Review of Environmental Factors

Garden Street Headwall Repair

Prepared pursuant to Part 5 of the Environmental Planning and Assessment Act, 1979

Natural Environment & Climate Change
Northern Beaches Council
Civic Centre
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1 Introduction and Background

This Review of Environmental Factors (REF) has been prepared in order to fulfil the requirements of Part 5 of the *Environmental Planning and Assessment Act, 1979* for the proposed works as described below. This REF presents details of the proposed upgrade works, assesses the existing natural and social environments, describes the potential impacts on the environment; and presents safeguards to mitigate these identified impacts.

2 The Site and Surrounding Environment

2.1 Site Information

The Garden Street Headwall Project (the 'project') is located at the Garden Street crossing of Mullet Creek, which originates in the Northern Beaches Council ('Council') Local Government Area (LGA) and is at an elevation of approximately +4.0m Australian Height Datum (AHD). The catchment area draining to the headwall is approximately 3.7 km^2 which includes the suburbs of Ingleside and Elanora Heights. Mullet Creek collects stormwater runoff from the catchment and eventually discharges into South Creek (Narrabeen Lagoon). Please refer to **Figures 1** and **2** for the site location.

The culvert crossing consists of four (4) 1800mm diameter culverts and an additional 375mm diameter stormwater outlet for local street drainage. The project is focussed on replacing the headwall structure on the downstream side of the road crossing, which has been assessed as being in a deteriorated condition.

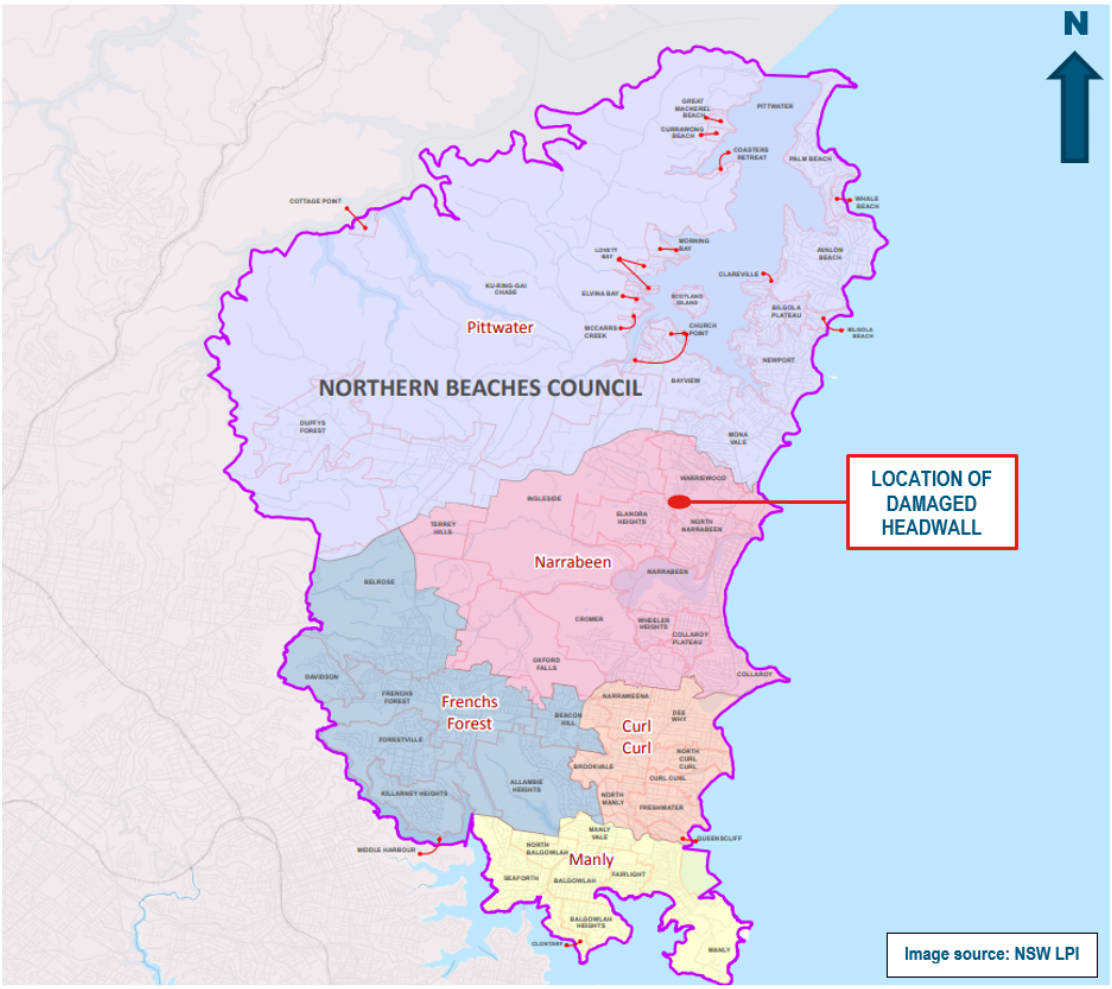

Figure 1 – Site Location

Figure 2 – Aerial photo showing the approximate location of the headwall (Source: Google Maps)

As documented in the *Ingleside, Elanora and Warriewood Overland Flow Flood Study* (WMAwater, 2019), peak flows and flood levels at Garden Street for a range of design storm events can be summarised as below (*refer* **Table 2-1)**.

Table 2-1 Peak Pipe and Overland Flows at Garden Street, Mullet Creek

Design Storm Event	Peak Flood Level[1] (mAHD)	Peak Flow (pipe)[2] (m^3/s)	Peak Flow (overland)[3] (m3/s)
20% AEP[4]	3.94	32.4	32.7
10% AEP	4.00	32.7	44.5
5% AEP	4.07	33.0	59.5
1% AEP	4.15	33.6	88.1
0.1% AEP	4.31	31.9	140.4
PMF	4.89	33.5	395.0

1. Peak flood levels as documented in Table 26 of WMAwater (2019) at Location H12.
2. Peak flows as documented in Table 28 of WMAwater (2019) at Location ID Q07. It is noted the location described in Table 28 is 'Narrabeen Creek under Macpherson Street', however based on Figure 15 of the same report the location ID Q07 coincides with the culverts under Garden Street at Mullet Creek. It is assumed the pipe flow corresponds to the peak discharge through the four Ø1800 culverts, however this is not stated explicitly in the report.
3. Peak flows as documented in Table 28 of WMAwater (2019) at Location ID Q07. It is noted the location described in Table 28 is 'Narrabeen Creek under Macpherson Street', however based on Figure 15 of the same report the location ID Q07 coincides with the culverts under Garden Street at Mullet Creek.
4. Annual Exceedance Probability (AEP)

Across three separate site visits, the water depth in the creek downstream of the culverts was observed to be approximately level with the downstream invert of the culverts. A concrete apron extends up to 4.5 metres downstream. The creek bed is approximately 14 metres wide and the creek bank slopes range between 1V:2H to 1V:1H. During site investigations, the banks were observed to be vegetated with mainly invasive groundcover species along with native and invasive understorey and mid-storey species. The vegetation recorded on site was observed to be in poor condition given the high level of disturbance and occurrence of weeds.

Aquatic vegetation was not observed in the section of the creek bed located within the proposed area of works during site investigations.

2.2 Location of Activity

The location of the proposed activity is summarised in **Table 2-2**.

Table 2-2 Location of Proposed Activity

Common name of site	Garden Street Downstream Headwall		
Street Address	Garden Street		
Suburb	Warriewood	Postcode	2102
Easting	151°17'19.3"E	Northing	33°41'37.1"S
Longitude	151.288702	Latitude	-33.693649
Landowner	Northern Beaches Council	Object ID (SEA)	SPP57933

2.3 Site Access, Office and Storage

Site access will be via an existing access road off Garden Street, within Lot 100 DP1127710. Please refer to **Figure 3** for the proposed site access and storage locations.

Vehicles and equipment shall:

- Be cleaned of dirt, mud or sediment prior to access on public roads;
- Remain on existing roads and defined site tracks where applicable; and
- Use the designated access point to avoid further impacts to the site.

The access point to the site of works will be determined by the contractor, with an allowance for a 3 metre wide track and small plant only. Although it was originally considered that a tree would need to be removed to facilitate access, this is no longer considered necessary.

Signage will be erected at the site that will detail:

- The name of the contractor that is carrying out the works;
- The reason/type of works being conducted; and
- The details of who should be contacted for enquires and in case of an emergency.

It is envisaged that the open grassed area to the north of the access track off Garden Street would be used for the temporary siting and storage of equipment, materials and workers facilities. It is noted that these areas are in a high-medium flood risk zone according to Northern Beaches Council online mapping. This area would be fully fenced off for safety and security. An alternative location for the site compound

and storage requirements is an existing access track on the western side of Garden street. These locations are identified in **Figure 3**.

The works area will need to be fenced off during the works to protect the public. This will include fencing on the upstream end of the western side of the culvert crossing in Mullet Creek to prevent entry to the works site through the culverts.

Figure 3 – Aerial photo showing site access

2.4 Description of the Proposed Activity

A number of issues have been identified at the site:

- A damaged headwall, including:
  - Southern wingwall which has failed and overturned;
  - Failing timber retaining wall behind the southern wingwall;
  - Concrete apron which has a localised eroded hole; and
- Scour in the creek bed downstream of the existing concrete apron.

Replacement of the damaged parts of the headwall will address the risk of structural failure due to the damaged and deteriorated components. However, in consultation with Council and during the concept options phase of the project, it has been agreed that the most appropriate course of action will involve replacement of the entire headwall structure. This will minimise the potential for future rehabilitative works to be required in the short to medium term.

The primary objectives for the proposed activity will be to:

- Replace damaged assets to avoid structural failure;
- Address scour in the creek bed; and
- Increase amenity by repairing damaged assets.

These objectives will be addressed by a nominated Contractor using the appropriate methodology as outlined below.

2.4.1 Proposed Works

A full set of design drawings are provided in **Appendix C** of this document. In addition, a description of the proposed works is provided below.

Existing Headwall and Demolition Works

Council has identified damage to the headwall on the eastern side of Garden Street (downstream end) at the crossing of Mullet Creek. The structure is an unreinforced concrete headwall that spans across four 1800mm diameter concrete pipe culverts, which convey flow in an easterly direction under Garden Street. The headwall also consists of a wingwall, through which a 375mm diameter stormwater pipe discharges run-off. The most significant and obvious damage to the headwall is at the location of this 375mm pipe, where a large crack and displacement of the wall is evident. Other damage includes:

- Horizontal cracking of the headwall;
- Overturning of the timber retaining wall behind the southern wingwall suggesting it is of inadequate depth; and
- Erosion of the concrete apron.

The following features of the site will need to be demolished and removed during the initial construction phase:

- Sections of the failed downstream headwall and wingwalls (refer **Appendix C** for details of the exact extent of headwall to be removed);
- The timber retaining wall; and
- Downstream Concrete apron.

Proposed Works

The proposed works include:

- Construction of a new headwall and wingwalls;
- Construction of a new concrete apron;
- Installation of new handrails;
- Installation of sandstone rock armour downstream of the concrete apron;
- Partial replacement of existing 375mm diameter stormwater pipe between southern wingwall and street drainage pit; and
- Revegetation of the works area.

Dewatering and Flow Diversion

Adequate dewatering and diversion measures will need to be put in place to ensure that creek flows are not blocked by the works, and to ensure that flows do not carry construction materials or sediments downstream. This is to be managed by the Contractor, however, it is envisaged that works might occur in a staged approach as follows:

1. Dewatering measures to be initially installed across half of the culverts, e.g. using a bund which only spans across two culverts.
2. Flows to be maintained through the remaining two culverts in order to allow for continuous flow through the culvert system.
3. Dewatering and flow diversion measures to be swapped over to the remaining culverts when first phase completed.

It is recognised that the contractor awarded the project may elect to undertake the works in an alternative manner. It will be their responsibility to ensure that the methodology complies with the recommendations of this REF.

2.4.2 Construction Methodology

The construction methodology of the proposed works and the plant and equipment which will be required for each step is summarised in **Table 2-3**.

Table 2-3 Proposed Construction Methodology

Technique	Yes	No	Description	Plant and Equipment
Mobilisation of plant to site and establishment of works area	☒	☐	Establishment of site compound area, fencing and construction access track. This will involve the clearing of vegetation, installation of site compound and material stockpiling.	Excavator, saw, site compound, trucks to deliver building materials.
Install erosion control measures	☒	☐	Erosion and control measures to be installed per the Blue Book, to reduce the occurrence of construction sediments downstream of the works.	Silt curtain, sediment fence and other erosion and sediment control measures
Install coffer dam/dewatering /flow diversion measures	☒	☐	To allow for dewatering of the site both upstream and downstream of the culverts. A flow management system including dewatering pump and water treatment though sedimentation should be established as part of erosion and sediment control measures. Works staging required to maintain flows and fish passage through the system, e.g. maintaining flows through half of culverts at any one time.	Coffer dam, pumps, bunds etc.
Install breakout slots in the existing concrete apron and install bored piles	☒	☐	Install breakout slots in the existing apron to facilitate installation of bored piles. Install bored piles through the existing apron.	Demolition saw, piling rig.
Demolish concrete apron	☒	☐	Demolish apron in front of existing headwall to facilitate replacement.	Demolition saw, jackhammer
Construct the new apron	☒	☐	Construct a new apron in front of the existing headwall	Formwork, concrete truck, cement mixer.
Demolish wingwalls, timber fence, pipe.	☒	☐	Demolish elements which are nominated for replacement due to damage. Pipe is removed up to the existing pit under Garden Street. Temporary stabilisation of the embankment may be required to mitigate risk of damage to the footpath or road pavement.	Excavator, jackhammer, temporary shoring
Construct new wingwalls and pipe	☒	☐	Construct new wingwalls, including 375mm pipe and pipe penetration through southern wingwall.	Formwork, concrete truck, cement mixer, trench excavator

Technique	Yes	No	Description	Plant and Equipment
Backfill behind wingwalls	☒	☐	Backfill behind wingwalls	Excavator, compacting plant e.g. wacker packer, plate compactor/roller
Excavation of vegetation and/or sediment from within creek or creek banks	☒	☐	Excavation of material using mechanical means to clear material from the creek bed. Removing of unsuitable fill off-site and storing remaining fill on-site as required.	Excavator
Place underlayer sandstone armour for scour protection	☒	☐	Underlayer placed for the proposed extent of scour protection	Excavator with grab attachment
Install sandstone rock armour	☒	☐	Install rock armour to prevent scour in the creek downstream of the headwall	Excavator with grab attachment
Landscape between wingwall and footpath	☒	☐	Landscaping to prevent erosion and to replace aesthetic value	Hydroseeding, jute mesh or geoweb
Reinstate footpath pavement and road pavement as required	☒	☐	Reinstate footpath and road pavement to existing levels. Reconstruct kerb and gutter as required.	Concrete mixer, formwork, concrete truck, compactor/roller
Repair internal culverts including re-grouting joints and repair to spalling	☒	☐	Grouting/repair as required	Concrete mixer, formwork etc.
Remove flow diversion and erosion and sediment control measures	☒	☐	Remove flow diversion measures to reinstate normal creek flows	N/A

2.4.3 Excavation

The excavation required for the proposed works is summarised in **Table 2-4**.

Table 2-4 Proposed Excavation

Technique	Yes	No	Description	Tools
Excavation of vegetation and/or sediment from within creek or creek banks	☒	☒	Excavation using mechanical means to clear material from the creek bed. It is envisaged that no more than 100 to 200 mm depth of material is required to be removed.	Excavator

2.4.4 Waste Disposal

The waste disposal requirements of the proposed works are summarised in **Table 2-5**.

Table 2-5 Waste Disposal Requirements

Technique	Yes	No	Description	Location of waste disposal
Waste disposal Offsite	☒	☐	Vegetation and sediment/material including material at the base of the headwall outlets is to be collected and transferred offsite by the Contractor. Appropriate waste classification is to be followed.	Kimbriki Resource Recovery Centre or other appropriate facility
Waste storage onsite	☒	☐	Materials stored on site are to be left in a neat and tidy pile. Storage of stockpiles shall be an adequate distance away from creek line i.e. riparian corridor.	Grass area adjacent to access track or on western side of Garden Street (refer Figure 3).

2.4.5 Construction Materials and Transport

The primary material components of the construction works is summarised in **Table 2-6**.

Table 2-6 Primary Material Requirements

Material	Estimated Quantity	Estimated Truck Deliveries
Project set up including delivery of site office, fencing, erosion and sediment controls and other equipment	N/A	2
Reinforced concrete construction of headwall, concrete apron and piles	70 m^3	12

Sandstone Rock Armour including underlay	350 tonnes	10
Dia. 450mm pipeline	Approximately 5 metres	1
Handrailing	Approximately 20 metres	1
Kerb and gutter for road reinstatement	Approximately 20 lineal metres of kerbing	1
Footpath reinstatement	Approximately 10.5 m3 of concrete	2
Landscaping	N/a	1

It is likely that all materials would be sourced locally from the Sydney area and that haulage requirements would not be material to local traffic movements.

As outlined in **Table 2-6**, an estimated total of 30 truck deliveries (60 truck movements) are required during the construction of the project. These deliveries would be spread across the timeframe of the project.

2.5 Alternative Options

A number of alternative options were developed during the options assessment phase of the design. These concepts are described below.

2.5.1 'Do Nothing'

An alternative option that was considered is to do nothing. This option is likely to have the following impacts on the site:

- The failed portion of the southern wingwall is expected to continue to overturn until collapsing into the riverbed. This is likely to result in exacerbating overturning of the timber retaining wall behind the wingwall and slumping of earth behind;
- Continued cracking in the headwall and the possibility of global structural failure;
- Potential failure of the adjoining footpath and roadway into the creek as a consequence of wingwall and headwall failure;
- Overturning of timber retaining wall due to rotting of the base of the posts and inadequate depth of concrete post foundations;
- Further erosion of concrete apron, resulting in undermining in front of the headwall;
- Increase scour of the creek bed immediately downstream of the headwall; and

- Reduction in amenity value.

