenue	1	F 5	38	66	60
1 Lauderdale Avenue	1	F 6	38	67	60
1 Lauderdale Avenue	1	F 7	38	68	60
1 Lauderdale Avenue	1	F 8	38	68	60
1 Lauderdale Avenue	1	F 9	39	69	60
1 Lauderdale Avenue	1	GF	38	63	60
1 Laurence Street	1	F 1	47	59	60
1 Laurence Street	1	GF	46	58	60
1 Margaret Street	1	F 1	39	51	60
1 Margaret Street	1	F 2	39	51	60
1 Margaret Street	1	F 3	39	52	60
1 Margaret Street	1	GF	39	53	60
1 Rowe Street	1	F 1	76	84	60
1 Rowe Street	1	GF	76	84	60
1 The Crescent	1	F 1	82	90	60
1 The Crescent	1	F 2	82	90	60
1 The Crescent	1	GF	81	89	60
10 Camera Street	1	F 1	67	79	60
10 Camera Street	1	GF	64	77	60
10 Eustace Street	1	F 1	50	58	60
10 Eustace Street	1	F 2	50	59	60
10 Eustace Street	1	F 3	51	60	60
10 Eustace Street	1	GF	49	58	60
10 Upper Gilbert Street	1	F 1	63	79	60
10 Upper Gilbert Street	1	GF	62	78	60
11 Camera Street	1	F 1	68	80	60
11 Camera Street	1	GF	66	75	60
11 Eustace Street	1	F 1	54	59	60
11 Eustace Street	1	F 2	55	61	60
11 Eustace Street	1	GF	51	59	60
11 Farlight Street	1	F 1	54	70	60
11 Farlight Street	1	GF	52	69	60
11 Gilbert Street	1	F 1	60	74	60
11 Gilbert Street	1	F 2	62	77	60
11 Gilbert Street	1	F 3	68	80	60
11 Gilbert Street	1	GF	58	69	60
11 The Crescent	1	F 1	83	92	60
11 The Crescent	1	F 2	83	93	60
11 The Crescent	1	GF	82	92	60
12 Camera Street	1	F 1	65	78	60
12 Camera Street	1	GF	61	74	60
12 Eustace Street	1	F 1	50	57	60

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Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
12 Eustace Street	1	F 2	51	58	60
12 Eustace Street	1	F 3	50	59	60
12 Eustace Street	1	GF	49	57	60
12 The Crescent	1	F 1	56	66	60
12 The Crescent	1	GF	52	65	60
12 Upper Gilbert Street	1	F 1	70	82	60
12 Upper Gilbert Street	1	GF	67	79	60
13 Camera Street	1	F 1	65	78	60
13 Camera Street	1	GF	62	71	60
13 Eustace Street	1	F 1	53	58	60
13 Eustace Street	1	F 2	55	63	60
13 Eustace Street	1	GF	52	57	60
13a Upper Gilbert Street	1	F 1	72	81	60
13a Upper Gilbert Street	1	GF	71	81	60
14 Camera Street	1	F 1	64	78	60
14 Camera Street	1	GF	58	73	60
14 Upper Gilbert Street	1	F 1	67	79	60
14 Upper Gilbert Street	1	GF	65	76	60
15 Farlight Street	1	F 1	54	69	60
15 Farlight Street	1	GF	53	68	60
15 The Crescent	1	F 1	80	93	60
15 The Crescent	1	F 2	81	93	60
15 The Crescent	1	GF	79	91	60
15 Upper Gilbert Street	1	F 1	74	84	60
15 Upper Gilbert Street	1	GF	73	84	60
15a Eustace Street	1	F 1	58	62	60
15a Eustace Street	1	F 2	61	64	60
15a Eustace Street	1	GF	58	61	60
16 Upper Gilbert Street	1	F 1	68	72	60
16 Upper Gilbert Street	1	GF	64	70	60
17 Eustace Street	1	F 1	52	59	60
17 Eustace Street	1	F 2	54	59	60
17 Eustace Street	1	GF	52	59	60
17 Farlight Street	1	F 1	56	65	60
17 Farlight Street	1	GF	55	64	60
17 The Crescent	1	F 1	77	93	60
17 The Crescent	1	F 2	77	93	60
17 The Crescent	1	GF	76	92	60
17 Upper Gilbert Street	1	F 1	71	78	60
17 Upper Gilbert Street	1	GF	70	73	60
19 Eustace Street	1	F 1	49	55	60
19 Eustace Street	1	F 2	51	56	60
19 Eustace Street	1	GF	48	55	60
19 The Crescent	1	F 1	63	88	60
19 The Crescent	1	F 2	71	89	60
19 The Crescent	1	GF	60	88	60
19 Upper Gilbert Street	1	F 1	61	70	60
19 Upper Gilbert Street	1	GF	59	68	60
1a Farlight Street	1	F 1	76	72	60
1a Farlight Street	1	GF	74	70	60
2 Farlight Street	1	F 1	72	78	60
2 Farlight Street	1	GF	71	73	60
2 Gilbert Street	1	F 1	52	78	60
2 Gilbert Street	1	F 2	54	81	60
2 Gilbert Street	1	GF	51	77	60
2 Margaret Street	1	F 1	48	58	60
2 Margaret Street	1	GF	49	59	60
2 Tower Street	1	F 1	71	83	60
2 Tower Street	1	F 2	72	83	60
2 Tower Street	1	F 3	73	82	60
2 Tower Street	1	GF	70	82	60

Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
20 The Crescent	1	F 1	55	64	60
20 The Crescent	1	GF	53	63	60
21 Eustace Street	1	F 1	48	62	60
21 Eustace Street	1	F 2	48	64	60
21 Eustace Street	1	GF	49	61	60
21a Eustace Street	1	F 1	51	64	60
21a Eustace Street	1	F 2	53	66	60
21a Eustace Street	1	GF	50	62	60
22 The Crescent	1	F 1	53	63	60
22 The Crescent	1	GF	52	62	60
23 The Crescent	1	F 1	76	91	60
23 The Crescent	1	F 2	77	91	60
23 The Crescent	1	GF	76	90	60
24 The Crescent	1	F 1	52	61	60
24 The Crescent	1	GF	51	61	60
25 The Crescent	1	F 1	67	86	60
25 The Crescent	1	F 2	68	87	60
25 The Crescent	1	GF	66	86	60
26 The Crescent	1	F 1	46	65	60
26 The Crescent	1	F 2	47	65	60
26 The Crescent	1	F 3	50	64	60
26 The Crescent	1	GF	47	62	60
27 The Crescent	1	F 1	53	71	60
27 The Crescent	1	F 2	57	74	60
27 The Crescent	1	GF	52	70	60
28 The Crescent	1	F 1	46	58	60
28 The Crescent	1	F 2	47	58	60
28 The Crescent	1	F 3	48	58	60
28 The Crescent	1	GF	46	58	60
29 The Crescent	1	F 1	49	69	60
29 The Crescent	1	F 2	50	69	60
29 The Crescent	1	F 3	50	70	60
29 The Crescent	1	F 4	50	71	60
29 The Crescent	1	F 5	53	73	60
29 The Crescent	1	GF	49	67	60
2a Gilbert Street	1	F 1	64	71	60
2a Gilbert Street	1	F 2	67	76	60
2a Gilbert Street	1	GF	61	68	60
3 Camera Street	1	F 1	71	78	60
3 Camera Street	1	GF	69	77	60
3 Eustace Street	1	F 1	60	76	60
3 Eustace Street	1	F 2	62	78	60
3 Eustace Street	1	F 3	68	78	60
3 Eustace Street	1	GF	57	74	60
3 Farlight Street	1	F 1	57	72	60
3 Farlight Street	1	GF	54	71	60
3 Laurence Street	1	F 1	47	57	60
3 Laurence Street	1	GF	47	56	60
3 Margaret Street	1	F 1	39	51	60
3 Margaret Street	1	GF	39	51	60
3 Tower Street	1	F 1	69	79	60
3 Tower Street	1	F 2	70	80	60
3 Tower Street	1	F 3	71	80	60
3 Tower Street	1	GF	68	78	60
3 West Promedade	1	F 1	52	57	60
3 West Promedade	1	F 2	52	57	60
3 West Promedade	1	F 3	53	61	60
3 West Promedade	1	GF	51	59	60
31 The Crescent	1	F 1	50	63	60
31 The Crescent	1	GF	50	63	60
32 The Crescent	1	F 1	46	55	60

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Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
32 The Crescent	1	F 2	47	56	60
32 The Crescent	1	F 3	47	56	60
32 The Crescent	1	GF	47	56	60
33 The Crescent	1	F 1	49	63	60
33 The Crescent	1	F 2	50	64	60
33 The Crescent	1	GF	49	63	60
34 The Crescent	1	F 1	48	58	60
34 The Crescent	1	F 2	48	59	60
34 The Crescent	1	F 3	49	60	60
34 The Crescent	1	GF	48	58	60
35 The Crescent	1	F 1	51	62	60
35 The Crescent	1	GF	50	62	60
36 The Crescent	1	F 1	46	61	60
36 The Crescent	1	F 2	47	61	60
36 The Crescent	1	F 3	48	60	60
36 The Crescent	1	GF	46	60	60
37 The Crescent	1	F 1	49	58	60
37 The Crescent	1	F 2	48	58	60
37 The Crescent	1	F 3	48	58	60
37 The Crescent	1	F 4	48	58	60
37 The Crescent	1	F 5	48	58	60
37 The Crescent	1	F 6	49	59	60
37 The Crescent	1	F 7	50	59	60
37 The Crescent	1	GF	49	58	60
38 The Crescent	1	F 1	44	58	60
38 The Crescent	1	F 2	45	59	60
38 The Crescent	1	F 3	45	60	60
38 The Crescent	1	GF	44	58	60
4 Camera Street	1	F 1	70	79	60
4 Camera Street	1	GF	67	76	60
4 Farlight Street	1	F 1	71	72	60
4 Farlight Street	1	GF	70	71	60
4 Gilbert Street	1	F 1	62	74	60
4 Gilbert Street	1	F 2	63	74	60
4 Gilbert Street	1	GF	58	71	60
4 Laurence Street	1	F 1	49	58	60
4 Laurence Street	1	F 2	50	59	60
4 Laurence Street	1	F 3	51	60	60
4 Laurence Street	1	GF	49	58	60
4 The Crescent	1	F 1	71	85	60
4 The Crescent	1	GF	70	84	60
4 Tower Street	1	F 1	66	79	60
4 Tower Street	1	F 2	66	79	60
4 Tower Street	1	F 3	67	79	60
4 Tower Street	1	GF	64	78	60
41 The Crescent	1	F 1	45	58	60
41 The Crescent	1	GF	45	57	60
43 The Crescent	1	F 1	46	60	60
43 The Crescent	1	GF	48	59	60
45 The Crescent	1	F 1	45	60	60
45 The Crescent	1	GF	44	59	60
47 The Crescent	1	F 1	44	59	60
47 The Crescent	1	GF	44	59	60
49 The Crescent	1	F 1	46	60	60
49 The Crescent	1	GF	45	59	60
4a Camera Street	1	F 1	66	70	60
4a Camera Street	1	GF	61	66	60
4a Eustace Street	1	F 1	55	67	60
4a Eustace Street	1	F 2	61	71	60
4a Eustace Street	1	F 3	66	77	60
4a Eustace Street	1	GF	52	65	60

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Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
4b Eustace Street	1	GF	49	64	60
5 Camera Street	1	F 1	68	80	60
5 Camera Street	1	GF	62	76	60
5 Eustace Street	1	F 1	59	69	60
5 Eustace Street	1	F 2	62	72	60
5 Eustace Street	1	GF	57	67	60
5 Farlight Street	1	F 1	55	68	60
5 Farlight Street	1	GF	55	68	60
5 Margaret Street	1	F 1	42	54	60
5 Margaret Street	1	GF	42	54	60
5 The Crescent	1	F 1	82	90	60
5 The Crescent	1	F 2	83	91	60
5 The Crescent	1	GF	81	90	60
5 Tower Street	1	F 1	49	60	60
5 Tower Street	1	F 2	50	61	60
5 Tower Street	1	F 3	52	64	60
5 Tower Street	1	GF	48	58	60
51 - 53 The Crescent	1	F 1	45	60	60
51 - 53 The Crescent	1	F 10	52	66	60
51 - 53 The Crescent	1	F 11	51	64	60
51 - 53 The Crescent	1	F 12	52	65	60
51 - 53 The Crescent	1	F 13	53	65	60
51 - 53 The Crescent	1	F 2	47	60	60
51 - 53 The Crescent	1	F 3	48	62	60
51 - 53 The Crescent	1	F 4	48	62	60
51 - 53 The Crescent	1	F 5	49	63	60
51 - 53 The Crescent	1	F 6	50	64	60
51 - 53 The Crescent	1	F 7	50	64	60
51 - 53 The Crescent	1	F 8	51	65	60
51 - 53 The Crescent	1	F 9	52	65	60
51 - 53 The Crescent	1	GF	45	59	60
54 - 66 West Esplanade Lower	1	F 1	70	80	60
54 - 66 West Esplanade Lower	1	F 2	70	81	60
54 - 66 West Esplanade Lower	1	GF	69	80	60
54 - 66 West Esplanade Upper	1	F 1	68	79	60
54 - 66 West Esplanade Upper	1	F 2	70	80	60
54 - 66 West Esplanade Upper	1	F 3	70	81	60
54 - 66 West Esplanade Upper	1	F 4	70	81	60
54 - 66 West Esplanade Upper	1	F 5	70	81	60
55 Margaret Street	1	F 1	45	65	60
55 Margaret Street	1	F 2	46	66	60
55 Margaret Street	1	F 3	46	67	60
55 Margaret Street	1	GF	45	65	60
6 Camera Street	1	F 1	66	69	60
6 Camera Street	1	GF	63	68	60
6 Eustace Street	1	F 1	49	61	60
6 Eustace Street	1	F 2	48	64	60
6 Eustace Street	1	F 3	49	67	60
6 Eustace Street	1	GF	50	61	60
6 Farlight Street	1	F 1	70	72	60
6 Farlight Street	1	GF	69	70	60
6 The Crescent	1	F 1	70	80	60
6 The Crescent	1	GF	69	78	60
6 Tower Street	1	F 1	47	56	60
6 Tower Street	1	F 2	48	58	60
6 Tower Street	1	F 3	51	61	60
6 Tower Street	1	GF	47	55	60
6 Upper Gilbert Street	1	F 1	73	83	60
6 Upper Gilbert Street	1	GF	72	83	60
6 West Promenade	1	F 1	53	60	60
6 West Promenade	1	F 2	54	61	60

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Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
6 West Promenade	1	F 3	56	60	60
6 West Promenade	1	GF	52	59	60
65 Sydney Road	1	F 1	44	56	60
65 Sydney Road	1	F 2	44	55	60
65 Sydney Road	1	GF	47	58	60
67 Sydney Road	1	F 1	48	60	60
67 Sydney Road	1	F 2	49	61	60
67 Sydney Road	1	GF	47	58	60
6b Farlight Street	1	F 1	67	71	60
6b Farlight Street	1	GF	65	70	60
7 Eustace Street	1	F 1	57	69	60
7 Eustace Street	1	F 2	60	72	60
7 Eustace Street	1	GF	55	67	60
7 Farlight Street	1	F 1	56	66	60
7 Farlight Street	1	GF	53	64	60
7 Margaret Street	1	F 1	43	54	60
7 Margaret Street	1	GF	43	54	60
7 The Crescent	1	F 1	83	92	60
7 The Crescent	1	F 2	84	93	60
7 The Crescent	1	F 3	84	93	60
7 The Crescent	1	F 4	83	93	60
7 The Crescent	1	F 5	83	93	60
7 The Crescent	1	F 6	83	93	60
7 The Crescent	1	GF	83	92	60
7 Tower Street	1	F 1	45	55	60
7 Tower Street	1	F 2	45	55	60
7 Tower Street	1	F 3	46	57	60
7 Tower Street	1	GF	45	55	60
73 Sydney Road	1	GF	52	64	60
75 - 76 West Esplanade	1	F 1	74	83	60
75 - 76 West Esplanade	1	F 2	74	83	60
75 - 76 West Esplanade	1	GF	74	82	60
75 Sydney Road	1	GF	64	71	60
77 Sydney Road	1	GF	55	66	60
78 West Esplanade	1	F 1	75	84	60
78 West Esplanade	1	F 2	75	84	60
78 West Esplanade	1	GF	74	83	60
79 Sydney Road	1	GF	55	63	60
8 Camera Street	1	F 1	64	72	60
8 Camera Street	1	GF	62	69	60
8 Eustace Street	1	F 1	50	63	60
8 Eustace Street	1	F 2	50	66	60
8 Eustace Street	1	F 3	51	69	60
8 Eustace Street	1	GF	50	61	60
8 The Crescent	1	F 1	67	77	60
8 The Crescent	1	GF	64	75	60
8 Upper Gilbert Street	1	F 1	69	71	60
8 Upper Gilbert Street	1	GF	68	70	60
8 West Promenade	1	F 1	47	57	60
8 West Promenade	1	F 2	48	57	60
8 West Promenade	1	F 3	49	60	60
8 West Promenade	1	GF	46	56	60
81 Sydney Road	1	GF	57	63	60
81 W Esplanade	1	F 1	79	86	60
81 W Esplanade	1	F 10	80	88	60
81 W Esplanade	1	F 11	80	88	60
81 W Esplanade	1	F 2	79	86	60
81 W Esplanade	1	F 3	80	87	60
81 W Esplanade	1	F 4	80	87	60
81 W Esplanade	1	F 5	80	87	60
81 W Esplanade	1	F 6	80	87	60

Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
81 W Esplanade	1	F 7	81	88	60
81 W Esplanade	1	F 8	81	88	60
81 W Esplanade	1	F 9	80	88	60
81 W Esplanade	1	GF	78	85	60
83 Sydney Road	1	GF	57	63	60
83 W Esplanade	1	F 1	79	86	60
83 W Esplanade	1	F 2	80	86	60
83 W Esplanade	1	F 3	80	87	60
83 W Esplanade	1	GF	78	85	60
85 Sydney Road	1	GF	56	67	60
85 W Esplanade	1	F 1	81	87	60
85 W Esplanade	1	F 2	81	87	60
85 W Esplanade	1	F 3	82	87	60
85 W Esplanade	1	GF	80	86	60
86 W Esplanade	1	F 1	82	87	60
86 W Esplanade	1	F 2	83	88	60
86 W Esplanade	1	F 3	84	88	60
86 W Esplanade	1	F 4	84	88	60
86 W Esplanade	1	GF	81	87	60
87-88 W Esplanade	1	F 1	83	88	60
87-88 W Esplanade	1	F 2	84	88	60
87-88 W Esplanade	1	GF	82	87	60
87a Sydney Road	1	GF	54	68	60
89 Sydney Road	1	GF	54	65	60
89 W Esplanade	1	F 1	83	88	60
89 W Esplanade	1	F 2	84	88	60
89 W Esplanade	1	GF	82	87	60
9 Camera Street	1	F 1	57	80	60
9 Camera Street	1	GF	57	76	60
9 Eustace Street	1	F 1	51	65	60
9 Eustace Street	1	F 2	52	67	60
9 Eustace Street	1	GF	51	63	60
9 Farlight Street	1	F 1	53	67	60
9 Farlight Street	1	GF	51	65	60
9 Margaret Street	1	GF	44	54	60
9 The Crescent	1	F 1	82	92	60
9 The Crescent	1	F 2	83	92	60
9 The Crescent	1	GF	81	91	60
91 W Esplanade	1	F 1	82	89	60
91 W Esplanade	1	F 2	83	89	60
91 W Esplanade	1	F 3	84	90	60
91 W Esplanade	1	F 4	84	90	60
91 W Esplanade	1	F 5	83	90	60
91 W Esplanade	1	F 6	83	90	60
91 W Esplanade	1	F 7	83	90	60
91 W Esplanade	1	GF	81	88	60
93 W Esplanade	1	F 1	80	87	60
93 W Esplanade	1	F 2	81	88	60
93 W Esplanade	1	GF	80	87	60
Manly Club Gilbert Park	1	F 1	60	70	60
Manly Club Gilbert Park	1	F 2	63	74	60
Manly Club Gilbert Park	1	F 3	68	78	60
Manly Club Gilbert Park	1	GF	57	67	60
Manly Uniting Church	1	GF	54	62	60
1 Ashburner Street	2	GF	54	69	60
1 Wentworth Street	2	F 1	48	64	60
1 Wentworth Street	2	F 2	50	67	60
1 Wentworth Street	2	F 3	58	71	60
1 Wentworth Street	2	F 4	61	73	60
1 Wentworth Street	2	F 5	61	73	60
1 Wentworth Street	2	F 6	61	73	60

Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
1 Wentworth Street	2	GF	47	62	60
1 Whistler Street	2	F 1	60	74	60
1 Whistler Street	2	GF	57	74	60
13 Wentworth Street	2	F 1	49	65	60
13 Wentworth Street	2	F 2	53	66	60
13 Wentworth Street	2	F 3	60	70	60
13 Wentworth Street	2	F 4	64	75	60
13 Wentworth Street	2	F 5	64	75	60
13 Wentworth Street	2	F 6	65	76	60
13 Wentworth Street	2	F 7	65	76	60
13 Wentworth Street	2	GF	47	63	60
2 Victoria Parade	2	F 1	61	72	60
2 Victoria Parade	2	F 2	61	73	60
2 Victoria Parade	2	GF	61	72	60
20 - 23 East Esplanade	2	F 1	60	71	60
20 - 23 East Esplanade	2	GF	59	71	60
24 East Esplanade	2	F 1	62	73	60
24 East Esplanade	2	F 2	60	72	60
24 East Esplanade	2	F 3	60	72	60
24 East Esplanade	2	F 4	60	72	60
24 East Esplanade	2	F 5	61	72	60
24 East Esplanade	2	F 6	61	72	60
24 East Esplanade	2	GF	62	73	60
26 East Esplanade	2	F 1	60	72	60
26 East Esplanade	2	F 2	60	72	60
26 East Esplanade	2	GF	60	72	60
27 East Esplanade	2	F 1	60	72	60
27 East Esplanade	2	F 2	61	72	60
27 East Esplanade	2	F 3	58	70	60
27 East Esplanade	2	GF	60	72	60
3 Ashburner Street	2	GF	56	63	60
35-36 East Esplanade	2	F 1	62	74	60
35-36 East Esplanade	2	F 2	62	74	60
35-36 East Esplanade	2	F 3	62	74	60
35-36 East Esplanade	2	F 4	62	74	60
35-36 East Esplanade	2	F 5	62	74	60
35-36 East Esplanade	2	F 6	63	74	60
35-36 East Esplanade	2	F 7	63	74	60
35-36 East Esplanade	2	GF	62	74	60
37 East Esplanade	2	F 1	62	74	60
37 East Esplanade	2	F 2	63	74	60
37 East Esplanade	2	F 3	63	74	60
37 East Esplanade	2	F 4	63	74	60
37 East Esplanade	2	F 5	63	75	60
37 East Esplanade	2	F 6	63	75	60
37 East Esplanade	2	F 7	63	75	60
37 East Esplanade	2	GF	62	74	60
38 East Esplanade	2	F 1	48	59	60
38 East Esplanade	2	F 2	50	61	60
38 East Esplanade	2	F 3	52	63	60
38 East Esplanade	2	F 4	56	66	60
38 East Esplanade	2	F 5	61	71	60
38 East Esplanade	2	F 6	62	73	60
38 East Esplanade	2	F 7	63	74	60
38 East Esplanade	2	GF	47	58	60
39-40 East Esplanade	2	F 1	62	73	60
39-40 East Esplanade	2	F 2	62	73	60
39-40 East Esplanade	2	F 3	62	73	60
39-40 East Esplanade	2	F 4	62	74	60
39-40 East Esplanade	2	F 5	62	74	60
39-40 East Esplanade	2	F 6	62	74	60

Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
39-40 East Esplanade	2	F 7	62	74	60
39-40 East Esplanade	2	GF	61	73	60
4 Darley Road	2	F 1	49	59	60
4 Darley Road	2	F 2	51	60	60
4 Darley Road	2	F 3	55	62	60
4 Darley Road	2	F 4	59	64	60
4 Darley Road	2	GF	48	58	60
45 East Esplanade	2	F 1	63	76	60
45 East Esplanade	2	F 2	63	76	60
45 East Esplanade	2	GF	63	76	60
5 Ashburner Street	2	F 1	58	69	60
5 Ashburner Street	2	GF	55	67	60
5 Victoria Parade	2	F 1	54	70	60
5 Victoria Parade	2	F 2	54	71	60
5 Victoria Parade	2	F 3	47	60	60
5 Victoria Parade	2	F 4	48	61	60
5 Victoria Parade	2	GF	53	70	60
6 Victoria Parade	2	F 1	59	72	60
6 Victoria Parade	2	F 2	59	72	60
6 Victoria Parade	2	F 3	59	72	60
6 Victoria Parade	2	GF	59	72	60
7 Wentworth Street	2	F 1	46	58	60
7 Wentworth Street	2	F 2	47	58	60
7 Wentworth Street	2	F 3	47	59	60
7 Wentworth Street	2	GF	46	57	60
8 Victoria Parade	2	F 1	46	59	60
8 Victoria Parade	2	F 2	48	61	60
8 Victoria Parade	2	GF	45	59	60
8-22 The Corso	2	F 1	54	71	60
8-22 The Corso	2	F 2	56	74	60
8-22 The Corso	2	F 3	58	75	60
8-22 The Corso	2	GF	51	68	60
East Manly Cove Beach	2	GF	58	69	60
Manly Court House	2	GF	55	65	60
Manly Police Station	2	F 1	54	68	60
Manly Police Station	2	GF	52	67	60
Manly Town Hall	2	F 1	56	66	60
Manly Town Hall	2	F 2	58	68	60
Manly Town Hall	2	F 3	62	69	60
Manly Town Hall	2	GF	53	64	60
Manly Village Public School	2	F 1	51	59	60
Manly Village Public School	2	F 2	53	62	60
Manly Village Public School	2	GF	48	57	60
Manly Village Public School	2	F 1	39	49	60
Manly Village Public School	2	F 2	40	50	60
Manly Village Public School	2	GF	39	49	60
Manly Village Public School Hall	2	GF	49	57	60
Manly Village Public School Hall	2	GF	37	48	60
1 Cove Avenue	3	F 1	53	62	60
1 Cove Avenue	3	F 2	56	67	60
1 Cove Avenue	3	GF	51	60	60
1 East Esplanade	3	F 1	59	71	60
1 East Esplanade	3	GF	59	71	60
1 Osborne Road	3	F 1	56	70	60
1 Osborne Road	3	F 2	56	70	60
1 Osborne Road	3	F 3	56	70	60
1 Osborne Road	3	F 4	56	71	60
1 Osborne Road	3	F 5	56	71	60
1 Osborne Road	3	F 6	56	71	60
1 Osborne Road	3	F 7	56	71	60
1 Osborne Road	3	GF	56	70	60

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Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
10 Beatty Street	3	F 1	51	63	60
10 Beatty Street	3	GF	51	63	60
10 East Esplanade	3	F 1	59	71	60
10 East Esplanade	3	F 2	59	71	60
10 East Esplanade	3	F 3	59	71	60
10 East Esplanade	3	GF	59	71	60
10 Oyama Avenue	3	F 1	56	68	60
10 Oyama Avenue	3	GF	56	68	60
11 Cove Avenue	3	F 1	57	70	60
11 Cove Avenue	3	F 2	57	70	60
11 Cove Avenue	3	GF	56	70	60
11 Oyama Avenue	3	F 1	56	69	60
11 Oyama Avenue	3	GF	56	69	60
11a Oyama Avenue	3	F 1	59	71	60
11a Oyama Avenue	3	GF	58	70	60
12 Beatty Street	3	F 1	51	63	60
12 Beatty Street	3	GF	51	63	60
12 Cove Avenue	3	F 1	58	71	60
12 Cove Avenue	3	F 2	58	71	60
12 Cove Avenue	3	F 3	58	71	60
12 Cove Avenue	3	F 4	58	71	60
12 Cove Avenue	3	F 5	58	71	60
12 Cove Avenue	3	GF	58	70	60
12 Oyama Avenue	3	F 1	56	68	60
12 Oyama Avenue	3	GF	56	68	60
13 Cove Avenue	3	F 1	55	67	60
13 Cove Avenue	3	F 2	57	69	60
13 Cove Avenue	3	GF	51	62	60
13 East Esplanade	3	F 1	59	71	60
13 East Esplanade	3	F 2	59	71	60
13 East Esplanade	3	F 3	59	71	60
13 East Esplanade	3	F 4	59	71	60
13 East Esplanade	3	F 5	59	71	60
13 East Esplanade	3	F 6	59	71	60
13 East Esplanade	3	F 7	59	71	60
13 East Esplanade	3	F 8	59	71	60
13 East Esplanade	3	F 9	59	71	60
13 East Esplanade	3	GF	59	71	60
14 Beatty Street	3	F 1	51	63	60
14 Beatty Street	3	GF	51	63	60
14 Cove Avenue	3	F 1	58	70	60
14 Cove Avenue	3	F 2	58	71	60
14 Cove Avenue	3	GF	58	70	60
14 Oyama Avenue	3	F 1	56	69	60
14 Oyama Avenue	3	GF	56	68	60
14a Beatty Street	3	F 1	52	64	60
14a Beatty Street	3	GF	51	64	60
15 Cove Avenue	3	F 1	57	70	60
15 Cove Avenue	3	F 2	57	70	60
15 Cove Avenue	3	GF	57	70	60
15 East Esplanade	3	F 1	59	73	60
15 East Esplanade	3	F 2	59	71	60
15 East Esplanade	3	F 3	59	71	60
15 East Esplanade	3	GF	59	73	60
16 Beatty Street	3	F 1	51	63	60
16 Beatty Street	3	GF	51	63	60
16 Cove Avenue	3	F 1	58	70	60
16 Cove Avenue	3	GF	57	70	60
17 East Esplanade	3	F 1	60	72	60
17 East Esplanade	3	GF	59	72	60
18 Cove Avenue	3	F 1	58	70	60