The option to 'do nothing' does not address the objectives of the proposed works as defined in **Section 2.4**. The 'do nothing' approach has the potential to cause further harm to the environment and structural damage to the headwall leading to future possible failure, therefore, it is not considered a viable option.

2.5.2 Partial Repair of the Headwall Structure

The southern downstream wingwall has failed and requires rectification works to be undertaken. It is possible that works could be limited to replacement of this part of the structure only. The works would include the following:

- Demolish existing timber retaining wall;
- Demolish entire southern downstream wingwall, and adjoining headwall to southernmost pipe;
- Remove 375mm pipe and temporarily divert flow;
- Construct new 375mm pipe, wingwall (including retaining wall) and scour protection:
    - Replace pipe along existing alignment, or
    - Lay alignment from existing street pit and connect to existing 1800mm diameter culvert through direct connection.
- Construct new handrail; and
- Monitor other defects for signs of further deterioration.

The new wingwall and headwall would extend to the centreline between the southernmost and adjacent 1800mm diameter pipe (as shown below in **Figure 4**). In this way the southernmost 1800mm diameter pipe could be used as a temporary flow diversion when carrying out future upgrades. The new wingwall would retain up to 2700mm of earth and, hence, would need to be underpinned. This would most likely be in the form of concrete piles.

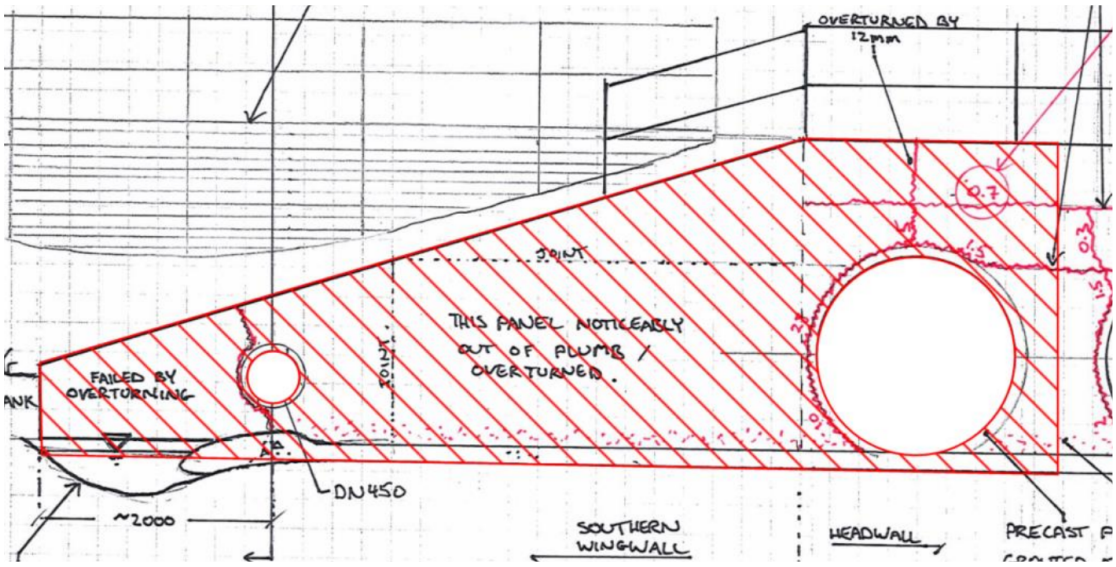

Figure 4 – Sketch showing extent of walls recommended to be replaced for immediate repairs

While the option would address the immediate issue of failure of the wingwall, it was considered to be not preferred as it would potentially require subsequent packages of works to repair and replace the remainder of the headwall in the event of failure.

2.5.3 Other Options

Other options initially considered but not taken forward for further assessment also include:

- Diversion of the existing 375mm stormwater line in Garden Street and provision of a new pipe outlet approximately 40 metres south of the existing outlet. This option was ruled out at an early stage as it would have a higher capital cost to install and would require extensive vegetation removal, whilst also still requiring the headwall to be repaired.
- Diversion of the existing 375mm stormwater line in Garden Street and provision of a new pipe along the alignment of the access track, with outlet located 60m downstream and possibly incorporating a Water Sensitive Urban Design (WSUD) outlet. This option was been ruled out at an early stage as well, as it would have a higher capital cost to install and would encounter land ownership and services constraints, whilst also still requiring the headwall to be repaired.

Reasons as to why these options were not pursued are discussed further in the options report.

2.5.4 Summary

Council identified that the preferred option was replacement of the entire headwall including the northern and southern wingwalls. This option would achieve all the required design objectives and would reduce the overall construction costs of the project by avoiding the need for any future remediation works on the northern portion of the headwall.

2.6 Timing of Works

Works are targeted to commence in October 2021, with an intended completion date of the end of December 2021. Work will be in accordance with the Interim Construction Noise Guideline (Department of Environment and Climate Change (DECC), 2009) as detailed below in **Table 2-7**.

Table 2-7 Proposed Working Times

Monday - Friday	7:00 am – 6:00 pm
Saturday	8:00 am – 1:00 pm
Sunday/Public Holidays	No work will occur on Sunday or public holidays

The estimated construction time for this project is 3-4 months from establishment to handover.

2.7 Justification of the Proposal

The objectives stated in **Section 2.4** will be addressed by undertaking the works associated with the preferred option, namely the entire replacement of the headwall and provision of downstream scour protection. The works will have a positive impact on the environment and prevent future damage to the headwall resulting in possible failure and scour of the creek bed. The assessment of the proposal against the relevant environmental planning requirements is provided in the remainder of this REF.

3 Existing Environment

A summary of the existing environment at the project area is provided in **Table 3-1**.

Table 3-1 Primary Material Requirements

Meteorological Data	The Bureau of Meteorology (BOM) website was accessed on Thursday, 4 March 2021 to reveal the following meteorological data: Max Average Temp: 21.9°C. Min Average Temp: 13.3°C Average Rainfall: 1077 mm/year The data above is based on the Terrey Hills Automated Weather Station (AWS) meteorological station which is located 5.2km away from the site. The site of the works is located at the upstream end of a waterway that drains to Narrabeen Lagoon (gauge No. 213422). The gauge can be assumed to be representative of the water level at the headwall during periods of dry weather.
Surrounding land uses	Council's GIS system (SEA) was searched on Thursday, 4 March 2021 and found the surrounding land was a mix of environmental conservation (E2 zoning) and low density residential (R2 zoning). The site is covered approximately by 70% E2 and 30% R2 zoned areas.
Soil Type & Properties	A search was undertaken of the soil types and properties around the site and the following characteristics were identified. Warriewood sits within the Hornsby plateau on Hawkesbury Sandstone. The site is a part of the Warriewood landscape group and Watagan landscape group. Soils within the Warriewood landscape group consist of sandy humus podzols and dark, mottled siliceous sands overlying acidic peats (extending to depths of 1.5 m), and underlain by podzols and pale siliceous sands. Soils within the Watagan landscape group consists of siliceous sands and yellow podzolic soils on sandstone (extending to depths of 2 m), underlain by podzolic soils on shale (extending to depths of 2 m).
Waterways & Catchments	Council's GIS system (SEA) was searched on Thursday, 4 March 2021 and found Mullet Creek within the works area which is a part of the Mullet Creek catchment.
EEC's	A Protected Matters search was undertaken on Thursday, 4 March 2021 . The search revealed 6 Ecologically Endangered Communities (EEC's) within a 5km buffer of the site: • Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community • Coastal Upland Swamps in the Sydney Basin Bioregion • Littoral Rainforest and Coastal Vine Thickets of Eastern Australia

	• Posidonia australis seagrass meadows of the Manning-Hawkesbury ecoregion • River-flat eucalypt forest on coastal floodplains of southern New South Wales and Eastern Victoria • Subtropical and Temperate Coastal Saltmarsh * Where an EEC has been identified within the 5km buffer zone a test of significance must be carried out in accordance with Appendix B. However, field surveys undertaken by Niche Environment & Heritage (refer **Appendix D**) established that only Coastal Swamp Oak Forests occur within the site and as per directions in Appendix B a test of significance has only been completed for that species.
Wetland Communities	A Protected Matters search was undertaken on Thursday, 4 March 2021. The search revealed 0 wetlands of national importance within a 5km buffer of the site.
Aboriginal Heritage	A search of Aboriginal Heritage Information Management System (AHIMS) on Thursday, 4 March 2021 revealed 0 Aboriginal place(s) or artefact(s) located within the subject area. A desktop and site walkover of Aboriginal Heritage was undertaken by Niche. This report is included in **Appendix E**. The report identified no items of relevance within the study area
Other Heritage	A search of the State Heritage Inventory was undertaken on Thursday, 4 March 2021 Section 1 contains items listed by the Heritage Council under the NSW Heritage Act. This includes listing on the state heritage register, an interim heritage order or protected under section 136 of the NSW Heritage Act. This information is provided by the Heritage Branch. Section 2 contains items listed by local councils and shires and State Government agencies. The search returned 0 results under the NSW Heritage Act section 1. The search returned 0 results under the NSW Heritage Act section 2.
Threatened Species	A search of the NPWS Bionet Atlas undertaken on Thursday, 4 March 2021 revealed records of 19 threatened species occurring within a 1km radius of the subject site. *Where the search has returned 1 or more results, they have been recorded in Appendix A.*
Protected species	A Protected Matters search undertaken on Thursday, 4 March 2021 revealed 26 protected species which were listed marine

	species with habitat and/or records within 1km of the subject site. However, as per advice from Niche Environment & Heritage, marine species have been excluded from the assessment as there is no marine habitat within the study area.
DPI Key Fish Habitat	DPI Key Fish Habitats Maps database was searched on Thursday, 4 March 2021 and found that the subject site is not identified within the DPI Key Fish Habitat map for the Sydney region. *Where the search has returned 1 or more results, they have been recorded in Appendix A.*
Acid Sulfate Soils or Contaminated Land	The EPA list of contaminated sites was searched on the Thursday, 4 March 2021 and found that the subject site is not part of a recognised contaminated site. Acid Sulfate Soils (ASS) have been identified by the Council's GIS system (SEA) (Class 3).

3.0.1 Matters of National Environmental Significance (MNES)

Under the *Environmental Protection, Biodiversity & Conservation Act* (EPBC Act) several Matters of National Environmental Significance (MNES) and impacts on Commonwealth land shall be considered. If MNES are identified to be significant then the project should be referred to the Australian Government Department of Environment. A summary of the MNES is provided in **Table 3-2**.

Table 3-2 Matters of National Significance Assessment

Any environmental impact on a world heritage property?	No
Any environmental impact on National Heritage places?	No
Any environmental impact on RAMSAR wetlands?	No
Any environmental impact on Commonwealth listed threatened species or ecological communities?	No
Any environmental impact on Commonwealth listed migratory species?	No
Does any part of the project involve nuclear action?	No
Any environmental impact on a Commonwealth marine area?	No
Any impact on Commonwealth land?	No

3.0.2 Clause 228 of the Environmental Planning and Assessment Regulation

The following 16 factors listed in **Table 3-3** are to be considered under Part 5 of the EPA&A Act.

Table 3-3 Factors Considered under Part of the EP&A Act

FACTOR FOR CONSIDERATION	Response
Any Environmental Impact on a Community?	None
Any transformation of a locality?	None
Any environmental impact on the ecosystems of the locality?	None
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	None
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?	None
Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974)?	None
Any endangering of any species of animal, plant or other form of life whether living on land, in water or in the air?	None
Any long-term effects on the environment?	None
Any degradation of the quality of the environment?	None
Any risk to the safety of the environment?	None
Any reduction in the range of beneficial uses of the environment?	None
Any pollution of the environment?	None
Any environmental problems associated with the disposal of waste?	None
Any increased demands on resources (natural or otherwise) that are or are likely to become in short supply?	None
Any cumulative environmental effect with other existing or likely future activities?	None
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	None

4 Planning Context & Consultation

4.0.1 Land Use and Ownership

The Project is located within the Northern Beaches Council LGA. Northern Beaches Council was formed on the 12th May 2016 after the amalgamation of the Manly, Pittwater and Warringah Councils. The Project is in the former Pittwater Council area.

According to the Pittwater Council Local Environmental Plan (LEP) of 2014, the local area is zoned as follows:

- Garden Street is zoned as R2 – Low Density Residential
- The creek downstream of the culvert under Garden Street is zoned as E2 – Environmental Conservation

A primary aim of the Pittwater LEP is to ensure that all development appropriately responds to environmental constraints and does not adversely affect the character, amenity or heritage of the area or its existing permanent residential population.

Land Zone R2 for low density residential has the following objectives:

- To provide for the housing needs of the community within a low-density residential environment;
- To enable other land uses that provide facilities or services to meet the day to day needs of residents; and
- To provide for a limited range of other land uses of a low intensity and scale, compatible with surrounding land uses.

Land Zone E2 for environmental conservation has the following objectives:

- To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values;
- To prevent development that could destroy, damage or otherwise have an adverse effect on those values;
- To ensure the continued viability of ecological communities and threatened species; and
- To protect, manage, restore and enhance the ecology, hydrology and scenic values of riparian corridors and waterways, groundwater resources, biodiversity corridors, areas of remnant native vegetation and dependent ecosystems.

4.0.2 Environmental Planning and Assessment Act 1979 (EP&A Act)

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) provide the framework for development and environmental assessment in NSW. Before the approvals pathway (i.e. assessment under Part 3A, 4 or 5 of the EP&A Act) for a development can be defined, it is necessary to answer two key questions:

- Whether development consent is required under a relevant local environmental planning instrument; and
- Whether the project is likely to have a significant impact on the environment.

The proposed activity may proceed in accordance with Part 5 of the EP&A Act, as development consent under Part 4 is not required due to the provisions of the State Environmental Planning Policy (Infrastructure) 2007 (refer below).

Consent under Part 3A of the Act is also not required as the proposal is not declared major infrastructure or development to which Part 3A applies. Council must satisfy Sections 111 and 112 of that Act by examining, and taking into account to the fullest extent possible, all matters which are likely to affect the environment. This REF is intended to assist, and ensure compliance, with the EP&A Act including Sections 111 and 112.

4.0.3 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (SEPP) (Infrastructure) 2007 aims to facilitate the effective delivery of infrastructure across the State. Unless land is reserved under the NPW Act the activity is classified as Permissible without Consent under section 129 "*waterway or foreshore management activities*" which states:

Division 25 - Waterway or foreshore management activities
In addition, the activity is "Permissible without Consent" pursuant to Clause 129, Division 25 "waterway or foreshore management activities" of the SEPP Infrastructure, which states:

129 Development permitted without consent

(1) Despite clause 129A, development for the purpose of waterway or foreshore management activities may be carried out by or on behalf of a public authority without consent on any land.

(1A) To avoid doubt, subclause (1) does not permit the subdivision of any land.

(2) In this clause, a reference to development for the purpose of waterway or foreshore management activities includes a reference to development for any of the following purposes if the development is in connection with waterway or foreshore management activities:

a) construction works,
b) routine maintenance works,
c) emergency works, including works required as a result of flooding, storms or coastal erosion,
d) environmental management works.

For the purposes of the above, waterway or foreshore management activities are defined as (refer cl.128):

a) riparian corridor and bank management, including erosion control, bank stabilisation, re-snagging, weed management, revegetation and the creation of foreshore access ways, and
b) instream management or dredging to rehabilitate aquatic habitat or to maintain or restore environmental flows or tidal flows for ecological purposes, and
c) coastal management and beach nourishment, including erosion control, dune or foreshore stabilisation works, headland management, weed management, revegetation activities and foreshore access ways, and
d) coastal protection works, and
e) salt interception schemes to improve water quality in surface freshwater systems, and
f) installation or upgrade of waterway gauging stations for water accounting purposes."

4.0.4 Coastal Management Act 2016

The Coastal Management Act ensures the management of coastal environmental in line with the principles of ecologically sustainable development and the following objectives:

- The protection of natural coastal processes and environmental values
- Supporting social and cultural values of the coastal zone
- Mitigate risks from coastal hazards and recognising the dynamic effects of coastal processes
- Encourage and promote plans for coastal resilience
- Support public participation in coastal management
- Acknowledge Aboriginal peoples' use of the coastal zone

Northern Beaches Council is to comply and consult with the Coastal Management Act to ensure all previously stated objectives are met. It is noted that the site falls outside the zone where the Coastal Management Act applies and so is not applicable to this activity.

4.0.5 State Environmental Planning Policy (Coastal Management) 2018

This SEPP employs coastal Protection controls development within the Coastal Zone (as defined under the Costal Management Act 2016). It aims to ensure:

- Development in the NSW coastal zone is appropriate and suitably located;
- There is a consistent and strategic approach to coastal planning and management; and
- There is a clear development assessment framework for the Coastal Zone.

SEPP 71 applies when determining a development application for a development (as required by Clause 7). Clause 8 of SEPP 71 lists the matters for consideration by a consent authority when it determines a development application under Part 4 of the EP&A Act to carry out development on any land to which this policy applies. This does not apply to the works proposed as part of the activity under assessment.

4.0.6 Biodiversity Conservation Act 2016

The Biodiversity Conservation Act (BC Act) is the chief legislation addressing threatened species and wildlife protection in NSW. The purpose of the Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community consistent with the principles of ecologically sustainable development.

Section 7.3 of the Act requires proponents of activities subject to Part 5 of the EP&A Act to determine whether they will have a significant impact on threatened species. The test for significant impact is described in section 7.3 of the Act.

A significant impact also occurs if the activity is carried out in an area of outstanding biodiversity value. If a significant impact is likely to occur, the proponent of the activity must prepare a Species Impact Statement in accordance with section 7.20 or a Biodiversity Development Assessment Report.

The assessment for this REF determined that there is not likely to be a significant effect on threatened species, populations and/or ecological communities or their habitats from the proposed activities. Therefore, a species impact statement is not required.

4.0.7 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places defined in the Act as matters of national environmental significance.