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Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
18 Cove Avenue	3	GF	58	70	60
18-19 East Esplanade	3	F 1	61	71	60
18-19 East Esplanade	3	GF	60	71	60
19 Cove Avenue	3	F 1	57	69	60
19 Cove Avenue	3	F 2	57	69	60
19 Cove Avenue	3	GF	57	69	60
2 Beatty Street	3	F 1	52	64	60
2 Beatty Street	3	GF	52	64	60
2 East Esplanade	3	F 1	59	71	60
2 East Esplanade	3	F 2	59	71	60
2 East Esplanade	3	F 3	59	71	60
2 East Esplanade	3	GF	59	71	60
2 Osborn Road	3	F 1	58	70	60
2 Osborn Road	3	GF	56	66	60
2 Oyama Avenue	3	F 1	56	69	60
2 Oyama Avenue	3	GF	56	69	60
20 Cove Avenue	3	F 1	59	72	60
20 Cove Avenue	3	GF	54	66	60
22 Beatty Street	3	F 1	50	64	60
22 Beatty Street	3	GF	50	64	60
22 Cove Avenue	3	F 1	58	70	60
22 Cove Avenue	3	GF	58	70	60
22a Beatty Street	3	F 1	50	64	60
22a Beatty Street	3	GF	50	64	60
24 Beatty Street	3	F 1	49	64	60
24 Beatty Street	3	GF	47	64	60
24 Cove Avenue	3	F 1	58	70	60
24 Cove Avenue	3	GF	57	70	60
26 Beatty Street	3	F 1	46	61	60
26 Beatty Street	3	GF	48	62	60
26a Beatty Street	3	F 1	47	64	60
26a Beatty Street	3	GF	47	64	60
28 Beatty Street	3	F 1	48	66	60
28 Beatty Street	3	GF	48	66	60
2a Beatty Street	3	F 1	51	63	60
2a Beatty Street	3	GF	51	63	60
3 Cove Avenue	3	F 1	51	65	60
3 Cove Avenue	3	F 2	54	65	60
3 Cove Avenue	3	GF	47	62	60
3 East Esplanade	3	F 1	59	71	60
3 East Esplanade	3	F 2	59	71	60
3 East Esplanade	3	F 3	59	71	60
3 East Esplanade	3	GF	59	71	60
3 Oyama Avenue	3	F 1	57	70	60
3 Oyama Avenue	3	GF	57	70	60
3 Wood Street	3	F 1	51	65	60
3 Wood Street	3	GF	50	64	60
30 Beatty Street	3	F 1	44	63	60
30 Beatty Street	3	GF	44	63	60
34 Beatty Street	3	F 1	45	63	60
34 Beatty Street	3	GF	44	63	60
36 Beatty Street	3	F 1	44	63	60
36 Beatty Street	3	GF	44	63	60
38 Beatty Street	3	F 1	42	63	60
38 Beatty Street	3	GF	42	63	60
4 East Esplanade	3	F 1	59	71	60
4 East Esplanade	3	F 2	59	71	60
4 East Esplanade	3	F 3	59	71	60
4 East Esplanade	3	GF	59	71	60
4 Oyama Avenue	3	F 1	56	69	60
4 Oyama Avenue	3	GF	56	68	60

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Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
4 Wood Street	3	F 1	56	69	60
4 Wood Street	3	F 2	59	72	60
4 Wood Street	3	GF	54	66	60
40 Beatty Street	3	F 1	41	63	60
40 Beatty Street	3	GF	40	63	60
42 Beatty Street	3	F 1	40	63	60
42 Beatty Street	3	GF	40	62	60
44 Beatty Street	3	F 1	40	62	60
44 Beatty Street	3	GF	40	62	60
46 Beatty Street	3	F 1	40	62	60
46 Beatty Street	3	GF	40	62	60
5 Cove Avenue	3	F 1	47	59	60
5 Cove Avenue	3	F 2	54	65	60
5 Cove Avenue	3	GF	43	55	60
5 East Esplanade	3	F 1	59	71	60
5 East Esplanade	3	F 2	59	71	60
5 East Esplanade	3	F 3	59	71	60
5 East Esplanade	3	GF	59	71	60
5 Osborne Road	3	F 1	58	70	60
5 Osborne Road	3	F 2	58	70	60
5 Osborne Road	3	F 3	58	70	60
5 Osborne Road	3	GF	58	70	60
5 Oyama Avenue	3	F 1	57	69	60
5 Oyama Avenue	3	GF	57	69	60
5 Wood Street	3	F 1	56	68	60
5 Wood Street	3	GF	55	68	60
6 Beatty Street	3	F 1	51	63	60
6 Beatty Street	3	GF	52	66	60
6 Oyama Avenue	3	F 1	56	68	60
6 Oyama Avenue	3	GF	56	68	60
6-18 Cove Avenue	3	F 1	59	71	60
6-18 Cove Avenue	3	F 2	59	71	60
6-18 Cove Avenue	3	F 3	59	71	60
6-18 Cove Avenue	3	F 4	59	71	60
6-18 Cove Avenue	3	GF	59	71	60
6-7 East Esplanade	3	F 1	59	71	60
6-7 East Esplanade	3	F 2	59	71	60
6-7 East Esplanade	3	F 3	59	71	60
6-7 East Esplanade	3	GF	59	71	60
7 Cove Avenue	3	F 1	55	68	60
7 Cove Avenue	3	F 2	55	67	60
7 Cove Avenue	3	GF	52	65	60
7 Osborne Road	3	F 1	56	70	60
7 Osborne Road	3	F 2	57	70	60
7 Osborne Road	3	F 3	58	70	60
7 Osborne Road	3	GF	55	70	60
7 Oyama Avenue	3	F 1	57	69	60
7 Oyama Avenue	3	GF	57	69	60
8 Beatty Street	3	F 1	51	63	60
8 Beatty Street	3	GF	46	58	60
8 East Esplanade	3	F 1	59	71	60
8 East Esplanade	3	F 2	59	71	60
8 East Esplanade	3	F 3	59	71	60
8 East Esplanade	3	GF	59	71	60
8 Oyama Avenue	3	F 1	56	68	60
8 Oyama Avenue	3	GF	56	68	60
8a Beatty Street	3	F 1	51	64	60
8a Beatty Street	3	GF	51	64	60
8b Beatty Street	3	F 1	52	64	60
8b Beatty Street	3	GF	52	64	60
9 Cove Avenue	3	F 1	49	61	60

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Receiver	NCA	Floor	Construction Noise Level dB(A), LAMax		LAmax Criteria, dB(A)
			Scenario 2	Scenario 4	
LAmax > 60 dB(A)					
9 Cove Avenue	3	F 2	55	67	60
9 Cove Avenue	3	GF	45	57	60
9 East Esplanade	3	F 1	59	71	60
9 East Esplanade	3	F 2	59	71	60
9 East Esplanade	3	F 3	59	71	60
9 East Esplanade	3	GF	59	71	60
9 Oyama Avenue	3	F 1	57	69	60
9 Oyama Avenue	3	GF	57	69	60
9 Stuart Street	3	F 1	59	72	60
9 Stuart Street	3	F 2	60	73	60
9 Stuart Street	3	GF	58	72	60

Table 30: Predicted construction noise levels (LAeq) compared to CNVG NMLs for non-residential sensitive uses criteria – NCAs 1-3

Location	Criteria	Construction Noise Level, Leq dB(A)				
		Scenario 1 (Day)	Scenario 2 (Day)	Scenario 2 (Night)	Scenario 4 (Night)	Scenario 6 (Day)
Exceeds criteria						
St Mary's Catholic College	**55**	53	53	27	54	40
Manly Village Public School	**55**	55	53	39	55	46
Manly Waters Private Hospital	**55**	57	57	45	57	49
Bear Cottage Children's Hospice	**55**	52	52	40	52	44
Manly Community Pre-school	**50**	49	42	30	43	34
Manly Oval	**65**	45	48	42	45	45
Dobroyd Head/Forty Baskets Beach	**60**	52	51	40	52	44
Manly Cove Beach/West Esplanade Park	**60**	85	81	75	80	75
Tower Hill Park	**60**	69	67	50	68	58
Gilbert Park	**60**	56	57	44	57	50
East Manly Cove Beach	**60**	62	61	51	61	54
Manly Wharf	**70**	68	67	55	67	59
Manly Town Centre	**70**	68	67	54	67	58
Manly Yacht Club	**70**	59	58	46	58	51
Boat House Kiosk	**70**	83	93	79	91	94
Manly Art Gallery & Museum	**70**	82	86	84	84	83

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APPENDIX B

Predicted Construction Noise Levels – Noise Contour Maps

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Figure 11: Predicted Noise Contour Map – Scenario 1 – Site Establishment, NCA1 Ground Level – Standard Hours



Figure 12: Predicted Noise Contour Map – Scenario 1 – Site Establishment, NCA2 Ground Level – Standard Hours



Figure 13: Predicted Noise Contour Map – Scenario 1 – Site Establishment, NCA3 Ground Level – Standard Hours

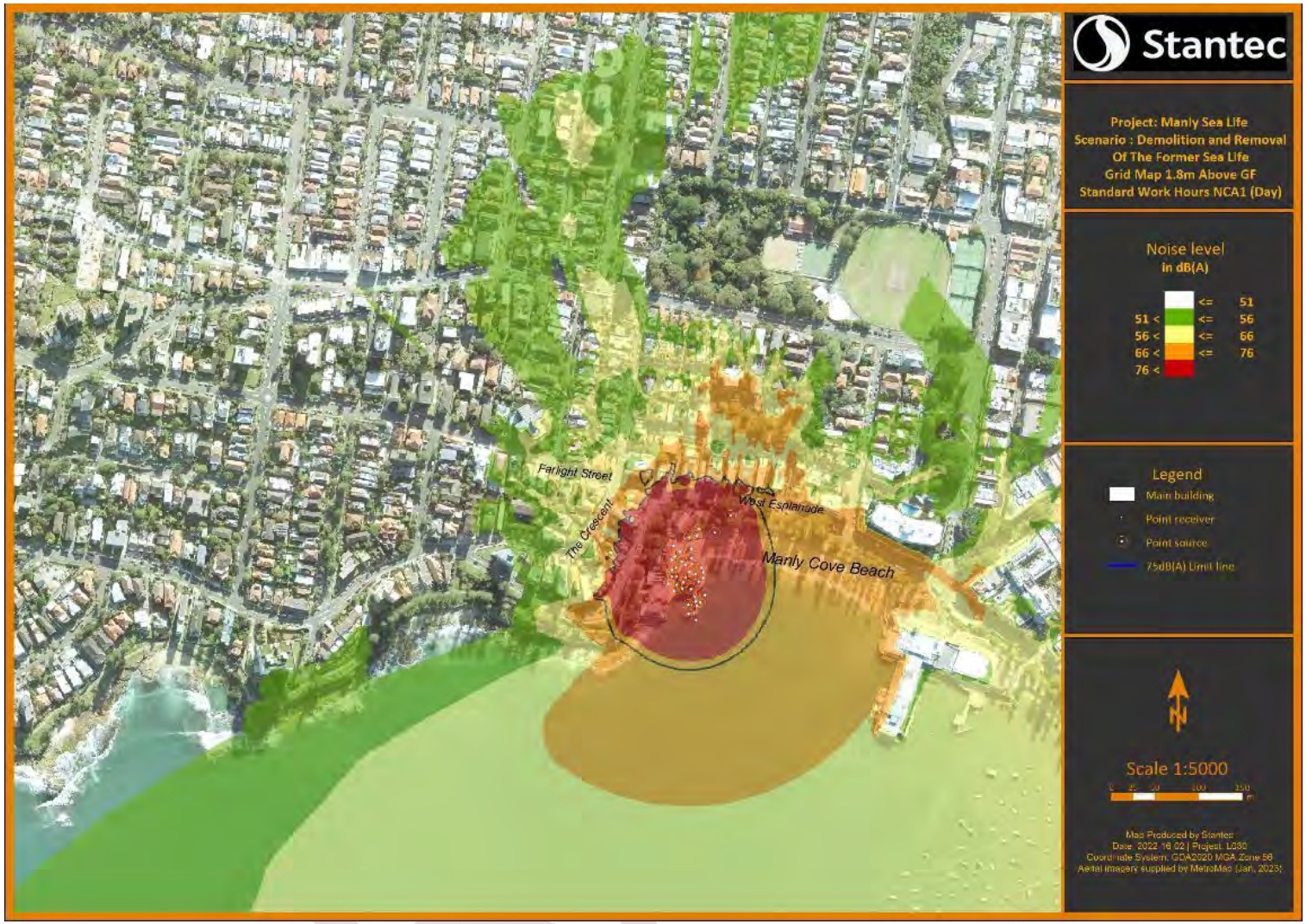


Figure 14: Predicted Noise Contour Map – Scenario 2 – Demolition and Removal of former Sea Life, NCA1 Ground Level – Standard Hours



Figure 15: Predicted Noise Contour Map – Scenario 2 – Demolition and Removal of former Sea Life, NCA2 Ground Level – Standard Hours



Figure 16: Predicted Noise Contour Map – Scenario 2 – Demolition and Removal of former Sea Life, NCA3 Ground Level – Standard Hours

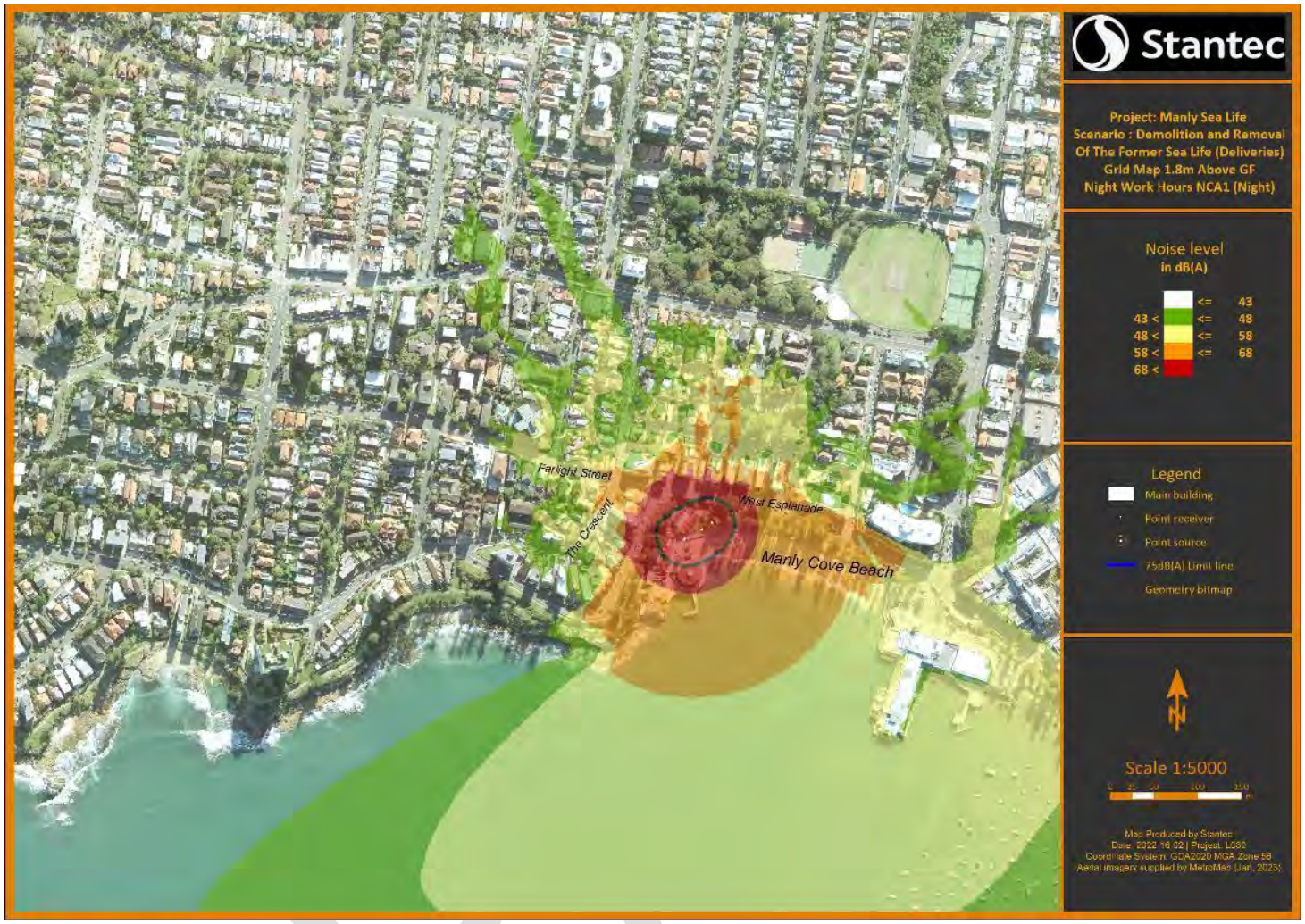


Figure 17: Predicted Noise Contour Map – Scenario 2 – Demolition and Removal of former Sea Life, NCA1 Ground Level – Non-Standard Hours



Figure 18: Predicted Noise Contour Map – Scenario 2 – Demolition and Removal of former Sea Life, NCA2 Ground Level – Non-Standard Hours

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Figure 19: Predicted Noise Contour Map – Scenario 2 – Demolition and Removal of former Sea Life, NCA3 Ground Level – Non-Standard Hours

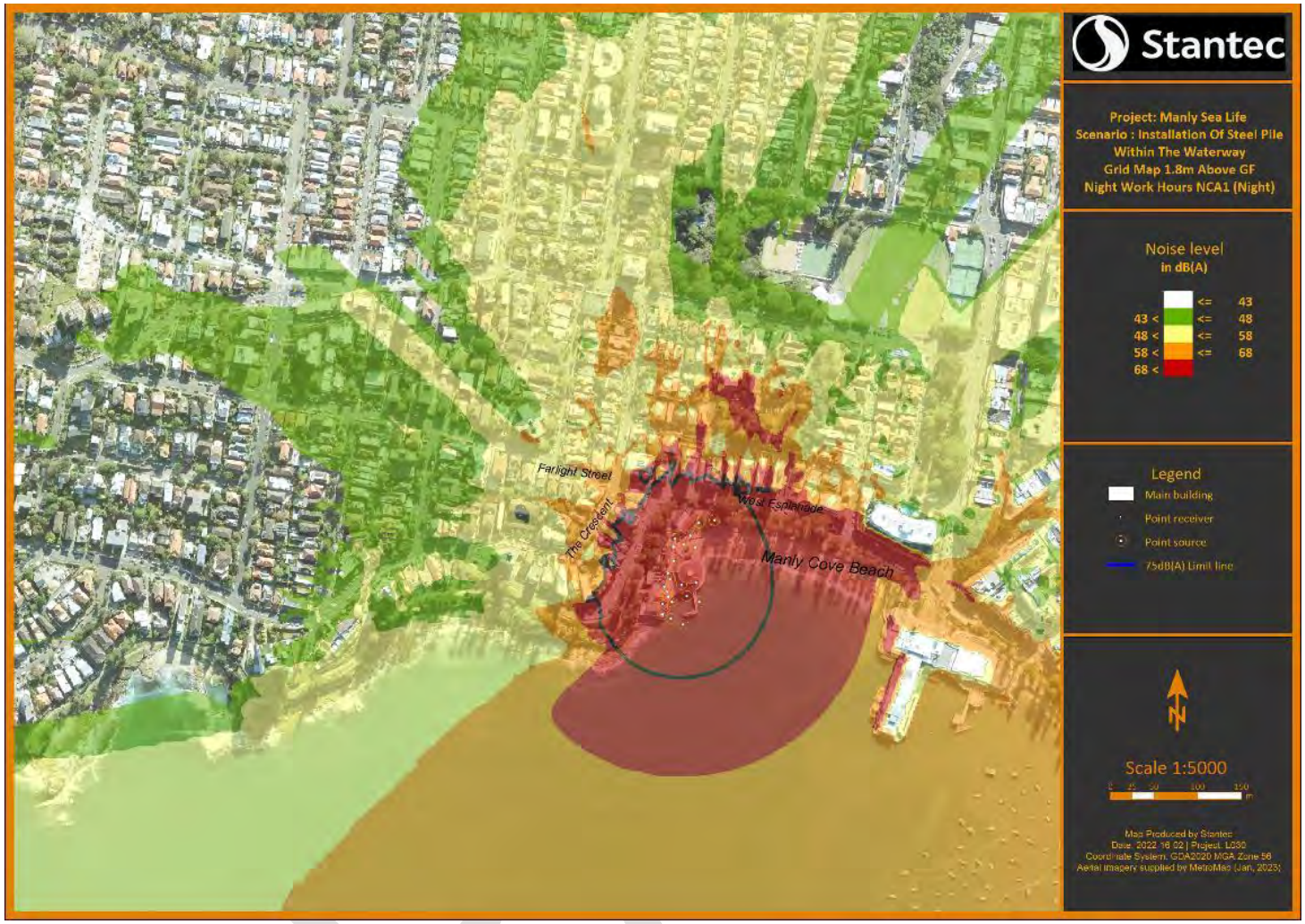


Figure 20: Predicted Noise Contour Map – Scenario 4 – Installation of Steel Piles within Waterway, NCA1 Ground Level – Non-Standard Hours



Figure 21: Predicted Noise Contour Map – Scenario 4 – Installation of Steel Piles within Waterway, NCA2 Ground Level – Non-Standard Hours

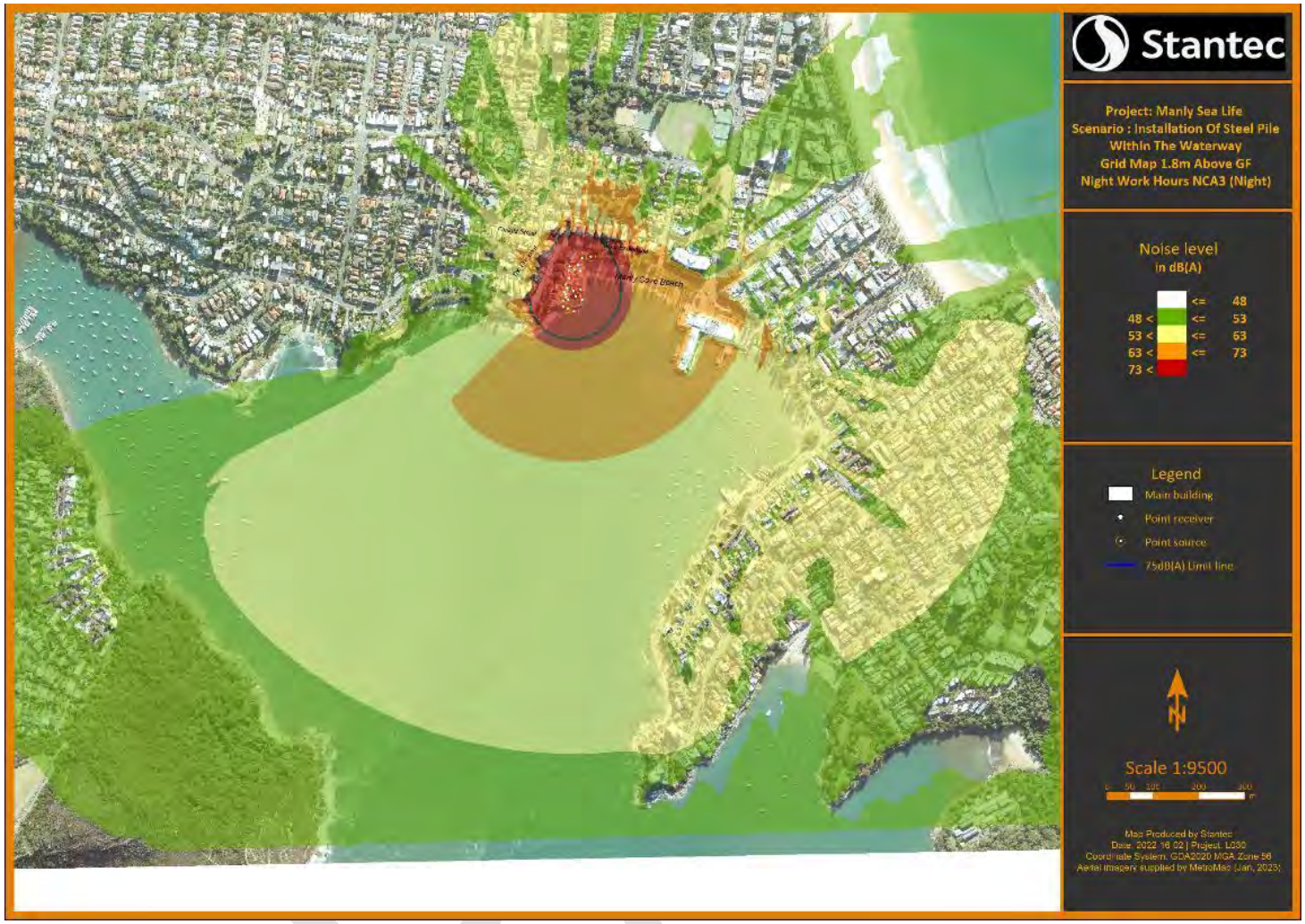


Figure 22: Predicted Noise Contour Map – Scenario 4 – Installation of Steel Piles within Waterway, NCA3 Ground Level – Non-Standard Hours

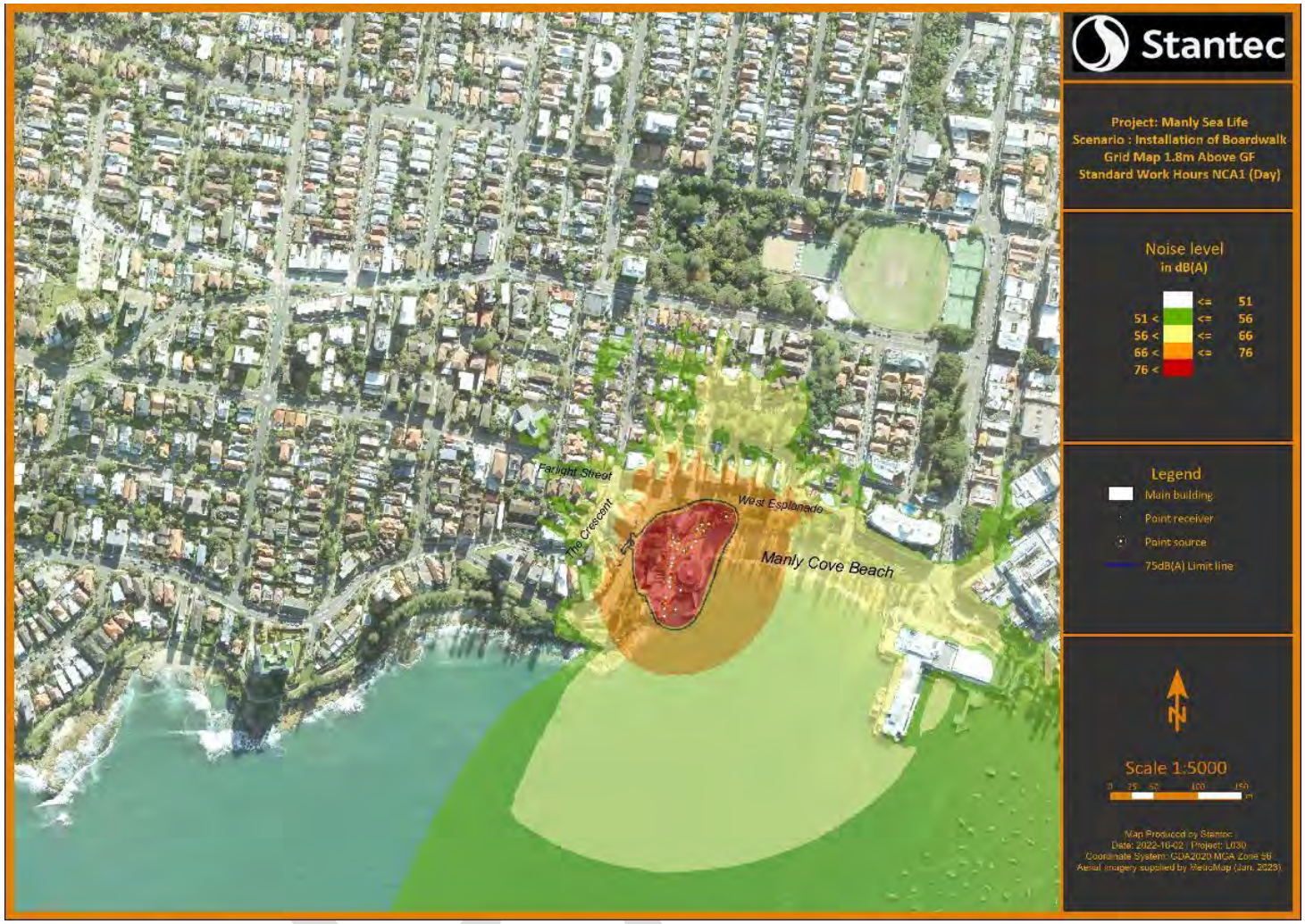


Figure 23: Predicted Noise Contour Map – Scenario 6 – Installation of Boardwalk, NCA1 Ground Level – Standard Hours



Figure 24: Predicted Noise Contour Map – Scenario 6 – Installation of Boardwalk, NCA2 Ground Level – Standard Hours



Figure 25: Predicted Noise Contour Map – Scenario 6 – Installation of Boardwalk, NCA3 Ground Level – Standard Hours

Appendix G - Landscape Character and Visual Impact Assessment

Landscape Character and Visual Impact Assessment

Manly Cove West (Manly Sea Life)
Stage 1

15 April 2024

Prepared for:

Transport for NSW

Prepared by:

Stantec Australia

Project No: 304501345-R002

Revision	Description	Author		Quality Check	
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B	Final	Monique Dryden	15/04/24	Nadine Page	15/04/24

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Executive Summary

Transport for NSW (TfNSW) has engaged Stantec to undertake a Review of Environmental Factors (REF) for demolition of Manly Sea Life building to promenade level.