The objectives of the EPBC Act are to:

- Provide for the protection of the environment, especially matters of national environmental significance;
- Conserve Australian biodiversity;
- Provide a streamlined national environmental assessment and approvals process;
- Enhance the protection and management of important natural and cultural places;
- Control the international movement of plants and animals (wildlife), wildlife specimens and products made or derived from wildlife; and
- Promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources.

The proposed works would not have a significant impact on any of the above, therefore, referral to the Federal Minister for approval is not required.

4.0.8 Fisheries Management Act 1994

The objects of this Act are to conserve, develop and share the fisheries resources of the State for the benefit of present and future generations. The Minister for Primary Industries must be notified of any proposed dredging and reclamation works in accordance with Section 199 of the *Fisheries Management Act 1994*.

Based on advice provided by Niche, the site is not considered to be within Key Fish Habitat and therefore a permit is understood to not be required.

4.0.9 Heritage Act 1977

The Heritage Act provides protection of the environmental heritage of the state which includes places, buildings, works, relics, movable objects or precincts that are of state or local heritage significance. A key measure for the identification and conservation of state significant items is listing on the State Heritage Register (SHR) as provided in Part 3A of the Heritage Act.

4.0.10 National Parks and Wildlife Act 1974

Under Section 86(4) of the *National Parks and Wildlife Act 1974*, it is an offence to harm or desecrate a declared Aboriginal place. Harm includes destroying, defacing or damaging an Aboriginal place. The potential impacts of the development on an Aboriginal place must be assessed if the development will be in the vicinity of an Aboriginal place.

4.0.11 Contaminated Land Management Act 1997

The general object of this Act is to establish a process for investigating and (where appropriate) remediation of land where contamination presents a significant risk of harm to human health or some other aspect of the environment Contaminated land has not been identified at the works site. The EPA list of contaminated sites identifies any notices which have been issued under the *Contaminated Land Management Act 1997* in the proposed works area.

4.0.12 Protection of the Environment Operations Act 1997

The Act aims to protect, enhance and restore the quality of the environment in NSW, to reduce risk to human health and promote mechanisms that minimise environmental degradation through a strong set of provisions and offences. A licence is required from the NSW EPA if any of the activities associated with the proposed works are determined to be a 'scheduled activity' under Schedule 1 of the Act.

The works in question do not constitute a 'scheduled activity'.

4.0.13 Water Management Act 2000

A controlled activity approval is generally required under Chapter 3, Part 3 of the Act for any works that take place within 40m of a prescribed watercourse for all groups. Public authorities are exempt from this requirement under clause 38 of the Water Management (General) Regulation 2011.

Northern Beaches Council is a public authority and is therefore exempt from the need to obtain a controlled activity approval. However, the requirement to undertake the works in accordance with the Act remains.

4.0.14 Biosecurity Act 2015

The Biosecurity Act 2015 provides a framework for the prevention, elimination and minimisation of biosecurity risks posed by an activity as a matter of biosecurity. As defined in Part 3, section 23 of the act, any non-conformance by an individual is defined as guilty of an offence.

4.0.15 Natural Resources Access Regulator Act 2017

Consultation was undertaken with the Natural Resources Access Regulator (NRAR) to determine whether the activity triggered any licensing requirements under the Act. The NRAR has confirmed that licensing is not required for the Project. A copy of the consultation is provided in **Appendix F**.

4.1 Pittwater Local Environmental Plan 2014

Clause 8 of SEPP Infrastructure and s36 of the EPA Act 1979, the provisions of State Environmental Planning Policy (Infrastructure) 2007 relevantly states:

(1) Except as provided by subclause (2) if there is an inconsistency between this Policy and any other environmental planning instrument, whether made before or after the commencement of this Policy, this Policy prevails to the extent of the inconsistency.

Note. Subclause (1) does not prevent a local environmental plan from making provision about development of a kind specified in Part 3 in a particular zone if the provisions of this Policy dealing with development of that kind do not apply in that zone.

Accordingly, the SEPP Infrastructure is the prevailing instrument for permissibility and the provisions of PLEP 2011 are not applicable in this instance.

The following clauses of the LEP are pertinent to the headwall development.

4.1.1 Clause 5.10 Heritage Conservation

The objective of this clause is to conserve the environmental heritage of Pittwater, the heritage significance of heritage items and areas, archaeological sites and Aboriginal objects and places of heritage significance.

Development consent is required for the following:

- Demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance) including a heritage item, an Aboriginal object or a building, work relic or tree within a heritage conservation area;
- Altering a heritage item that is a building by making structural changes to its interior or by making changes to anything inside the item that is specified in Schedule 5 in relation to the item;

- Disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed;
- Disturbing or excavating an Aboriginal place of heritage significance;
- Erecting a building on land on which a heritage item is located or that is within a heritage conservation area, or on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance; and
- Subdividing land on which a heritage item is located or that is within a heritage conservation area, or on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance.

A desktop review and site walkover of Aboriginal heritage was undertaken by Niche (*refer* **Appendix E**). No aboriginal objects or places of heritage significance were identified within the study area. A database search identified no other heritage items. No additional approvals are considered necessary for the proposed works beyond this REF, subject to the findings and recommendations made by Niche during the construction of the works.

4.1.2 Clause 6.1 Acid Sulfate Soils

The objective of this clause is to ensure that development does not disturb, expose or drain acid sulfate soils and cause environmental damage. Development on land identified as Class 1, 2, 3, 4 or 5 on the LEP Acid Sulfate Soils Hazard Map (Table 4-1) is to be carried out in a manner that manages any disturbance to acid sulfate soils so as to minimise impacts on natural waterbodies and wetlands, and on agriculture, fishing, aquaculture, urban activities and infrastructure.

In particular, consent must not be granted to proposed works outlined below in Table 4-1 for the Class of land concerned, that disturb more than one tonne of soil or that are likely to lower the water table, unless Council has considered an acid sulfate soils management plan prepared in accordance with the Acid Sulfate Soils Assessment Guidelines. However, an acid sulfate soils management plan is not required where a preliminary assessment of the proposed works undertaken in accordance with these guidelines indicates that the proposed works need not be carried out pursuant to an acid sulfate soils management plan, and a copy of the assessment has been given to the Council. A preliminary assessment is provided in the text below **Table 4-1**.

Table 4-1 Class of Acid Sulfate Soils Lands

Class of Land as Shown on LEP Map	Works
1	Any Works
2	Works below natural ground surface Works by which the water table is likely to be lowered
3	Works beyond 1 metre below natural ground surface
4	Works beyond 2 metres below natural ground surface Works by which the water table is likely to be lowered beyond 2 metres below natural ground surface
5	Works on land below the 10 metre AHD contour and within 500 metres of adjacent Class 1, 2, 3 or 4 land which are likely to lower the water table below 1 metre AHD on adjacent Class 1, 2, 3 or 4 land

A preliminary assessment of the site was undertaken to determine the potential impacts associated with ASS. The LEP identifies the area in which the headwall is

located as being a Class 3 ASS area. Whilst the proposal will involve some excavation to accommodate the headwall, it is not anticipated that this disturbance will typically extend 1 metre below natural ground surface. It is noted that the proposed piers will extend greater than 1 metre below natural ground level, however the excavation will be isolated from the surrounding soil and any material collected will be removed off site, with no anticipated disturbance to the water table.

4.1.3 Clause 6.2 Earthworks

The objective of this clause is to ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land.

Development consent is required for earthworks unless:

- the earthworks are exempt development under this Plan or another applicable environmental planning instrument, or
- the earthworks are ancillary to development that is permitted without consent under this Plan or to development for which development consent has been given.

In deciding whether to grant development consent for earthworks (or for development involving ancillary earthworks), the consent authority must consider the following matters:

- the likely disruption of, or any detrimental effect on, drainage patterns and soil stability in the locality of the development
- the effect of the development on the likely future use or redevelopment of the land
- the quality of the fill or the soil to be excavated, or both
- the effect of the development on the existing and likely amenity of adjoining properties
- the source of any fill material and the destination of any excavated material
- the likelihood of disturbing relics
- the proximity to, and potential for adverse impacts on, any waterway, drinking water catchment or environmentally sensitive area

With regard the above requirements, below identifies whether this development is compliant or not.

Table 4-2 Clause 6.2 of Pittwater LEP – Earthworks

Matters to be considered	Comment
Disruption to drainage patterns	The design will incorporate effective drainage
Effect on future use of land	The use of the land will not change
Quality of fill to be used	Fill will come from accredited sources within Sydney
Effect on adjoining properties amenity	There will be a small amount of disruption during construction.
Source of fill material / destination of waste material	Fill will come from accredited sources within Sydney and will be sent off-site to accredited facilities

Likelihood of disturbing relics	No relics expected to be encountered on-site
Any impacts on sensitive areas	Compliant – no significant impacts

4.1.4 Clause 6.4 Flood Planning

The objectives of this clause are as follows:

- to minimise the flood risk to life and property associated with the use of land,
- to allow development on land that is compatible with the land's flood hazard, taking into account projected changes as a result of climate change,
- to avoid significant adverse impacts on flood behaviour and the environment.

In deciding whether to grant development consent for land at or below the flood planning level, the consent authority must consider the following matters:

- Is compatible with the flood hazard of the land;
- Is not likely to significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties;
- Incorporates appropriate measures to manage risk to life from flood;
- Is not likely to significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses; and
- Is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding.

With regard to the above requirements, **Table 4-3** evaluates whether this development is compliant or not.

Table 4-3 Clause 6.3 of Pittwater LEP – Flood Planning

Matters to be considered	**Response**
Compatible with flood hazard of land	Yes, works are only replacement works with no additional infrastructure built
Not likely to adversely affect flood behaviour	Works are only replacement works with no additional infrastructure built
Incorporates measures to manage risk of life from flood	Works are only replacement works with no additional infrastructure built
Not likely to adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or reduction in bank stability	Works are only replacement works with no additional infrastructure built. Appropriate erosion and sediment control measures and vegetation stabilisation measures to be implemented.
Not likely to result in unsustainable social or economic costs to the community due to flooding	Works are only replacement works with no additional infrastructure built

4.2 Stakeholder Consultation

The REF will be reviewed and endorsed by the Manager Coast & Catchments. The REF shall be reviewed and approved by another Manager within the Natural Environment and Climate Change Unit, prior to final determination by the Development Unit of Northern Beaches Council. Refer to **Table 4-4** for details on project consultation.

Table 4-4 Summary of Stakeholder Consultation

Person(s) Consulted	Method/Details of consultation	Date of consultation	Evidence of Consultation Provided in Appendix F
Residents	Council performed consultation with residents adjacent to the area of works.	To be advised by Northern Beaches Council	None
State Transit	State Transmit informed of effect of works on bus stop at Garden St opposite Irrawong Road via submission of online form. An email response was received on 10th March 2021 that the information was forwarded to the "Regional Customer Operations manager for their information and further action". It is recommended that the contractor be required to liaise with the Sydney Buses to confirm any requirements for temporary changes to the bus stop based on the contractors traffic management plan	9th March 2021	Yes
NRAR	Email Correspondence	12th April 2021	Yes
NSW Department of Primary Industries - Fisheries	An application for a permit was made to NSW DPI Fisheries. Fisheries advised that the Part 7 Fisheries Permit is not required as the creek is not mapped as a key fish habitat.	20th July 2021	Yes

4.3 Summary of Licences/Permits required

Table 4-5 contains a list of common approvals which may or may not be applicable to the proposed activity, and specifies those which are required.

Table 4-5 Summary of Common Approvals

Act	Licence Name	Licence Details	Permit/ Licence	Required
BC ACT	Threatened species licence	Authorises acts which are otherwise considered offence under part 2 of the Act. Including: ▸ harm to an animal that is a threatened species or part of an ecological community ▸ picking a plant that is a threatened species or part of an ecological community ▸ damage to a habitat of a threatened species or ecological community ▸ damage to a declared area of outstanding biodiversity conservation value	Threatened species licence application form	No
Heritage Act 1977	Section 60 Application	When a place is listed on the State Heritage Register or affected by an interim heritage order, the approval of the Heritage Council of NSW is required for any major work. According to section 60 of Heritage Act 1977	Section 60 Application Form	No
NPW ACT	An Aboriginal Heritage Impact Permit (AHIP)	Where harm to an Aboriginal object or Aboriginal place cannot be avoided, an AHIP can be issued by the Chief Executive of OEH under Part 6 of the NPW Act.	AHIP Application Form	No
EPBCC Act	Listed Species and Ecological Community Permit Form	The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) requires a permit for activities which may kill, injure, take, trade, keep or move a member of a listed threatened species or ecological community, a member of a listed migratory species, or a member of a listed marine species in or on a Commonwealth area.	Listed Species and Ecological Community Permit Form	No
EPA&A Act	Threatened Species test of significance	The threatened species test of significance is used to determine if a development or activity is likely to significantly affect threatened species or ecological communities, or their habitats	Guideline for test of significance	Yes See Appendix B. for completed Test of Significance

Act	Licence Name	Licence Details	Permit/ Licence	Required
FM Act	Part 7 Fisheries Management Act permit	A permit is required under Part 7 of the Fisheries Management Act for activities involving: • dredging and reclamation work • activities temporarily or permanently obstructing fish passage • using explosives and other dangerous substances • harming marine vegetation	Part 7 Fisheries Management Act permit form	No
	Section 220ZW licence	A permit is required under section 220ZW of the Fisheries Management Act where there is potential to cause: • harm to a threatened species, population or ecological community; • damage to critical habitat; or • damage to the habitat of a threatened species, population or ecological community	Section 220Z application	No
POEO Act	Environmental Protection Licence	An Environmental Protection License (EPL) is required if the activity is listed in Schedule 1 of the POEO Act.	EPL Application Form	No
Roads Act 1993	Hoarding Permit Application Form	Consent to erect hoardings or other construction facilities on Council property. This includes overhead hoardings, scaffolding, site fencing and site offices.	Hoarding Permit Application Form	Yes
Roads Act 1993	Infrastructure Works on Council Roadway - Section 138A	Application for construction of kerb & gutter, footpath, pavement and any other encroachment works on council's road reserve.	Infrastructure Works on Council Roadway Application Form	No
Roads Act 1993	Road Opening	Road Opening - Approval to Excavate Council Roads and Footpaths In accordance with Section 138 and 139 of the Roads Act.	Road Opening Application Form	No

Act	Licence Name	Licence Details	Permit/ Licence	Required
N/A	Traffic Control Application	To Implement a Traffic Control Plan/Traffic Management Plan including Construction Traffic Management Plan, whenever traffic is being managed on the road pavement or footpath area but where an application to stand plant is not required.	Traffic Control Application Form	No
N/A	Transport for NSW Approval	Approval from Transport for New South Wales (RMS) is required for work on tfNSW roads.	Approval	No
N/A	Tree Removal and Pruning Application	Application to remove trees.	Tree Removal and Pruning Application Form	Yes
Natural Resources Access Regulator Act 2017	Dewatering Licence	License to undertake dewatering activities	NRAR license	No

5 Environmental Impacts and Management

The following (**Table 5-1**) identifies the anticipated physical and chemical impacts that may occur during the construction and operational phases of the project. The Table also identifies the proposed mitigation measures that can be employed to avoid or ameliorate them.

Table 5-1 Summary of Impact and Mitigation Measures – Physical and Chemical Impacts

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
Soil erosion and/or sedimentation	☒	Medium Negative	Some soil will be disturbed on the bank of the creek line where machines enter/exit the creek for sediment removal as part of the in-stream works. The clearing of vegetation from the banks for access and works activities may lead to increased sediment runoff into the creek. The bed of the creek will be disturbed as a result of the construction works and there is potential for sediment to travel downstream. Movement and stockpiling of materials (if required) could lead to additional sediment entering the creek if not handled and stored correctly. This may include material stuck to excavator tracks and moved offsite during transit. Any dewatering activities could lead to water quality issues unless treated and discharged of correctly.	A detailed erosion and sediment control plan has been developed for the works (refer **Appendix C**) There will be one designated entry/exit point for the instream works that will be remediated with vegetation post work. There will also be a silt curtain installed downstream to prevent movement of disturbed sediment down the creek line. Creek bed disturbance to be minimised by permitting only the necessary machinery in the creek and ensuring only necessary excavation occurs. All machinery entering/exiting the site will use a shaker pad to minimise the potential for additional sediments from entering the creek and the road. Project will be undertaken during dry weather to minimise the amount of sediment that is mobilised. Areas that are stripped of vegetation following the works will be revegetated to minimise future erosion. Sediment curtain will be installed downstream of works area to prevent sedimentation downstream of works area. Further sediment controls may be installed at toe of creek bank where machinery enter/exit the creek to prevent erosion/sedimentation in these areas. Additional sediment controls (e.g. curtains, hay bales etc.) will be held onsite for the duration of the works and used for any unforeseen sedimentation issues.

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
				Stockpiling of excavated sediment will be stored outside of the 1:20 flood levels. Consideration of wetting or covering stockpiles should be afforded if open to the wind and risk of significant aeolian movement is possible.
Soil contamination	☒	Low Negative	Machinery may leak oil, fuel or chemicals in the soil.	Maintenance of plant equipment or any other activity which may result in the spillage of a chemical, fuel or lubricant is to be undertaken, where possible and/or away from any location where there is direct drainage to a waterway and within areas that are suitably protected. Any maintenance otherwise undertaken within direct drainage to a waterway is to be undertaken using best practice standards. In the event of plant breakdowns, where the machinery cannot be moved to the designated locations, spill kits will be held on site and used for the plant breakdowns (where necessary). Spill kits to be used by trained Contractor personnel. In the event of any spillages during the proposed activity, Council will be contacted immediately. Contaminants would be contained immediately, removed, treated (if necessary) and disposed of satisfactorily according to EPA regulations. A construction management plan should be prepared by the contractor that addresses ways in which pollution of the site by fuel and oil will be avoided. This should include protocols for equipment maintenance, storage of fuel and other chemicals and materials, and refuelling procedures.