A Landscape Character and Visual Impact Assessment (LCVIA) report dated 10 March 2023 was prepared assessing the impacts of a proposed concept design to demolish the former Manly Sea Life building to seabed level, remove the existing timber jetty and to construct a new boardwalk in the front of Manly Pavilion. Following preparation of the LCVIA the project was put on hold while TfNSW re-evaluated the project. Subsequent to the evaluation TfNSW reduced the scope of the project and in December 2023, it was decided that the project would be divided into two stages as follows:

- Stage 1 – demolition of the former Manly Sea Life Building to promenade level and temporary remedial work below the promenade level (subject of this proposal)
- Stage 2 – revitalisation work including structural works below the promenade level, removal of the existing jetty and urban design for the space (not included in this assessment).

This LCVIA provides an assessment of impact of Stage 1 of the project on the local landscape and visual quality in accordance with *Guideline for Landscape Character and Visual Impact Assessment - Environmental Impact Assessment Practice Note EIA-NO4* (TfNSW, 2023a).

The proposal area is a highly scenic and popular area located at the western foreshore of Manly Cove, in the northern reaches of Sydney Harbour. The site is accessed from the West Esplanade and a beachfront promenade between Manly Ferry Wharf and Manly Pavilion, a popular tourist destination. The site is located in a high quality and significant landscape setting, as identified in the principles, objectives and provisions numerous applicable planning strategies, documents and legislation.

The assessment identified four landscape character zones (LCZ): Sydney Harbour/Manly Cove zone; Recreation, Foreshore Reserves and Conservation zone; Residential and Urban Slopes zone; and Level Urban Centre zone. The potential impact of the proposal on each existing LCZ was assessed considering a combination of the sensitivity of its landscape and magnitude of the proposed works/structures. The assessment concluded that the surrounding LCZs would potentially experience the highest impact from the proposal include the Sydney Harbour/Manly Cove and Foreshore Reserves and some residential slopes within close proximity. Lower impacts are likely to more distant character zones, having regard to the low scale of the proposal.

The overall impact to landscape character is considered to be moderate, despite the visual prominence and high importance of the site due to the reduction in prominent built form (i.e. the Manly Sea Life building) in the proposal area, and the revealing of low scale attractive elements to the foreshore (existing heritage buildings, existing promenade and a new circular promenade area).

The assessment considered the visual impacts of the proposal from five viewpoints identified to be representative of sensitive receivers. One photomontage was prepared to assess the comparative impacts from the existing situation. The assessment concluded that the visual impacts generated by the proposal would be variable depending on the location of the viewer and distance from the site. When viewed from close proximity, the proposal forms a significant change and therefore high impact.

However the impact is a positive one, as it removes an unsympathetic built element to enable the visibility of the existing lower scale and more complimentary buildings. This, together with the existing promenade and a new circular promenade area creating a space for public use would enhance the landscape setting and character.

This report recommends measures relating to materials for the proposal including during temporary construction works, which if implemented, would contribute toward a high quality new built element in the local landscape that would be consistent with the values of its visual and landscape environment.

Overall, the proposal was assessed to have a high visual impact that would improve and enhance the visual character from various viewpoints, and the proposal is worthy of support.

Glossary

BC SEPP	*State Environmental Planning Policy (Biodiversity and Conservation) 2021*
BZ	Background zone
CBD	central business district
Compound areas	The temporary facilities required for construction, including for example an office and amenities compound, construction compound, materials handling and load out area. These compound areas would likely be in the vicinity of the Manly Art Gallery and Museum and on a reclaimed section of Manly Cove Beach (refer Figure 2-2).
FZ	Foreground zone
Landscape character	The combined quality of built, natural and cultural aspects which make up an area and provide its unique sense of place
Landscape character magnitude	The measurement of the scale, form and character of a development proposal when compared to the existing condition. In the case of visual assessment this also relates to how far the proposal is from the viewer. Combined with sensitivity, magnitude provides a measurement of impact.
Landscape character sensitivity	The sensitivity of a landscape character zone or view and its capacity to absorb change of the nature of the proposal. In the case of visual impact this also relates to the type of viewer and number of viewers. Combined with magnitude, sensitivity provides a measurement of impact.
LCVIA	Landscape Character and Visual Impact Assessment
LCZ	Landscape Character Zones
LGA	Local Government Area
Manly DCP	Manly Development Control Plan 2013
Manly LEP	*Manly Local Environmental Plan 2013*
MZ	Middle ground zone
the proposal	Demolition of the former Manly Sea Life building to promenade level
proposal area	The area around the proposal footprint required for construction including the compound area and material handling and load out area (refer Figure 2-2).
Proposal footprint	The area directly impacted by proposed work, including the removal of structures and installation of new structures (refer Figure 2-2).
REF	Review of Environmental Factors
Study area	The study area of this assessment extended to a radius of approximately 1 kilometre from the proposal, as shown on Figure 2-3.
TfNSW	Transport for NSW
Visual impact	refers to impact on the views from residences, workplaces and public places.
Visual magnitude	Refers to the “form – scale, size, character – of the project and its proximity to the viewer”.
Visual sensitivity	The sensitivity of a landscape character zone or view and its capacity to absorb change of the nature of the proposal. In the case of visual impact this also relates to the type of viewer and number of viewers. Combined with magnitude, sensitivity provides a measurement of impact.

1.0 INTRODUCTION

Transport for NSW (TfNSW) has engaged Stantec to undertake a Review of Environmental Factors (REF) for demolition of Manly Sea Life building to promenade level.

A Landscape Character and Visual Impact Assessment (LCVIA) report dated 10 March 2023 was prepared assessing the impacts of a proposed concept design to demolish the former Manly Sea Life building to seabed level, remove the existing timber jetty and to construct a new boardwalk in the front of Manly Pavilion. The LCVIA report was prepared in accordance with the following TfNSW guidelines:

- *Beyond the Pavement: urban design approach and procedures for road and maritime infrastructure planning, design, and construction* (TfNSW, 2023b)
- *Guideline for Landscape Character and Visual Impact Assessment – Environmental Impact Assessment Practice Note EIA-NO4* (TfNSW, 2023a).

Following preparation of the LCVIA the project was put on hold while TfNSW re-evaluated the project. Subsequent to the evaluation TfNSW reduced the scope of the project and in December 2023, it was decided that the proposed work would be divided into two stages as follows:

- Stage 1 – demolition of the former Manly Sea Life Building to promenade level and temporary remedial work below the promenade level (subject of this proposal)
- Stage 2 – revitalisation work including structural works below the promenade level, removal of the existing jetty and urban design of the space (not included in this assessment).

1.1 PURPOSE AND SCOPE OF THIS REPORT

The LCVIA has been prepared for TfNSW as part of the REF for Stage 1 of the Manly Cove West redevelopment. The purposes of this report are to:

- Inform the design of the works so the proposal can avoid negative impacts on local landscape character and views from surrounding areas and properties
- Undertake a view analysis to and from the site from nominated adjoining properties, key vantage points and streetscape locations, including a photomontage or perspectives of the proposed development
- Provide a visual impact assessment to identify the visual changes and impacts on the site and the surrounding area when viewed from the nominated key vantage points
- Recommend management and mitigation measures to be implemented if the proposal was approved.

1.2 ASSESSMENT GUIDELINES

The LCVIA has been prepared in accordance with the guidelines outlined in the *Environmental Impact Assessment Practice Note EIA-NO4 – Guideline for landscape character and visual assessment* (TfNSW, 2023b). The guideline establishes the assessment tasks for a landscape character and visual assessment which are:

- Analyse existing landscape character and identify landscape character zones; determine the magnitude of landscape character impacts; and assess landscape character impact
- Identify the extent of the visibility of the proposal
- Identify existing viewpoints an determine the magnitude of change from each viewpoint
- Assess the visual impact
- Refine concept design to avoid and minimise the impact
- Develop a strategy to manage landscape character and visual impact.

Section 5.2 of this assessment report addresses the assessment methodology in more detail.

2.0 THE PROPOSAL

2.1 OBJECTIVES

The objectives of the LCVIA for Stage 1 of the Manly Cove West redevelopment is to facilitate an outcome that:

- Ensures the proposal is compatible with the existing built and natural environments
- Contributes to the landscape character of the area
- Protects key elements and features of the local landscape character
- Safeguards key and significant viewpoints to and from the site
- Enhances the overall visual and landscape quality of the public domain for the community and users of the site
- Upgrades facilities to meet current standards and improve visual and landscape amenity.

2.2 THE PROPOSAL

TfNSW proposes to demolish the former Manly Sea Life building to promenade level and create a space for public use in front of Manly Pavilion (the proposal). The key features of the Stage 1 work are as follows and illustrated in Figure 2-1.

- Temporary remedial work below the promenade level to facilitate demolition
- Demolition of the former Manly Sea Life building down to promenade level
- Retention of the circular footprint and existing structural elements below the promenade level including the concrete foundations and shark tank
- Temporary infill of existing stairs and other penetrations on the promenade slab
- Make good of the promenade slab of interim use prior to Stage 2
- Temporary reclamation of a portion of Manly Cove Beach with gabion basket or rock/sand bag retaining wall to allow for a construction vehicle turning circle and plant staging area.

The proposal footprint, proposal area and compound areas have been defined as follows (Figure 2-2):

- Proposal footprint – the area directly impacted by proposed work, including the removal of structures and installation of new structures.
- Proposal area – the general area around the proposal footprint which includes areas required for construction such as the compound area and beach reclamation area.
- Compound areas – the temporary facilities required for construction, including for example an office and amenities compound, construction compound, and materials handling area. These compound areas would likely be in the vicinity of the Manly Art Gallery and Museum and on a reclaimed section of Manly Cove Beach.

2.3 STUDY AREA

The study area for this assessment was determined based on the height of the proposal, the topography and the viewshed of the proposal generated via GIS mapping. Based on these factors, the study area extended to a radius of approximately 1 kilometre from the proposal, as shown on Figure 2-3.



Figure 2-1: Key features of the proposal

Manly Cove West Stage 1 REF
Manly, NSW

Project Code: 3045013045-GS-003
Drawn By: TB, Checked By: SM
Figure: 3-1 | Rev: 02
Date: 2024-02-28

Legend

- Existing infrastructure to be removed (demolition area)
- Beach reclamation area
- Cadastre

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery (MetroMap, Nov 2023)
2. Cadastre (NSW SS, 2023)

Subject to detailed design

0 10 20 30 Metres

Scale at A3: 1:600



Stantec

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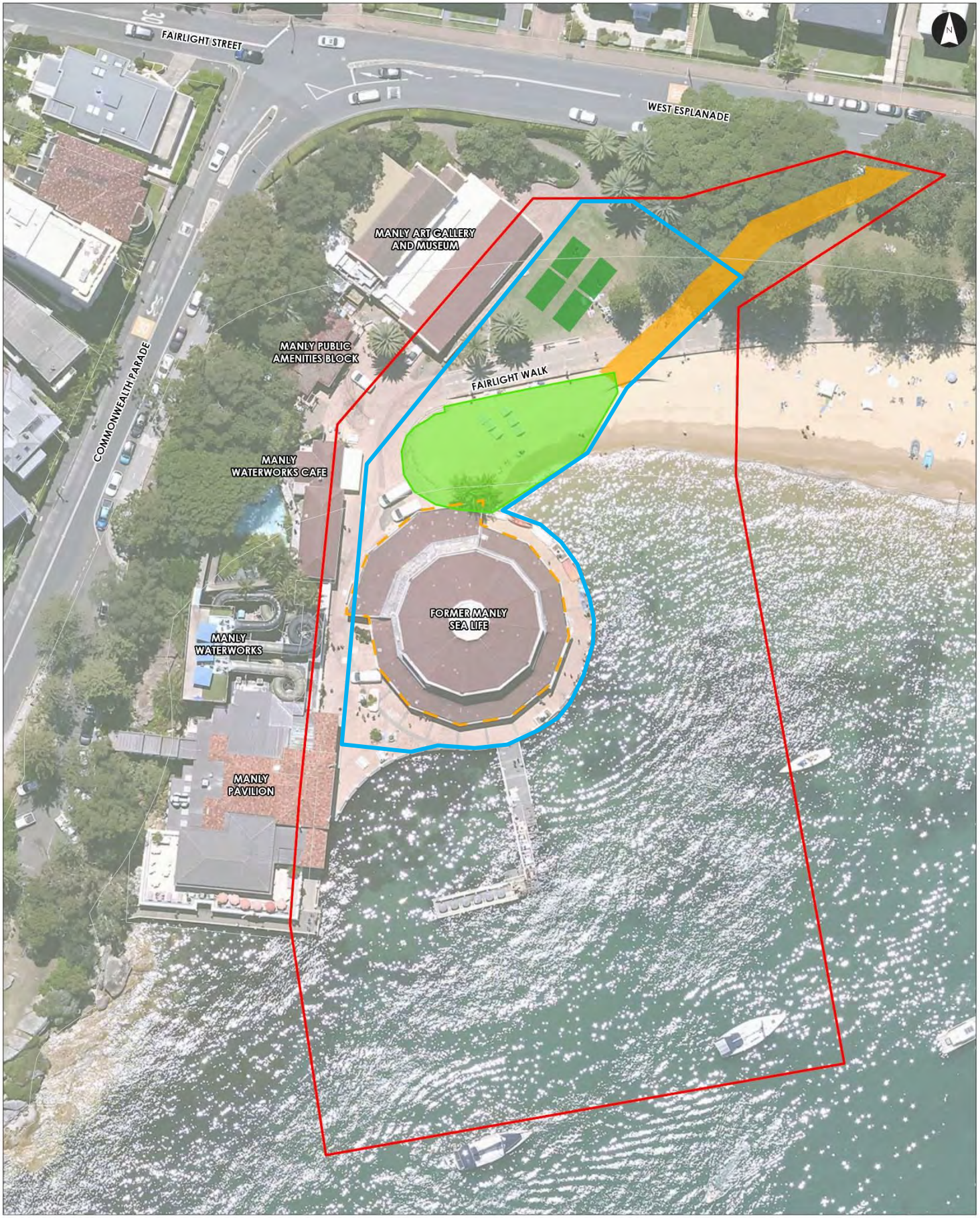


Figure 2-2: Proposal Areas

Manly Cove West Stage 1 REF
Manly, NSW

Project Code: 304501345-GS-004
Drawn By: TB. Checked By: SM
Figure: 3-2 | Rev: 02
Date: 2024-02-28

Legend

- Proposal area
- Existing infrastructure to be removed (demolition area)
- Cadastre
- Hoarding plan
- Construction haul road
- Compound area
- Beach reclamation area

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery (MetroMap, Nov 2023)
2. Cadastre (NSW SS, 2023)

Subject to detailed design

0 10 20 30 Metres

Scale at A3: 1:600



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Figure 2-3: Study Area

Manly Cove West Stage 1 REF
Manly, NSW

Project Code: 304501345-GS-005
Drawn By: MM, Checked By: TB
Figure: 2-3 | Rev: 01
Date: 2024-02-26

Stantec

Legend

- Proposal Area
- Manly Sea Life
- Major Road
- 1km Buffer

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery (MetroMap, Nov 2023)
2. Major Road (NSW SS)

0 100 200 300 400 Metres

Scale at A3: 1:10,000



This document has been prepared based on information provided by others as cited in the data sources. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

3.0 LOCATION AND SITE CONTEXT

The study area is a highly scenic and popular area located at the western foreshore of Manly Cove, in the northern reaches of Sydney Harbour. The site is situated approximately 11.3 kilometres by water and 14.3 kilometres by road from the Sydney central business district (CBD).

The site is accessed from the West Esplanade, Commonwealth Parade, and a beachfront promenade between Manly Ferry Wharf and Manly Pavilion. The site is dominated by the disused Manly Sea Life building, which blocks sightlines between the heritage-listed Manly Pavilion and the Ferry Wharf. The Manly Art Gallery and Museum, amenities building and café are located adjacent to the Manly Sea Life building.

To the immediate north and east of the site is Manly Cove Beach, a popular swimming destination with a netted bathing area. The beach is a tourist and local hub, and spans the 600 metre wide Cove. A public reserve and popular pathway/promenade lined with prominent Norfolk Island Pine trees adjoins the beach and extends long the foreshore, which links the Manly Yacht Club and 16 Foot Skiff Sailing Club located on the eastern side of the Cove.

The Manly Wharf complex is located to the east mid-way along Manly Cove Beach, and is the terminal for ferry transport to and from Circular Quay. The wharf complex contains restaurants and cafés. Opposite and to the north and east of the wharf complex is a commercial and retail precinct, straddling The Corso, a pedestrian mall linking to Manly Ocean Beach (approximately 400 metres to the north).

Adjacent to the wharf complex, commercial areas and the remaining foreshore areas comprise residential areas, typically high-density residential flat buildings, with the exception of a few heritage-listed workers' cottages and terraces.

The location of the site in the context of the surrounding locality is shown in Figure 3-1.



Figure 3-1 Panoramic view of Manly Cove (Source: Nearmaps)

4.0 LAND USE PLANNING CONTEXT

The study area is located within the Northern Beaches Council Local Government Area (LGA). This section provides a brief overview of the key state, regional and local land use planning documents that have relevance to the assessment of the landscape character and visual assessment.

4.1 STATE AND REGIONAL POLICY

4.1.1 State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 6 of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (BC SEPP) applies as the proposal area is located within the Sydney Harbour Catchment. The proposal is considered to meet the relevant provision of Clause 6.9 'Recreation and public access' as it would maintain and improve public access to and from the harbour. A portion of the proposal area and immediate surrounds are mapped as Zone 2 Environmental Protection under the BC SEPP as shown on Figure 4-1. The objectives of this zone are:

- To protect the natural and cultural values of waters in the zone.
- To prevent damage to, or the possibility of long-term adverse impact on, the natural and cultural values of waters in the zone and adjoining foreshores.
- To enhance and rehabilitate the natural and cultural values of waters in the zone and adjoining foreshores.
- To provide for the long-term management of the natural and cultural values of waters in the zone and adjoining foreshores.

Additionally, the study area is located within the Foreshores and Waterways Area, Significant Seagrasses Area, and Rocky Foreshore Area under the BC SEPP.

4.1.2 Heritage

The Manly Pavilion is located immediately adjacent to the site and is a building of state heritage significance listed on the State Heritage Register (item no. 01433) under the *Heritage Act 1977*. The proposed works would potentially impact on this item and therefore the provisions of *Heritage Act 1977* will be assessed in the REF, including the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item. The nearby Manly Wharf is also listed under the State Heritage Register (item no. 01434) as having state heritage significance. Refer to Figure 4-2.

4.1.3 North District Plan

The North District Plan (Greater Sydney Commission, 2018) *is:*

"a 20-year plan to manage growth in the context of economic, social and environmental matters to achieve the 40-year vision for Greater Sydney. It is a guide for implementing the Greater Sydney Region Plan: A Metropolis of Three Cities."

The North District Plan includes the Northern Beaches Council LGA. The plan sets out 'Planning Priorities' for the District, and of relevance to the proposal is Planning Principle 17 'Protecting and

enhancing scenic and cultural landscapes' which identifies the importance of views to and from Sydney Harbour. The following actions are provided in the Plan:

- *67. Identify and protect scenic and cultural landscapes;*
- *68. Enhance and protect views of scenic and cultural landscapes from the public realm.*

The proposal would support these priorities by providing a design that enhances views to the surrounding harbour.

4.2 LOCAL POLICIES AND PLANS

4.2.1 Manly Local Environmental Plan 2013

The site is located within the Northern Beaches LGA which was created by the merger of Manly and Pittwater Councils in 2016. Prior to the merger, the site was part of Manly LGA, thus the *Manly Local Environmental Plan 2013* (Manly LEP) applies.

Land use zoning: A small portion of land-side study area is zoned as RE1 – Public Recreation, with adjacent areas predominantly zoned R1 General Residential and B2 Local Centre under the Manly LEP as shown on Figure 4-1. Refer section 4.1.1 for zoning of the waterside portion of the proposal area. The objectives of the RE1 zone 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.

The proposal is considered to be consistent with the objectives of the zone and with the adjoining zones that are relevant to landscape character or visual amenity.

Heritage conservation (clause 5.10): The proposal area is located within an area of high heritage significance. The harbour foreshore itself is listed, in addition to other landscape and built items located in the vicinity of the proposal. Refer to Figure 4-2 for key heritage items within the vicinity of the proposal which include:

- Item I1 – Harbour foreshore within the former Manly LGA
- Item I2 – All stone kerbs within the former Manly LGA. One such kerb runs along Commonwealth Parade
- Item I249 – Manly Cove Pavilion (State heritage significance)
- Item I250 – Manly Cove Amenities Block
- Item I251 – Parklands along Fairlight Walk and Cabbage Tree Beach.
- Item I115 – House, 10 The Crescent Manly
- Item I98 – Residential Flat Building, "Hilder Lea" 7 Commonwealth Parade Manly
- Item I248 – Governor Phillip Monument
- Items I145/I146 – Manly Ferry Wharves
- Item C2 – Manly Town Centre Conservation Area – Many additional heritage items therein
- Item I149 – Residential Flat Building, "Abbyleix" 2 Victoria Parade Manly
- Item I150 – Pair of terraces, 41-42 East Esplanade Manly
- Item I143 – Parklands along East Esplanade
- Item I144 – Monument/Memorial, broken fountain
- Item I142 – Manly Rowing, Sailing, Yacht, and Launch Club group of buildings.

Foreshore Scenic Protection Area (Clause 6.9) and Limited development on foreshore area (Clause 6.10): The subject area and surrounds are mapped within and adjacent to the Foreshore Scenic Protection Area and Foreshore Building Line (refer to Figure 4-3). The provisions of Clause 6.9 and 6.10 of the LEP applies which aim to:

- protect visual aesthetic amenity and views to and from Sydney Harbour, the Pacific Ocean and the foreshore in Manly
- ensure that development in the foreshore area will not impact on natural foreshore processes or affect the significance and amenity of the area.

4.2.2 Towards 2040

Towards 2040 (Northern Beaches Council, 2020) is the Local Strategic Planning Statement for the Northern Beaches Council LGA. Of the 30 priorities outlined in this Statement, the following priorities have been identified as being relevant to this proposal with respect to landscape character and visual amenity:

- Priority 3 Protected scenic and cultural landscapes: This priority reinforces the importance of the landscapes of the Northern Beaches, including Manly Cove. Of the principles relating to this priority, the following two are particularly relevant to the proposal:
  - Enhance and protect views of scenic and cultural landscapes from public areas
  - Make new development visually subservient to scenic and cultural landscapes.
- Priority 6 High quality open space for recreation: The following three principles within this priority are supported by the proposal:
  - Use open space to connect people to nature
  - Ensure developments result in no net loss of public open space
  - Design vibrant, accessible, and interactive open spaces.
- Priority 26 Manly as Sydney's premier seaside destination: The following three principles under this priority are relevant to the proposal:
  - Maximise sunshine on the beach, harbour and foreshore areas, The Corso and East and West Esplanades
  - Continue Manly's function as a tourism precinct and enhance nature-based tourism opportunities
  - Retain a strong pedestrian-focused core.

4.2.3 Development Control Plan 2013

The *Manly Development Control Plan 2013* (Manly DCP) contains heritage controls which are relevant to the proposal and are to be addressed in the specialist heritage impact assessments accompanying the REF. The Manly DCP references the Development Control Policy for Manly Cove 1996 document for consideration.

The Policy includes the following aims and objectives, supported by the proposal:

- To preserve and enhance the amenity of Manly Cove including public places and areas visible from public places or from the navigable waters of Sydney and North Harbours
- To provide for maximum public visual and scenic quality to the harbour front and to avoid as much as possible private, exclusive use
- To ensure that all development in Manly Cove is complementary to and does not detract from the shoreline and adjacent reserves in Manly Cove

- To retain all of the existing beach frontage for aquatic and recreational activities
- To make optimum use of the Manly Pavilion precinct while still retaining its existing character.

The proposed demolition of the Manly Sea Life building would reduce the scale of development at the foreshore, enhance the amenity and scenic qualities of the precinct as viewed from within and from outside the proposal area. Overall, the proposal would reveal and enhance the heritage features and character of this scenic location and improve view lines to and from these elements at parklands on the foreshore, the harbour and surrounds. The proposal is considered to complement the shoreline and intent of the above strategic planning polices and documents, to preserve and enhance the visual character of the area.

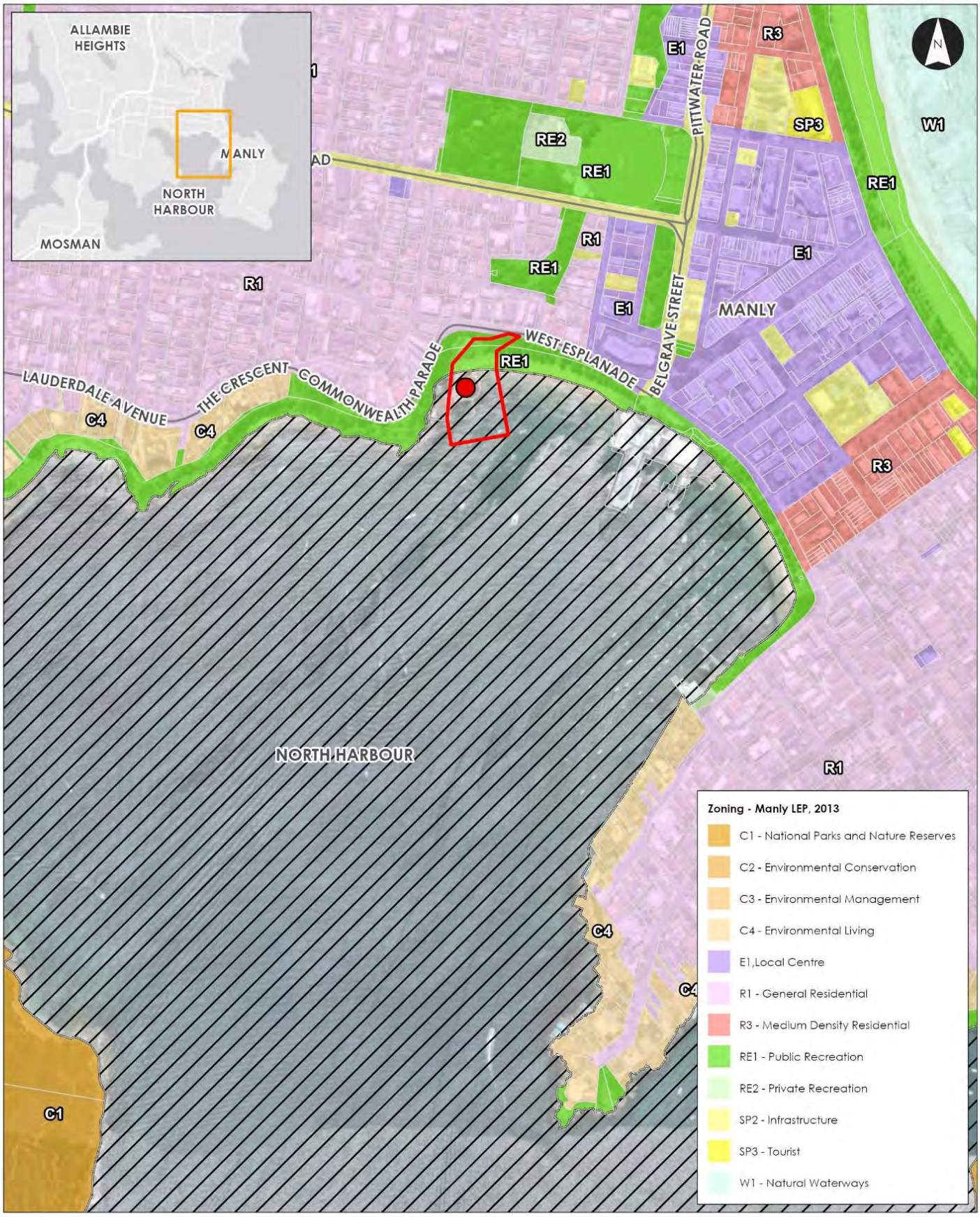


Figure 4-1: Zoning

Manly Cove West Stage 1 REF
Manly, NSW

Project Code: 304501345-GS-006
Drawn By: MM, Checked By: TB
Figure: 4-1 | Rev: 01
Date: 2024-02-26

Stantec

Legend

- Proposal Area
- Manly Sea Life
- Major Road
- Cadastre

Zoning - Biodiversity and Conservation SEPP

- Zone 2 Environment Protection

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery (MetroMap, Nov, 20233)
2. Roads (NSW SS)
3. Cadastre (NSW SS, 2023)
4. Manly LEP Zoning (DPE, 2023)
5. Biodiversity and Conservation SEPP Zoning (DPE, 2023)

0 50 100 150 200 250 Metres

Scale at A4: 1:8,000

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Figure 4-2: Conservation and Heritage

Manly Cove West Stage 1 REF
Manly, NSW

Project Code: 304501345-GS-006
Drawn By: MM, Checked By: TB
Figure: 4-2 | Rev: 01
Date: 2024-02-26

Stantec

Legend

- Proposal Area
- Manly Sea Life
- Major Road
- Cadastre
- State Heritage Register

Heritage - Manly LEP, 2013

- Conservation Area - General
- Item - General
- Item - Archaeological
- Item - Landscape

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial Imagery (MetroMap, Nov 2023)
2. Roads (NSW SS)
3. Cadastre (NSW SS, 2023)
4. State Heritage Register (DPC, 2023)
5. LEP Heritage (DPE, 2023)

0 50 100 150 200 250 Metres
Scale at A4: 1:8,000

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Figure 4-3: Foreshore Scenic Protection

Manly Cove West Stage 1 REF
Manly, NSW

Project Code: 304501345-GS-006
Drawn By: MM, Checked By: TB
Figure: 4-3 | Rev: 01
Date: 2024-02-26

Stantec

Legend

- Proposal Area
- Manly Sea Life
- Major Road
- Cadastre
- Foreshore Area
- Foreshore Building Line
- Scenic Protection Land

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery (MetroMap, Nov 2023)
2. Roads (NSW SS)
3. Foreshore Area, Building Line and Scenic Protection Land (Manly LEP, 2013) (DPE, 2023)

0 50 100 150 200 250 Metres
Scale at A4: 1:8,000

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5.0 LANDSCAPE CHARACTER ASSESSMENT

5.1 LANDSCAPE CHARACTER

The *Guideline for Landscape Character and Visual Impact Assessment – Environmental Impact Assessment Practice Note EIA-NO4* (TfNSW, 2023a) defines landscape character as follows:

> ***Landscape character**: The combined quality of built, natural and cultural aspects which make up an area and provide its unique sense of place.*

The landscape character assessment evaluates the overall impact of the proposal on the surrounding character and sense of place.