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
				Industry standards and pollution prevention regulations shall be adhered to during refuelling, transfer, storage and handling of hazardous materials. No major maintenance of equipment shall be undertaken on-site. Timing of works should be planned to avoid, where possible, periods of high rainfall or during storm/wind warnings. Where this is not possible, preparation and tidying should occur around the worksite to reduce the potential for contamination of the waterway from stormwater runoff. Weather and tide forecasts need to be checked regularly during construction. Where flooding or inundation is forecast to the any work area, all equipment and materials need to be removed from the landside construction zone or appropriately secured above expected flood levels in the area. The lowest level of hydrocarbons (oil, grease, petrol, diesel) practicable will be stored on site. If storage on-site of hazardous substances is required then effective bunding should be used in construction areas. Non-toxic and/or biodegradable chemicals should be used for curing of concrete. Appropriate site and project inductions/training detailing potential water quality impacts and relevant construction measures and spill and emergency response procedures should be used.
Soils and geology	☒	Negligible N/A	Boreholes taken within the creek bed indicated the presence of 'softened' material overlying medium-dense sand. A borehole taken south of the headwall indicated the presence of interbedded sand and clayey sand strata, terminating on weathered sandstone. A borehole taken at Garden Street encountered gravelly sand fill.	Based on geotechnical investigations and the extent of works, it is not considered that the construction or operation of the headwall will impact on the geology. Unsuitable or potentially contaminated fill should be disposed of to a facility that is appropriately licensed to receive this waste stream. The facility should be contacted to obtain the required approvals prior to commencement of excavation. Excess excavated materials will be disposed of to a licensed waste facility.

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
Potential acid sulphate soils (PASS)	☒	Medium Negative	Oxidation of PASS can lead to the generation of acid that can cause ecological and environmental impacts and cause damage to infrastructure. PASS exposed to air can leach acid into the waterways and groundwater table if not neutralised appropriately with Lime (CaCO3).	PASS laboratory testing will be conducted as a requirement of Kimbriki Resource Recovery Centre. PASS that is present within any removed sediment will be managed according to the Acid Sulfate Soil Management Plan submitted to and approved by Council prior to any works. The acidic soil will be neutralised using Lime (CaCO3) in accordance with the liming rate provided by an accredited laboratory. PASS are identified within the vicinity of the site by the councils GIS system SEA and included in the REF. Contractors are briefed on the absence or presence of PASS.
Flooding for tidal regimes and storm events	☒	Medium Negative	Works will be undertaken within the creek line and will be temporarily exposed to flooding during some storm events.	The contractor will consider the fact that the site is located in zone which is subject to flooding during storm events, and materials and machinery are to be stockpiled and stored outside of the 1:20 flood levels, unless approved otherwise by Council. It is recommended that all works occur during dry weather conditions and that weather forecasts are consulted prior to commencement of works. Works may be staged to coincide with Narrabeen Lagoon opening, in order to lower the water level at the culverts. This would be managed by the Contractor in coordination with Council and other authorities.
Water contamination from hazardous substances or chemicals	☒	Low Negative	Potential of encountering asbestos fragments may increase with sediment removal works.	In the event that asbestos fragments are found during sediment removal activities, excavation will cease and qualified asbestos consultants will be employed to handle and dispose of the substance appropriately.

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
Generation and/or disposal of wastes or emissions	☒	Low Negative	Incorrect storage of waste materials which have the potential to leach or migrate to waterways Litter left on site by staff and/or contractors Generation of exhaust fumes from machinery Fuel-powered machinery will be used to complete the proposed construction works. With this comes the potential for fuel, oil, coolant leaks, hydraulic hose rupture and/or refueling spills to occur.	Correct stockpiling techniques are to be used; and stockpiles are to be located in the riparian corridor away from the waterway (if not taken offsite). All small waste i.e. litter must be removed from site and bins shall be provided for workers for day to day rubbish. All vehicles/equipment must be maintained in accordance with the manufacturer's specifications, including inspections for any leaks prior to entering site. Vehicles/equipment are to be turned off when not in use to reduce idling. Should a hydraulic leak be encountered works are to cease, machinery made safe and shut down and hydraulic system repaired. The NSW EPA and NSW Fire and Rescue will be contacted in the event of a serious pollution incident. Waste material (for example packaging, strapping, off-cuts) shall be contained within the land-based site during construction and then be removed to an authorised waste disposal facility in accordance with the EPA Waste Classification Guidelines. No material shall be placed in any location or in any manner that would allow it to enter the waterway or escape from the site. Stockpiles of debris and construction materials shall be stored at least 10 metres away from areas that may be inundated by the sea at high tide or during flood conditions. General refuse shall be disposed of to a covered container stored at the site. This container, when full, shall be transported to Council's local waste disposal centre. No waste shall be burnt or buried on-site. No material shall be disposed of into the creek at any time. To prevent contaminated material being placed on the site, if material is imported for fill, it shall be either virgin excavated natural material as defined in the Protection of the Environment Operations Act or be excavated natural material that has been tested in accordance with the 'excavated natural material exemption 2014'. Otherwise, an environment protection licence would be required under the Act. Portable toilets to be emptied on a regular basis and waste disposed of to a local sewage treatment plant.

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
Air quality	☒	Low Negative	Generation of particulates e.g. dust through excavation works or ground disturbance. Generation of exhaust fumes from machinery, vehicles or equipment. Generation of dust through vehicle movement.	Dust suppression controls are to be established if necessary e.g. water down or cover large stockpiles of sediment. All machinery and equipment is to be maintained in accordance with the manufacturer's specifications. Ensure all vehicles adhere to speed limit, follow designated access paths and are not idling when not in use.
Noise and vibration	☒	Low Negative	The closest residential receivers to construction noise relevant to the proposed works sites are residential properties at 149 and 182A Garden Street. Due to the low background noise levels in this area, the demolition of the existing headwall, presence of site workers, excavation plant and truck movements. 149 Garden Street is the closest property to the proposed construction access and site compound, and any users of the nearby walking track. The proposed construction activities would involve use of plant and machinery, however construction noise would be temporary and short term (i.e. approximately 3-4 months).	Standard construction good practice noise guards and mitigation measures would be expected on site. With appropriate measures in place, it is anticipated that noise impacts during this period would be of a minor nature and acceptable to local receptors given their temporary nature and the necessary requirements for the works. It is required to contact the nearby residences to inform them of the works. Works would be undertaken during the standard construction hours where practicable. Where works are required outside of the standard hours, notification will need to be provided to Council and local residents. Plant to be turned off when not in use (e.g. not left idling). Instructions should be issued to the Contractor that appropriate silencers are to be fitted on all plant and equipment where possible. Noisy plant and equipment is to be oriented away from sensitive receivers where possible. Temporary screens or other items that provide a noise buffer (including plant and equipment) are to be used proximate to noise sources. Broadband reversing alarms or similar (and if available) are to be used as an alternative to a traditional beeper reversing alarm for vehicles permanently on site. The use of horns and alarms are to be minimised. High vibration methods are to be substituted with lower vibration methods where possible.

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
Traffic Management	☒	Medium Negative	Excavation works are likely to require temporary lane closures and traffic management on Garden Street.	A Construction Traffic Management Plan will need to be prepared by the Contractor, however methodology may include the following: • One lane closed and traffic control implemented to allow for two-way traffic flows. • Existing lanes are narrowed or shifted to maintain two lanes open, and traffic control implemented to control traffic flow and prevent accidents. It is envisaged that the existing traffic island will need to be removed in either case.

The following (**Table 5-2**) identifies the anticipated biological impacts that may occur during the construction and operational phases of the project. The Table also identifies the proposed mitigation measures that can be employed to avoid or ameliorate them.

Table 5-2 Summary of Impact and Mitigation Measures – Biological Impacts

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
Clearing or modification of vegetation	☒	Low Negative	An existing native vegetation or ecological community currently occurs within the vicinity of works, however the impacts are very minor. The works will involve removing a small area of vegetation to allow access from the creek bank into the creek bed. Exotic species will be targeted for removal and native species will be protected and/or appropriately relocated where necessary.	The machinery entry/exit point will be chosen where vegetation is comprised of predominantly exotic species and at a point which result in the minimal dewatering extent of the creek. Removed plants will be reinstated with native vegetation. Existing native vegetation will not be removed except as explicitly nominated for removal. All construction works must be undertaken by suitably qualified and experienced Contractor(s) to reduce the risk of error and accidental environmental damage. Any trees nominated for removal will be assessed for the opportunity to relocate the trees to another alternative appropriate site. Any trees which cannot be relocated are to be reinstated with appropriate native species. The appropriate process for tree removal will need to be followed as it relates to Council's policies and internal approval requirements, and as specified in the DCP. The tree nominated for removal at the southern headwall is a mature tree (Eucalyptus Robusta) however the removal of this mature tree will not significantly reduce the foraging habitat availability within the locality. A hollow-bearing tree adjacent to the tree nominated for removal is to be retained. It is recommended that pre- and post- dilapidation survey be conducted for vegetation to assess the effects of the works on trees. All native vegetation proposed for retention is to be fenced off so that clearing does not encroach these areas. Fencing should be fauna friendly and specified in the CEMP, an example being heavy duty orange mesh fencing. Fencing should also delineate the edge of the access track. It is recommended that prior to any vegetation removals (native or exotic), a

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
				pre-clearing survey be undertaken by a Qualified Ecologist to identify any native fauna nesting or roosting in vegetation proposed for removal. The Ecologist can safely relocate native animals within vegetation proposed for removal. As no hollow-bearing trees are proposed for removal, it is not essential that the Ecologist supervise the felling of the tree.
Biodiversity and EEC's	☒	Medium Negative	Reduced biodiversity through the clearing of incorrect/native species Weed seeds may enter site in equipment and disturbed soil may stimulate initial flush of weed growth. Vibration or noise may affect native fauna Excess trampling on site, or destruction of native vegetation from vehicle access - altering sites biodiversity. Ecological assessment indicates that it is unlikely for any EECs to be impacted by the works.	All staff are to be fully briefed and inducted to the site, a thorough site inspection and CEMP is to be undertaken. All construction works must be undertaken by suitably qualified and experienced Contractor(s) to reduce the risk of error and accidental environmental damage. Where an EEC is identified a test of significance must be undertaken as presented in Appendix B. Cleaning of all plant, vehicles, tools and shoes prior to entering work areas to prevent the introduction of new weeds. Contractors are to be briefed if EEC's exist within the works vicinity and a barrier may be erected where necessary. No native species are to be removed, except as explicitly identified. Ensure all vehicles adhere to designated entry & exit points and pathways.
Threatened Species, their habitats or an Area of Outstanding Biodiversity Value	☐	Negligible Negative	Impacts to species, their habitats or an Area of Outstanding Biodiversity Value due to interruptions to the ecosystem functioning during the proposed works Ecological assessment indicates that impacts to threatened species, their habits or areas of outstanding biodiversity value are unlikely to occur as part of the works. The site is a known roost for microbat species. Mitigation measures have been identified below.	Selected vegetation will be replanted in areas that have been disturbed including entry/exit points and elsewhere as stated in the REF and/or provided proposal. Vegetation for replanting should be swamp sclerophyll forests EEC only. REF was carried out to determine any threatened species, their habitats or any Area of Outstanding Biodiversity Value. All associated permits have been applied for where necessary and no significant impact has been identified. Threatened species have been assessed using the Test of Significance as found in appendix A.

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
				All construction works must be undertaken by suitably qualified and experienced Contractor(s) to reduce the risk of error and accidental environmental damage. Workers shall be informed of their obligations and possible offences under the NSW National Parks and Wildlife Act and Australian Environmental Protection and Biodiversity Conservation Act with respect to threatened and migratory species. It is noted that microbats have been observed to roost in the culverts. Measures to mitigate that impact are discussed below.
Potential to endanger or disturb fauna	☒	Low Negative	Fauna may be displaced during the works due to disturbance within ecosystem functioning. Fauna which utilise the site for nesting and foraging habitat may be impacted by the disturbance or habitat removal.	A thorough search has been conducted as part of the REF and consideration has been made regarding the potential disturbance or endangerment of fauna. Any fauna displaced by the works will be appropriately relocated to a nearby site of suitable habitat. Any residual impacts will be temporary. All considerations have been made to ensure the works result in minimal disruptions to existing fauna. All construction works must be undertaken by suitably qualified and experienced Contractor(s) to reduce the risk of error and accidental environmental damage. In relation to the potential impacts to microbat species that may be roosting in the culverts, the following is required: • *Site inspection before commencement of works (as close a feasible) to be undertaken by an appropriately qualified ecologist to determine presence of microbats. Work can commence if no microbats are present.* • *Works should be undertaken outside of the likely torpor period during colder months (April to September).* • *Personnel should be wary of and monitor potential microbat activity and stop works if bats are observed flying from underneath the works area.*

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
				• *If bat activity is detected, the level of activity should be noted (i.e. attempts made to estimate the number of bats flying) and advice sought from Council or other appropriately qualified ecologists as to development of an appropriate management process prior to recommencing works.*
Introduction of weeds, vermin, or feral species	☒	Low Negative	Disturbance of soil may stimulate initial flush of weed growth. Potential for weed propagules to be introduced to site in equipment, vehicles and tools. Planting of weeds instead of native plants due to inexperience of workers.	Initial flush of weed growth will be targeted as part of the ongoing weed removal works. All plant and equipment is to be cleared prior to being used on site and upon leaving site. Only vegetation to be used for replanting should be swamp sclerophyll forests EEC. All landscape workers are to be trained and competent in bush regeneration works. All construction works must be undertaken by suitably qualified and experienced Contractor(s) to reduce the risk of error and accidental environmental damage. When revegetating sites, the following plants shall not be used and should be controlled in according to a weed management plan for the sites: - Plant species listed as weeds by NSW Department of Primary Industries (http://www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds/profiles) - Plant species listed as part of key threatening processes (http://www.environment.nsw.gov.au/threatenedspecies/KeyThreateningProcessesByDoctype.htm).
Blocking creek flows, dewatering	☒	Low Negative	Dewatering and flow diversions will be required prior to works commencing and during works to ensure that creek flows are not blocked by the works, and to ensure that flows do not carry construction materials or sediments downstream.	Appropriate dewatering measures and flow diversions will be implemented on site and managed by the contractor. Any silt collected in the bunded section of the culverts will be disposed of appropriately.

The following (**Table 5-3**) identifies the anticipated community impacts that may occur during the construction and operational phases of the project. The Table also identifies the proposed mitigation measures that can be employed to avoid or ameliorate them.

Table 5-3 Summary of Impact and Mitigation Measures – Community Impacts

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
Impacts on underground infrastructure	☒	Medium Negative	Excavation may occur within the depths of underground services or infrastructure potentially causing damage or interruption to services.	Investigations such as Dial Before You Dig and services tracing/potholing will be carried out by the Contractor(s) to ensure that all appropriate measures are in place to minimise the potential risks to existing utilities and services prior to commencement of construction works, such as the sewer and gas main.
Aboriginal Heritage	☒	Low Negative	Uncovering of aboriginal heritage has not been identified. Damage to existing identified aboriginal heritage may occur if items are encountered on site.	If the heritage items of significance are discovered during the works, the Contractor will immediately cease work at that location and will notify project manager for appropriate action. REF is to satisfy sections 3 and 4 through the run of an AIHMS search Any identified aboriginal areas are to be assessed in the REF and measures preventing damage to the identified sites must be discussed with all staff.
Historic Heritage	☒	Low Negative	Uncovering of heritage has not been identified. Damage to existing identified heritage.	Should a heritage site be discovered during the activity works must cease immediately and notify the Project Manager. The project manager will then contact OEH with the Notification to OEH of a relic form. REF is to satisfy sections 3 and 4 through the run of an Heritage search Any identified heritage areas are to be assessed in the REF and measures preventing damage to the identified sites must be discussed with all staff.

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
Community & residents, public access and safety	☒	Medium Negative	The works will extend into the Garden Street footpath and potentially into the roadway. This will result in disruption to traffic flows and require closure of the south-bound lane. Visual amenity due to changes/clearing in vegetation and/or machinery present. Works may affect the operation of the bus stop on the eastern side of Garden Street.	Vehicles and equipment must be positioned to minimise impacts to public access and parking Appropriate traffic control, temporary signage to be erected and WH&S safeguards employed for the general public and users. Pedestrians and cyclists along the footpath on the eastern side of Garden Street will need to be redirected around the works. This will need to be incorporated into a Traffic Management Plan. Bus stop on eastern side of Garden Street to be relocated during the works. Consultation has occurred with State Transit notifying of the works. Consultation with nearby residents and community members by Council to advise of proposed works will be conducted. Works are to be conducted in line with the DECC, 2009 as outlined in section 2.6. Prior to commencement of works, boundaries of the construction and access areas need to be marked with temporary barrier fencing. The fencing shall be monitored daily by the site supervisor and immediately repaired or replaced if necessary and shall be removed when construction is completed. Machinery shall only access the defined work sites via clearly defined routes.The use of plant machinery on the creek bank should be minimised where possible. A Council contact should be provided for the works in the event of any complaints. Workers and plant drivers to maintain awareness of residents and community members at all times. Limit speed of plant whilst working in the area.

Area of Impact	Applicable?	Impact Level (Negligible, low, medium or high; negative, positive or N/A)	Reasons	Mitigation Measures
Landscape and visual character	☒	Negligible Positive	Reconstruction of the headwall Vegetation clearing for construction and access	The headwall will be replaced with a new headwall which will improve the visual character of the site. Areas which are cleared during construction will be revegetated following construction and will return to their pre-construction conditions where possible. This will aid in re-instating visual aesthetics. The batter slope behind the southern wingwall will match the slope to the south (approximately 1V:3H). The construction site should be kept tidy and in an orderly fashion at all time to minimise visual impacts to local residents.
Cumulative environmental effect with other existing or likely future activities	☒	Negligible N/A	There are several residential development projects in progress in the Warriewood Valley, including some on Garden Street north of Mullet Creek. The proposed repair works may coincide with other developments or civil infrastructure projects.	The works at Garden Street are considered to be relatively minor in the context of overall development in the Warriewood Valley and are being undertaken to ultimately improve the built environment, effectively replacing an existing structure. It is considered to have a negligible impact to any cumulative environmental effect.