5.2 ASSESSMENT METHODOLOGY

The potential impact of the proposal on the existing landscape character is a combination of the sensitivity of its landscape and magnitude of the proposed works/structures. The *Guideline for Landscape Character and Visual Impact Assessment – Environmental Impact Assessment Practice Note EIA-NO4* (TfNSW, 2023a) defines sensitivity and magnitude as:

> ***Sensitivity** The sensitivity of a landscape character zone or view and its capacity to absorb change of the nature of the proposal. In the case of visual impact this also relates to the type of viewer and number of viewers. Combined with magnitude, sensitivity provides a measurement of impact.*
>
> ***Magnitude** The measurement of the scale, form and character of a development proposal when compared to the existing condition. In the case of visual assessment this also relates to how far the proposal is from the viewer. Combined with sensitivity, magnitude provides a measurement of impact.*

The assessment intends to identify the overall impact of the proposed works/structures on each of the Landscape Character Zones (LCZ) through predicting the sensitivity of the LCZ to changes as a result of the proposed works/structures followed by identifying the anticipated magnitude change that would result from implementation of the proposed works/structures within each LCZ.

Based on the measures of sensitivity and magnitude, a rating of the landscape character impact for the Manly Cove West precinct can be formulated, as shown in Table 5-1.

Table 5-1 Landscape character rating matrix (Source: TfNSW, 2023a)

	Magnitude				
Sensitivity		High	Moderate	Low	Negligible
	High	High	High-moderate	Moderate	Negligible
	Moderate	High-moderate	Moderate	Moderate-low	Negligible
	Low	Moderate	Moderate-low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

For this assessment, the magnitude rating for the landscape character impact is categorised in Table 5-2.

Table 5-2 Landscape character impact rating descriptors

Rating	Description
High	The proposed works/structures would be the dominant feature in the landscape. It would significantly affect and alter the current character of the area.
Moderate	The proposed works/structures would be visible and constitute a new feature and alter the area's existing character.
Low	The proposed works/structures would constitute a minor feature, resulting in small changes to the existing landscape character.
Negligible	Only a small proportion of the proposed works/structures would be discernible, or the changes to the landscape character would be barely noticeable due to the separation distance.
None	The existing landscape character would not be altered as the proposed works/structures would not be noticeable.

5.3 SUB-PRECINCTS AND CHARACTER STATEMENTS

To determine the impact of the proposal, the broader proposal area has been divided into five LCZ as shown in Figure 5-1, which are:

- Sydney Harbour/Manly Cove
- Recreation, Foreshore Reserves, and Conservation
- Residential and Urban Slopes
- Level Urban Centre
- Beachfront.

The sensitivity of each LCZ was assessed and a summary of the impact is provided in Table 5-3. The Beachfront LCZ is not addressed in Table 5-3 as it is not visible to/from the proposal area.



Figure: 5-1: Landscape Character

Manly Cove West Stage 1 REF
Manly, NSW

Project Code: 304501345-GS-006
Drawn By: MM, Checked By: TB
Figure: 5-1 | Rev: 01
Date: 2024-02-26

Stantec

Legend

- Proposal Area
- Manly Sea Life
- Major Road
- Cadastre

Landscape Character Zone

- Recreation, Foreshore Reserves and Conservation
- Residential and Urban Slopes
- Sydney Harbour / Manly Cove
- Beachfront
- Level Urban Centre

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery (MetroMap, Nov 2023)
2. Roads (NSW SS)

0 50 100 150 200 250 Metres
Scale at A4: 1:8,000

This document has been prepared based on information provided by others as cited in the data sources. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Table 5-3 Landscape character assessment

Landscape Character Zone	Description	Sensitivity	Magnitude	Landscape Character Impact
Sydney Harbour / Manly Cove	Sydney Harbour is a large body of water, which formed from a flooded river estuary. Manly Cove is located within North Harbour and is the gateway to the locality from other parts of Sydney Harbour. This is a busy and scenic waterbody, with ferries transporting to and from Manly Wharf, and private recreational watercraft use. The waterbody is framed by the surrounding landform which includes peninsulas with steep slopes rising to ridgelines (built form and vegetated). Visually, parts of the Harbour also include moored yachts, marinas and boat houses flanking the foreshores.	High • The site is located within the western side of Manly Cove partly located within the waterline and foreshore interface and is a visually prominent location as viewed from the Harbour, in particular on arrival by ferry. • The existing Manly Sea Life building is a prominent feature within this landscape as it protrudes into Manly Cove close to the shoreline. • Manly Cove Beach is highly sensitive as a natural sandy beach area.	Moderate • The removal of the Manly Sea Life building would be a significant change to the immediate viewing of this site and would alter the character as the building has been in-situ for over 50 years. However, its removal to promenade level and creating a space for public use would be a reduction in visibility of built form, to moderate the impact rather than introducing an additional form. • The reclamation area would transform a natural sandy beach area to a hardstand pavement, however the change would be temporary.	High-Moderate • The proposal would reduce the significant built form elements (Manly Sea Life building) which would impact the character of the western Manly Cove. It would visually expose existing buildings (including the state-significant heritage item, Manly Pavilion). • The proposal would provide opportunities for connection with and increased viewpoints of the scenic Harbour. • The beach reclamation area would be an additional feature and would reduce the existing natural beach formation by providing more paved area at the same level as the existing promenade. This is intended to be temporary.
Recreation, Foreshore Reserves, and Conservation	A distinguishing feature of the northern reaches of the Harbour is its connection to nature at the foreshore line including cliffs, stairs and vegetation. This is accentuated through the series of parklands at the shoreline, linked by a series of walking tracks including Fairlight Walk. The avenue of Norfolk Island Pine trees along East and West Esplanade framing Manly Cove foreshore is a prominent landscape feature.	High • The foreshore reserves have a strong association with Sydney Harbour, The Spit, Manly and are a major tourist attraction in their own right. • Sydney Harbour National Park covers much of the area from which the site can be seen, and	Moderate • The promenade as a space for public use would impact the character of the area; however, this impact would be an increase in intensity of use and a decrease in scale of built form in the area.	High-Moderate • The adjacent beach reclamation area would be an additional feature and would reduce the existing natural beach edge to the parkland/foreshore by providing more paved area at the same level as the

Landscape Character Zone	Description	Sensitivity	Magnitude	Landscape Character Impact
	These parklands have a variety of uses, including sporting fields, passive exercise, walking trails, environmental conservation, and children's playgrounds. This zone is also characterised by a strong heritage character, including Manly Pavilion.	is heavily used by walkers, photographers, and for events. • The site is ringed by Esplanade Park, a long linear park containing several pathways linking Manly and The Spit.		existing promenade. This is intended to be temporary. • The promenade as a space for public use would impact the character of the foreshore; however, this impact is the greater integration of the foreshore parklands with the Harbour, its beaches, and each other. • Sydney Harbour is one of the more scenic harbours in the world, and the demolition of the Manly Sea Life building allows for improved views of this scenic vista from the parklands.
Residential and Urban Slopes	This zone is characterised by a mix of two to three storey residential dwellings and four to 15 storey residential flat buildings. Architectural styles and buildings vary from large Federation dwellings to tower form residential flats. Building heights are generally low, with only a few buildings rising above 10 storeys. The terrain generally slopes down from Sydney Road to the harbour and Manly Cove foreshore. Tree lined streets and mature vegetation is interspersed through the residential areas which form a significant part of the appearance of the zone, with residential flats exceeding through the canopy and achieving visibility of the harbour.	Moderate • The residential slopes have a strong association with the significant Sydney Harbour, Manly Cove Foreshore, Manly Ferry Wharf, and associated parklands. • The proposed works are located in close proximity to, and within, Manly Cove West, and would be visible within part of this immediate residential zone only.	Moderate • The promenade as a space for public use would have some impact to the character of the area from the residential dwellings closest to Manly Pavilion nearest the shoreline, however the reduction in built form shall increase harbour views, improving local amenity for these residents. Other dwellings on the residential slopes within close proximity to the site and further away would experience negligible to low impacts as a result of the proposal.	Moderate • Notwithstanding the level of impact on residents of the slopes, the resulting impact of the Manly Sea Life demolition would be generally positive, as wider harbour views would be available from affected buildings.
Level Urban Centre	The Level Urban Centre is located to the east of the site and makes up the	Moderate	Negligible	Negligible

Landscape Character Zone	Description	Sensitivity	Magnitude	Landscape Character Impact
	commercial core of Manly Town Centre. It is located to the immediate north-east of and adjacent to; but does not include Manly Ferry Wharf. This zone is centred upon the heritage-listed streetscape of The Corso, linking the Manly Ferry Wharf with Manly Beach. To each side of The Corso, commercial, mixed-use, and residential buildings can be found. Building heights in the heritage listed section are generally under five storeys, while certain buildings on neighbouring streets exceed this height.	• This zone contains buildings in a variety of ages, heights, and architectural styles. • While a commercial precinct would generally be considered to have a lower sensitivity to changes in character, the presence of the heritage-listed core of The Corso raises this sensitivity to moderate.	• The Manly Sea Life building is only visible from a limited number of buildings within this precinct. Views of the Manly Sea Life building would be replaced with that of Manly Pavilion and a slightly larger harbour view.	• Due to the low visibility, landscape character impacts on this zone would be considered negligible. • No landscape element within the zone would be modified as part of this proposal.

5.4 OVERALL SENSITIVITY –MODERATE TO HIGH

A high sensitivity has been assessed for the Sydney Harbour/Manly Cove area close to the project area, which is a bustling transport gateway for residents and tourists with a scenic maritime character. Similarly, the adjacent foreshore reserves and recreation areas are important natural edge to the harbour for recreation and conservation purposes with high visual and heritage importance. A more moderate sensitivity is applied to the residential and urban slopes and level urban centre which have more varied elements, topography and distance to the proposal. Given the visibility and importance of these surrounding landscapes, the overall sensitivity of these character areas is assessed as moderate to high.

5.5 OVERALL MAGNITUDE – NEGLIGIBLE TO MODERATE

As the proposal would involve the removal of an existing prominent structure (Manly Sea Life building), its magnitude of change to the Sydney Harbour/Manly Cove and adjacent foreshore reserves would be high. However, this is moderated by retention of the existing promenade within the building footprint (to be demolished) to reveal the existing important heritage buildings beyond. The magnitude of impact to the residential slopes and level urban centre character areas are considered to be negligible given the limited visibility and distance from the proposal. It is considered that the general magnitude of impact to the surrounding character zones is negligible to moderate.

5.6 OVERALL LANDSCAPE CHARACTER IMPACT – MODERATE

The surrounding LCZs that would potentially experience the highest impact from the proposal include the Sydney Harbour/Manly Cove and Foreshore Reserves and to a lesser extent, some residential slopes within close proximity. Lower impacts to more distant character zones are likely, having regard to the low scale of the proposal. By the reduction in prominent built form (i.e. the Manly Sea Life building) in the proposal area, and the revealing of low scale attractive elements to the foreshore (existing heritage buildings), the overall impact to landscape character is considered to be moderate, notwithstanding the visual prominence and high importance of the site.

6.0 VISUAL IMPACT ASSESSMENT

6.1 VISUAL IMPACT

The *Guideline for Landscape Character and Visual Impact Assessment – Environmental Impact Assessment Practice Note EIA-NO4* (TfNSW, 2023a) defines visual impact as follows:

> ***Visual Impact** refers to impact on the views from residences, workplaces and public places.*

6.2 ASSESSMENT METHODOLOGY

To determine the potential visual impact of the proposal, the assessment combines the viewers' sensitivity to the proposed works/structures with the magnitude of the proposed works/structure within the existing views.

6.2.1 Visual sensitivity

According to the *Guideline for Landscape Character and Visual Impact Assessment – Environmental Impact Assessment Practice Note EIA-NO4* (TfNSW, 2023a) visual sensitivity is defined as follows:

> ***Visual sensitivity**: The sensitivity of a landscape character zone or view and its capacity to absorb change of the nature of the proposal. In the case of visual impact this also relates to the type of viewer and number of viewers. Combined with magnitude, sensitivity provides a measurement of impact.*

To determine the visual sensitivity, the following factors should be taken into consideration:

- Distance between the proposed works/structures and the viewer
- The category of viewer (resident, worker and open space user)
- The element of the proposal that would be visible
- The importance of the view.

6.2.2 Magnitude

Magnitude refers to the "*form – scale, size, character – of the project and its proximity to the viewer*" (TfNSW, 2023a). Magnitude assessment should also consider the distance of the proposed works/structures from the viewer. Other factors that should be considered include:

- The scale of the change within the view as a result of the proposed works/structures
- The integration of the proposed works/structures (i.e. form, scale and mass) within the landscape
- The nature and extent of the view
- The location of the proposed works/structure in relation to the region
- The scale of the change within the view with respect to the addition (or loss) of elements taken up by the proposed development.

For this assessment, the magnitude rating is categorised in Table 6-1.

Table 6-1 Visual impact magnitude rating descriptors

Rating	Description
High	The proposed works/structures would result in the total loss of key elements/features/characteristics of the existing landscape and/or introduction of elements inconsistent with the aspect of the current landscape character.
Moderate	The proposed works/structures would result in the partial loss or alteration to key elements/features/characteristics of the existing landscape. The new elements would be prominent but not considered to be significantly uncharacteristic of the existing landscape.
Low	The proposed works/structures would result in a minor loss or alters the key elements/features/characteristics of the existing landscape. However, the new elements are generally consistent with the existing landscape.
Negligible	The proposed works/structures would result in a minor alteration to the essential elements/features/characteristics. The introduction of the new elements would have no to minimal impact on the existing landscape.

6.2.3 Visual impact assessment

Based on the measures of sensitivity and magnitude, a rating can be assigned to Manly Cove West's visual impact, as shown in Table 6-2.

Table 6-2 Visual impact rating matrix (Source: TfNSW, 2023a)

		Magnitude			
Sensitivity		High	Moderate	Low	Negligible
	High	High	High-moderate	Moderate	Negligible
	Moderate	High-moderate	Moderate	Moderate-low	Negligible
	Low	Moderate	Moderate-low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

For this assessment, the rating for the visual impact is categorised in Table 6-3.

Table 6-3 Visual impact rating descriptors

Rating	Description
High	The proposed works/structures would be highly visible and form a significant element within the current views, which would alter the overall character positively or negatively.
Moderate	The proposed works/structures would be visible and recognisable as a new element within the existing view and maybe readily noticeable by a viewer.
Low	The proposed works/structures would result in minor changes to the existing view and unlikely to be recognisable by a casual observer. The new elements would not have much impact on the overall quality of the view and visual sensitivity is likely to be low.
Negligible	A small proportion of the proposed works/structures would be discernible and/or the new elements would be located at a significant distance from the viewpoint that it would hardly be visible.

6.2.4 Distance zones and key view points

Typically, the following distance zones/categories are utilised to assess key views within the vicinity of the site.

- Foreground zone (FZ): 0 – 250 metres from the viewer
- Middle ground zone (MZ): 250 – 500 metres from the viewer
- Background zone (BZ): 500 meters or greater from the viewer.

A GIS based generation of a visual catchment for the proposal was prepared within a one kilometre radius of the site (refer Figure 6-1). This figure provides an indication of the likely visibility of the site.

A logical process was adopted for the identification of the visual catchment of the site and site inspections were conducted to determine the critical view locations within the catchment that are representative of general views towards the site from the public domain. The following six viewpoints were identified to be representative of these locations:

- Viewpoint A – Esplanade Park, northeast of Manly Sea Life building
- Viewpoint B – Aerial view of site
- Viewpoint C – South-eastern corner of Manly Pavilion
- Viewpoint D – Residential Building at 17 Commonwealth Parade, Manly
- Viewpoint E – Western side of Manly Ferry Wharf
- Viewpoint F – Manly Yacht Club.

In consultation with TfNSW, only one viewpoint (Viewpoint A) was identified for preparation of a photomontage to illustrate proposed changes and to determine the likely visual impact generated by the proposed Manly Sea Life building demolition and temporary beach reclamation and retaining wall for vehicle turning adjacent to the works area.

This location is approximately 50 metres northeast of Manly Sea Life building (Figure 6-1 and Figure 6-2). It is noted that the earlier LCVIA (10 March 2023) included photomontages of the original concept design for Viewpoints B to F. The visual impact was determined to be of low significance and revised photomontages for these viewpoints are not warranted. However, photographs of the existing views toward the proposal area have been included in this assessment to illustrate the likely low sensitivity and magnitude of the proposed works/structures from these critical viewpoints due to the distance from the study area. Refer Figures 6-3 to 6-8.

6.2.5 Photomontage

A photomontage (refer Figure 6-3) has been developed to illustrate the proposed changes and to determine the likely visual impact generated by demolishing the former Manly Sea Life building to promenade level and creating a space for public use.

The software used to develop and render the model was Autodesk Navisworks. In order to place the model in real life, a geo-referenced photograph of the viewpoint was taken. The images reference points were overlaid in an AutoCad survey dwg, then imported into Autodesk Navisworks to align the 3D model with the project elements to the perspective of the photograph. An export of the model at the viewpoint was extracted and imported into Adobe Photoshop for post-production editing of the photomontage.



Figure 6-1: Visibility and Key Viewpoints

Manly Cove West Stage 1 REF
Manly, NSW

Project Code: 304501345-GS-005
Drawn By: MM, Checked By: TB
Figure: 6-1 | Rev: 01
Date: 2024-02-27

Legend

- Proposal Area
- Manly Sea Life
- Viewpoint
- 1km Buffer

Visibility

- Visible

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery (MetroMap, Nov 2023)
2. Major Road (NSW SS)

0 100 200 300 400 Metres

Scale at A3: 1:10,000



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6.3 VIEWPOINT ASSESSMENT

6.3.1 Viewpoint A – Esplanade Park, northeast of Manly Sea Life building



Figure 6-2 Viewpoint A – existing view



Figure 6-3 Viewpoint A – photomontage

6.3.1.1 Viewpoint A – description

Viewpoint A is located in Esplanade Park, at the intersection of two pedestrian paths looking south-west toward the site. Manly Cove Beach and the netted swimming area are to the left of frame, while the kiosk and Manly Waterworks are to the right. The existing photograph shows the prominent Manly Sea Life building proposed to be demolished.

6.3.1.2 Viewpoint A – Visual Impact Assessment

Sensitivity	Magnitude	Distance Zone	Overall Rating
High	High	FZ	High

Viewpoint A is representative of a close perspective view from the foreshore park (also incorporating pedestrian pathway and beachfront) at West Esplanade. The sensitivity of Viewpoint A is high for the following reasons:

- Close proximity to the site by the viewer
- High usage area by a range of users
- High value on enjoyment of views from this location
- Availability of view of all elements of the proposal.

The proposed demolition of the Manly Sea Life building removes a substantial element to the viewing of the site from this viewpoint. As illustrated by the photomontage, this magnitude of change would be rated high given its visual prominence.

The existing promenade and the new circular promenade area, including balustrade to perimeter and the sandbag retaining wall is considered to be complimentary to the landscape character and setting, with significant positive benefits. The revealing of Manly Pavilion, with its modest scale and heritage character within the landscape setting would be noticeable to the viewer.

Overall, the visual impact rating is considered to be high from this viewpoint as it forms a significant (positive) change. The construction compound area would be visible during the construction phase, however this would be temporary.

6.3.2 Viewpoint B – Aerial View



Figure 6-4 Viewpoint B – existing view

6.3.2.1 Viewpoint B - description

Viewpoint B is an oblique aerial image of the site taken from above and west of the site. While not a perspective viewed by the community, this photograph and view illustrates the scale of the proposal and its relationship to Manly Cove. It also illustrates the existing prominence of the Manly Sea Life building.

6.3.2.2 Viewpoint B – visual impact assessment

Sensitivity	Magnitude	Distance Zone	Overall Rating
High	Moderate	FZ	High-Moderate

This is not a typical viewpoint and therefore not applicable for technical assessment of impacts of sensitivity to viewers. However it illustrates the relationship of the existing and proposed structures to the study area and surrounds, in particular the setting within Manly Cove. This photograph demonstrates the high sensitivity of the study area due to its prominence at the western end of Manly Cove, direct visibility to Manly Wharf and close proximity to high use areas including coastal reserves and beach, and heritage structures. It is also located within close proximity from high rise residential apartment buildings, although many views from apartments to the site would be obstructed by existing mature vegetation (principally the row of Norfolk Island Pine trees).

The proposed demolition of the Manly Sea Life building would remove a substantial element to the viewing of the site and this would be rated a high magnitude of change. However, the replacement of the building footprint with an extension to the pedestrian area is complimentary to the landscape character and setting and therefore a moderate impact to the magnitude of change is considered appropriate. Overall, the visual impact rating is considered to be moderate from this viewpoint.

6.3.3 Viewpoint C –South-eastern edge of Manly Pavilion building



Figure 6-5 Viewpoint C – existing view

6.3.3.1 Viewpoint C - description

Viewpoint C is located at the south-eastern corner of the State heritage listed Manly Pavilion, looking north-east back to the Manly Cove Beach and Esplanade Park. The existing view is dominated by the Manly Sea Life building and timber jetty, with Esplanade Park behind.

6.3.3.2 Viewpoint C – Visual Impact Assessment

Sensitivity	Magnitude	Distance Zone	Overall Rating
High	High	FZ	High

Viewpoint C is highly sensitive as it is adjacent to state-listed heritage building (Manly Pavilion, used as a popular restaurant/event centre) and forms part of the Fairlight Walk, a pedestrian walk along the coastline that forms part of the 'Spit to Manly walk'. This location is viewed by a range of users (locals and tourist alike) and experiences high usage. The Manly Sea Life building is an imposing element of this view. Its demolition would likely enhance the importance and usage of the area and maintain the high sensitivity of the view.

The proposed demolition of the Manly Sea Life building is considered a high magnitude of change given its visual prominence. The construction compound area would be visible during the construction phase, however this would be temporary. The proposed replacement with an extension to the pedestrian area would reveal the beachfront and parkland view, considered to be more complimentary to the landscape character and setting, with significant positive benefits, in particular along this important coastal route. Overall, the visual impact rating is considered to be high from this viewpoint as it forms a significant (positive) change.

6.3.4 Viewpoint D –Residential Building at 17 Commonwealth Parade, Manly



Figure 6-6 Viewpoint D – existing view

6.3.4.1 Viewpoint D - description

Viewpoint D is located within the property (on entry steps) of an apartment building on Commonwealth Parade and faces due east. This view is representative of the impact to residences adjacent to (west of) the proposal area and the proposal (a distance of approximately 60 metres). Having regard to the topography of the area, these residential buildings are elevated above Commonwealth Parade, and the site is set at a lower level again to the east, beyond a retaining wall. The Manly Sea Life building and beach area is visible behind a screen of trees, with Manly Pavilion roof visible to the right, and Manly Ferry Wharf in the background. Manly Cove Beach is visible at the back left of frame.

6.3.4.2 Viewpoint D – Visual Impact Assessment

Sensitivity	Magnitude	Distance Zone	Overall Rating
Moderate	Low	FZ	Moderate-Low

Viewpoint D is representative of views from nearby residences to the west. Consideration of impacts to views from the public pedestrian pathway along Commonwealth Parade are also comparable to this viewpoint. The sensitivity of Viewpoint D is considered to be moderate having regard to: the close proximity; the highly valuable views; limited number of viewers (residents of private dwellings only) and short term pedestrian walkers; existence of some heritage-listed properties in vicinity of the viewpoint; and existing landscape screening. The overall magnitude of impact on the view is considered low as the removal of the Manly Sea Life building would result in a minor change to the existing view. The change would be positive as it would marginally increase the attractive Manly Cove views, albeit still screened by existing vegetation. The overall visual impact of the proposal is considered to be moderate to low.

6.3.5 Viewpoint E – Western side of Manly Ferry Wharf



Figure 6-7 Viewpoint E – existing view

6.3.5.1 Viewpoint E - description

Viewpoint E is located upon the western side of Manly Ferry Wharf, looking further west to the Manly Sea Life building (a distance of approximately 210 metres). The foreground is dominated by the waters of Manly Cove, with Manly Cove Beach to the right of frame. The Manly Sea Life building is visible at centre frame of the background, while Manly Pavilion occupies the left of the background, and the Manly Art Gallery and Museum is visible at right frame background.

6.3.5.2 Viewpoint E – Visual Impact Assessment

Sensitivity	Magnitude	Distance Zone	Overall Rating
Moderate	Low	FZ	Moderate-Low

Viewpoint E is representative of views experienced by diners at the restaurants of the Manly Wharf, ferry passengers and pedestrians traversing the foreshore park pathways. The sensitivity to change from this viewpoint is considered to be moderate having regard to:

- High quality Harbour setting and enjoyment of views
- Medium distance to the site
- High usage area by a range of users, however this is for temporary periods (seated diners and commuters/pedestrians)
- Heritage significance and historical character setting.

The removal of the Manly Sea Life building, replacement use as an extended paved pedestrian area would be noticeable from this viewpoint, however its magnitude is considered to be low due to the viewing distance and it being a single building among other built elements. Its removal would expose existing buildings of a similar scale and distance and the boardwalk would be a minor element, consistent with the existing landscape character and setting and backdrop. The overall significance of visual impact is considered to be moderate to low.

6.3.6 Viewpoint F – Manly Yacht Club



Figure 6-8 Viewpoint F – existing view

6.3.6.1 Viewpoint F - description

Viewpoint F is located upon the western side of Manly Cove at the Manly Yacht Club approximately 560 metres east of the proposal. The waters of Manly Cove are the primary feature in the foreground and centre of the photograph. Manly Ferry Wharf is visible at the centre right frame, with Manly Cove Beach immediately behind. The Manly Sea Life building is visible at the centre frame background, clustered with Manly Pavilion and Manly Art Gallery and Museum. Behind this, Esplanade Park and residential development beyond are visible.

6.3.6.2 Viewpoint F – Visual Impact Assessment

Sensitivity	Magnitude	Distance Zone	Overall Rating
Low	Low	BZ	Low

Viewpoint F is representative of views experienced by users of the Manly Yacht Club and adjacent Sailing Club (including restaurant), and also for pedestrians traversing the elevated pathway adjacent to East Esplanade. While the quality of the view is very high and the proposal is centrally visible within this view, the sensitivity to change from this viewpoint is moderated by the significant distance (560m), activity of watercraft in the foreground, and use for temporary periods (seated diners, pedestrians and sailing crew etc.). The sensitivity to change is therefore considered to be low.