6 Work Health and Safety

The Principal Contractor will be responsible for ensuring that all works and activities are carried out in accordance with the *Work Health and Safety Act 2011* and the Safe Work Method Statements (SWMS) provided by the contractor. The SWMS must cover, as a minimum, excavation of bank material, transportation of rock material, installation of excavated material and rock and working in close proximity to large machinery and within the waterway.

All Contractors and Council staff working at, supervising or visiting the work site will be inducted in accordance with Council's WH&S Policy and Procedures and will be required to possess appropriate WorkCover insurance certification. The contractor is required to provide a comprehensive and approved Safety Plan covering all aspects of the works at the site as well as for transport to and from the site for materials and staff. A register of all staff and visitors who enter and are within the site must be kept and maintained by the contractor, with full personal details, company details and mobile phone numbers.

Fencing is necessary to reduce the accident risk through unauthorised entry to the site. Barriers to the work site will be erected before works begin and signage will be installed to restrict access, the will be visible to pedestrians and residents using the area.

The site is to be maintained in a clean and tidy state and free of rubbish to provide a safe and clean work site for all workers.

The contractor must also ensure that access to amenities is provided for all staff and hygienic conditions exist on site.

For the duration of the site works, a 'spotter' will be present to provide traffic control, alert machinery driver(s) to any potential hazards, provide information to members of the public, and to keep members of the public at a safe distance from the work-site.

The 'Spotter' and/or 'Traffic control' contractor(s) are to erect and maintain appropriate signage at the work site.

The above WH&S requirements will be fully implemented as part of the works proposed.

7 Conclusions

The activity is permissible pursuant to Part 5 of the Environmental Planning and Assessment Act, through the provisions Clause 129, Division 25 "*waterway or foreshore management activities"* of State Environmental Planning Policy (Infrastructure), 2007.

In consideration of all relevant information and legislative requirements, including the heads of consideration under cl.228 of the *EP&A Regulations 2000*, the proposed activity is not likely to have a significant environmental impact and therefore an environmental impact statement or species impact statement is not required.

In conclusion, there is not likely to be a significant effect on the environment or on threatened species, populations, ecological communities or their habitats. Work is also not taking place within land that is, or part of, critical habitat.

The impacts associated with the proposal are considered to be minor in nature and in some cases only temporary. Adequate controls will be installed where required to mitigate these minor and/or temporary impacts.

The works will have an overall positive impact on the environment and community by renewal of existing infrastructure, revegetation with native species, reduction in erosion downstream and protection of existing services.

In consideration all relevant information, the activity is permissible pursuant to clause 129 (2)(c) of SEPP (Infrastructure) 2007. In addition, it is concluded that the proposed activity will not result in limited adverse impacts on the environment; and as such an Environmental Impact Statement is not required.

8 Declaration

To the best of my knowledge the information contained in this report is accurate and correct.

Signature	
Name (printed)	Andrew Morris
Position	Senior Civil and Water Resources Engineer
Date	9/9/21

The activity is permissible & complies with clause 228 of the Environmental Planning and Assessment Regulations 2000.

Name (printed)	
Date of Meeting	
Trim link to Minutes	

Approved by:

Signature	
Name (printed)	
Position	
Date	

9 References

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WMA Water, 2019, *Ingleside, Elanora and Warriewood Overland Flow Flood Study*

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10 Appendices

Appendix A – Threatened, Protected, Vulnerable and/or Endangered Species List

(*As prepared by Niche Environment & Heritage)*

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
Acacia bynoeana	Bynoe's Wattle	E	V	Grows mainly in heath and dry sclerophyll forest in sandy soils. Mainly south of Dora Creek-Morisset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from near Kurri Kurri in the Hunter Valley and from Morton National Park.	**Low** – no suitable habitat within Study Area.	**No**
Acacia pubescens	Downy Wattle	V	V	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.	**Low** – no suitable habitat within Study Area.	**No**
Acacia terminalis subsp. terminalis	Sunshine Wattle	E	E	Very limited distribution, mainly in near-coastal areas from the northern shores of Sydney Harbour S to Botany Bay, with most records from the Port Jackson area and the eastern suburbs of Sydney. Coastal scrub and dry sclerophyll woodland on sandy soils. Habitat is generally sparse and scattered.	**Low** – no suitable habitat within Study Area.	**No**
Ancistrachne maidenii		V	-	Restricted to northern Sydney, around St Albans - Mt White - Maroota - Berowra areas and to the Shannon Creek area south-west of Grafton. Habitat requirements appear to be specific, with populations occurring in distinct bands in areas associated with a transitional geology between Hawkesbury and Watagan soil landscapes. Grows in dry sclerophyll forest on sandstone-derived soils.	**Low** – no suitable habitat within Study Area.	**No**
Anthochaera phrygia	Regent Honeyeater	CE	E, M	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. The distribution of the species has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some year's flocks converge on flowering coastal woodlands and forests.	**Low** – no suitable habitat within Study Area.	**No**
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	Dusky woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, 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	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
				understorey of eucalypt saplings, acacias and other shrubs, and groundcover of grasses or sedges and fallen woody debris.		
Asterolasia buxifolia		E	-	Known from a single site at a granite outcrop in the riparian zone of the Lett River. Apparently restricted to dense riparian scrub along rocky watercourses with a granitic substrate.	**Low** – no suitable habitat within Study Area.	**No**
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 in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest.	**Low** – no suitable habitat within Study Area.	**No**
Boronia umbellata		V	V	Grows as an understorey shrub in and around gullies in wet open forest.	**Low** – no suitable habitat within Study Area.	**No**
Botaurus poiciloptilus	Australasian Bittern	E	E	The Australasian Bitterns is widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and spikerushes.	**Low** – no suitable habitat within Study Area.	**No**
Burhinus grallarius	Bush Stone-curlew	E	-	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east, it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights.	**Low** – no suitable habitat within Study Area.	**No**
Caladenia tessellata	Thick-lip Spider Orchid	E	V	The Tessellated Spider Orchid is found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct.	**Low** – no suitable habitat within Study Area.	**No**
Calidris ferruginea	Curlew Sandpiper	E	-	The Curlew Sandpiper is distributed around most of the coastline of Australia. It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes, and lagoons on the coast and sometimes the inland	**Low** – no suitable habitat within Study Area.	**No**
Callistemon linearifolius	Netted Bottle Brush	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra.	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
				For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.		
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	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.	**Low** – no suitable habitat within Study Area.	**No**
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Inhabits forest with low nutrients, characteristically with key *Allocasuarina* spp. Tends to prefer drier forest types with a middle stratum of Allocasuarina below Eucalyptus or Angophora. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead. Endangered population in the Riverina.	**Low** – no suitable habitat within Study Area.	**No**
Camarophyllopsis kearneyi		E	-	Its occurrence appears to be limited to the Lane Cove Bushland Park. Does not produce above-ground fruiting structures all year but may be present only as non-reproductive hyphal structures below ground.	**Low** – no suitable habitat within Study Area.	**No**
Cercartetus nanus	Eastern Pygmy-possum	V	-	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5ha area over a 5-month period.	**Low** – no suitable habitat within Study Area.	**No**
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and mines in groups of between 3 and 37 individuals.	**Low** – no suitable habitat within Study Area.	**No**
Chamaesyce psammogeton		E	-	Found sparsely along the coast from south of Jervis Bay (at Currarong, Culburra and Seven Mile Beach National Park) to Queensland (and Lord Howe Island). Populations have been recorded in Wamberal Lagoon Nature Reserve, Myall Lakes National Park and Bundjalung National Park. Grows on fore-dunes and exposed headlands, often with Spinifex sericeus.	**Low** – no suitable habitat within Study Area.	**No**
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	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 forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
				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.		
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. 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*).	**Low** – no suitable habitat within Study Area.	**No**
Cynanchum elegans	White-flowered Wax Plant	E	E	Recorded from rainforest gullies scrub and scree slopes from the Gloucester district to the Wollongong area and inland to Mt Dangar.	**Low** – no suitable habitat within Study Area.	**No**
Daphoenositta chrysoptera	Varied Sittella	V	-	Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature Eucalypts with hollows.	**Low** – no suitable habitat within Study Area.	**No**
Darwinia biflora		V	V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas. The northern, southern, eastern and western limits of the range are at Maroota, North Ryde, Cowan and Kellyville, respectively. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. The vegetation structure is usually woodland, open forest or scrub-heath.	**Low** – no suitable habitat within Study Area.	**No**
Darwinia peduncularis		V	-	Occurs as local disjunct populations in coastal NSW with a couple of isolated populations in the Blue Mountains. It has been recorded from Brooklyn, Berowra, Galston Gorge, Hornsby, Bargo River, Glen Davis, Mount Boonbourwa and Kings Tableland. Usually grows on or near rocky outcrops on sandy, well drained, low nutrient soil over sandstone.	**Low** – no suitable habitat within Study Area.	**No**
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E	Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	**Low** – no suitable habitat within Study Area.	**No**
Deyeuxia appressa		E	E	A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area (Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown and Killara, near Hornsby). Almost nothing is known about the species' habitat and ecology. Flowers spring to summer and is mesophytic (grows in moist conditions).	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
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.	**Low** – no suitable habitat within Study Area.	**No**
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	Mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.	**Low** – may pass through the Study Area but would not be dependent on the habitat within the Study Area.	**No**
Erythrotriorchis radiatus	Red Goshawk	CE	-	The Red Goshawk occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia.	**Low** – no suitable habitat within Study Area.	**No**
Esacus magnirostris	Beach Stone-curlew	CE	-	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. Beach Stone-curlews are 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.	**Low** – no suitable habitat within Study Area.	**No**
Eucalyptus camfieldii	Heart-leaved Stringybark	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace Area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. 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.	**Low** – no suitable habitat within Study Area.	**No**
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock. Seedling recruitment is common, even in disturbed soils, if protected from grazing and fire.	**Low** – no suitable habitat within Study Area.	**No**
Eucalyptus scoparia	Wallangarra White Gum	E	V	In NSW it is known from only three locations near Tenterfield. Found in open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops, typically at high altitudes. At lower elevations can occur in less rocky soils in damp situations.	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
Falco hypoleucos	Grey Falcon	E	-	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. Also occurs near wetlands where surface water attracts prey.	**Moderate**	**No**
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor. This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites.	**Low** – no suitable habitat within Study Area.	**No**
Genoplesium baueri	Bauer\'s Midge Orchid	E	E	Grows in dry sclerophyll forest and moss gardens over sandstone. Flowers February to March. Has been recorded between Ulladulla and Port Stephens. Currently the species is known from just over 200 plants across 13 sites. The species has been recorded in Berowra Valley Regional Park, Royal National Park and Lane Cove National Park and may also occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments.	**Low** – no suitable habitat within Study Area.	**No**
Genoplesium plumosum	Tallong Midge Orchid	CE	E	Occurs exclusively in heathland, generally dominated by violet kunzea, common fringe-mytre and parrot-peas. Grows on very shallow soils or within mosses on sandstone conglomerate shelves. Plants exists only as a dormant tuber for much of the year, with leaves or fruiting stems dying back in winter. Reproduces by seed and has no mechanism for vegetative reproduction.	**Low** – no suitable habitat within Study Area.	**No**
Glossopsitta pusilla	Little Lorikeet	V	-	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.	**Low** – no suitable habitat within Study Area.	**No**
Grammitis stenophylla	Narrow-leaf Finger Fern	E	-	Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	**Low** – no suitable habitat within Study Area.	**No**
Grantiella picta	Painted Honeyeater	V	V	Inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) 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*.	**Low** – no suitable habitat within Study Area.	**No**
Grevillea caleyi		E	E	Restricted to an 8 km square area around Terrey Hills, approximately 20 km north of Sydney. Occurs 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. All sites occur on the ridgetop between elevations of 170 to 240m asl, in association with laterite soils and a vegetation community of open forest,	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
				generally dominated by *Eucalyptus sieberi* and *Corymbia gummifera*. Commonly found in the endangered Duffys forest ecological community.		
Grevillea juniperina subsp. juniperina		V	-	Endemic to Western Sydney, centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town. Recorded from Cumberland Plain woodland, Castlereagh Ironbark woodland, Castlereagh Scribbly Gum woodland and Shale-Gravel Transition forest. Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels.	**Low** – no suitable habitat within Study Area.	**No**
Grevillea parviflora subsp. supplicans		E	-	Occurs in heathy woodland associations on skeletal sandy soils over massive sandstones. This taxon is strongly associated with clay-capped ridged of the Lucas Heights and Faulconbridge soil landscapes, but that it is quite restricted within these areas, suggesting it has a preference for yellow clays with periodically impeded drainage.	**Low** – no suitable habitat within Study Area.	**No**
Grevillea shiressii		V	V	Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils.	**Low** – no suitable habitat within Study Area.	**No**
Haliaeetus leucogaster	White-bellied Sea-Eagle	-	M	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	**Low** – no suitable habitat within Study Area.	**No**
Haloragodendron lucasii		E	E	Occurs on Hawkesbury Sandstone in moist sandy loam soil. The species prefers sheltered aspects and inhabits gentle slopes below cliff lines near creeks in low open woodland or open forest. Its distribution is correlated with high soil moisture and phosphorus levels.	**Low** – no suitable habitat within Study Area.	**No**
Heleioporus australiacus	Giant Burrowing Frog	V	V	The Giant Burrowing Frog has been recorded breeding in a range of water bodies associated with more sandy environments of the coast and adjacent ranges from the Sydney Basin south the eastern Victoria. It breeds in hanging swamps, perennial non-flooding creeks and occasionally permanent pools, but permanent water must be present to allow its large tadpoles time to reach metamorphosis.	**Low** – no suitable habitat within Study Area.	**No**
Hibbertia puberula		E	-	Occurs on sandy soil often associated with sandstone. Flowering time is October to November.	**Low** – no suitable habitat within Study Area.	**No**
Hibbertia superans		E	-	Flowering time is July to December. The species occurs on sandstone ridgetops often near the shale-sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides.	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
Hieraaetus morphnoides	Little Eagle	V	-	Most abundant in lightly timbered areas with open areas nearby. Often recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. May nest in farmland, woodland and forest in tall trees.	**Low** – may pass through the Study Area but would not be dependent on the habitat within the Study Area.	**No**
Hirundapus caudacutus	White-throated Needletail	-	M	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	**Low** – may pass through the Study Area but would not be dependent on the habitat within the Study Area.	**No**
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Occurs almost exclusively in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they spend most of the year sheltering in and under rock crevices and exfoliating rock. However, some individuals will migrate to tree hollows to find shelter during hotter parts of summer.	**Low** – no suitable habitat within Study Area.	**No**
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	-	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.	**Low** – no suitable habitat within Study Area.	**No**
Ixobrychus flavicollis	Black Bittern	V	-	Usually found on coastal plains below 200 m. Often found along timbered watercourses, in wetlands with fringing trees and shrub vegetation. The sites where they occur are characterized by dense waterside vegetation.	**Moderate**	**No**
Kunzea rupestris		V	V	Grows in shallow depressions on large flat sandstone rock outcrops. Characteristically found in short to tall shrubland or heathland.	**Low** – no suitable habitat within Study Area.	**No**
Lasiopetalum joyceae		V	V	Grows in heath on sandstone.	**Low** – no suitable habitat within Study Area.	**No**
Lathamus discolor	Swift Parrot	E	E	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
Leptospermum deanei		V	V	woodland on lower hill slopes or near creeks. Sandy alluvial soil or sand over sandstone. Occurs in riparian scrub, woodland and open forest.	**Low** – no suitable habitat within Study Area.	**No**
Litoria aurea	Green and Golden Bell Frog	E	V	Inhabits a very wide range of water bodies including marshes, dams and streams, particularly those containing emergent vegetation such as bullrushes or spikerushes. It also inhabits numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes waterbodies that are un-shaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.	**Low** – no suitable habitat within Study Area.	**No**
Lophoictinia isura	Square-tailed Kite	V	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW 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 100km2. 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.	**Low** – no suitable habitat within Study Area.	**No**
Macadamia tetraphylla		V	V	Confined chiefly to the Richmond and Tweed Rivers in north-east NSW, extending just across the border into Queensland. Found in subtropical rainforest, usually near the coast.	**Low** – no suitable habitat within Study Area.	**No**
Macquaria australasica	Macquarie Perch		E	Recent research indicates that there may be at least two distinct forms of Macquarie Perch, one from the western rivers (Murray-Darling Basin form) and one from the eastern rivers (the Shoalhaven and Hawkesbury-Nepean systems) (the coastal form). The species has also been stocked or translocated into a number of reservoirs including Talbingo, Cataract and Khancoban reservoirs and translocated into streams including the Mongarlowe River. Macquarie Perch are found in both river and lake habitats; especially the upper reaches of rivers and their tributaries	**Low** – no suitable habitat within Study Area.	**No**
Macropus parma	Parma Wallaby	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 Queensland border. Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	**Low** – no suitable habitat within Study Area.	**No**
Melaleuca biconvexa	Biconvex Paperbark	V	V	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	**Moderate**	**No**
Melaleuca deanei	Deane\'s Paperbark	V	V	Grows in wet heath on sandstone in coastal districts from Berowra to Nowra.	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond and Clarence River areas. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions, though it is very rare in the latter.	**Low** – no suitable habitat within Study Area.	**No**
Micronomus norfolkensis	Eastern Freetail-bat	V	-	Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species' habits.	**Low** – no suitable habitat within Study Area.	**No**
Microtis angusii	Angus's Onion Orchid	E	E	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 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 EEC under the TSC Act and ranges from open forest to low open forest and rarely woodland.	**Low** – no suitable habitat within Study Area.	**No**
Miniopterus australis	Little Bentwing-bat	V	-	Coastal north-eastern NSW and eastern Queensland. Little Bent-wing Bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel 100s km from feeding home ranges to breeding sites. Little Bent-wing Bat has a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.	**Moderate**	**No**
Miniopterus orianae oceanensis	Large Bentwing-bat	V	-	Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	**Moderate**	**No**
Mixophyes balbus	Stuttering Frog	E	V	Associated with streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones by the females and the tadpoles swim free into the stream when large enough to do so. Outside of breeding, individuals range widely across the forest floor and can be found hundreds of metres from water	**Low** – no suitable habitat within Study Area.	**No**
Myotis macropus	Southern Myotis	V	-	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	**Moderate**	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
Neophema pulchella	Turquoise Parrot	V	-	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, 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. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	**Low** – no suitable habitat within Study Area.	**No**
Ninox connivens	Barking Owl	V	-	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country.	**Low** – no suitable habitat within Study Area.	**No**
Ninox strenua	Powerful Owl	V	-	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within red turpentine in tall open forests and black she-oak within open forests. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm.	**Low** – no suitable habitat within Study Area.	**No**
Numenius madagascariensis	Eastern Curlew	-	CE, MA, M	A primarily coastal distribution. Found in all states, particularly the north, east, and south-east regions including Tasmania. Rarely recorded inland. Mainly forages on soft sheltered intertidal sand flats or mudflats, open and without vegetation or cover. Breeds in the northern hemisphere.	**Low** – no suitable habitat within Study Area.	**No**
Pandion cristatus	Eastern Osprey	V	M, MA	Found right around the Australian coastline, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	**Low** – no suitable habitat within Study Area.	**No**
Perameles nasuta	Long-nosed Bandicoot, North Head	EP	-	*P. nasuta* has been reliably reported as occurring on North Head, in an area bounded by North Head, Cannae Point, Manly Point and Blue Fish Point.	**Low** – no suitable habitat within Study Area.	**No**
Persicaria elatior		V	V	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	**Moderate**	**No**
Persoonia hirsuta	Hairy Geebung	E	E	Distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. A large area of occurrence, but occurs in small populations, increasing the species's fragmentation in the landscape. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Probably killed by fire (as other *Persoonia* spp. are) but will regenerate from seed.	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
Persoonia mollis subsp. maxima		E	E	Occurs in sheltered aspects of deep gullies or on the steep upper hillsides of narrow gullies on Hawkesbury Sandstone. These habitats support relatively moist, tall forest vegetation communities, often with warm temperate rainforest influences. Flowers are likely to be pollinated predominantly by native bees. Self-pollination is usually unsuccessful.	**Low** – no suitable habitat within Study Area.	**No**
Petalura gigantea	Giant Dragonfly	E	-	The Giant Dragonfly is found along the east coast of NSW from the Victorian border to northern NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Coffs Harbour to Nadgee in the south. Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence.	**Low** – no suitable habitat within Study Area.	**No**
Petauroides volans	Greater Glider	-	V	The Greater Glider occurs in eucalypt forests and woodlands. The Greater Glider occurs in eucalypt forests and woodlands. The species nests in hollows and are typically found in older forests. Generally, the home range for the greater glider is between 0.7-3 hectares and tends to have a population density of 0.01-5 individuals per hectare. The home ranges of females can overlap with males and females however for the males the home ranges never overlap.	**Low** – no suitable habitat within Study Area.	**No**
Petaurus australis	Yellow-bellied Glider	V	-	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	**Low** – no suitable habitat within Study Area.	**No**
Petaurus norfolcensis	Squirrel Glider	V	-	Generally, occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias. There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked. Endangered population in the Wagga Wagga LGA.	**Low** – no suitable habitat within Study Area.	**No**
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices.	**Low** – no suitable habitat within Study Area.	**No**
Petroica boodang	Scarlet Robin	V	-	The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from the coast to the inland slopes. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
Phascolarctos cinereus	Koala	V	V	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall.	**Low** – no suitable habitat within Study Area.	**No**
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.	**Low** – no suitable habitat within Study Area.	**No**
Polytelis swainsonii	Superb Parrot	V	V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. Inhabits box-gum, box-cypress-pine and boree woodlands and river red gum forest.	**Low** – no suitable habitat within Study Area.	**No**
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V	Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy.	**Low** – no suitable habitat within Study Area.	**No**
Prasophyllum fuscum	Tawny Leek-orchid	CE	V	Tawny Leek-orchid is confined to the Blue Mountains, Hawkesbury sandstone, and the Burrawang district, NSW. This species grows on the margins of swamps at moderate altitudes, about 500–700 m above sea level. Tawny Leek-orchid grows in wet low heathland on gentle slopes, in brown silty loam or in moist heath, often along seepage lines. The species can also be found in grasslands with scattered low Leptospermum and rushes, in silty peat loam, or in boggy soils in open heath, sometimes in running water or at the ecotone between grassy woodland-forest and swamps.	**Low** – no suitable habitat within Study Area.	**No**
Prostanthera densa		V	V	Villous Mintbush is generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	**Low** – no suitable habitat within Study Area.	**No**
Prostanthera junonis		E	E	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.	**Low** – no suitable habitat within Study Area.	**No**
Prostanthera marifolia		CE	CE	Occurs in localised patches in 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.	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
Prototroctes maraena	Australian Grayling	-	V	Historically, this species occurred in coastal streams from the Grose River Valley, southwards through NSW, Vic. and Tas. It also occasionally occurred high upstream in the Snowy R. A single juvenile specimen was collected from Lake Macquarie in 1974. This species spends only part of its lifecycle in freshwater. The Tambo River population inhabits a clear, gravel-bottomed stream with alternating pools and riffles, and granite outcrops. It has also been associated with clear, gravel-bottomed habitats in the Mitchell & Wonnangatta Rivers but was present in a muddy-bottomed, heavily silted habitat in the Tarwin R.	**Low** – no suitable habitat within Study Area.	**No**
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	V	-	In NSW the Eastern Chestnut Mouse mainly occurs north from the Hawkesbury River area as scattered records along to coast and eastern fall of the Great Dividing Range extending north into Queensland. There are however isoltaed records in the Jervis bay area. In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. In the tropics it is more an animal of grassy woodlands. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously. By the time the heath is mature, the larger Swamp Rat becomes dominant, and Eastern Chestnut Mouse numbers drop again.	**Low** – no suitable habitat within Study Area.	**No**
Pseudomys novaehollandiae	New Holland Mouse	-	V	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	**Low** – no suitable habitat within Study Area.	**No**
Pseudophryne australis	Red-crowned Toadlet	V	-	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. After raining these creeks are characterised by a series of shallow pools lined by dense grasses, ferns and low shrubs and usually contain leaf litter for shelter. Eggs are terrestrial and laid under litter, vegetation or rocks where the tadpoles inside will reach a relatively late stage of development before waiting for flooding waters before hatching will occur.	**Low** – no suitable habitat within Study Area.	**No**
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	**Moderate**	**No**
Ptilinopus magnificus	Wompoo Fruit-dove	V	-	Distributed north of the Hunter River in NSW on the coast and coastal ranges. Inhabits rainforest, monsoon forest, adjacent eucalypt forest and brush box forest.	**Low** – no suitable habitat within Study Area.	**No**
Ptilinopus regina	Rose-crowned Fruit-dove	V	-	Coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. Vagrants are occasionally found further south to Victoria. Rose-crowned Fruit-doves	**Low** – may pass through the Study	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
				occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.	Area but would not be dependent on the habitat within the Study Area.	
Ptilinopus superbus	Superb Fruit-dove	V	-	The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. There are records of vagrants as far south as eastern Victoria and Tasmania. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	**Low** – may pass through the Study Area but would not be dependent on the habitat within the Study Area.	**No**
Rhizanthella slateri	Eastern Australian Underground Orchid	V, EP (Great Lakes)	E	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. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore, usually located only when the soil is disturbed. 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.	**Low** – no suitable habitat within Study Area.	**No**
Rhodamnia rubescens	Scrub Turpentine	CE	-	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *R. rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	**Low** – no suitable habitat within Study Area.	**No**
Rostratula australis	Painted Snipe	E	E, MA	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin. 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.	**Low** – no suitable habitat within Study Area.	**No**
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	**Low** – no suitable habitat within Study Area.	**No**
Sarcochilus hartmannii	Hartman's Sarcochilus	V	V	From the Richmond River in northern NSW to Gympie in south-east Queensland. Favours cliff faces on steep narrow ridges supporting eucalypt forest and clefts in volcanic rock from 500 to 1,000 m in altitude.	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m. In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat. This species roosts in hollow tree trunks and branches.	**Moderate**	**No**
Senecio spathulatus	Coast Groundsel	E	-	Coast Groundsel occurs in Nadgee Nature Reserve (Cape Howe) and between Kurnell in Sydney and Myall Lakes National Park (with a possible occurrence at Cudmirrah). In Victoria there are scattered populations from Wilsons Promontory to the NSW border. Coast Groundsel grows on primary dunes.	**Low** – no suitable habitat within Study Area.	**No**
Stagonopleura guttata	Diamond Firetail	V	-	Feeds exclusively on the ground, on ripe and partly ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Found in grassy eucalypt woodlands, including box-gum woodlands and snow gum woodlands. Also occurs in open forest, mallee, natural temperate grassland, and in secondary grassland derived from other communities.	**Low** – no suitable habitat within Study Area.	**No**
Syzygium paniculatum	Magenta Lilly Pilly	E	V	Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State forest. On the south coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities	**Low** – no suitable habitat within Study Area.	**No**
Tetratheca glandulosa		V	V	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone bench. Soils are generally shallow, consisting of a yellow, clayey-sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands-open woodlands, and open forest.	**Low** – no suitable habitat within Study Area.	**No**
Tetratheca juncea		V	V	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest-woodland with a mixed shrub understorey and grassy groundcover. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape. Cryptic species that requires survey in September-October.	**Low** – no suitable habitat within Study Area.	**No**
Thesium australe	Austral Toadflax	V	V	Grows in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Grows on kangaroo grass tussocks but has also been recorded within the exotic coolatai grass.	**Low** – no suitable habitat within Study Area.	**No**

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence	Assessment of Significance
Triplarina imbricata	Creek Triplarina	E	E	Found only in a few locations in the ranges south-west of Glenreagh and near Tabulam in north-east NSW. Along watercourses in low open forest with water gum.	**Low** – no suitable habitat within Study Area.	**No**
Tyto novaehollandiae	Masked Owl	V	-	Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. Nest hollows are usually located within dense forests or woodlands. Masked owls' prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet.	**Low** – no suitable habitat within Study Area.	**No**
Tyto tenebricosa	Sooty Owl	V	-	Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude less than 500 metres. Nests and roosts in hollows of tall emergent trees, mainly eucalypts often located in gullies. Nests have been located in trees 125 to 161 centimetres in diameter.	**Low** – no suitable habitat within Study Area.	**No**
Varanus rosenbergi	Rosenberg's Goanna	V	-	This species is a Hawkesbury-Narrabeen sandstone outcrop specialist. Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests.	**Low** – no suitable habitat within Study Area.	**No**
Vespadelus troughtoni	Eastern Cave Bat	V	-	The Eastern Cave Bat is 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. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. 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.	**Low** – no suitable habitat within Study Area.	**No**
Wilsonia backhousei	Narrow-leafed Wilsonia	V	-	In NSW Narrow-leaf Wilsonia is found on the coast between Mimosa Rocks National Park and Wamberal north of Sydney. This is a species of the margins of salt marshes and lakes.	**Low** – no suitable habitat within Study Area.	**No**

Appendix B – Test of Significance

A species does not have to be considered as part of the test of significance if recent and reliable data, relating to the study area and subject site and derived from field surveys consistent with OEH guidelines, clearly show that the species:

- Does not occur in the study area, and
- Will not use on-site habitats on occasion, and
- Will not be influenced by off-site impacts of the proposal.

Otherwise all species likely to occur in the study area and known to use that type of habitat shall be considered.

Measures that offset or otherwise compensate for the development or activity should not be considered in determining the degree of the effect on threatened species or ecological communities

The following questions have been answered after careful research and reference to the above sections of the REF. Where 'yes' has been selected a short description is to be provided.

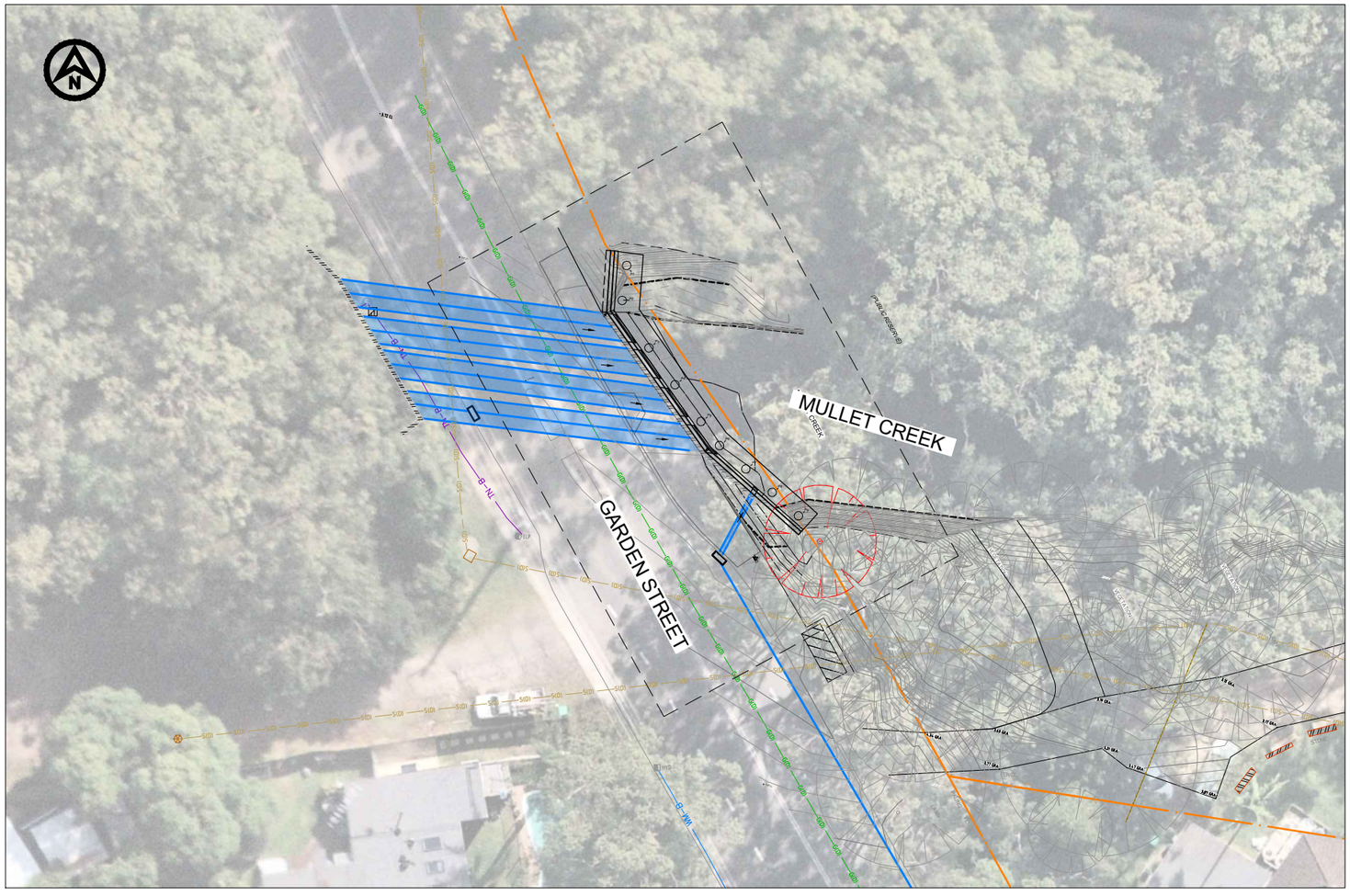
Response: Refer 5 part test as covered in Niche's Ecological Impact Assessment (*refer* **Appendix D**).

Appendix C – Detail Design Drawings

DRAWING No.
PA2317-RHD-00-XX-DR-ME-1001

DO NOT SCALE

NORTHERN BEACHES COUNCIL
GARDEN STREET HEADWALL REPLACEMENT



LOCALITY PLAN
1:200 (A1)

DRAWING LIST	
DRAWING NUMBER	TITLE
PA2317-RHD-00-XX-DR-ME-1001	COVER SHEET, LOCALITY PLAN AND DRAWINGS LIST
PA2317-RHD-00-XX-DR-ME-1002	NOTES AND CONSTRUCTION SPECIFICATIONS SHEET 1 OF 2
PA2317-RHD-00-XX-DR-ME-1003	NOTES AND CONSTRUCTION SPECIFICATIONS SHEET 2 OF 2
PA2317-RHD-00-XX-DR-ME-1100	GENERAL ARRANGEMENT PLAN
PA2317-RHD-00-XX-DR-ME-1110	EXISTING SURVEY AND SERVICES PLAN
PA2317-RHD-00-XX-DR-ME-1121	EROSION AND SEDIMENT CONTROL PLAN
PA2317-RHD-00-XX-DR-ME-1122	SITE ACCESS AND TEMPORARY STOCKPILE AREAS
PA2317-RHD-00-XX-DR-ME-1123	EROSION AND SEDIMENT CONTROL DETAILS
PA2317-RHD-00-XX-DR-ME-1130	DEMOLITION AND VEGETATION REMOVAL PLAN
PA2317-RHD-00-XX-DR-ME-1150	SITEWORKS PLAN
PA2317-RHD-00-XX-DR-ME-1151	SITEWORKS SECTIONS SHEET 1 OF 3
PA2317-RHD-00-XX-DR-ME-1152	SITEWORKS SECTIONS SHEET 2 OF 3
PA2317-RHD-00-XX-DR-ME-1153	SITEWORKS SECTIONS SHEET 3 OF 3
PA2317-RHD-00-XX-DR-ME-1161	STRUCTURAL DETAILS HEADWALL ARRANGEMENT
PA2317-RHD-00-XX-DR-ME-1162	STRUCTURAL DETAILS CONSTRUCTION SEQUENCE
PA2317-RHD-00-XX-DR-ME-1163	STRUCTURAL DETAILS REINFORCEMENT SHEET 1 OF 2
PA2317-RHD-00-XX-DR-ME-1164	STRUCTURAL DETAILS REINFORCEMENT SHEET 2 OF 2
PA2317-RHD-00-XX-DR-ME-1171	CIVIL, DRAINAGE AND REVEGETATION DETAILS
PA2317-RHD-00-XX-DR-ME-1181	REINSTATEMENT PLAN & DETAILS

AUSTRALIAN HEIGHT DATUM | **D5** | **FOR CONSTRUCTION**

4 0 4 8 12 16 20m
1:400 (A3) 1:200 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.03	08.09.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.02	27.04.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.04.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.04.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT
GARDEN STREET
HEADWALL REPLACEMENT

TITLE
COVER SHEET, DRAWINGS LIST
AND LOCALITY PLAN

Level 14, 56 Berry Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	08.09.2021

REF.
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1001	D5	C01.03

C:\USERS\920269\BOX\PA2317 RLGARDENSTHW\PA2317 RLGARDENSTHW WIP\E11 WORKING DRAWINGS\PA2317-GARDEN-ST

DRAWING No.
PA2317-RHD-00-XX-DR-ME-1002

DO NOT SCALE

GENERAL

ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THESE SPECIFICATIONS OR NORTHERN BEACHES COUNCIL SPECIFICATIONS IN THAT ORDER.