Removal of the Manly Sea Life building and temporary beach reclamation area would be noticeable from this viewpoint, however its magnitude is considered to be low due to the significant viewing distance and it being a single building among other built elements. Its removal would expose existing buildings of a similar scale and distance and the new features would be minor elements, consistent with the existing landscape character and setting and backdrop.

The overall significance of visual impact is considered to be low from this viewpoint.

6.4 OVERALL VISUAL IMPACT ASSESSMENT – MODERATE

Following the assessment of the viewpoints, the overall visual impact of the proposal to demolish the former Manly Sea Life building is considered to be moderate. The visual impacts generated by the proposal would be variable depending on the location of the viewer and distance from the site as follows:

- As viewed within and adjacent to proposal area: high impact
  - The assessment identified that as viewed from close proximity, the proposal forms a significant change and therefore a high impact. This is primarily due to the high value and significance of the site itself, and the removal of the prominent Manly Sea Life building. However the impact is a positive one, as it removes an unsympathetic built element and provides an additional foreshore promenade area within the demolished building footprint to enable the visibility of the existing lower scale and more complimentary buildings. This would create a space for public use and would enhance the landscape setting and character. The reclaimed beach area to create a new/additional paved area would replace a highly valued natural area and would have a high visual impact. However this is temporary and would allow construction access for the duration of the works, and would be rectified at completion of the Stage 2 work.
- As viewed from further afield: low to moderate impact
  - The viewpoints assessed that located further from the site were also high value settings, however were less sensitive to the proposed change due to the increased distance and visibility and for having more temporary use in the context of the view. From these viewpoints, the removal of the Manly Sea Life building and adjacent temporary works would be noticeable, however this magnitude is low due to its visibility of the exposed buildings appearing at a similar scale and as a relatively minor element of the view, consistent with the existing landscape character and setting and backdrop.

7.0 SUMMARY OF PROPOSAL AND MITIGATION STRATEGY

7.1 SUMMARY OF DESIGN CONCEPT AND MITIGATION STRATEGY

This assessment has identified that the proposal to demolish the former Manly Sea Life building (that protrudes into Manly Cove) to promenade level and create a space for public use in front of the Manly Pavilion would have an overall positive impact on the landscape character and view of the site from Esplanade Park (Viewpoint A). The removal of the unsympathetic building removes an impediment to views and sightlines in the Manly Cove West precinct to the existing historic group of buildings and enhances scenic views and usability of the waterfront areas of Manly Cove.

While the detail of proposed materials is not provided on the available plans, it is understood that selected materials and landscape works would complement the natural environment, landscape and heritage structures, which is supported. The recommendations of the Urban Design Report and Heritage Impact Assessment report should also be consulted and adopted with respect to appropriate materials. Other considerations for appropriate materials for the proposal include:

- Minimise visual impacts of temporary structures (e.g. sandbags, concrete barriers, painted concrete), having consideration to colour and materials.
- Consider pedestrian/user safety, weather protection and equitable access for users.
- Use complimentary materials at the interface of the proposal and existing landscape including beachfront.
- Where park furniture, pillars and signage etc. are temporarily removed for the works – make good to ensure tidy and safe usage of the spaces. Where relevant, use appropriate in-fill turf or landscape species that complement the existing landscape.
- Any temporary removal of and/or installation of lighting or light poles for the works should consider ongoing safety and surveillance, be complimentary to the heritage character, and avoid adverse light spill impacts.

The construction phase of the proposal would require the temporary storage and handling of equipment and materials in a prominent and highly visible site within the public domain. While detail of this is not yet known, the following mitigation measures are recommended to alleviate visual impacts during this temporary period:

- Where possible, use attractive screen enclosures for stockpile and storage areas, particularly that require secure barriers
- Ensure that the site is maintained and kept tidy
- Monitor and control quantities of equipment storage and stockpile area use, and where possible minimise material kept on site
- Restore temporary areas used to original condition and/or with materials that better compliment the materials used in the adjacent completed landscape works.

With these measures in place it is considered that the proposal would contribute toward a high quality local landscape that would be consistent with the values of its visual and landscape environment.

7.2 CONCLUSION

The assessment of the impacts of the proposed concept design to demolish the former Manly Sea Life building to promenade level and create a space for public use on the local landscape and visual quality has been carried out in accordance with *Guideline for Landscape Character and Visual Impact Assessment - Environmental Impact Assessment Practice Note EIA-NO4* (TfNSW, 2023a).

The proposal area is a highly scenic and popular area located at the western foreshore of Manly Cove, in the northern reaches of Sydney Harbour. The site is accessed from the West Esplanade and a beachfront promenade between Manly Ferry Wharf and Manly Pavilion, a popular tourist destination. The site is located in a high quality and significant landscape setting, as identified in the principles, objectives and provisions numerous applicable planning strategies, documents and legislation.

The assessment identified as assessed four landscape character zones: Sydney Harbour/Manly Cove zone; Recreation, Foreshore Reserves and Conservation zone; Residential and Urban Slopes zone; and Level Urban Centre zone.

The potential impact of the proposal on each existing LCZ was assessed considering a combination of the sensitivity of its landscape and magnitude of the proposed works/structures. The assessment concluded that the surrounding LCZs would potentially experience the highest impact from the proposal include the Sydney Harbour/Manly Cove and Foreshore Reserves and some residential slopes within close proximity. Lower impacts are likely to more distant character zones, having regard to the low scale of the proposal.

The overall impact to landscape character is considered to be moderate, despite the visual prominence and high importance of the site due to the reduction in prominent built form (i.e. the Manly Sea Life building) in the proposal area, and the revealing of low scale attractive elements to the foreshore (existing heritage buildings, existing promenade and a new circular promenade area).

The assessment considered the visual impacts of the proposal from one viewpoint identified to be representative of sensitive receivers. One photomontage was prepared to assess the comparative impacts from the existing situation. The assessment concluded that when viewed from close proximity, the proposal forms a significant change and therefore high impact. However the impact is a positive one, as it removes an unsympathetic built element to enable the visibility of the existing lower scale and more complimentary buildings. This, together with the expanding the existing promenade (by demolition of the building) will be positive as it creates additional space for public use that will enhance the landscape setting and character. There will be high visual impacts with the construction phase, including the reclaimed beach area to create a new/additional paved area and construction compound. However, this is temporary and will be rectified at completion of the project, where impacts will be nullified.

This report recommends measures relating to materials for the proposal including during temporary construction works, which if implemented, would contribute toward a high quality new built element in the local landscape that would be consistent with the values of its visual and landscape environment.

Overall, the proposal was assessed to have a high visual impact that would improve and enhance the visual character from the one viewpoint, and the proposal is worthy of support.

8.0 REFERENCES

Northern Beaches Council (2020) *Towards 2040. Local Strategic Planning Statement*. Northern Beaches Council, March 2020.

Greater Sydney Commission (2018) The North District Plan – connecting communities. Greater Sydney Commission, March 2018.

TfNSW (2023a*) Guideline for Landscape Character and Visual Impact Assessment - Environmental Impact Assessment Practice Note EIA-NO4.* Transport for NSW, June 2023.

TfNSW (2023b) *Beyond the Pavement: urban design policy, procedures and principles for roads and waterway projects*. Transport for NSW, June 2023.

TfNSW (2023c) *Ferry Wharf Upgrade Program – Package 3, Former Manly Sea Life Site, Project Brief – Detailed Design.*

Appendix H - Socio-Economic Impact Assessment

Socio-Economic Impact Assessment

Manly Cove West (Manly Sea Life)
Stage 1

15 April 2024

Prepared for:

Transport for NSW

Prepared by:

Stantec Australia

Project No: 304501345-R003

Revision	Description	Author		Quality Check	
A	Draft for client review	Yadi Wang	8/3/24	Kyle Barrie	8/3/24
B	Final report	Yadi Wang	15/4/24	Kyle Barrie	15/4/24

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1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

Transport for NSW (Transport) proposes to demolish the former Manly Sea Life building to promenade level and retain the circular footprint. The proposal is the first stage of the Manly West project to create a vibrant public space for locals and tourists that would celebrate Aboriginal culture, sensitively respond to the heritage values of the state heritage listed Manly Pavilion and provide a canvas for a range of community activities.

The Manly Cove West project would be staged as follows:

- Stage 1 – demolition of the former Manly Sea Life building to promenade level and temporary remedial work below the promenade level (the subject of this proposal).
- Stage 2 – finalisation of work including structural works below the promenade level, removal of the existing jetty and urban design of the space (not included in this assessment).

This socio-economic impact assessment (SEIA) report relates to the Stage 1 work and its purpose is to examine the potential socio-economic impacts of constructing and operating the proposal and recommend mitigation measures to address the identified impacts. The SEIA report has been prepared by Stantec Australia to inform the Review of Environmental Factors (REF) and support the application for approval of the proposal. The SEIA comprises:

- A description of the existing socio-economic conditions of the regional, local area, and communities that would potentially be impacted, to provide a basis for predicting likely changes and future monitoring of impact management and strategies.
- Outcomes from consultation with the local community and key stakeholders.
- Identification of potential socio-economic benefits and impacts associated with the upgrade of the former Manly Sea Life site, covering both construction and operational phases.
- Management and mitigation measures for each identified impact.

1.2 THE PROJECT

1.2.1 Key features

As part of the Stage 1 work, Transport proposes to demolish the former Manly Sea Life building to promenade level (the proposal). Key features of the proposal include (refer Figure 1-1):

- Temporary remedial work below the promenade level to facilitate demolition.
- Demolition of the former Manly Sea Life building down to promenade level.
- Retention of the circular footprint and existing structural elements underneath the promenade level including the concrete foundations and shark tank.
- Temporary infill of existing stairs and other penetrations on the promenade slab.
- Make good of the promenade slab for interim use prior to Stage 2

- Temporary reclamation of a portion of Manly Cove Beach with gabion basket or rock/sand bag retaining wall to allow for a construction vehicle turning circle and plant staging area.

The construction of the proposal would be staged to ensure the demolition of the former Manly Sea Life building proceeds as soon as possible as the existing building is in poor repair and poses a public safety risk. The staged construction also reduces negative impacts on the operation of the Manly Pavilion, the Manly Art Gallery and Museum and other businesses nearby the proposal site.

1.2.2 Construction overview

For the purposes of the Stage 1 work, the proposal footprint, proposal area and compound areas have been defined as follows (refer Figure 1-2):

- Proposal footprint - the area directly impacted by proposed work, including the removal of structures and installation of new structures.
- Proposal area - the general area around the proposal footprint which includes areas required for construction such as the compound area and beach reclamation area.
- Compound areas - the temporary facilities required for construction, including for example an office and amenities compound, construction compound and materials handling area. These compound areas would likely be in the vicinity of the Manly Art Gallery and Museum and on a reclaimed section of Manly Cove Beach. These areas are shown on Figure 1-2 and described in Section 1.2, however, the exact locations would be determined prior to construction.



Figure 1-1: Key features of the proposal

Manly Cove West Stage 1 REF
Manly, NSW

Project Code: 304501304S-GS-003
Drawn By: TB, Checked By: SM
Figure: 3-1 | Rev: 02
Date: 2024-02-28

Legend

- Existing infrastructure to be removed (demolition area)
- Beach reclamation area
- Cadastre

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery (MetroMap, Nov 2023)
2. Cadastre (NSW SS, 2023)

Subject to detailed design

0 10 20 30 Metres

Scale at A3: 1:600



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This document has been prepared based on information provided by others as cited in the data sources. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.



Figure 1-2: Proposal Areas

Manly Cove West Stage 1 REF
Manly, NSW

Project Code: 304501345-GS-004
Drawn By: TB. Checked By: SM
Figure: 3-2 | Rev: 02
Date: 2024-02-28

Legend

- Proposal area
- Existing infrastructure to be removed (demolition area)
- Cadastre
- Hoarding plan
- Construction haul road
- Compound area
- Beach reclamation area

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery (MetroMap, Nov 2023)
2. Cadastre (NSW SS, 2023)

Subject to detailed design

0 10 20 30 Metres

Scale at A3: 1:600



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1.2.3 Work methodology and construction stages

The appointed Contractor would confirm the final demolition methodology in discussion with Transport. The below typical work methodology has been used for the purposes of this environmental assessment.. Should the work method substantially differ from what is proposed in this REF, the Contractor would consult Transport to determine if additional impact assessment is needed.

The proposal would comprise a sequence of work activities as described in Table 1-1.

Table 1-1 Staging plan for the proposal

Phase	Activity	Associated work
1	Site establishment	• Establish a temporary site compound (erect site offices, amenities, and plant/material storage areas etc.). The site compound would be situated adjacent to the Manly Art Gallery and Museum (refer Figure 1-2). • Install temporary fencing or hoarding around the perimeter of the site to segregate the construction areas from the public space (refer Figure 1-2). • Establish site entry and exit points, and a haul road for the construction work site (refer Figure 1-2). To ensure an appropriate width is obtained for the haul road, the bollards, seats, two light poles and the 'Manly Style' bollards would be temporarily removed and stored for the duration of Stage 1. • Establish pedestrian access from West Esplanade including a temporary compliant ramp in replacement of the stairs next to the Manly Art Gallery and Museum. • Establish traffic control measures (for pedestrians, and vehicles) in accordance with the traffic management plan (TMP). Appropriate wayfinding signage would be installed advising of alternative transport routes where necessary. • Temporary reclaim a portion of Manly Cove Beach to become a laydown area for construction vehicles and for material processing (refer Figure 1-2). • Establish environmental controls, including installation of tree protection works and a silt curtain, in accordance with the construction environmental management plan (CEMP).
2	Remedial work below the promenade slab	• Terminate, cap, and seal all services except those nominated to be retained in the retained items schedule. • Remove all fixtures, fittings, furnishings, plant, pipework and associated non-structural building elements from the below promenade level including the plantroom. • Ballast below the promenade level with mass concrete or other means approved in the contractor's demolition methodology. • Prop the promenade from the base of the existing shark and sediment tanks. Propping would remain in place until the demolition of the building above the promenade level is complete.
3	Demolition of the former Manly Sea Life building above the promenade level	• Set up perimeter scaffolding. • Demolish the former Manly Sea Life building in stages down to the promenade level. Demolition would be conducted using a combination of excavators with pulverising attachments, road sawing, and wiring sawing. A crawler crane would be utilised for vertical material movements across the site. • Process the demolition material on the beach laydown area and dispose to an offsite facility. • Infill the existing stair voids and other penetrations on the promenade slab with engineered concrete to allow new paving to match existing and to finish flush with the existing promenade slab level.
4	Site clean up	• Clean-up and restoration of site to its previous state. • Re-instate construction compound areas to pre-existing conditions. • Remove sediment controls and temporary structures. • Retention of the beach reclamation area for use during the Stage 2 work.

1.2.4 Construction hours and duration

1.2.4.1 Start date and length of construction

The proposal would be built over a duration of approximately four months commencing in Q2-2024, depending on weather, maritime, and staging requirements.

Programming of the demolition works would exclude weekends and public holidays to maintain community and business continuity. The construction program would be affected by the need to co-ordinate with Northern Beaches Council, residents, and other key stakeholders.

The duration between Stage 1 and Stage 2 would be approximately 12 to 15 months. The program for the final phase of the construction would be developed as part of Stage 2 REF.

1.2.4.2 Working hours

Most of the work would take place within standard working hours as follows:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm.

However, out of hours work (OOHW) may be required for the termination of services (for example water, power, gas and/or sewer) to reduce impacts on the operation of adjacent businesses and the Manly Art Gallery Museum.

1.2.5 Workforce

While about 30 people would be needed to carry out the main construction activities it is expected that there would be approximately 10-15 people on site at any time on average.

The workforce would be a locally sourced where possible, with targeted indigenous participation.

1.2.6 Traffic management

Road and pedestrian traffic management would be required during the demolition work. This may involve:

- Two new additional no stopping zones on West Esplanade and associated loss of parking
- Stop-go provisions on West Esplanade during major deliveries that take place by road
- Heavy vehicles accessing the site during site establishment and demolition
- Shared pedestrian / vehicle access along West Esplanade
- Changed access arrangements to the Manly Waterworks and Café, Manly Pavilion and Manly Art Gallery and Museum
- Closure of the accessible parking spot and loading parking bay along the haul route.

Access arrangements during the demolition work are as follows:

- Public access to Manly Pavilion, Manly Waterworks and Café, Manly Art Gallery and Museum and the public amenities block would be maintained, however, alternative access arrangements would be provided as shown on Figure 1-3. Public access would be via the existing step-free path on

Commonwealth Parade/West Esplanade, and an additional temporary ramp would be established over the stairs next to the Manly Art Gallery and Museum to ensure wheelchair access is provided.

- Fairlight Walk would remain open to the public, however, alternative access options via footpaths on Commonwealth Parade and West Esplanade would be provided as shown on Figure 1-3.

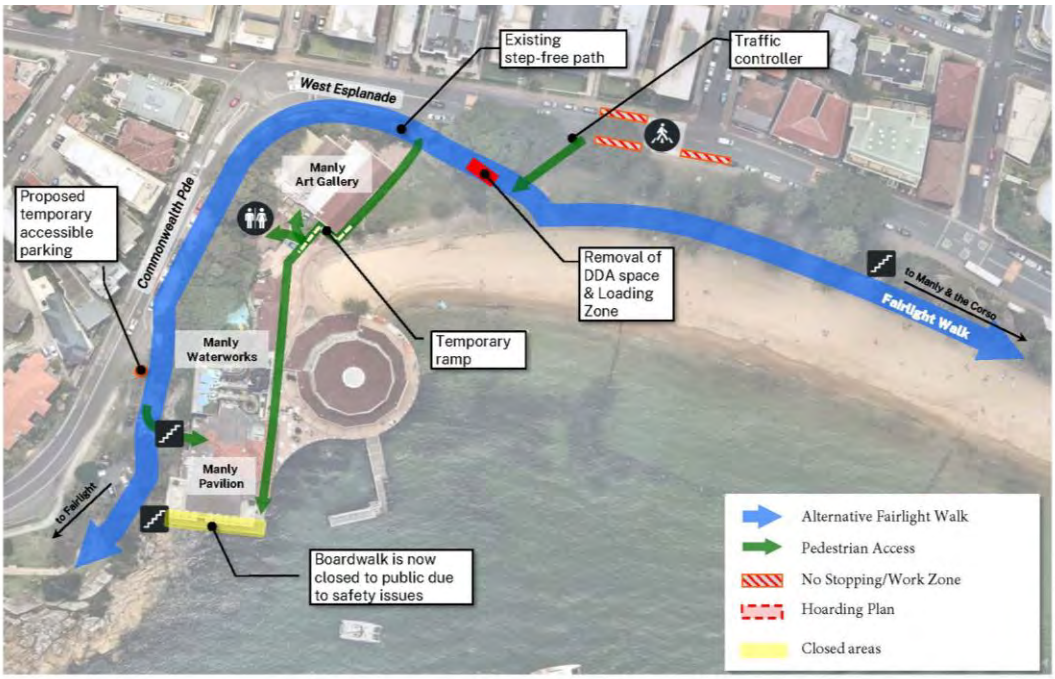


Figure 1-3 Temporary access arrangements

No private residential property access would be impacted during construction.

It is anticipated that all materials and equipment would be delivered to site and demolition material removed from site via road transport.

1.2.6.1 Haulage route and construction vehicles

The construction vehicles for the proposal would travel down Sydney Road, along Belgrave Street and then along West Esplanade to access the site, turning around at the reclaimed area on Manly Cove Beach as shown in Figure 1-3.

Approximate construction vehicle movements per day in each phase are as follows:

- Phase 1 - Site Establishment: ten vehicle movements per day.
- Phase 2 – Remedial work below the promenade slab: five vehicle movements per day.
- Phase 3 - Demolition of Former Sea Life building: twenty vehicle movements per day.
- Phase 4 - Site clean-up: five vehicle movements per day.

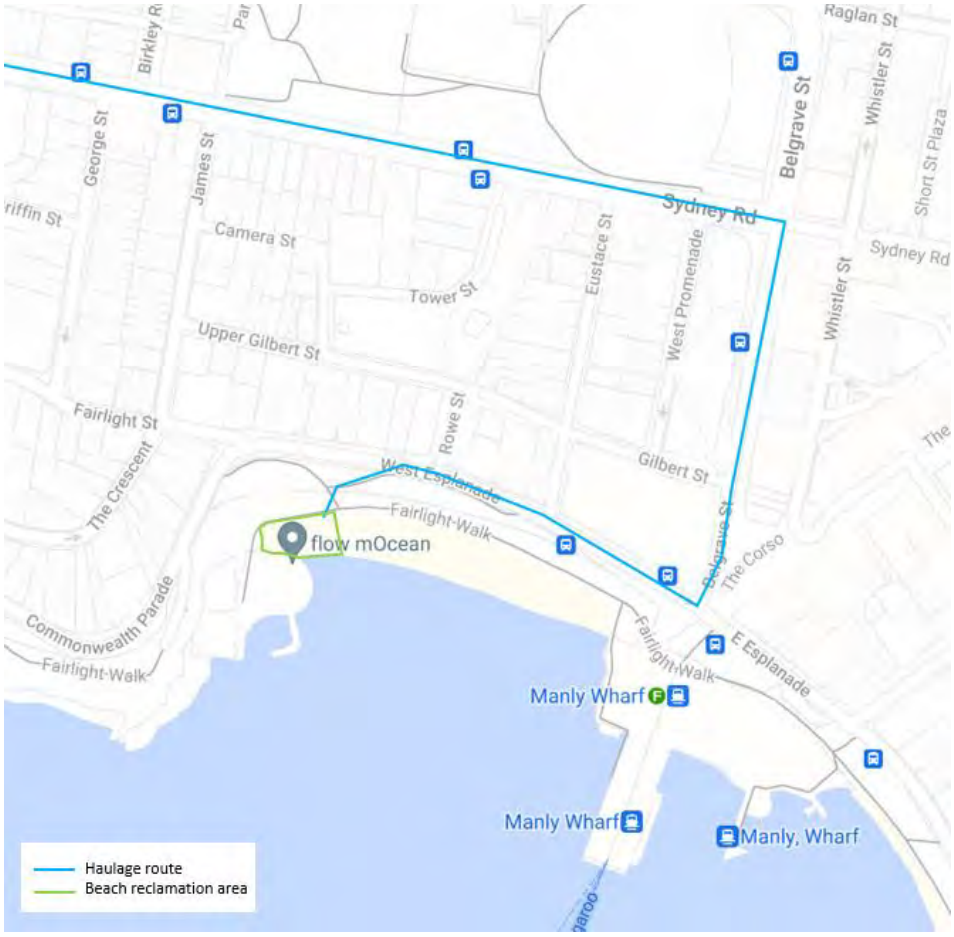


Figure 1-4 Proposed haulage route

1.2.7 Ancillary facilities

A temporary site compound would be located in the vicinity of the Manly Art Gallery and Museum, as shown on Figure 1-2. This compound would be used to establish offices, lunchrooms, amenities, and limited storage. The compound would only utilise the grassed area of the park and no tree clearance would be required. The compound would be fenced off and tree protection would be used to ensure the trees adjacent to the compound are not harmed.

The compound would likely be used during the work hours described in section 1.2.4.2. Due to the proximity of the compound to sensitive receivers some hours may be adjusted to reduce impacts to nearby businesses.

The reclaimed Manly Cove Beach (refer Figure 1-2) would be utilised temporarily as a laydown area, crane set-up, for processing of materials and vehicle movements.

1.3 REPORT STRUCTURE

The report is comprised of the following sections:

- Section 2 – Methodology: a summary of the methods and guidance used for the assessment of the proposal.
- Section 3 – Legislative and policy context: summarises the legislation and policy documents which are relevant to the proposal.
- Section 4 – Existing environment: an overview of the demographic and community characteristics in the study area.
- Section 5 – Stakeholder consultation: summarises the outcomes of consultation relevant to this assessment.
- Section 6 – Construction impact assessment: potential socio-economic impacts that may result from construction of the proposal.
- Section 7 – Operation impact assessment: potential socio-economic impacts that may result from operation of the proposal.
- Section 8 – Cumulative impact assessment: potential cumulative socio-economic impacts that may result from the proposal.
- Section 9 – Recommended mitigation and management measures: provides recommendations of proposed mitigation options for the construction and operational impacts of the proposal.
- Section 10 – Conclusion: presents a summary of the socio-economic assessment findings and sets out the principal conclusions for the study.
- Section 11 – References: presents a list of references which have been utilised for this assessment.

2.0 METHODOLOGY

This SEIA has been prepared in accordance with the *Environmental Impact Assessment Practice Note (EIA-N05): Scio-economic Assessment* (TfNSW, 2020). The following sub-sections explain the SEIA methodology.

2.1 SCOPING OF SOCIO-ECONOMIC IMPACTS

To identify the appropriate level of SEIA required for the proposal, the scoping for the proposal was competed in accordance with the Practice Note (TfNSW, 2020a) and grounded on a review of the proposal design and activities which would occur during construction and operation. After the scoping process was completed, it was concluded that a medium level of assessment would be prepared.

This informed the understanding of potential socio-economic effects, such as changes to local amenity, access, and connectivity, impacts on local business operations, and the estimated effects of the proposal on the local economy. This information was also used in the identification of potential cumulative impacts. Findings are captured in the scoping checklist included as Appendix A.

2.2 IDENTIFYING THE STUDY AREA

While households, businesses, and communities in the vicinity of the proposal area would be most affected by both the short-term construction and long-term operation of the proposal, it is expected that the socio-economic effects of the proposal would spread beyond the proposal boundaries noted in Section 1.2.

The extent of the study area for this assessment comprises the communities that have potential to experience changes due to the construction and operation of the proposal. To provide a comprehensive evaluation of the border population and community that may be affected by the proposal, the study areas are:

- The regional study area is the Northern Beaches Local Government Area (LGA), covering a broader population that might be impacted by the proposal.
- The local study area is Manly-Fairlight Statistical Area – Level 2 (SA2), comprising the communities that have potential to experience changes due to the construction and operation of the proposal.

The study areas are shown in Figure 2-1.

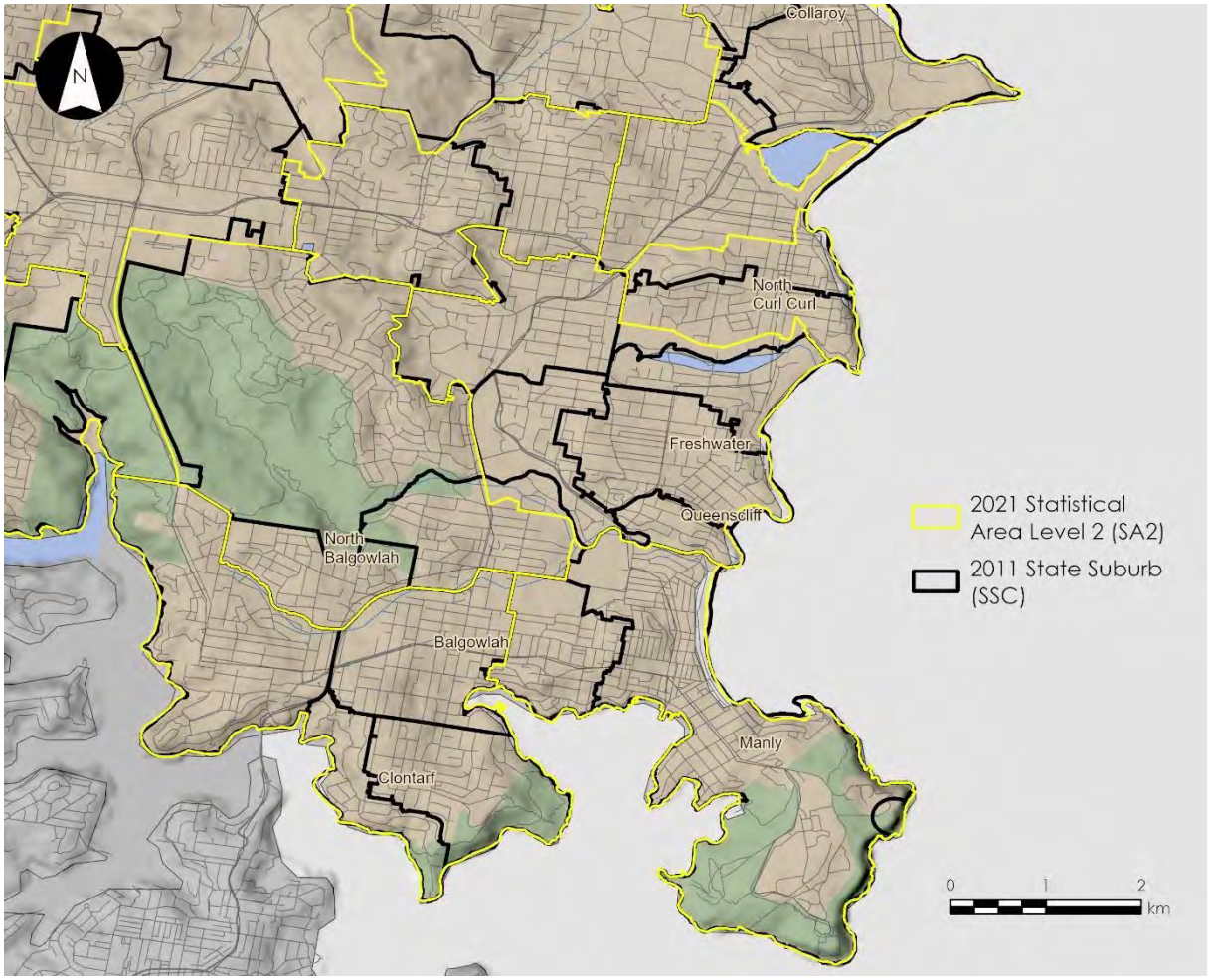


Figure 2-1 Study areas

2.3 ESTABLISHING THE SOCIO-ECONOMIC BASELINE CONDITIONS

The socio-economic baseline depicts the present social and economic characteristics and conditions as well as known or likely future conditions within the study area for the SEIA. The baseline forms the ground upon which the potential socio-economic impacts (both positive and negative) arising from the construction and operation of the proposal can be determined and gauged.