ANY DISCREPANCIES BETWEEN THESE DRAWINGS AND COUNCIL OR OTHER DOCUMENTATION SHALL BE REFERRED TO THE SUPERINTENDENT AS APPOINTED BY THE PRINCIPAL PRIOR TO INSTALLATION.

ALL EXISTING SERVICES AND UTILITIES SHALL BE LOCATED, EXPOSED, LEVELLED AND RECORDED PRIOR TO COMMENCEMENT OF ANY WORKS. ALL INFORMATION SHOWING SERVICES AND UTILITIES ON THESE DRAWINGS IS FOR GUIDANCE ONLY AND ITS ACCURACY IS NOT GUARANTEED.

THE CONTRACTORS WORK AREA IS CONFINED TO THE SITE AND AS SHOWN ON THESE DRAWINGS UNLESS NOTED OTHERWISE. NO WORK IS TO BE CARRIED OUT ON ADJOINING PROPERTIES WITHOUT WRITTEN PERMISSION FROM THE OWNER.

ALL FINISHED GRADING SHALL BE TO THE SATISFACTION OF THE SUPERINTENDENT.

NO WORKS ARE TO BE UNDERTAKEN OUTSIDE OF THE EXTENT OF WORKS SHOWN ON THE DRAWINGS UNLESS INSTRUCTED IN WRITING BY THE SUPERINTENDENT.

ALL NEW WORKS SHALL MAKE A SMOOTH TRANSITION WITH EXISTING WORKS.

WORKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH A CEMP (CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN) PREPARED BY THE CONTRACTOR.

THE CONTRACTOR IS RESPONSIBLE FOR THE PREPARATION OF A TRAFFIC CONTROL PLAN FOR WORKS TO BE CARRIED OUT ON EXISTING STREETS, INCLUDING APPROPRIATE SIGNAGE.

ALL EXTERNAL ROADS ARE TO REMAIN TRAFFICABLE TO LOCAL TRAFFIC DURING CONSTRUCTION WHERE PRACTICAL.

THE CONTRACTOR SHALL, ON COMPLETION OF THE WORKS, REMOVE FROM THE SITE AND ALL AREAS UTILISED BY THE CONTRACTOR FOR THE PURPOSE OF THE CONTRACT, ALL PLANT, BUILDINGS, TEMPORARY FENCES, RUBBISH, UNUSED MATERIALS, CONSTRUCTION FACILITIES, TEMPORARY FLOW MANAGEMENT WORKS, AND OTHER MATERIALS BELONGING TO THE CONTRACTOR OR USED UNDER THE CONTRACTOR'S DIRECTION AND LEAVE THE SITE AND SUCH AREAS CLEAN AND TIDY TO THE SATISFACTION OF THE PRINCIPAL OR PRINCIPAL'S AUTHORISED PERSON.

IN DISPOSING OF SUCH RUBBISH AND OTHER MATERIAL, THE CONTRACTOR SHALL NOT DISPOSE OF THEM ON LAND UNDER THE CONTROL OF THE PRINCIPAL OR PRINCIPAL'S AUTHORISED PERSON. RUBBISH AND OTHER MATERIAL IS TO BE TAKEN OFF SITE AND DISPOSED AT A REGISTERED LANDFILL SITE.

DESIGN CRITERIA

CHANNEL RIPRAP

DESIGN LIFE FOR THE CHANNEL RIPRAP, UNLESS NOTED OTHERWISE, SHALL BE 50 YEARS.

DESIGN LOADING:

- LOADING - RIPRAP DESIGN IS BASED ON THE FOLLOWING CHANNEL PEAK FLOW VELOCITIES:

AEP%	PEAK VELOCITY (m/s)
20	4.0

HEADWALL AND WINGWALLS

THE DESIGN LIFE FOR THE HEADWALL AND WINGALLS, UNLESS NOTED OTHERWISE, SHALL BE 50 YEARS.

WORK HEALTH & SAFETY & ENVIRONMENTAL CONTROLS

IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE ALL WORKS ARE TO BE CARRIED OUT IN ACCORDANCE WITH NSW WORK HEALTH & SAFETY ACT 2011.

ALL PLANT AND DEBRIS FROM CONSTRUCTION WORKS SHALL BE COMPLETELY REMOVED CLEAR OF THE CHANNEL AT THE COMPLETION OF EACH DAY.

THE CONTRACTOR SHALL NOT CARRY OUT WORKS IN THE CREEK WHEN THERE IS A RISK OF FLOOD FLOWS IN THE CREEK WHICH WOULD BE A HAZARD TO PERSONNEL. THE CONTRACTOR SHALL MONITOR THE WEATHER IN THE UPSTREAM CATCHMENT AREA AT ALL TIMES AND TAKE STEPS TO ENSURE THAT ADEQUATE WARNING IS GIVEN SO THAT PLANT, MATERIALS AND PERSONNEL CAN BE REMOVED FROM THE CREEK PRIOR TO FLOODING.

THE CONTRACTOR SHALL MAINTAIN FLOOD INSURANCE THAT COVERS ALL PLANT, MATERIAL AND LOSS OF TIME DELAYS FOR EVENTS AS FREQUENT AT AS 10% AEP EVENT.

WORKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH A CEMP (CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN) PREPARED BY THE CONTRACTOR. THIS PLAN SHALL DETAIL THE MEASURES WHICH WILL BE USED TO MITIGATE THE RISKS ASSOCIATED WITH FLOODING AT THE SITE, INCLUDING EARLY WARNING, AND MINIMISATION OF THE RISK OF DAMAGE TO THE WORKS.

ENVIRONMENTAL PROTECTION MEASURES SHALL COMPLY WITH THE REQUIREMENTS OF THE RELEVANT SECTION OF NBC AUS-SPEC GUIDELINES.

DEMOLITION

CARRY OUT DEMOLITION WORK IN ACCORDANCE WITH AS 2601 MAKING DUE ALLOWANCE FOR THE DETERIORATED CONDITION OF THE STRUCTURES.

PROTECT PROPERTY AND SERVICES WHICH ARE TO REMAIN ON OR ADJACENT TO THE SITE.

LAWFULLY DISPOSE OF ALL DEMOLITION MATERIALS.

ITEMS TO BE DEMOLISHED SHALL BE COMPLETELY REMOVED CLEAR OF MULLET CREEK. ALL FOUNDATIONS AND PILES SHALL BE FULLY WITHDRAWN FROM THE BANK AND NOT CUT OFF UNLESS SUCH REMOVAL RESULTS IN SLOPE INSTABILITY.

ALL DEBRIS SHALL BE COMPLETELY REMOVED CLEAR OF THE CHANNEL AS THE DEMOLITION WORK PROGRESSES SO THAT FLOOD FLOWS ARE NOT IMPEDED.

SURVEY

A DETAILED TOPOGRAPHIC SURVEY WAS PROVIDED BY CMS SURVEYORS PTY LTD. UNLESS STATED OTHERWISE, ALL TOPOGRAPHIC INFORMATION USED FOR THIS DESIGN WAS SOURCED FROM THIS SURVEY. THE CONTRACTOR SHALL SOURCE AND CONFIRM SETOUT INFORMATION AND DATUMS PRIOR TO CONSTRUCTION.

BENCHMARK ADOPTED SSM43671.

ALL WORKS SHALL BE SET OUT BY A SUITABLY QUALIFIED SURVEYOR, AND WORKS-AS-EXECUTED SURVEY SHALL BE CONDUCTED BY A SUITABLY QUALIFIED SURVEYOR, AT THE COMPLETION OF THE WORKS, EMPLOYED BY THE CONTRACTOR.

ANY ELECTRONIC FILE IS PROVIDED WITHOUT WARRANTY AND SHOULD BE USED ONLY IN CONJUNCTION WITH THE SUPPLIED PDF/PAPER COPY OF THESE PLANS.

BOUNDARIES HAVE NOT BEEN DEFINED (TITLE DIMENSIONS ONLY). BASIC BOUNDARY SURVEY HAS BEEN UNDERTAKEN. BOUNDARY DEFINITION SUBJECT TO FURTHER SURVEY. EXCEPT WHERE SHOWN BY DIMENSIONS, LOCATION OF DETAIL WITH RESPECT TO BOUNDARIES IS INDICATIVE ONLY.

ONLY VISIBLE SERVICES ARE POSITIVELY LOCATED.

UNDERGROUND UTILITY SERVICES SHOWN ARE INDICATIVE ONLY AND ARE SOURCED FROM THE FOLLOWING:

- "DIAL BEFORE YOU DIG" INQUIRY
- GROUND PENETRATION RADAR SURVEY DATED MAY 20' BY SURESEARCH

CONFIRMATION OF THE EXACT POSITION SHOULD BE MADE WITH DIAL BEFORE YOU DIG PLANS, FULL UTILITY POTHOLING AND SURVEY AND THROUGH LIAISON WITH THE RELEVANT SERVICE AUTHORITIES PRIOR TO ANY EXCAVATION WORK. OTHER SERVICES MAY EXIST WHICH ARE NOT SHOWN.

TREE SIZES ARE ESTIMATED ONLY.

CONTOURS ARE AN INDICATION OF TOPOGRAPHY AND ARE DIAGRAMMATIC AND SHOULD NOT BE TAKEN IN PREFERENCE TO SPOT LEVELS SHOWN.CRITICAL SPOT LEVELS TO BE CONFIRMED WITH THE SURVEYOR.

ADJOINING CADASTRE PROVIDED BY THE SURVEYOR.

ALL PUBLIC UTILITIES AFFECTED BY CONSTRUCTION NOT LIMITED BY THOSE SHOWN ON THESE PLANS BUT DISCOVERED DURING CONSTRUCTION SHALL BE RELOCATED AND ADJUSTED AS NECESSARY WITH THE FULL PERMISSION OF THE RELEVANT SERVICE AUTHORITY AND NORTHERN BEACHES COUNCIL.

THE CONTRACTOR IS TO CARRY OUT QUALITY CONTROL FEATURE LEVEL SURVEY OF ALL CRITICAL LEVELS ACROSS THE SITE, INCLUDING (BUT NOT LIMITED TO) ALL FINISHED SURFACES, REDUCED LEVELS AND INVERT LEVELS OF PIPEWORK, OUTLETS, INLETS, TOP OF BANKS AND SUPPLY EVIDENCE IN THE FORM OF PRINT AND ELECTRONIC 'AS BUILT' SURVEY.

THIS WAE SURVEY MUST CONFIRM ALL CRITICAL DESIGN LEVELS HAVE BEEN ACHIEVED. IF DESIGN LEVELS HAVE NOT BEEN ACHIEVED, THE CONTRACTOR IS TO CARRY OUT RECTIFICATION, AS REQUIRED TO ACHIEVE COMPLIANCE, TO THE SATISFACTION OF THE PRINCIPAL.

ALL FINAL GRADES AND SURFACES ARE TO BE CARRIED OUT TO SATISFACTION OF THE PRINCIPAL BEFORE LANDSCAPE FINISHING.

THE PRINCIPAL RESERVES THE RIGHT TO CARRY OUT SPOT LEVEL CHECKS OF THE FINAL SURFACES TO CONFIRM QUALITY CONTROL OF ALL LEVELS. IF DISCREPANCIES ARE FOUND, THE CONTRACTOR WILL BE REQUIRED TO RECTIFY THE SURFACES ACCORDINGLY AND PROVIDE CONFIRMATION THAT DESIGN LEVELS HAVE BEEN ACHIEVED.

SOIL EROSION AND SEDIMENTATION CONTROL

THE CONTRACTOR SHALL CONSTRUCT OR INSTALL SOIL EROSION AND SEDIMENTATION CONTROL MEASURES IN ACCORDANCE WITH THE CONTRACT DOCUMENTATION AND TO THE SATISFACTION OF THE SUPERINTENDENT PRIOR TO ANY DISTURBANCES TO THE SITE. SOIL EROSION AND SEDIMENTATION CONTROL DEVICES SHALL BE TO THE STANDARD RECOMMENDED BY THE NSW DEPARTMENT OF HOUSING'S 'BLUE BOOK' TITLED "MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION", 2004.

IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL SOIL EROSION AND SEDIMENTATION CONTROL DEVICES ARE MAINTAINED TO PROTECT ALL DISTURBED AREAS.

FOR FURTHER NOTES REGARDING EROSION PROTECTION THE CONTRACTOR SHALL REFER TO THE DRAWINGS.

THE CONTRACTOR SHOULD BE AWARE THAT THE WORKS AREA IS SUBJECT TO FLOODING.

EARTHWORKS

GENERAL EARTHWORKS

THESE STANDARDS APPLY TO GENERAL EARTHWORKS.

WITHIN EXTENTS OF WORK AREA, STRIP ALL PAVEMENT AND/OR TOPSOIL AND ANY DELETERIOUS MATERIAL AND STOCKPILE FOR RE-USE ON-SITE OR DISPOSE OF OFFSITE TO A LICENSED WASTE MANAGEMENT CENTRE. REMOVE ALL STRUCTURES AND DEBRIS.

EXCAVATE, STOCKPILE FOR RE-USE OR DISPOSE OF MATERIAL TO EXPOSE SUB-GRADE AS SPECIFIED IN CUT AREAS.

EXCAVATED MATERIAL THAT MEETS THESE SPECIFICATIONS AND IS VENM MAY BE USED AS FILL SUBJECT TO THE SUPERINTENDENT'S APPROVAL.

TESTING OF ALL COMPACTED LAYERS, INCLUDING SUB-GRADE TO BE ALLOWED FOR BY THE CONTRACTOR.

MINIMUM BEARING CAPACITY FOR CREEK INVERT SUBGRADE PRIOR TO PLACEMENT OF REVETMENT UNDERLAY SHALL BE 50KPa. SHOULD GROUND CONDITIONS INDICATE SOFTER SUBGRADE, THEN THE CONTRACTOR SHALL CONTACT THE SUPERINTENDENT TO ARRANGE FOR AN INSPECTION PRIOR TO OVER EXCAVATION, REPLACEMENT AND COMPACTION OF APPROPRIATE BRIDGING MATERIAL SUCH AS CRUSHED QUARRY STONE.

HANDLING, TREATMENT AND DISPOSAL OR RE-USE OF CONTAMINATED AND ASBESTOS CONTAINING MATERIALS ARE TO BE UNDERTAKEN IN ACCORDANCE WITH THESE SPECIFICATIONS AND RELEVANT AUSTRALIAN STANDARDS.

ALL PAVEMENTS TO BE COMPACTED AS SPECIFIED ON THE DRAWINGS AND WITHIN THIS SPECIFICATION.

ALL LEVEL 2 TESTING WORKS SHALL BE UNDERTAKEN AND CERTIFIED BY A NATA REGISTERED LABORATORY. A COPY OF ALL TEST RESULTS, CLEARLY INDICATING THE LOCATIONS OF SAMPLING AND CERTIFICATES SHALL BE PROVIDED TO THE SUPERINTENDENT.

THE CONTRACTOR SHALL PROGRAM THE EARTHWORKS OPERATION SO THAT THE WORKING AREAS ARE ADEQUATELY DRAINED DURING THE PERIOD OF CONSTRUCTION THE SURFACE SHALL BE GRADED AND SEALED OFF TO REMOVE DEPRESSIONS, ROLLER MARKS AND SIMILAR WHICH WOULD ALLOW WATER TO POND AND PENETRATE THE UNDERLYING MATERIAL. ANY DAMAGE RESULTING FROM THE CONTRACTOR NOT OBSERVING THESE REQUIREMENTS SHALL BE RECTIFIED.

THE CONTRACTOR SHALL DO ALL THINGS NECESSARY TO DIVERT ANY WATER INTERFERING WITH THE PROGRESS OF WORKS, KEEP THE EXCAVATIONS FREE FROM WATER WHILE THE WORKS ARE IN PROGRESS AND PREVENT ANY DAMAGE TO THE WORKS BY WATER DUE TO NORMAL CREEK FLOW, TIDAL INUNDATION, GROUNDWATER INFLUX, FLOODS OR OTHER CAUSES. THE CONTRACTOR SHALL HAVE PUMPING EQUIPMENT FOR KEEPING THE EXCAVATION BEHIND WALLS CONSTANTLY DE-WATERED DURING THE TIMES THE WORKS ARE IN PROGRESS. ANY WORK OR MATERIAL DAMAGED BY WATER SHALL BE MADE GOOD BY THE CONTRACTOR.