To better understand the existing socio-economic condition of the study area, the following data sources and information have been engaged:

- ABS Census data describing the relevant demographic characteristics.
- Local community structure and patterns (sourced from Northern Beaches Council's webpage).
- Relevant business and economic data (neighbouring business).
- Key stakeholders and interest groups and outcomes of targeted consultation (i.e. Northern Beaches Council, Department of Primary Industry (DPI), Heritage Council, Aboriginal Community etc.).
- Studies commissioned as part of the REF:

  - Noise and vibration impact assessment (NVIA)
  - Statement of heritage impact (SOHI)
  - Landscape character and visual impact assessment (LCVIA).

- Existing socio-economic policies and strategies, including local government policies and strategies.

2.4 STAKEHOLDER CONSULTATION

The communication and engagement plan regarding the proposal's concept design commenced December 2021. All stakeholders, including community members, local businesses, local residents, etc. were strongly encouraged to provide comments and feedback through various channels (email, phone, or online project, meetings, online interactive platform, and survey).

As part of the community consultation program, a community consultation report summarising over 200 comments provided by the community and stakeholders regarding the Manly Wharf 3 and Manly Sea Life building (this proposal) was prepared in August 2022. A summary of the report is provided in section 5.

Engagement with the Aboriginal community was undertaken through a Connecting with Country approach which involved engagement with the Aboriginal community to incorporate cultural values of Gayemagal people into the proposed design. This process led to the opportunities being identified for inclusion of indigenous motifs and planting of local endemic species that are significant to local Aboriginal people (WSP, 2022).

Meetings and consultation with local businesses and key stakeholders are arranged on a regular basis to closely monitor their feedback about the proposal. Specifically, as tenants of the Council, consultation with the boathouse, café, and museum is ongoing throughout early investigations to discuss the proposal and seek feedback.

A summary of the key concerns and feedback collected in the community consultation activities are provided in section 5.

2.5 METHODOLOGY FOR IDENTIFYING AND ASSESSING SOCIO-ECONOMIC IMPACTS

The methodology for identifying and assessing the socio-economic impacts associated with the proposal is adopted from the Practice Note (TfNSW, 2020a), accompanied with:

- Initial scoping of potential socio-economic issues.
- Identification of potential issues through proposal design review.
- Review of the results of stakeholder consultation.
- Review of other technical studies and chapters prepared for the REF.

Cumulative socio-economic impacts have also been assessed, considering other projects that have been approved but where construction has not yet commenced, projects where construction has commenced, and projects that have been recently completed in the surrounding area.

2.5.1 Impact identification

The Practice Note (TfNSW, 2020) provides an overview of indicative socio-economic impacts to be considered in assessing the socio-economic benefits and impacts of Transport projects. For this SEIA, the socio-economic impacts to be considered according to the Practice Note have been classified into categories, which are delineated in Table 2-1.

Table 2-1 Matters to be considered in assessing socio-economic impact by categories

Socio-economic impact category	Matters to be considered
Property	Impacts of the proposal on property amenity. This can impact the access or severance of properties.
Economy, employment, and business	High-level impacts on the local and regional business and economy within the study area, including procurement and employment opportunities. Social implications of how changes to access and amenity (if any) affect local businesses owners, employees, and customers. Social implications of impacts on local job and employment market resulting from impacts on businesses
Social infrastructure	Impacts on local social infrastructure facilities in the study area, including changes in access to local or regional level community services and facilities, changes to the availability of public realm and facilities to users, changes in the level of amenity of infrastructure facilities and public realm located near to the proposal. It should be noted that the impacts on social infrastructure will be assessed in conjunction with "Community values and local amenity" and "Access and connectivity".
Community values and local amenity	Potential impacts on community values due to temporary changes to local access and connectivity, changes in the level of community severance, disruption in access to public places (like parks and harbour foreshore), and changes in noise, air quality or visual environment impacting on local amenity.
Access and connectivity	Temporary changes to traffic patterns, pedestrian and cycle networks, property access due to construction work, and permanent changes to people's access to the public infrastructure facilities in the study area.

The Practice Note highlighted that the SEIA should consider and assess the whole of life impacts of the proposal, including both the construction and operation phases.

2.5.2 Impact assessment

The proposal has the potential to affect pedestrians, nearby residents, businesses, social infrastructure users and the wider community, both positively and negatively. The level of significance of the identified socio-economic impacts have been assessed through two dimensions:

- The sensitivity of the receptor, and
- The magnitude of the potential impacts (subject to the information available at time when the assessment is performed).

Sensitivity refers to the qualities of the receptor which influence its vulnerability to change and capacity to adapt. In this context the receptor may include the environmental characteristics, communities, businesses, business clusters, social infrastructure, residences etc. The levels of sensitivity are shown in Table 2-2.



Table 2-2 Level of sensitivity

Sensitivity	Definition
Negligible	No vulnerability and able to absorb or adapt to change.
Low	Minimal areas of vulnerabilities and a high ability to absorb or adapt to change.
Moderate	Several vulnerabilities but retains some ability to absorb or adapt to change.
High	Multiple vulnerabilities and/or very little capacity to absorb or adapt to change.

Magnitude refers to the scale, duration, intensity, and scope of the proposal including how it will be constructed and operated. Qualities of magnitude include, but are not limited to:

- Scale and intensity (the types of works, operational uses and built form etc.).
- Spatial extent (e.g. the geographical area affected which may be local, suburb, regional, State, International or to community groups etc.).
- Duration (short, medium, or long-term, hours of works, frequency, reversibility etc.).

The levels of magnitude are set out in Table 2-3.

Table 2-3 Level of magnitude

Sensitivity	Definition
Negligible	No discernible positive or negative changes caused by the impact. Change from the baseline remains within the range commonly experienced by receptors.
Low	A discernible change from baseline conditions. Tendency is that the impact is to a small proportion of receptors over a limited geographical area and mainly in the vicinity of the project. The impact may be short-term, or some impacts may extend over the life of the proposal.
Moderate	A clearly noticeable difference from baseline conditions. Tendency is that the impact is to a small to large proportion of receptors and may be over an area beyond the vicinity of the project. Duration may be short term to medium or some impacts may extend over the life of the project.
High	A change that dominates over existing baseline conditions. The change is widespread or persists over many years or is effectively permanent.

Only negative impacts are assigned a level of significance. The level of significance is considered for construction impacts and operational impacts.

Each issue or, alternatively each sub-issue, is assigned a level of significance. For example, if the issue can be adequately addressed under one heading, such as ‘community values’ a level of significance of impact is assigned under that heading. Where sub-issues are needed under ‘community values’, each sub-issue is assigned a level of significance (but a level of significance is not needed for the overarching issue).

The matrix shown in Table 2-4 is used to assess the level of significance of the potential impacts. This is done by combining the level of sensitivity and magnitude. It is noted that the above methodology is not applied to positive impacts, however these are assessed and discussed as appropriate.



Table 2-4 Level of significance

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

2.6 DEVELOPING SOCIO-ECONOMIC IMPACT MITIGATION MEASURES

Proposal-specific management and mitigation measures to mitigate, reduce, or all together avoid the negative impacts of the proposal on quality of life or socio-economic conditions within the study area are delineated in section 9.0.

The measures are determined based on the results of the existing environment (section 4.0), summation of stakeholder effects, and the results of the SEIA. Where possible, the measures proposed are adaptive in so much as they can change – based on ongoing monitoring of the proposal – over the proposal's operational lifecycle. Finally, the measures are considered in tandem with management and mitigation measures proposed in other technical studies that inform the REF.



3.0 LEGISLATIVE AND POLICY CONTEXT

3.1 COMMONWEALTH LEGISLATION AND POLICIES

Table 3-1 lists out the Commonwealth legislation and policies relevant to this SEIA.

Table 3-1 Commonwealth legislation and policies

Legislation or policy	Policy description	Relevance to this SEIA
Disability Discrimination Act 1992 (Australian Government, 1992)	The *Disability Discrimination Act 1992* (Commonwealth) (DDA) is established to prohibit discrimination against people with disabilities in employment, education, publicly available premises, provision of goods and services, accommodation, clubs and associations, and other contexts. The Disability Standards for Accessible Public Transport (DSAPT), issued under the DDA, prescribes minimum standards of accessibility in relation to premises, infrastructure, and conveyances.	A key aspect of the proposal is creating a prominent waterfront location and connecting people to land and water. The dilapidated Manly Sea Life building compromises the access to the Manly Pavilion and heritage buildings. As such, removing the Manly Sealife building adheres to and complies with the legislation and related standards. It should be noted that during Stage 1, the DDA space providing access to the beach from West Esplanade would not be available. Alternative DDA space is proposed along Commonwealth Parade, which is shown in Figure 1-3.

3.2 NSW LEGISLATION AND POLICIES

Table 3-2 lists out the NSW legislation and policies relevant to this SEIA.

Table 3-2 NSW legislation and policies

Legislation or policy	Policy description	Relevance to this SEIA
Future Transport Strategy 2056 (TfNSW, 2018)	The *Future Transport Strategy* highlights the importance of "More choice, better access", in particular improving walking and cycling networks across the Greater Sydney region. This includes stronger investment in small to medium interventions to optimize the transport network and not just mega project. The *strategy* also emphasizes the theme of "Thriving places" to enhance liveability for residents and communities, placing emphasis on improving access in communities by having wider footpaths, cycle lanes, street trees, pedestrian crossings and lower speeds.	The proposal aims at enhancing the Manly West Esplanade precinct area and reconnecting the Manly Pavilion and heritage buildings with the beach by removing the Manly Sea Life building. Although in Stage 1 (and post Stage 1), a portion of Manly Cove Beach would be set as a temporary reclamation area with gabion basket or rock/sand retaining wall, these restrictions would be lifted up after the completion of stage 2, providing sufficient space for walking and other physical activities along the beach over the long run. By doing so, public waterfront access would be improved, which is in line with the priorities outlined in the *Strategy*.
North District Plan (Greater Sydney Commission, 2018)	The North District covers Hornsby, Hunter's Hill, Ku-ring-gai, Lane Cove, Mosman, North Sydney, Northern	The proposal intends to retain the circular footprint and existing structural elements below the

Legislation or policy	Policy description	Relevance to this SEIA
	Beaches, Ryde and Willoughby local government areas. The *North District Plan* is a 20-year plan to manage growth in the context of economic, social, and environmental matters to achieve the 40-year vision for Greater Sydney. It is a guide for implementing the Greater Sydney Region Plan, A Metropolis of Three Cities, at a district level and is a bridge between regional and local planning. The key planning priorities that are relevant to the proposal include: • Planning Priority N1: Planning for a city supported by infrastructure: o Maximise the utility of existing infrastructure assets, and consider strategies to influence behaviour changes, to reduce the demand for new infrastructure, including supporting the development of adaptive and flexible regulations to allow decentralised utilities. • Planning Priority N3: Providing services and social infrastructure to meet people's changing needs: o Deliver social infrastructure that reflects the needs of the community now and in the future o Optimise the use of available public land for social infrastructure	promenade level, including the concrete foundations and shark tank, to protect the heritage listed Manly Cove Pavilion. Considering the high levels of pedestrian traffic in front of the Manly Pavilion and the hub of activity, this design also minimises disruptions to pedestrian movements around the construction site. As such, the proposal accounts for impacts on behaviour changes and attempts to reduce construction workload where applicable when delivering better public infrastructure, which strictly adhere to the *Plan*.

3.3 COUNCIL POLICIES

Table 3-3 lists out the NSW legislation and policies relevant to this SEIA.

Table 3-3 Local government policies

Legislation or policy	Policy description	Relevance to this SEIA
Towards 2040 Northern Beaches Council Local Strategic Planning Statement (Northern Beaches Council, 2020)	The *Northern Beaches Council Local Strategic Planning Statement 2020* sets out the local strategic context and planning priorities in four themes: sustainability, infrastructure and collaboration, liveability and productivity, and will guide the local land use planning over the next 20 years. The *statement* reflects local values and aspirations, building on the vision of the Northern Beaches and North District. Under the four themes, there are several planning priorities that are of great relevance to this SEIA, including: • Sustainability – Priority 6: High quality open space for recreation	The proposal would remove the disused Manly Sea Life building (which also blocks sight lines to the heritage buildings behind) and create a prominent waterfront location for outdoor dining and a recreational edge, providing a safe, family friendly place for the West Esplanade. The proposal also retains the former Manly Sea Life sub-structure to protect the heritage listed Manly Pavilion. The workforce for the proposal would be a locally sourced where

Legislation or policy	Policy description	Relevance to this SEIA
	• Infrastructure and collaboration – Priority 9: Infrastructure delivered with employment and housing growth • Liveability – Priority 18: Protected, conserved and celebrated heritage • Productivity – Priority 21: Redesigned road space and facilities to match changing community needs	possible, with targeted indigenous participation. As such, the proposal strictly adheres to and complies with the council's *Statement*.
Northern Beaches Transport Strategy 2038 (Northern Beaches Council)	The *Northern Beaches Transport Strategy* emphasize the vision for a safe, sustainable and smart transport networks within the Northern Beaches. The strategy figures out 5 themes with each having up to eight future directions. Under the Accessible and Livable Places theme, the future directions that are identified to be of great relevance to this SEIA are: • Create and enhance "Places for People" that are integrated with the public transport, creating vibrant, connected places with wide footpaths, safe cycling options and where the car is not the first option • Delivering walking links including wider paths to destinations from both residential areas and transport hubs	The proposal creates better waterfront space for walking, cycling, and outdoor dining The proposal is adjacent to several destinations from both residential areas, including the Manly Art Gallery and Museum, and the Manly Pavilion that houses several hospitality venues. Removing the disused Manly Sea Life building effectively connects people to those destinations. As such, the proposal strictly adheres to and comply with the council's *Strategy*.
Destination Northern Beaches (Northern Beaches Council, 2021)	*Destination Northern Beaches* is a five-year strategic plan aligning with the *NSW Visitor Economy Strategy 2030*. Recognizing the value of the visitor economy in boosting the local economy, the goal of this *Plan* is to balance the local economic potential of tourism with protection of the environment and the value of the local lifestyle. The *Plan* embarks upon two focus areas – Destination Management and Destination Marketing - with each comprising a series of action plans. The action plans that are identified to be relevant to this SEIA are: • Undertake a Place Plan for Manly which will include a focus on tourism, local and night-time economy, street activations, recreation, signage/wayfinding, key pedestrian movement corridors, public amenity and creativity • Improve and manage sustainable recreational access whilst protecting environmentally sensitive lands • Consider scenic and cultural landscapes and heritage in strategic land-use planning, development controls and when undertaking works (i.e. Beaches Coast Walk)	The proposal demolishes the old obstructing Manly Sea Life building, creating a better public realm with better public amenity and improved pedestrian and cyclist mobility. The design of the proposal reflects the recognition of the importance of creating a place that respects the local cultural heritage, connecting people to land and water. As such, the proposal strictly adheres to and complies with the council's *Plan*.

Legislation or policy	Policy description	Relevance to this SEIA
Manly West Esplanade Heritage Activation Plan (Northern Beaches Council, 2019)	The plan sets the vision for West Esplanade to be 'a place for residents and visitors to enjoy, that is family friendly, protects its extraordinary environment and cares for its heritage'. The plan also provides recommendations specific to the Manly Sea Life building based on community consultation. The plan recommends the following: • Manly Sea Life building to be demolished to reinstate view of the State Heritage listed Manly Pavilion building and improve safety of the area. • The site to become a public open space. • A space for a variety of community activities including local performances and community markets with adequate seating and plantings. • Change of use of this space with the possibility of limiting vehicle access to certain times. • Replacement of the existing dilapidated jetty.	The proposal aligns with the following design principles of the plan: • Maintain and celebrate the heritage of the area. • Ensure the area is a safe, family friendly place to be. • Protect the natural environment. • Highlight the Manly Art Gallery and Museum. • Embrace the community need for soft social environments. Removal of the Manly Sea life building aligns with majority of the recommendations above by creating a new public open space which reinstates views of heritage rich items while limiting vehicle access.

4.0 EXISTING ENVIRONMENT

4.1 OVERVIEW OF THE REGIONAL AND LOCAL SOCIO-ECONOMIC CONTEXT

4.1.1 Regional study area

The proposal is located in the Northern Beaches LGA, in the state of NSW, Australia. The Northern Beaches area encompasses a total land area of about 254.2 square kilometres, mainly consisting of low to medium density residential areas and national park. The LGA is 35 kilometres north-east of the Sydney Central Business District (CBD) and includes roughly 27 kilometres of ocean coastline. The Traditional Owners of the land occupied by the Northern Beaches LGA are Garigal and Caregal people. The Garigal or Caregal clans continue to live and move around the northern and north-western Sydney coastal areas.

4.1.2 Local study area

The proposal is located in Manly-Fairlight SA2 in North Sydney. This area comprises two State Suburb (SSC) areas: Manly and Fairlight, which is approximately 6.8 square kilometres and is located roughly 17 kilometres north-east of the Sydney CBD. The top three land zoning types in this SA2 area include:

- C1 National Parks and Nature Reserves (1.809 km^2).
- R1 General Residential (1.805 km^2).
- C2 Environmental Conservation (0.631 km^2).

This area is highly scenic and popular. The proposal site area, which is dominated by the disused Manly Sea Life building, is located west of the West Esplanade, east of the Commonwealth Parade, and north-east to the beachfront promenade between Manly Ferry Wharf and the listed-heritage Manly Pavilion. The Manly Art Gallery and Museum, amenities building, and café are located adjacent to the Manly Sea Life building. The site is adjacent to the West Esplanade Reserve which runs from Lauderdale Street in Fairlight in the west to Manly Wharf in the east. Those areas are valued by residents, visitors and tourists for manifold amenity and leisure purposes.

The Manly 'Marineland' aquarium was the first building to be located on the site and was a brick building constructed c.1962. In 1987 'Marineland' was largely demolished and a new circular brick aquarium was constructed, which is now the Manly Sea Life building, a structure that is suspended within the water at Manly Cove. The Manly Sea Life building is a multi-storey building with a bell cast tile roof. The building has a public pedestrian walkway which wraps around all sides of the building with scattered areas of planting. The eastern side of the pedestrian walkway offers public bench seating that overlooks Manly Cove. The Manly Sea Life building closed in 2018.

4.2 POPULATION AND DEMOGRAPHY

4.2.1 Population and growth

At the time of 2021 Census, the total population of the SSC, SA2, and LGA study areas were 16,296, 22,438, and 263,554 (as shown by Figure 4-1), respectively. The gender distribution is similar across all three-levels study areas, with females occupying 49% and males 51%.

The Aboriginal and Torres Strait Islander population accounts for 0.47%, 0.45%, and 0.65% of the total population in the SSC, SA2, and LGA study areas, respectively.

All the study areas experienced population growth between 2016 and 2021. The population growth in the broader LGA area was 4.2%, exceeding that in the SSC at 2.71% and SA2 at 3.88%. This is reflective of the constrained housing supply in smaller geographies surrounding the proposal. The

population growth rate in Greater Sydney was much higher at 8.4% during the same period, again a likely reflection of the greater supply of housing across a much larger and less constrained geographic area.

The 2022 population projections estimate that the population of the Manly-Fairlight SA2 area will increase from 24,525 in 2021 to 26,089 in 2041, rising by 6% within the next two decades (Department of Planning, Industry and Environment, 2022). The population of the Northern Beaches LGA is expected to grow by 15,514 people per year, from 274,015 in 2021 to 308,616 by 2041, equivalent to 13%. The projected population growth rate is lower in the SA2 and LGA areas than in NSW, which is forecast to increase from 8,166,757 in 2021 to 9,872,934 by 2041, equivalent to 21%.

Securing sound living conditions and improving the quality of public realm, as delivered by this proposal, will help to maintain commensurate recreational infrastructure with the increasing demands for living space.

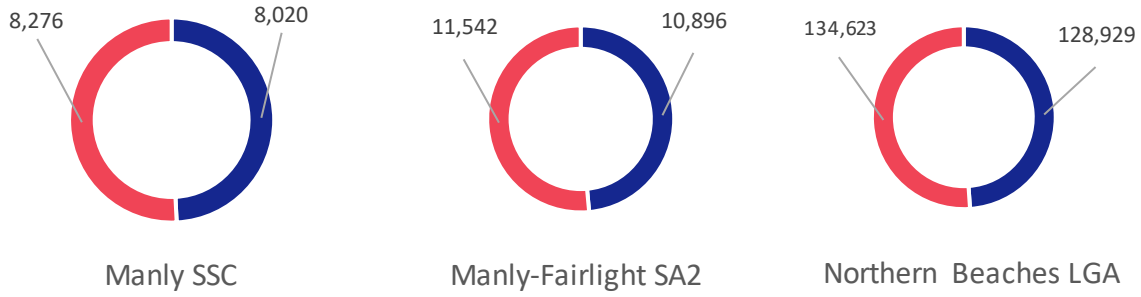


Figure 4-1 Gender distribution of population in the three-level study areas (Manly SSC, Manly Fairlight SA2, and the Northern Beaches LGA) in 2021 (Source: ABS, 2021). Females (red), males (blue).

4.2.2 Age

In 2021, the median age of the Manly SSC and Manly-Fairlight SA2 study area was 38 years, and the Northern Beaches LGA was 41 years. As shown by Figure 4-2 ,the groups aged between 25-44 years represented the highest proportion of people in Manly (39%) and Manly-Fairlight (37 per cent), which were 50% higher than that group in the Northern Beaches LGA. In the Northern Beaches LGA, population groups aged above 44 years accounted for about 46% (as per Figure 4-2) as of 2021, which was higher than that in the Manly-Fairlight SA2 (40%) and Manly SSC (39%).

This reflects that the Manly SSC and Manly-Fairlight SA2 have high concentrations of young and mid-aged cohort in reproductive-age classes (aged below 45 years)[1], indicating stronger population growth momentum in succeeding years. However, this group are more capable and likely to move elsewhere for work or education purposes than the older aged groups. Sustaining and improving local living conditions that meet the requirements of this cohort could reduce the possibility of future population outflow and even attract more inflow.

[1] As defined by the ABS:
https://www.abs.gov.au/ausstats/abs@.nsf/Previousproducts/3301.0Glossary12015?opendocument&tabname=Notes&prodno=3301.0&issue=2015&num=&view=

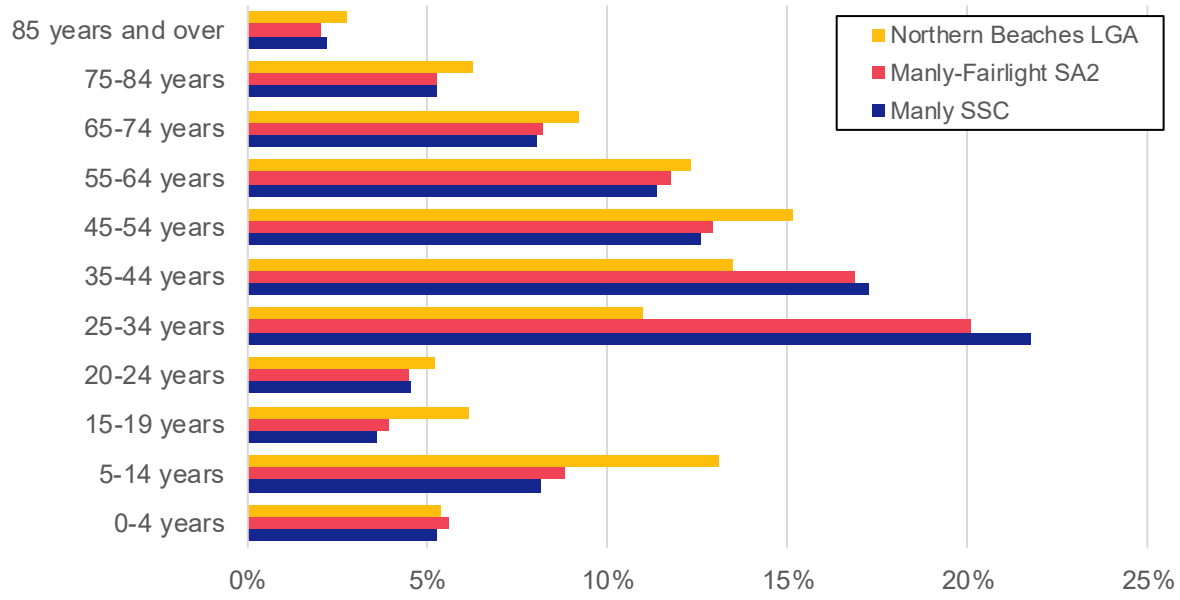


Figure 4-2 Age distribution of population in the three-level study areas (Manly SSC, Manly Fairlight SA2, and the Northern Beaches LGA) in 2021 (Source: ABS, 2021)

4.2.3 Cultural diversity

Informed by the 2021 Census (Figure 4-3), the top three countries of birth of population in Manly SSC (blue), Manly-Fairlight SA2 (yellow), and the Northern Beaches LGA (red) are identical. Most of the residents were born in Australia, followed by England and New Zealand. The study areas are culturally diverse with European descendants accounting for a predominant proportion. The top three common ancestries were English (41-43%), Australian (25 – 31%), and Irish (12-15%).

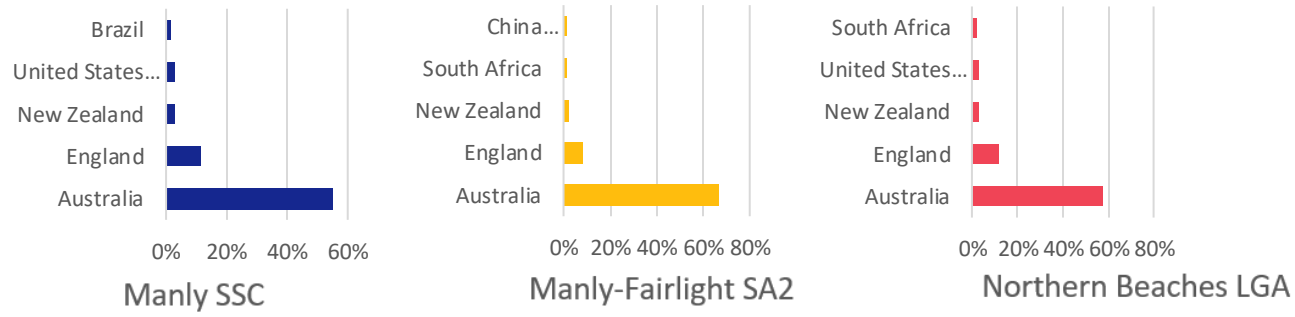


Figure 4-3 Country of birth distribution of population in the three-level study areas (Manly SSC, Manly Fairlight SA2, and the Northern Beaches LGA) in 2021 (Source: ABS, 2021)

4.2.4 Families and households

In 2021, the average household size of the Manly SSC, Manly-Fairlight SA2, and the Northern Beaches LGA study areas are 2.2, 2.2, and 2.7, respectively, and the average household size of the Greater Sydney area is 2.7. The family composition of 'couple family with children' occupied a more predominant proportion in LGA than in the SSC and SA2. The SSC and SA2 study areas had a slightly higher proportion of 'couple family with no children' at 54% and 51%, compared to about 37% in the Northern Beaches LGA.

This is aligned with the high concentration of the cohort aged between 25-34 years in the SSC and SA2 areas. In Australia, the average maternal age has risen for both first-time mothers (from 28.3 years in 2010 to 29.6 in 2020) and those who have given birth previously (from 31.3 years in 2010 to 32.0 in 2020) (Australian Institute of Health and Welfare, 2022). The highest proportion of mothers were aged between 30 and 34 (more than one-third (36%) of all mothers) (Australian Institute of Health and Welfare, 2022).

Grounded on this information, it can be inferred that the number of children is likely to rapidly increase in the near future in the SSC and SA2 study area, implying a growing demand on children-friendly and family-friendly infrastructure and public realm with safe and convenient access to active transport modes.

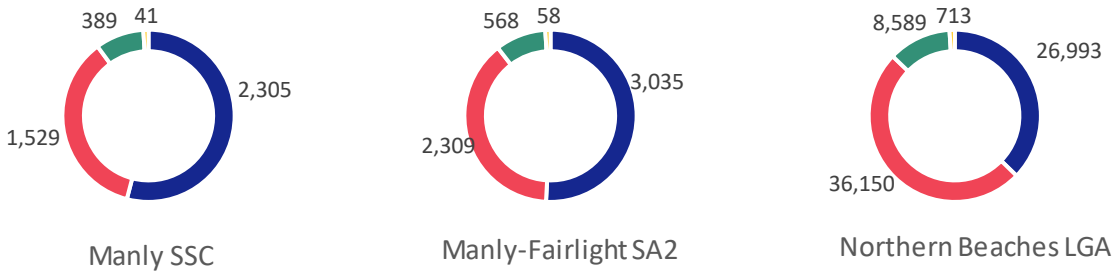


Figure 4-4 Family composition in the three-level study areas (Manly SSC, Manly Fairlight SA2, and the Northern Beaches LGA) in 2021 (Source: ABS, 2021). Couple Family No Children (Blue), Couple Family with Children (red), One Parent Family with Children (green), Other Family (yellow).

4.2.5 Housing

Of the occupied private dwellings, the majority residents of the Manly SSC (64%) and Manly-Fairlight SA2 (60%) study areas lived in flats or apartments, followed by single detached house (9% for Manly SSC and 13% for Manly-Fairlight SA2). This is reflective of the housing density surrounding the proposal area. However, 53% of residents in the Northern Beaches LGA lived in single detached houses, and only 31% lived in flat or apartments. The vacancy rate of private dwellings in the LGA was 8%, lower than that in the SSC (16%) and SA2 (14%).

As aforementioned, this observation can be attributed to the constrained housing supply in smaller geographies surrounding the proposal. However, the higher vacant rate implies that the SSC and SA2 study areas have higher unoccupied housing stock to handle future housing demand result in population inflow or growth, where the quantity and quality of supporting infrastructure are key factors affecting housing decisions.

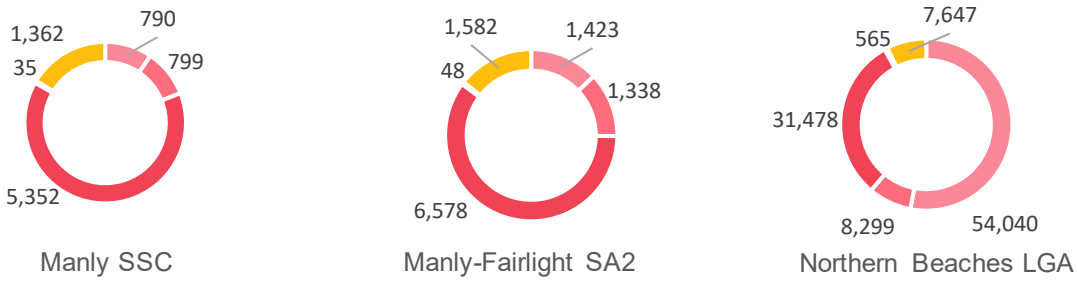


Figure 4-5 Private dwellings occupancy status in the three-level study areas (Manly SSC, Manly Fairlight SA2, and the Northern Beaches LGA) in 2021 (Source: ABS, 2021). Separate house (light pink), Semi-detached, row or terrace house, townhouse etc (dark pink), Flat or apartment (red), Other dwelling and dwelling structure not stated (yellow), unoccupied private dwellings (green).

4.2.6 Transport and access

Transport in the Northern Beaches LGA is provided by an extensive network of public transport operating modes including train, bus, and ferry, as well as an expansive network of roadways, cycleways, and walkways, which play an important role in the regional connectivity between northern Sydney, Sydney CBD, and up to the Central Coast area located to the north.

Public transport services to the Manly SSC and Manly-Fairlight SA2 are ferry services from Manly wharf, and Keolis Downer Northern Beaches bus services heading to Sydney CBD and other suburbs. With a scheduled headway of 20 to 30 minutes, the Manly ferry service between Manly wharf and Circular Quay generally takes 30 minutes and allows for scenic views of Sydney Harbour, surrounding national parks and Sydney icons including the Harbour Bridge and Opera House. Private moorings are available for recreational boats and vessels in eastern Manly Cove. The Esplanade, known as Fairlight Street before the intersection with James Street and split into East Esplanade and West Esplanade at the intersection with Belgrave Street, traverses parallel to the Manly Cove and provides access to key destinations such as the Manly wharf, Manly Beach, and other recreational destinations along Manly Cove.

In 2021, 44% of the employed residents in the Northern Beaches LGA worked from home, which is lower than that in the Manly SSC (59%) and Manly-Fairlight SA2 (58%). The most popular commute mode chosen by employed residents in all three-level study areas is car, following by walking and bus. Working from home excludes the daily work-home commute and elongates the time spending around home, implying increased demand on local public places where activities and exercises can be carried out.

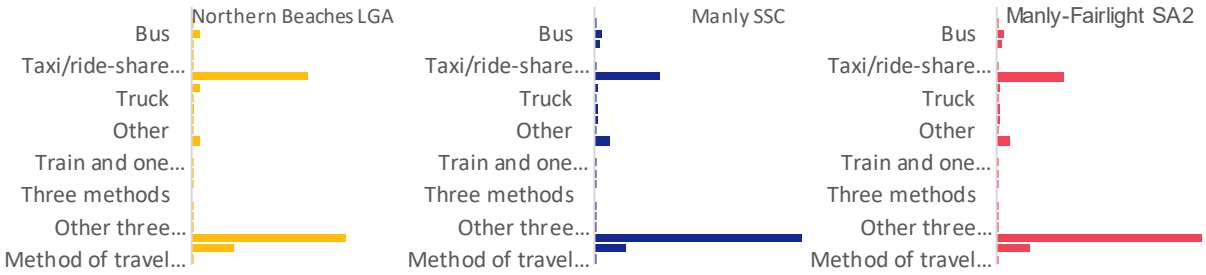


Figure 4-6 Method of travel to work in the three-level study areas (Manly SSC, Manly Fairlight SA2, and the Northern Beaches LGA) in 2021 (Source: ABS, 2021)

4.3 ECONOMIC PROFILE

4.3.1 Income

In 2021, the median weekly household income in the Manly SSC and the Manly-Fairlight SA2 areas were closely aligned at $3,164 and $3,185, respectively. These were 22-23% higher than the Northern Beaches LGA which had a median weekly household income of $2,592.

The differences in the median weekly individual income between the local study areas and the regional study area are even larger than that in household income. The median weekly individual income in the SSC and SA2 areas was $1,595 and $1,568, which were 41-44 per cent higher than that for the Northern Beaches LGA at $1,109.

These income statistics are a reflection of the higher spending power of people living in or around the proposal area, implying the potential for higher levels of spend in areas that can improve accessibility and associated dwell time.

4.3.2 Labour force and employment

In 2021, the employed population (includes all persons who work full-time, part-time, away from work, and not state current work hours) accounts for 96.4%, 96.5%, and 96.8% of the total labour force (comprises all persons who fulfil the requirements for inclusion among the employed and the unemployed, or alternatively, the sum of employed and unemployed population) in the three-level study areas, respectively. In comparison to the employment reported by the 2016 census, which were 96.1%, 96.3%, and 96.5% respectively, the employment status of the total workforce in the three-level study areas remains steady before and after the COVID-19 pandemic. The proportion of employed population working full-time in the SSC and SA2 study areas are higher than in the LGA.

The proportion of employed population out of the total number of persons aged 15 years and over was 66.94%, 67.16%, and 63.41% for the three-level study areas respectively, revealing that the labour force participation in Manly and Manly-Fairlight regions are higher than in the Northern Beaches LGA. This correlates with the high percentage of the “middle-aged workforce (aged between 24-44)” cohort residents in the Manly and Manly-Fairlight areas.

The top three predominant industries of employment in Manly and Manly-Fairlight are identical, which were professional, scientific, and technical services, financial and insurance services, as well as health care and social assistance. Albeit professional, scientific, and technical services was also the most common industry in the broader Northern Beaches LGA, health care and social assistance as well as construction were the second and third largest sectors in terms of employment in the LGA.



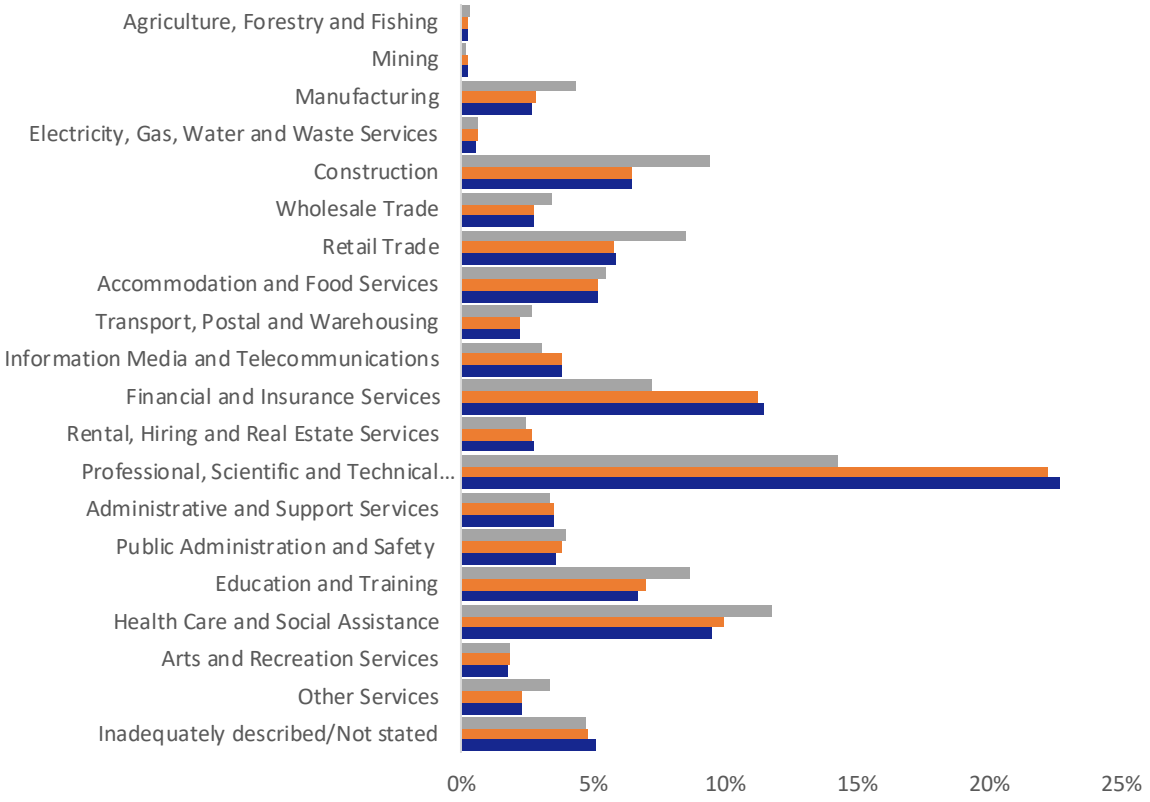


Figure 4-7 Industry distribution of labour force in the three-level study areas (Manly SSC [grey], Manly Fairlight SA2 [orange], and the Northern Beaches LGA [blue]) in 2021 (Source: ABS, 2021)

4.3.3 Local business and services

In the financial year 2021/22, there were 34,491 local businesses in the Northern Beaches LGA, creating 105,694 local jobs (The Northern Beaches Council, 2021).

The proposal area, namely the Manly Sea Life building and the Manly Pavilion, is located to the west of Manly Cove to which several local businesses are located in close proximity. Local businesses and services within a 500 meters radius of the proposal site include:

- Manly Pavilion - a heritage listed waterside venue offering a restaurant and lounge space and open all seasons. It is located in the proposal site.
- Manly Waterworks – an outdoor water park and playground in manly. It is located to the west of the proposal site.
- Kiosk – small local kiosk with outdoor seating, located between Manly Waterworks and the public toilets.
- Manly Public Amenities Block – located to the north of the proposal site.
- Fairlight Walk – a scenic walkway. It starts from the Fairlight Park and terminates to the west of the proposal site.
- Manly Art Gallery and Museum - located to the north of the proposal site.

4.4 LANDSCAPE CHARACTER AND VISUAL AMENITY

Land zoning in the vicinity of the proposal is mapped in Figure 4-8. The land-side portion of the proposal area is zoned as RE1 - Public Recreation, with adjacent areas predominantly zoned R1 General Residential and B2 Local Centre under the *Manly Local Environmental Plan 2013*. Adjacent to the commercial areas and the remaining foreshore areas and surrounds comprises residential areas, typically high-density residential flat buildings, except for a few heritage-listed workers' cottages and terraces. The waterside portion of the proposal area is mapped as Zone 2 Environmental Protection under the *State Environmental Planning Policy (Biodiversity and Conservation) 2021.*

As per Figure 4-9, to the immediate north and east of the site is Manly Cove Beach, a popular swimming destination with a netted bathing area. A public reserve and popular pathway/promenade lined with prominent Norfolk Island Pine trees adjoins the beach and extends long the foreshore, which links the Manly Yacht Club and 16 Ft Skiff Sailing Club located on the eastern side of the Cove.

The Manly Wharf complex is located to the east mid-way along Manly Cove Beach and is the terminal for ferry transport to and from Circular Quay. The wharf complex contains restaurants and cafés. Opposite and to the north and east of the wharf complex is a commercial and retail precinct, straddling The Corso, a pedestrian mall linking Manly Ocean Beach (approximately 400 metres to the north).

The proposal would demolish the disused Manly Sea Life building which blocks sight lines to the heritage buildings and the wider waterfront areas. This reconnects people to the beach, the wharf complex, and the recreational destinations described, creating a prominent waterfront public realm with better visual amenity and improved walking access.

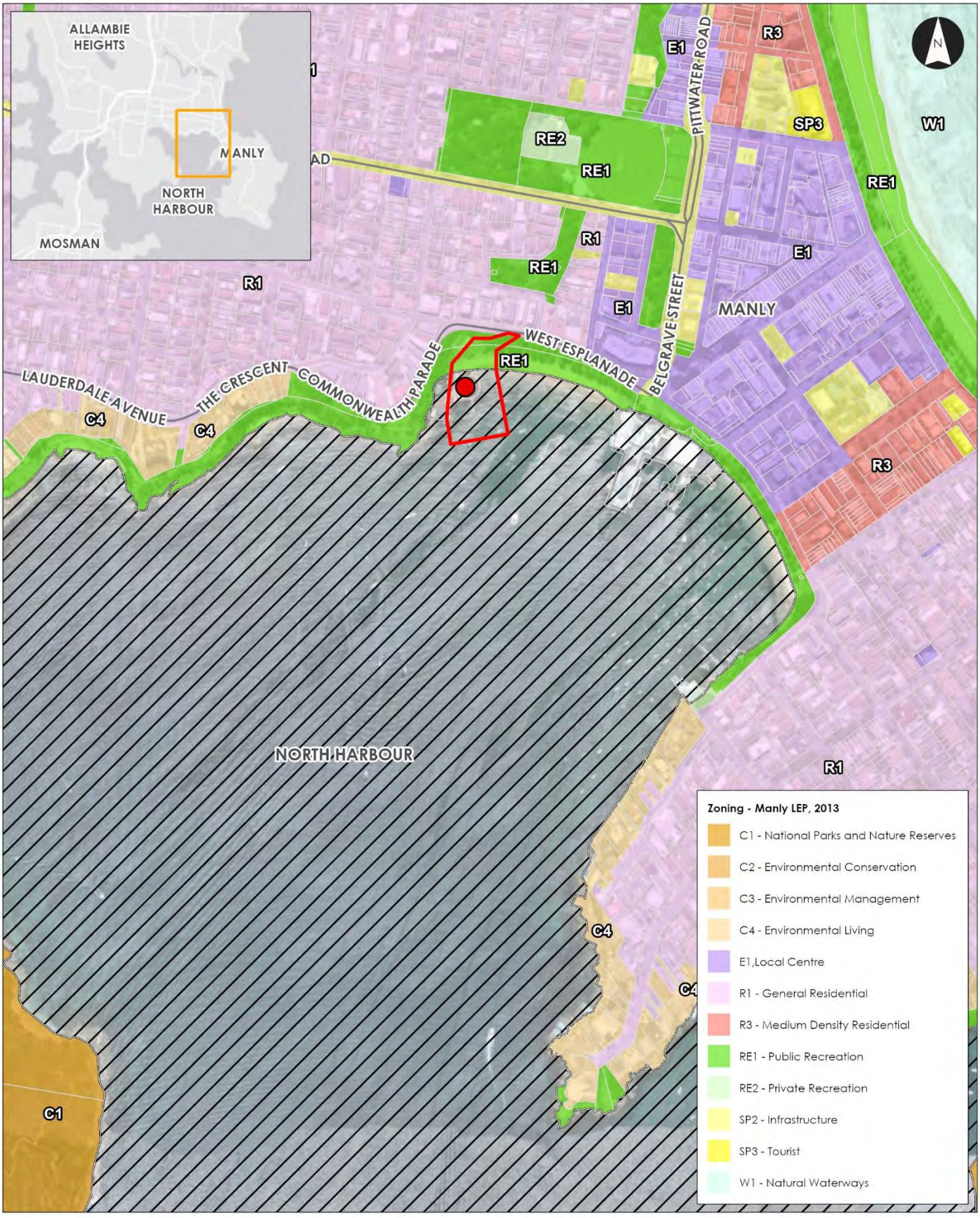


Figure 4-8: Zoning

Manly Cove West Stage 1 REF
Manly, NSW

Project Code: 304501345-GS-006
Drawn By: MM, Checked By: TB
Figure: 4-1 | Rev: 01
Date: 2024-02-26

Stantec

Legend

- Proposal Area
- Manly Sea Life
- Major Road
- Cadastre

Zoning - Biodiversity and Conservation SEPP

- Zone 2 Environment Protection

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery (MetroMap, Nov, 20233)
2. Roads (NSW SS)
3. Cadastre (NSW SS, 2023)
4. Manly LEP Zoning (DPE, 2023)
5. Biodiversity and Conservation SEPP Zoning (DPE, 2023)

0 50 100 150 200 250 Metres

Scale at A4: 1:8,000

This document has been prepared based on information provided by others as cited in the data sources. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.



Figure 4-9 Panoramic view of Manly Cove (Source: Nearmaps)

A logical process was adopted for the identification of the visual catchment of the site and site inspections were conducted to determine the critical view locations within the catchment that are representative of general view towards the site form the public domain. The following six viewpoints were identified to be representative of these locations:

- Viewpoint A – Esplanade Park, northeast of Manly Sea Life building.
- Viewpoint B – Aerial view of site.
- Viewpoint C – South-eastern corner of Manly Pavilion.
- Viewpoint D – Residential Building at 17 Commonwealth Parade, Manly.
- Viewpoint E – Western side of Manly Ferry Wharf.
- Viewpoint F – Manly Yacht Club.

A photomontage (refer Figure 4-11) has been developed to illustrate the proposed changes and to determine the likely visual impact generated by demolishing the former Manly Sea Life building to promenade level and creating a space for public use.

Figures have been selected to identify the different aspects of the proposal and determine the magnitude of the proposed works/structures from critical viewpoints in the proximity of the study area.

Viewpoint A is representative of a close perspective view from the foreshore park (also incorporating pedestrian pathway and beachfront) at West Esplanade, located at the intersection of two pedestrian paths looking south-west toward the site. Manly Cove and the netted swimming area are to the left of frame, while the kiosk and Manly Waterworks are to the right. The existing photograph shows the prominent Manly Sea Life building proposed to be demolished. The proposed demolition removes a substantial element to the viewing of the site from the viewpoint. As illustrated by the photomontage (Figure 4-11), the magnitude of change would be rated high given its visual prominence.



Figure 4-10 Viewpoint A – existing view



Figure 4-11 Viewpoint A - photomontage

Viewpoint B is an oblique aerial image of the site taken from above and west of the site. While not a perspective viewed by the community, this photograph and view illustrates the scale of the proposal and its relationship to Manly Cove. It also illustrates the existing prominence of the Manly Sea Life building.



Figure 4-12 Viewpoint B – existing view

Viewpoint C is located at the south-eastern corner of the State heritage listed Manly Pavilion building, looking north-east back to the beach and Esplanade Park. The existing view is dominated by the Manly Sea Life building and wharf, with Esplanade Park behind.



Figure 4-13 Viewpoint C – existing view

Viewpoint D is located within the property (on entry steps) of an apartment building and faces due east. This view is representative of the impact to residences adjacent to (west of) the proposal area and the proposal (a distance of approximately 60 metres). Having regard to the topography of the area, these residential buildings are elevated above Commonwealth Parade, and the subject site is set at a lower level again to the east, beyond a retaining wall. The Manly Sea Life building is visible behind a screen of trees, with the Manly Pavilion roof visible to the right, and Manly Ferry Wharf in the background. Cabbage Tree Beach is visible at the back left of frame.



Figure 4-14 Viewpoint D – existing view

Viewpoint E is located upon the western side of Manly Ferry Wharf, looking further West to the Manly Sea Life building (a distance of 210 metres). The foreground is dominated by the waters of Manly Cove, with Manly Cove Beach to the right of frame. The Manly Sea Life building is visible at centre frame of the background, while Manly Pavilion occupies the left of the background, and the Manly Art Gallery and Museum is visible at right frame background.



Figure 4-15 Viewpoint E – existing view

Viewpoint F is located upon the western side of Manly Cove at the Manly Yacht Club approximately 560 metres east of the subject site. The waters of Manly Cove are the primary feature in the foreground and centre of the photograph. Manly Ferry Wharf is visible at the centre right frame, with Manly Cove Beach immediately behind. The Manly Sea Life building is visible at the centre frame background, clustered with the Pavilion and Manly Art Gallery. Behind this, Esplanade Park and residential development beyond are visible.



Figure 4-16 Viewpoint F – existing view

4.5 HERITAGE SITES

The study area comprises of the Manly Sea Life building, which is not listed on any heritage registers. However, it is located adjacent to various locally and state listed items as outlined in Figure 4-17. The harbour foreshore itself is listed, in addition to other landscape and built items located in the vicinity of the study area. Refer to Table 4-1 for key heritage items within the vicinity (200 metre radius) of the proposal area.

Table 4-1 Results of register searches for the Manly Sea Life and heritage items in the vicinity (200m radius)

Register	Manly Sea Life	Other items
World Heritage List	Not listed	No items listed
National Heritage List	Not listed	No items listed
Commonwealth Heritage List	Not listed	No items listed
State Heritage Register	Not listed	• Manly Cove Pavilion SHR #01433 • Manly Wharf SHR #01434
Section 170 Registers (NSW Transport Asset Holding Entity [formerly RailCorp] s170)	Not listed	• Manly Cove Pavilion, Dressing Pavilion and Amenities Block (item ID 4920001) is under review for s170 register listing • Manly Wharf (item ID 4920067) is listed on RMS s170 heritage register
Manly LEP 2013	Not listed	• Harbour Foreshore LEP #I1 • All Stone Kerbs LEP #I2 • Residential Flat Building 'Hilder Lea' LEP #I98

Register	Manly Sea Life	Other items
		• House LEP #I115 • Manly Wharf LEP #I145 • Auckland Garage Building (former service station) LEP #I156 • Reserve Park LEP #I237 • Governor Phillip Monument LEP #I248 • Manly Cove Pavilion LEP #I249 • Manly Cove Amenities block LEP #I250 • Park LEP #I251 • Residential Flat Buildings LEP #I252 • House LEP #I92 • House, "Loldis" LEP #I235 • Uniting Church LEP #I253
SEPP (Biodiversity and Conservation) 2021	Not listed	• Manly Wharf, listing number 52
Register of the National Estate (RNE) (Non-Statutory)	Not listed	• Manly Reservoir R64 RNE Listing number 102238
National Trust of Australia (NT) NSW Register (Non-Statutory)	Not listed	• Earls Court Hotel Item ID 7360 • Hotel Manly Formerly Pier Hotel Item ID 7949 • Esplanade Park Fairlight, Item ID 7478

There are no known Aboriginal heritage sites within or near the wharf upgrade area.

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Figure 4-17 – State Heritage Register (SHR) and Local Environment Plan (LEP) listed items within the vicinity (200m radius) of Manly Sea Life (Source: Artefact, 2023)

Heritage Items

22090
Manly Sea Life

LGA: Manly

200 metre buffer
SHR Curtilage
Built
Landscape
LEP Curtilage
Item - General
Item - Landscape

0 25 50 75 100
1:3,000

Coordinate System: GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

SIZE @A4
DATE 17/01/2023

artefact

Document Path: D:\GIS\GIS_Mapping\22090 Manly Sea Life\MXD\22090_Heritage Items_v1_230117.mxd

5.0 STAKEHOLDER CONSULTATION

As described in section 2.4, a comprehensive communication and engagement program was carried out by Transport throughout the project initiation stages (between December 2021 and January 2023) and will continue in the subsequent stages. The key themes and concerns raised and discussed during stakeholder consultation that are relevant to the SEIA of this proposal are collected and documented in Table 5-1.

It should be noted that the scope of works has now (March 2024) changed subsequent to the stakeholder consultation organized between 2021 and 2023. Some of the concerns and issues related to previous scope of works may no longer be applicable to the current scope of works. Please note, concerns that are no longer applicable to this Stage 1 assessment are underscored in Table 5-1, and responses to these concerns are deleted.

Table 5-1 Summary of consultation outcomes and response (summarised based on Manly Cove Manly Wharf 3 Upgrade and Former Manly Sea Life Consultation Summary Report by Transport in July, 2022)

Theme	Concerns and issues raised	Response
Project Proposal	• Concerns about the demolition of the former Manly Sea Life building, which specifically refer to suggestions of the reuse of the building	• The old building closed in 2018 is dilapidated and not easily adapted to a future new use. The building also blocks sight lines to the heritage buildings behind.
	• Concerns about environmental and marine impact due to the demolition work	• Transport acknowledges concerns raised about potential environmental impacts and will consider these in its ongoing planning for the project.
Design considerations	• Request to preserve the existing footprint of the former Sea Life building structure and incorporate this into the boardwalk design	
	• Request for a wider path beside the Manly Pavilion and widened steps. • Request to consider the use of sustainable / recycled materials in the design	
	• Request for improved public amenities, such as more public toilets.	• Provision of new public toilets is not part of the scope for this project.
Environmental consideration	• Potential impacts to marine habitats and biodiversity in Manly Cove (including fairy penguins, sea grasses, seahorses, and other marine life) • Potential impacts on existing trees in Manly Cove.	• The proposal will be subject to an environmental impact assessment process with detailed environmental studies. Once finalised, the community will have an opportunity to comment as part of the public exhibition of the environmental impact assessment. • This assessment is being undertaken as part of the REF.
	• Potential impacts to local heritage and visual character of the heritage buildings on the western edge of Manly Cove	• Design principles used for the proposal have considered both heritage and visual impacts. • A Statement of Heritage Impact (SOHI) and Landscape Character and Visual Impact Assessment (LCVIA) are prepared as part of the environmental impact assessment process. The SOHI assesses potential impacts of the proposal on items of heritage value in proximity to the site.

Theme	Concerns and issues raised	Response
		The LCVIA evaluates the potential impacts on viewpoints in Manly Cove. • These assessments are being undertaken as part of the REF.
	• Request for acknowledgement of Indigenous history to be incorporated into the design.	• Transport is currently working with the Metropolitan Local Aboriginal Land Council and other traditional stakeholder groups to identify and consider aspects of cultural heritage in the proposal. • Transport will continue work with the Aboriginal community to identify opportunities to enable ongoing involvement, and to incorporate Aboriginal culture and language into the design of the project.
Recreational berthing in Manly Cove	• Concern regarding potential impacts of recreational berthing • Request to expand the availability of public moorings in Manly Cove	• Recreational berthing is not part of the Manly Sea Life proposal. • The provision of additional moorings within Manly Cove is not within project scope.
Placemaking considerations	• Requests to provide dining options, seating and relaxation spaces for the community along the proposed new extended boardwalk. • A few requests were received for the former Sea Life site not be used for dining options or for any kind of events.	

6.0 CONSTRUCTION IMPACT ASSESSMENT

The socio-economic impacts associated with the construction of the proposal are described and examined in this section.

The construction of the proposal would likely result in some changes and negative impacts during construction on the existing socio-economic environment for the businesses and residents in the local community.

The sensitivity and magnitude of the identified impacts have been determined using the methodology outlined in section 2.5. The tables showing the level of sensitivity (Table 2-2), level of magnitude (Table 2-3), and level of significance (Table 2-4) have been engaged. Outcomes from the assessment are summarised in Table 6-1.

Table 6-1 A summary of socio-economic impact of the proposal construction

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
Property						
Partial lease of land from the local government to support construction.	No property would be acquired under the proposal. The additional land needed to support construction would be used under agreement with Northern Beaches Council.	**Neutral** Direct Temporary	Leaseholders	**Negligible** Land needed for set up of temporary beach reclamation area and construction compound area would be sought via agreement with the Northern Beaches Council who are responsible for the property.	**Negligible** No discernible changes in the land due to the impact. The construction compound would only utilize the grassed area and no tree clearance would be required. Fence and tree protection would be in place to ensure the trees are free from damage.	**Negligible**

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
					The changes are expected to be temporary during the construction stage and limited to a small geographic area.	
Access and connectivity						
Changes to pedestrian facilities and active transport routes nearby the proposal site.	The following active transport management measures are required during construction: • shared pedestrian/vehicle access along West Esplanade • closure of the accessible parking spot (DDA space) and loading parking bay along the haul route. • boardwalk in front of Manly Pavilion is closed to public due to safety issues. • Fairlight Walk would remain open to public, however, alternate access options would be provided. • public access to Manly Pavilion, Manly Waterworks and Café, Manly Aart Gallery and Museum, and the public amenities block would be maintained, however, alternate access arrangements	**Negative** Direct Temporary	Local residents, and local businesses	**Low** Given that construction of the proposal would be staged, impacts on the access to the Manly Pavilion, the Manly Art Gallery and Museum, and other businesses or public amenities block would be temporary. Alternative access options with access ramp would be provided throughout the construction period to ensure the impacts are minimized.	**Low** Albeit the active transport access would differ from the baseline conditions, the changes are expected to be temporary and limited to small geographic area.	**Low**

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
	would be provided. An additional temporary ramp would be established to ensure wheelchair access is provided.					
Temporary changes to the access and use of haulage routes and West Esplanade.	The following changes in the access to West Esplanade would be required during construction: • additional no stopping zones on West Esplanade • stop-go provisions on West Esplanade during major deliveries that take place by road • heavy vehicles accessing the site during site establishment, demolition and construction • closure of the accessible parking spot and loading parking bay along the haul route.	**Negative** Direct Temporary	Residents	**Moderate** Considering the increased traffic and reduced mobility along West Esplanade, residents are likely to experience increased travel time, resulting in a moderate level of sensitivity to the compromised access in West Esplanade.	**Low** Changes to the access to West Esplanade would be temporary and limited to a small geographical area.	**Moderate-Low**
Community values and local amenity						
Changes to visual amenity nearby the proposal area due to construction activities.	Residents near the proposal site would be able to view construction activities and associated construction equipment and materials. This includes the demolition of the former Manly Sea Life building. This is likely to negatively affect the aesthetic nature and scenic value in the vicinity of Manly Cove and may	**Negative** Direct Temporary	Residents and visitors	**Low** Consultation with residents and local government would be carried out prior to construction. As such affected stakeholders are expected to be adaptable to changes.	**Low** Changes to visual amenity near the proposal area are expected to be temporary, limited to a small area in the vicinity, and	**Low**

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
	lead to reduced usage or enjoyment of outdoor areas.				impact a small portion of residents.	
	The presence of construction activities and associated construction equipment would negatively affect the scenic value and aesthetic nature of the study area.	**Negative** Direct Temporary	Residents and visitors	**Low** Signage would be placed to inform residents and visitors of construction activities in the proposal area. Impacts would last for the duration of time spent around the proposal area.	**Low** Changes are expected to be temporary and limited to a small area in the vicinity of the proposal area.	**Low**
	Local businesses, customers, and visitors (of the adjacent public facility like the Manly Art Gallery and Museum) located facing Manly Sea Life building would be able to view construction activities and associated construction equipment and materials during construction stage. Waterfront and beachfront views are key attraction points for customers and tourists visiting recreational destinations at Manly Cove. This may lead to reduced level of usage and visitation of recreational destinations and compromised enjoyment of the outdoor areas.	**Negative** Direct Temporary	Local businesses, customers, and visitors	**Moderate** Consultation with affected stakeholders would be organized prior to and throughout construction. Signage would be placed to inform residents and visitors of construction activities in the proposal area.	**Low** Changes are expected to be temporary and limited to a small area in the vicinity of the proposal area.	**Moderate-Low**

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
Impacts on State Heritage place and Local Environment Plan (LEP) -listed sites.	The proposal would have impacts on the Manly LEP listed 'Park' and 'Harbour Foreshore' and the state heritage listed Manly Pavilion. This may result in a temporarily compromised character for the local area, however, as outlined in the statement of heritage impact report prepared for the REF, the proposal would not alter the character of the heritage places in Manly Cove precinct or cause the loss of significant fabric.	**Negative** Direct Temporary	Residents and visitors	**Moderate** Residents are likely to have a moderate level of sensitivity to potential impacts on heritage characters in the proposal precinct during construction stage.	**Low** Changes are expected to be temporary, not reduce the overall heritage character in the precinct, and limited to the small area in the vicinity of the proposal area.	**Moderate-Low**
Increased vibration and noise levels due to construction activities.	Increased noise levels caused by construction activities may be a nuisance to some residents, especially vulnerable residents who are sensitive to noise and may find it hard to adapt to compromised amenity.	**Negative** Direct Temporary	Residents	**Moderate** Consultation with residents would be carried out prior to construction. Potentially affected receivers would be notified before undertaking any noisy construction activities.	**Low** Changes are expected to be temporary and limited to the small area in the vicinity of the proposal area.	**Moderate-Low**
Dust generated from construction activities may impact air quality on nearby residential areas.	Increased dust caused by exhaust from heavy vehicles and construction machinery, construction and demolition works, and limited earthworks could lead to negative impacts on local residents' way of living, such as keeping windows	**Negative** Direct Temporary	Local residents and businesses	**Low** No significant impacts expected.	**Low** Changes are expected to be temporary and limited to the small area in the vicinity of the proposal area.	**Low**

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
	closed and reducing outdoor activities in their yards.					
Economy, employment and business						
Impacts on parking availability, transport accessibility as well as reduced amenity due to construction activities may deter customers at businesses, in particular hospitality related businesses, at Manly Cove.	The combination of reduced transport access to and compromised amenity (visual and noise) of business near the proposal site would occur as a result of construction activities. These factors may lead to potential customers being deterred from accessing recreational destinations (like café and restaurants) during construction, and/or result in other customers not returning to the area due to a negative experience. Transport consultation indicated that customer loss is a concern amongst operators. It should however be noted that the impact would be temporary in nature and the proposal work would have a major positive impact, by improving accessibility in the proposal area and restoring views of Manly Pavilion which had previously been blocked by the intrusive Manly Sea Life building.	**Negative** Direct Temporary	Business owners and other operators	**Moderate** Businesses are likely to have a moderate level of sensitivity to potential reduction in customer and visitor volume and business turnover.	**Low** Changes are expected to be temporary (with alternative access being provided) and limited to the small area in the vicinity of the proposal.	**Moderate-Low**

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
Increased construction employment opportunities.	It is estimated that about 30 people would be needed to carry out the main construction activities during construction stage. There would be approximately 10-15 people on site at any time on average. This would lead to direct construction employment opportunities which would be locally sourced where possible, with targeted indigenous participation.	**Positive** Direct Temporary	Job seekers from construction and engineering industry in regional study area	**Low** The sensitivity to changes in regional and local employment market are perceived to be low given the low level of employment in the study areas.	**Negligible** Considering the temporary nature of the construction employment opportunities, the increased construction labor demand is less likely to be discernible from the existing market.	**Negligible (Positive)**
Increased opportunities for local businesses to supply goods and services to the construction workforce.	The construction workforce would likely increase the local demand for food and beverage and other retail services close to the site of the proposal. This is likely to increase turnover to local businesses, particularly those food and service providers located in and immediately around the proposal site.	**Positive** Direct Temporary	Local businesses	**Low** Considering that the size of anticipated construction workforce is small relative to the large volume of customers currently served by the local businesses, the local businesses are not expected to be sensitive to this change.	**Negligible** Increase in local business turnover attributed to the construction workforce is expected to be temporary.	**Negligible (Positive)**



7.0 OPERATIONAL IMPACT ASSESSMENT

The socio-economic impacts associated with the operation of the proposal are described and examined in this section.

The proposal has the potential to benefit the community in the broad regional and local area in the medium to long run through enhanced visual amenity and improved access and connectivity for users of the social infrastructure and public realm nearby the proposal.

The sensitivity and magnitude of the identified impacts have been determined using the methodology outlined in section 2.5. The tables showing the level of sensitivity (Table 2-2), level of magnitude (Table 2-3), and level of significance (Table 2-4) have been engaged. Outcomes from the assessment are summarised in Table 7-1.

Table 7-1 A summary of socio-economic impact of the proposal operation

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
Access and connectivity						
Enhanced public waterfront and beachfront access in the vicinity of the proposal area.	The proposal area is located adjacent to the 'Fairlight Walk', a pedestrian walkway along the coastline that forms part of the 'Spit to Manly walk' and connects people to the waterfront and beachfront recreational places. The proposed demolition would result in better connectivity of the coastline walking and cycling route.	**Positive** Direct Long term	People who stop by and dwell in the area adjacent to the proposal area.	**Moderate** Because the proposal forms a part of the coastal pedestrian walk and comprises a cluster of recreational destinations, LEP-listed sites, and state-listed heritage which are widely used by residents, visitors, and tourists, it is expected that these users would be sensitive to the upgrade.	**High** The change and its impacts are expected to be long term, which are highly noticeable and would be experienced by a large number of people who stop by or dwell in the and adjacent to the proposal area.	**High-Moderate (positive)**
Temporary impact of the beach reclamation area.	Temporary reclamation of a portion of Manly Cove Beach with gabion basket or rock/sand bag retaining wall would stay in the vicinity of the construction site for up to a year between stages 1 and 2. The	**Negative** Direct Temporary	People who stop by and dwell in the area adjacent to the proposal area.	**Low** Public access to the beach reclamation area would be allowed in the interim between Stages 1 and 2, and a new barrier (e.g. F-	**Low** Changes are expected to be temporary and limited to the small area in the	**Low**

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
	reclamation area would allow for a construction vehicle turning circle and plant staging area during Stage 1. The reclamation area would compromise public access to beachfront.			type concrete barrier or similar) would be placed around the perimeter of the beach reclamation area to ensure public safety. As a result, the impact of the reclamation area is expected to be low.	vicinity of the reclamation area.	
Community values and local amenity						
Wider public space.	The proposal includes the removal of the dilapidated Manly Sea Life building, featuring a wider public area for various physical activities and passive recreational use.	**Positive** Direct Long term	People who stop by and dwell in the area adjacent to the proposal area.	**Moderate** Because the proposal area is highly scenic and popular which is widely appreciated and used by a large volume of people, it is expected that these users would be sensitive to the upgrade.	**High** The change and its impacts are expected to be long term, which are highly noticeable and would be experienced by a large number of people who stop by or dwell in and adjacent to the proposal area.	**High-Moderate (positive)**
Impacts on visual amenity and scenic value.	The demolition of the old Manly Sea Life building enables direct visibility to Manly Pavilion and close proximity to high use areas including coastal reserves and beach, and heritage structures. The revealing of the Manly Pavilion building, with its modest scale and heritage character within the landscape setting would be noticeable to the viewer.	**Positive** Direct Long term	Local businesses, and people who stop by and dwell in the area adjacent to the proposal area.	**Moderate** Because the proposal area comprises a cluster of public facilities and assets, is highly scenic and popular, which is widely appreciated and used by a large volume of people, it is expected that these users would be sensitive to the upgrade.	**High** The change and its impacts are expected to be long term, which are highly noticeable and would be experienced by a large number of people who stop	**High-Moderate (positive)**

Change as a result of the proposal	Summary of the potential impact	Nature, type and duration of impact	Affected stakeholders	Sensitivity	Magnitude	Level of significance
					by or dwell in and adjacent to the proposal area.	
Improved social infrastructure and public realm.	The new public realm delivered by the proposal provides more comfort for people who stop by and dwell in the proposal area, facilitating the proposal area to be regarded as an attractive and safe piece of public domain.	**Positive** Direct Long term	People stop by and dwell in the area adjacent to the proposal area.	**Moderate** Because the proposal area, comprising a cluster of public facilities and assets is highly scenic and popular, which is widely appreciated and used by a large volume of people, it is expected that these users would be sensitive to the upgrade.	**High** The change and its impacts are expected to be long term, which are highly noticeable and would be experienced by a large number of people who stop by or dwell in and adjacent to the proposal area.	**High-Moderate (positive)**
Economy, employment and business						
Increased patronage and opportunities for local businesses.	With improved transport accessibility and better amenity characters, the new public realm in the proposal area is expected to attract a growing number of visitors, generating more opportunities for nearby businesses.	**Positive** Direct Long-term	Local businesses	**Moderate** Because the proposal area is highly scenic and popular, where a growing volume of people would come and visit, it is expected that the local businesses nearby the proposal area would be sensitive to the increased patronage.	**High** The change and its impacts are expected to be long term, which would be experienced by the local business in and adjacent to the proposal area.	**High-Moderate (positive)**

8.0 CUMULATIVE IMPACT ASSESSMENT

Other planned public initiatives may be undertaken concurrently with this proposal, resulting in potential cumulative socio-economic impacts in the local and regional study areas during the construction and operation of the proposal.

The potential cumulative socio-economic are described and summarized in Table 8-1.

Table 8-1 A summary of other projects in proximity to the proposal

Project	Project description	Construction impacts	Operation impacts
Manly West Esplanade Heritage Activation Plan (Northern Beaches Council, 2019)	West Esplanade is located within the western section of Manly Cove, stretching from Manly Wharf, west to the Manly Pavilion. The *Plan* highlights the history of the area pre and post European settlement. The plan aims to identify ways to help the community appreciate, interact with and enjoy the heritage of the area, and explore the nostalgia of West Esplanade including the art gallery facade.	Implementation of the plan may overlap with construction of the proposal. During this time local residences and businesses along West Esplanade may experience reduced or restricted transport access, elevated negative environmental externalities (noise and dust), compromised visual amenity, general disturbances and potential inconveniences from increased activities and traffic volume in the local area.	Operations of the proposal and the West Esplanade activation plan would result in a revitalized Manly Cove area with improved public waterfront access, greater visual and scenic amenity, and better public realm with improved placemaking and public facilities. History and the community value in the Manly Cove area would be facilitated through both the proposal and the West Esplanade area.
Manly Wharf 3 project (Transport for NSW, 2022)	The upgrade of Manly Wharf 3 will be delivered under the Ferry Wharf Upgrade Program (FWUP), which forms part of the Transport Access Program. The project includes significant construction works, including widening public promenade, establishing a covered customer waiting area, removing shade coverings between the Manly Wharf 1 and 2 building, removing the roof from the gangway of Wharf 3, etc.	Construction of Manly Wharf 3 is expected to start in mid 2024 and take up to eight months to complete, which may overlap with the construction of the proposal. During this time local residences and businesses along West Esplanade may experience reduced or restricted transport access, potential cumulative travel delays, elevated negative environmental externalities (noise and dust), compromised visual amenity, general disturbances and potential inconveniences from increased activities and traffic volume in the local area.	Operations of the proposal and the Manly Wharf 3 project would have a long-term positive cumulative impact in the study areas. People travelling to the recreational destinations in Manly Cove would experience upgraded public waterfront access and improved amenity.

Project	Project description	Construction impacts	Operation impacts
Manly Cove Pavilion Boardwalk Remedial Works (Nothern Beaches Council, 2022)	Northern Beaches Council is proposing to undertake remedial works to the timber federation boardwalk along the southern edge of Manly Pavilion.	Timing of the proposed works work may overlap with the construction of the proposal. During this time local residences and businesses along West Esplanade may experience reduced access to beachfront open space, reduced or restricted pedestrian access, potential cumulative travel delays, compromised visual amenity, general disturbances and potential inconveniences from increased activities and traffic volume in the local area.	After the remedial works, operations of the Manly Federation Boardwalk would have a long-term positive cumulative impact in the study areas. People travelling to the recreational destinations in the Manly Cove would experience upgraded public waterfront access and improved amenity.

9.0 RECOMMENDED MITIGATION AND MANAGEMENT MEASURES

The management and mitigation measures recommended in the SEIA target avoiding or minimising negative socio-economic impacts and enhancing potential benefits (outlined in Table 6-1, Table 7-1, and Table 8-1).

Closely incorporating and consulting key stakeholders and local communities in the planning, design and implementation of the proposal on an ongoing basis would be the key to avoiding, minimising and mitigating the negative socio-economic impacts associated with the proposal.

The measures developed to manage potential socio-economic impacts during the construction and operational phases are delineated in Table 9-1. Along with other measures listed in other technical reports and statements of impact assessments (such as landscape and visual impacts, noise and air quality impacts, and heritage impacts) prepared for the proposal, those mitigation strategies are expected to manage potential socio-economic and environmental impacts arising from the proposal.

Table 9-1 Mitigation measures

Socio-economic impacts	Mitigation measure	Description	Timing
General socio-economic impacts to residents and businesses	Community and Stakeholder Engagement Strategy	Transport has been engaging with the local community and key stakeholders during the planning stages of the proposal and will continue this engagement to provide timely and accurate information to stakeholders. This will help to ensure that: • The community and stakeholders are aware of the proposal progress and activities. • The community and stakeholders are given notice of the possible occurrence of any negative impacts (disturbances or disruptions) well in advance. • Detailed and accurate information about the proposal is available and accessible. • Community and stakeholders have access to report concerns and complaints regarding the proposal. • Timely response to any concerns or complaints raised by the community and stakeholders is provided.	Pre-construction and construction
General socio-economic impacts to residents and businesses	Communication management plan	A communication management plan dedicated to the proposal will be prepared by the primary construction contractor in line with the Community and Stakeholder Engagement Strategy and undertaken to identify the specific requirements for engagement during the construction stage. Engagement will include, and not be limited to, construction notifications and provision of signage.	Construction

Socio-economic impacts	Mitigation measure	Description	Timing
		The purpose of this engagement is to: • Notify the stakeholders about the schedule and arrangement of construction work and activities. • Notify the stakeholders about the potential changes to traffic access, changes to the use of public space and facilities in the vicinity of the proposal site area, impacts to adjacent heritage, noisy construction activities, and out-of-hour work. • Ensure enquiries and complaints raised by stakeholders are addressed in a timely manner. The communication management plan would define the requirements for the complaints management system to be implemented throughout the duration of the proposal, including 24-hour, seven days a week phone line, postal and email address for written enquiries, and publication of contact details.	
Socio-economic impacts to businesses	Construction and communication with businesses	Direct consultation with businesses will be carried out throughout the planning, detailed design and construction stages of the proposal to ensure that businesses owners or operators are made aware of any design features and construction activities that may affect the operation of their business. Continued consultation with business owners and operators throughout the construction phase will be crucial to understand and mitigate any access impacts associated with the proposal.	Pre-construction and construction
Employment and business opportunities	Local and Indigenous employment and procurement	Aligned with Transport's Aboriginal Participation Strategy (TfNSW, 2021). Transport has committed to prioritising opportunities for Indigenous workers and procurement in its proposals in line with the NSW's Governments Aboriginal Procurement Policy (NSW Treasury, 2021). This includes local and Indigenous participation commitment in its tender documents which outline the sub-contracting, employment, training, Indigenous and community contributions that contractors would need to deliver.	Pre-construction

10.0 CONCLUSION

The former Manly Sea Life building, closed in 2018, is dilapidated and not easily adapted to a future new use. The building also blocks sight lines to the heritage buildings behind. The existing old timber jetty located nearby the Manly Sea Life building has limited capacity to accommodate anticipated number of pedestrians and people with accessibility needs, especially during September to March which are peak times.

Transport proposes to demolish the former Manly Sea Life building to promenade level. The proposal creates prominent waterfront space and enables various activities such as walking, cycling, and outdoor dining. The improved public access via beaches and safety features incorporated into the design facilitates a family-friendly public realm with better placemaking.

This SEIA has identified and assessed the potential positive and negative social impacts associated with the construction and operation of the proposal, as well as cumulative impacts that may occur concurrently with the implementation of other initiatives in the surrounding area.

In the long term, the operation of the proposal is envisioned to provide a variety of socio-economic benefits for both the local and broader community, including:

- Enhanced public waterfront and beachfront access in the vicinity of the proposal area.
- Wider public space with improved walking platform.
- Improved visual amenity and scenic value.
- Improved social infrastructure and public realm with better placemaking.

In the short term, the potential positive impacts arising from the construction of the proposal are:

- Increased construction employment opportunities which will be locally sourced where possible, with targeted indigenous participation.
- Increased opportunities for local businesses to supply goods and services to the construction workforce.

While the proposal design has sought to minimise the impacts of construction as best as possible, the proposal is expected to have some negative impacts, including:

- Temporary changes to pedestrian facilities and active transport routes nearby the proposal site.
- Temporary changes to the access and use of Fairlight Walk in front of Manly Pavilion, Haulage routes and West Esplanade.
- Temporary changes to visual amenity nearby the proposal area due to construction activities.
- Temporary impacts on State Heritage place and Local Environment Plan (LEP) listed sites.

It is noteworthy that all the aforementioned negative impacts would be temporary in nature and are not expected to have a level of significance over ‘Moderate-Low’. It is considered that the negative impacts can be closely monitored and effectively managed with the implementation of mitigation measures identified in section 9. It is anticipated that the proposal would have an overall profound and beneficial impact on both the Manly and the wider Northern Beaches area.

11.0 REFERENCES

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APPENDIX A

Scoping Checklist

Scoping checklist

Issues	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents/ special interest groups/ businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
Property impacts	Are property acquisitions likely?	No				N/A	N/A
	Is there a potential for displacement of residents or businesses due to property acquisition?	No				N/A	N/A
	Will there be impacts on vulnerable groups (i.e. elderly, people in need of assistance, communities that demonstrate higher levels of disadvantage)?		Yes			Yes- Enhanced access benefits to public realm surrounding the proposal site could be enhanced through ongoing consultation with stakeholders.	Minority groups include people with a disability, people with mobility difficulties, and people with prams.
	Will the project impact upon any property improvements?	No				N/A	N/A
	Does the project result in fragmentation of rural properties?	No				N/A	N/A
Changes to population and demography	Will residents need to relocate as a result of property acquisition?	No				N/A	N/A
	Will the project's construction result in a large influx of workers to the study area?	No				N/A	30 people are needed to carry out the main construction, and 15 people are expected to be on site at any time. Construction workforce not likely to result in significant social impacts for local community.
Economy	Will the project impact on local employment?			Yes		Yes - Impacts could be managed by ongoing liaison with local commercial chamber and/or Indigenous groups about local	The construction workforce would be locally sourced where possible, with targeted Indigenous participation.

Issues	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents/ special interest groups/ businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
	Will the local population benefit from improvements in income as a result of the project?			Yes		employment and procurement opportunities	Increase in local construction turnover and increase in income for those hired on the project.
Business and industry	Does the project impact (either directly or indirectly) on businesses/ commercial enterprises, including agricultural businesses?		Yes			Yes - Impacts could be managed by ongoing consultation with affected local businesses.	Access constraints in construction stage and changes to access in operation stage may affect local businesses. Changes to local amenity during construction stage may impact customers at business surrounding the proposal site. Procurement opportunities for local businesses. Construction workforce spending at local businesses.
	Are impacts on businesses likely to have flow on effects for employees?		Yes			Yes - Impacts could be monitored and managed by ongoing consultation with affected local businesses.	Changes to amenity may be disruptive for employees
	Is the project likely to have direct or indirect effects on the regional economy?		Yes			N/A	Procurement opportunities for local businesses
	Will the project result in changes in access to or bypass of businesses?		Yes			Yes - Impacts could be monitored and managed by ongoing consultation with affected local businesses. Maintain alternative access and minimize the impacts of access constraints during the construction phase.	Changes to access during construction phase.
	Does the project impact on the composition of regional	No				N/A	N/A

Issues	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents/ special interest groups/ businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
	industries (i.e. tourism, agriculture, mining and resources, manufacturing)?						
Social Infrastructure	Will the project impact (directly or indirectly) any community services or facilities such as hospitals, schools, recreational facilities, aged care, etc.?		Yes			Yes – maintain alternative access to recreational facilities and destinations surrounding the proposal site during construction	The construction compound areas, including an office and amenities compound, construction compound, materials handling and load out area, would likely be in the vicinity of the Manly Art Gallery and Museum and on a reclaimed section of Manly Cove Beach. Access to those areas will be constrained temporarily during construction.
	Will the project impact on places that are used by the homeless for shelter or socially disadvantaged to congregate?	Unknown				N/A	N/A
Community values, including community health and safety, and community cohesion/ severance	Does the project impact on any places of Aboriginal or non-Aboriginal heritage?		Yes			N/A	The proposal would have temporary impacts on the state heritage significance of the Manly Cove Pavilion due to the demolition of the former Sea Life building.
	Does the project impact on any places likely to be of importance to the local community (i.e. environmental areas, local parks, local monuments, etc.)?		Yes			Yes - Access to the remaining part of beach, grass area, and the local parks outside of the construction compounding will be maintained during construction.	Access to the Manly Local Environmental Plan (LEP) listed 'Park' and 'Harbor Foreshore', the Manly Cove Amenities block, and the Manly Art Gallery will be constrained temporarily during construction.

Issues	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents/ special interest groups/ businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
	Do sections of the community have a strong attachment to place (e.g. large number of generations of a family have lived in the same area)?	No	Unknown			N/A	N/A
	Is there a potential for impacts (real or perceived) on community health or safety due to emissions to air or water, noise or chemical hazards?	Yes	Unknown			Yes - The proposal would be built under Transport specifications as managed by the Contractor under a Construction Environmental Management Plan (CEMP). The specifications included in the CEMP would cover factors such as environmental performance and management, materials storage and management and water quality. And the CEMP is expected to manage these changes. The dewatering of the shark and sediment level tanks as well as remedial work below the promenade slab would follow further specialist advice in terms of the risk and the appropriate method of disposal of water from the tanks.	Potential minor noise and air quality impacts at nearby residents and sensitive receivers during construction.
	During construction, is there a potential for impacts (real or perceived) on community health or safety due to emissions to air	No	Unknown			N/A	N/A

Issues	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents/ special interest groups/ businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
	or water, noise or chemical hazards?						
	Is there the potential for severance of communities or towns?	No				N/A	N/A
	Will the project change the way people use and access community facilities?	No				N/A	N/A
	Will the project change the unique character of the place or community in which it is located?	No				N/A	N/A
	Will the project result in changes to places of commemoration or memorialisation or with other intangible values?	No				N/A	N/A
Local amenity	Will the project change the amenity for residents, businesses, or community facilities? (i.e. through changes in air quality, visual and landscape impacts, noise and vibration)		Yes			Yes - Impacts could be monitored and managed by ongoing consultation with affected local businesses.	The proposed demolition of the Manly Sea Life building would impact the view of the precinct from within and from outside the study area.
	During construction, will the project change the amenity of residents, businesses or community facilities? (i.e. through changes in air quality, visual and landscape impacts, noise and vibration)		Yes			Yes - The proposal would be built under Transport specifications as managed by the Contractor under the CEMP which is expected to manage these impacts.	Potential impacts on amenity of nearby residents, businesses and community facilities due to construction activities.
Access and connectivity	Will the project change:						
	• travel patterns	Yes				N/A	N/A

Issues	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents/ special interest groups/ businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
	(e.g. introduce turning restrictions, traffic signals, road closures, new connections, etc.)						
	• cyclist facilities or access	No				N/A	N/A
	• pedestrian access (i.e. access to public transport, and to/ within commercial precincts, town centres, recreational locations, shops)	Yes				Yes – benefits could be optimized by ongoing consultation with stakeholders	Removing the former Manly Sea Life building would result in better connectivity of the coastline walking and cycling route.
	• public transport services or facilities	No				N/A	N/A
	• parking	No				N/A	N/A
	• property access	No				N/A	N/A
	• access for people with special needs (i.e. people with mobility difficulties, elderly, children, etc.)	No				N/A	N/A
	During construction, will the project						
	• generate large volumes of traffic	No				N/A	N/A
	• change pedestrian, cyclist or property access	Yes				Yes – Traffic control measures would be established in accordance with the traffic management plan (TMP).	Access to Fairlight Walk, other amenity blocks, and businesses would remain open to public with alternate access options (and wheelchair access) provided. There will be traffic management approaches like shared pedestrian, limited access and potential temporary partial closure (in accordance with the

Issues	Consideration	Scale of impact				Is the impact manageable using standard mitigation measures? If yes, how?	Comment
		Individuals only	Groups of residents/ special interest groups/ businesses	Sections of the community/ economy	Towns/ suburbs/ town centres		
							site-specific TMP) along West Esplanade.
	• alter public transport services or facilities	No				N/A	N/A
	• Alter travel patterns	Yes				Yes – Traffic control measures would be established in accordance with the traffic management plan (TMP).	Stop-go provisions on West Esplanade during major deliveries that take place by road. Shared vehicle access along West Esplanade.
	• Impact on traffic flow	No				N/A	N/A

Appendix I - Procedure for Aboriginal cultural heritage consultation and investigation

24 April 2023

Lisa Monaghan
Senior Development Manager
Transport for NSW

Dear Lisa Monaghan

Preliminary assessment results for Manly Cove West – Former Manly Sea Life Upgrade based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation* (the procedure).

The project, as described in the Stage 1 assessment checklist (see attached), was assessed as being unlikely to have an impact on Aboriginal cultural heritage.

The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and the Transport for NSW procedure.
- The cultural heritage potential of the study area appears to be reduced due to past disturbance.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If the scope of your project changes, you must contact me and your regional environmental staff Louis Dardare to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the course of the project, all works in the vicinity of the find must cease. Follow the steps outlined in the Transport for NSW *Unexpected Archaeological Finds Procedure*.

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For further assistance in this matter do not hesitate to contact me.

Yours sincerely



Noni Ross
Aboriginal Cultural Heritage Advisor – Sydney Region

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