WHERE DIRECTED BY THE SUPERINTENDENT THE BOTTOM OF EXCAVATIONS SHALL BE COMPACTED PRIOR TO THE PLACING OF ANY BEDDING OR CONCRETE MATERIALS. SHOULD, IN THE OPINION OF THE SUPERINTENDENT AND FOLLOWING INSPECTION BY A QUALIFIED GEOTECHNICAL ENGINEER, THE FOUNDATION MATERIAL BE INCAPABLE OF EFFECTIVE COMPACTION, THE MATERIAL SHALL BE REMOVED AND REPLACED WITH APPROPRIATE BRIDGING LAYER MATERIAL AS SPECIFIED ON THE DRAWINGS AND WITHIN THIS SPECIFICATION.

SHOULD ANY ACID SULFATE SOILS BE FOUND ON SITE, THEN IT SHALL BE TREATED WITH AN APPROPRIATE MASS OF LIME IF REQUIRED AND RE-USED IN THE WORKS, UNDER THE DIRECTION OF THE SUPERVISING GEOTECHNICAL ENGINEER.

THE CONTRACTOR SHALL CLASSIFY ALL WASTE MATERIAL THAT REQUIRES OFF-SITE DISPOSAL IN ACCORDANCE WITH THE EPA WASTE CLASSIFICATION GUIDELINES, PART 1: CLASSIFYING WASTE, JULY 2009. DISPOSAL DOCUMENTATION SHALL BE PROVIDED TO NORTHERN BEACHES COUNCIL FOR RECORD KEEPING PURPOSES. THIS INFORMATION SHALL ACCOMPANY THE CONTRACTOR'S PROGRESS CLAIMS AS SUPPORTING INFORMATION.

IMPORTED FILL MATERIAL (PLACED ABOVE WATER TABLE) SHALL BE WELL GRADED CLEAN FILL CBR ≥ 15%.

COMPACTION SHALL ACHIEVE 95% STANDARD DRY DENSITY WITHIN -2% TO +2% OF OPTIMUM MOISTURE CONTENT UNLESS NOTIFIED OTHERWISE.

MAXIMUM COMPACTION LAYER THICKNESSES:

- VIBRATORY ROLLER: 250mm THICK LAYERS PLACED
- WACKER PACKER: 150mm THICK LAYERS PLACED

SHARED PATH PAVEMENTS

CONNECTION TO EXISTING PAVEMENTS SHALL BE SAW CUT. CHASE BACK EXISTING PAVEMENT AS REQUIRED FOR FULL DEPTH OF PAVEMENT AND MAKE SMOOTH CONNECTION.

ACCESS TO EXISTING SITE FEATURES TO BE MAINTAINED IN A SAFE AND TRAFFICABLE STATE AT ALL TIMES. NORTHERN BEACHES COUNCIL SHALL BE NOTIFIED OF ANY DISRUPTION TO PEDESTRIAN TRAFFIC OUTSIDE DISRUPTION NOMINATED IN THE CONTRACTOR'S CTMP.

INSTALL ALL DRAINAGE AS PER THE DRAWINGS.

STRIP ANY EXISTING TOPSOIL, OVERLY WET, SOFT OR DELETERIOUS MATERIAL.

A CERTIFIED PRACTICING GEOTECHNICAL ENGINEER IS TO INSPECT SUB-GRADE PRIOR TO PLACEMENT OF PAVEMENT MATERIALS TO ENSURE DESIGN PARAMETERS ARE CORRECT. PROOF ROLLING IS REQUIRED TO PROVE FOUNDATION BEARING CAPACITY.

THE UPPERMOST 100mm OF EXPOSED NATURAL SUB-GRADE (OR ENGINEERED FILL) AND ALL SOFT AND OTHER UNSUITABLE MATERIAL SHALL BE REMOVED AND REPLACED WITH SAND OR ROAD BASE (RECYCLED ROAD BASE IS ACCEPTABLE) AND SHALL BE THOROUGHLY COMPACTED WITH VIBRATORY COMPACTION EQUIPMENT UNTIL IT SHOWS NO SIGN OF MOVEMENT.

A MINIMUM OF 95% STANDARD MAXIMUM DRY DENSITY (SMDD) OR EQUIVALENT 75% DENSITY INDEX, WHICHEVER IS APPLICABLE, AT +/- 2% STANDARD OPTIMUM MOISTURE CONTENT (OMC).

WHERE SUB-GRADE REPLACEMENT IS REQUIRED, REPLACEMENT BRIDGING LAYER MATERIAL COULD INCLUDE RE-USED PAVEMENT MATERIALS, RIPPED SANDSTONE OR APPROVED GRANULAR MATERIAL. THE SELECT FILLING MATERIAL SHOULD HAVE A MINIMUM CBR OF 15% AND SHALL BE INSPECTED AND APPROVED BY A CERTIFIED PRACTICING GEOTECHNICAL ENGINEER.

REPLACEMENT BRIDGING LAYER SUB-GRADE FILL SHALL BE PLACED IN LAYERS NOT EXCEEDING 150mm AND COMPACTED TO A MINIMUM OF 95% SMDD OR EQUIVALENT 70% DENSITY INDEX, WHICHEVER IS APPLICABLE, AT +/- 2% OMC.

BASE COURSE SHALL BE DGB20 (OR APPROVED EQUIVALENT) AS SPECIFIED IN RMS SPEC. 3051. MATERIAL SHALL BE COMPACTED TO 98% SMDD AT OMC ±2% IN ACCORDANCE WITH AS1289 5.2.1. DENSITY TESTS SHALL BE CARRIED OUT IN ACCORDANCE WITH AS3798-2007 AT A RATE OF 1 TEST PER 500m² WITH A MINIMUM OF 3 TESTS PER VISIT. MINIMUM COMPACTED BASE THICKNESS SHALL BE 100mm OR TO MATCH EXISTING PAVEMENTS.

ASPHALTIC CONCRETE WEARING COURSE

ASPHALTIC CONCRETE WEARING COURSE SHALL BE AC10 TO SATISFY A MINIMUM MODULUS OF 2500 MPa USING THE INDIRECT TENSILE TEST PROCEDURE, AS SPECIFIED IN AUSTROADS (2012), UNDER STANDARD TEST CONDITIONS.

THE CONTRACTOR SHALL UNDERTAKE FINAL SHAPING OF THE PATH TO ENSURE A SMOOTH SURFACE AND UNIFORM MIN.1:50 CROSS FALL AND MAXIMUM 1:20 LONGITUDINAL FALL FOR ALL PATHS UNLESS NOTIFIED OTHERWISE ON THE DRAWINGS.

WHEN THE CONTRACTOR HAS COMPLETED FINAL SHAPING, THE SURFACE IS TO CONFORM ACCURATELY TO THE LINE, GRADE AND CROSS SECTION SHOWN ON THE DRAWINGS AND NO ROOTS, SOD OR OTHER DELETERIOUS MATTER OR STONES OVER 20mm BE IN THE TOP 100mm OF THE PAVING.

THE CONTRACTOR SHALL NOTIFY THE PRINCIPAL FOLLOWING COMPLETION OF THE FINAL GRADING OF THE PATHWAY AND ALLOW AT LEAST 48 HOURS FOR THE PRINCIPAL TO INSPECT THE PATHWAY

STORMWATER DRAINAGE

ALL STORMWATER DRAINAGE TO BE IN ACCORDANCE WITH AS3500.3 AND NORTHERN BEACHES COUNCIL MINOR WORKS SPECIFICATION.

ALL CONCRETE PIPES ARE TO BE REINFORCED CONCRETE PIPES (RCP) RUBBER RING JOINTED UNLESS NOTED OTHERWISE.

PIPE BEDDING, HAUNCH ZONE AND SIDE ZONE CONSTRUCTION AND MATERIAL IS TO COMPLY WITH AS3725 AND NORTHERN BEACHES COUNCIL MINOR WORKS SPECIFICATION. IF IN THE OPINION OF THE SUPERINTENDENT THE ABILITY OF THE CONTRACTOR TO UTILISE SITE WON MATERIAL, DOES NOT PROVIDE SUFFICIENT QUALITY OF MATERIAL TO SATISFY AS3725, THEN THE CONTRACTOR MAY BE REQUIRED TO IMPORT MATERIAL THAT COMPLIES TO THIS STANDARD.

ALL PIPES REPLACEMENTS ARE TO REPLICATE THE EXISTING PIPE INVERT LEVELS AND ALIGNMENTS.

THE BASE OF THE TRENCH IS TO BE PROOF ROLLED TO THE SATISFACTION OF THE GEOTECHNICAL ENGINEER. IF ZONES OF SOFT GROUND ARE ENCOUNTERED, THEN THESE AREAS ARE TO BE OVER-EXCAVATED AND REPLACED WITH COMPACTED SELECTED FILL TO THE SATISFACTION OF THE SUPERINTENDENT.

FOR CERTAIN AREAS DUE TO POOR GROUND CONDITIONS, IT IS LIKELY THAT THE CONTRACTOR WILL ENCOUNTER AREAS OF LOOSE TO VERY LOOSE SILTY CLAYS AT THE BASE OF THE TRENCH. THESE AREAS ARE TO BE OVER EXCAVATED AND RECOMPACTED USING SELECT FILL TO THE SATISFACTION OF THE SUPERVISING GEOTECHNICAL ENGINEER. FOR HEADWALL OUTLET SECTIONS ADJACENT TO THE CREEK, SOME FORM OF CUTOFF WALL AND DE-WATERING WILL BE REQUIRED TO MAINTAIN THE EXCAVATION FREE FROM WATER.

D5 FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.02	27.08.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.06.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.06.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

NOTES AND CONSTRUCTION SPECIFICATIONS
SHEET 1 OF 2

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Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

REF.
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1002	D5	C01.02

IMPORTED PIPELINE BEDDING SAND MATERIAL IS TO BE LAID IN THE BASE OF THE TRENCH AND COMPACTED TO A MINIMUM DENSITY INDEX (DI) OF 75%.

PIPELINE HAUNCH ZONE AND SIDE ZONE MATERIALS ARE TO BE IMPORTED AND LAID IN LAYERS NOT EXCEEDING 150mm THICKNESS AND COMPACTED AND COMPACTED TO ACHIEVE A MINIMUM DENSITY INDEX OF 60%.

THE OVERLAY ZONE SHALL BE BACKFILLED WITH CLEAN FILL. FILL IS TO BE COMPACTED IN 150mm LAYERS TO 95% SMDD AT OMC ±2% IN ACCORDANCE WITH AS1289 5.2.1 TO A POINT AT LEAST 300mm ABOVE THE TOP OF THE PIPE.

BACK FILL SHALL FORM OVERBURDEN MATERIAL WHICH SHALL BE COMPACTED IN 150mm LAYERS TO 95% SMDD AT OMC ±2% IN ACCORDANCE WITH AS1289 5.4.1 TO NATURAL SURFACE LEVEL.

ALL CONNECTIONS TO PITS, HEADWALLS OR OTHER, EITHER EXISTING OR PROPOSED, WITHIN THE SITE TO BE GROUTED OR SEALED TO THE SATISFACTION OF THE SUPERINTENDENT.

THE CONTRACTOR SHALL ENSURE ALL PIPES ARE LAID IN ACCORDANCE WITH NORTHERN BEACHES COUNCIL MINOR WORKS SPECIFICATION AND AS 3725.

THE CONTRACTOR SHALL TEST THE WATERPROOFING OF ALL PIPE JOINTS IN ACCORDANCE WITH AS 3725 AND ANY OTHER RELEVANT STANDARDS. THE TEST RESULTS SHALL BE PROVIDED TO THE PRINCIPAL PRIOR TO BACKFILLING THE PIPEWORK.

CONCRETE

ALL WORKMANSHIP AND MATERIALS SHALL BE IN ACCORDANCE WITH AS 3600 CURRENT EDITION WITH AMENDMENTS, EXCEPT WHERE VARIED BY THE CONTRACT DOCUMENTS.

CONCRETE USED IN THE WORKS SHALL BE REINFORCED CONCRETE AS NOTED ON THE DRAWINGS AND SHALL COMPLY WITH THE FOLLOWING REQUIREMENTS:

- MAXIMUM AGGREGATE SIZE = 20mm
- EXPOSURE CLASSIFICATION = B2
- MINIMUM 28 DAY COMPRESSIVE STRENGTH (F'C) = 40 MPA (U.N.O)

THE AREA ON WHICH FOOTINGS ARE TO BE SITUATED SHALL BE STRIPPED OF ALL ORGANIC MATTER WHICH SHALL BE REMOVED FROM THE SITE. THIS INCLUDES TREE STUMPS AND / OR LARGE ROOTS.

TESTING AND ASSESSMENT FOR COMPLIANCE OF CONCRETE SHALL BE CARRIED OUT BY THE CONTRACTOR IN ACCORDANCE WITH AS 3600.

CONSTRUCTION JOINTS SHALL BE PROPERLY FORMED AND USED ONLY WHERE SHOWN ON THE DRAWINGS OR WHERE SPECIFICALLY APPROVED BY SUPERINTENDENT. THEY SHALL BE VERTICAL IN FOOTINGS AND BE SCABBLED AND CLEANED AND SHALL HAVE A NEAT CEMENT-WATER SLURRY BRUSHED ON BEFORE POUR CONTINUES.

ALL EXPOSED CONCRETE ARISES SHALL HAVE A 25mm X 25mm CHAMFER UNLESS NOTED OTHERWISE ON THE DRAWINGS.

COVER TO REINFORCEMENT TO BE MAINTAINED AT CHAMFERS, DRIP GROOVES, REGLETS, ETC.

CONSTRUCTION JOINTS WHERE NOT SHOWN SHALL BE LOCATED AS APPROVED BY THE SUPERINTENDENT.

FREE DROPPING OF CONCRETE FROM A HEIGHT GREATER THAN 1200mm SHALL NOT BE PERMITTED.

CONCRETE SHALL BE COMPACTED WITH MECHANICAL VIBRATORS.

THE FINISHED CONCRETE SHALL BE DENSE HOMOGENEOUS MASS, COMPLETELY FILLING THE FORMWORK, THOROUGHLY EMBEDDING THE REINFORCEMENT AND FREE OF STONE POCKETS AND CRACKS HAVING A CRACK WIDTH EQUAL TO OR GREATER THAN 0.2mm AT THE END OF THE DEFECTS LIABILITY PERIOD. IF CRACKING EXCEEDS THIS LIMIT, THE CONTRACTOR SHALL MAKE GOOD AT THEIR EXPENSE, THE CRACKS TO THE SATISFACTION OF THE SUPERINTENDENT WHICH MIGHT COMPRISE REPLACEMENT OF CONCRETE ELEMENT OR SEALING THE CRACKS OR OTHER WORKS.

DURING AND IMMEDIATELY FOLLOWING POURING, THE CONCRETE SHALL BE PROTECTED FROM WIND AND SUN TO PREVENT PLASTIC SHRINKAGE CRACKING. AWNINGS AND WIND BREAKS ARE TO BE UTILISED FOR THIS PURPOSE.

CURING OF ALL CONCRETE IS TO BE ACHIEVED BY KEEPING SURFACES CONTINUOUSLY WET WITH FRESH WATER (NOT SALT WATER) FOR A PERIOD OF 7 DAYS, AND PREVENTION OF LOSS OF MOISTURE FOR A TOTAL OF 14 DAYS FOLLOWED BY A GRADUAL DRYING OUT. USE POLYTHENE SHEETING OR WET HESSIAN AS NECESSARY TO PROTECT CONCRETE SURFACES FROM WIND AND TRAFFIC. DO NOT USE APPLIED CURING AGENTS.

REINFORCEMENT

REINFORCEMENT IS TO BE MANUFACTURED IN ACCORDANCE WITH AS/NZS4671 AND SHALL BE FIXED AS SHOWN ON THE DRAWINGS.

PROVIDE ACRS (AUSTRALIAN CERTIFICATION AUTHORITY FOR REINFORCING STEEL LTD) CERTIFICATION OF COMPLIANCE WITH AS/NZS4671 FOR ALL REINFORCEMENT.

ALL REINFORCEMENT SHALL BE HOT DIP GALVANISED, EXCEPT REINFORCEMENT USED IN SHARED PATHS ABOVE RL 1.5m, AHD WHICH MAY BE MILD STEEL

PROVIDE DOCUMENTATION TO SHOW THAT REINFORCEMENT SUPPLIER AND MILL COMPLIES WITH AS/NZS4671.

REINFORCEMENT IS TYPICALL NOTED AS 17N20-300 AND IS DEFINED IN THE FOLLOWING FORMAT:

- 17 - THE NUMBER OF BARS
- N - THE BAR MATERIAL
- 20 - THE NOMINAL BAR SIZE IN mm
- 300 - THE MAXIMUM BAR SPACING IN mm

MATERIAL IS INDICATED BY THE FOLLOWING SYMBOLS:

- Y - DEFORMED BAR GRADE 400
- N - DEFORMED BAR GRADE 500 (NORMAL DUCTILITY)
- R - PLAIN ROUND BAR GRADE 25
- W - PLAIN WIRE GRADE 450
- SL - SQUARE FABRIC GRADE 500
- RL - RECTANGULAR FABRIC GRADE 500

THE FOLLOWING NOTATIONS MAY HAVE BEEN USED ON THE DRAWINGS:

- LV - LENGTH VARIES
- CV - COG VARIES
- EW - EACH WAY
- EF - EACH FACE
- SV - SHAPE VARIES
- B1 - BOTTOM REINFORCEMENT - LAID FIRST
- B2 - BOTTOM REINFORCEMENT - LAID SECOND
- T1 - TOP REINFORCEMENT - LAID FIRST
- T2 - TOP REINFORCEMENT - LAID SECON
- T&B - TOP AND BOTTOM
- ALT - ALTERNATING BARS

THE SUPERINTENDENT SHALL BE GIVEN 24 HOURS' NOTICE FOR REINFORCEMENT INSPECTION AND CONCRETE SHALL NOT BE DELIVERED UNTIL SUCH INSPECTION HAS TAKEN PLACE.

REINFORCEMENT IS REPRESENTED DIAGRAMMATICALLY AND NOT NECESSARILY IN TRUE PROJECTION.

CONCRETE COVERS NOTED ARE MEASURED FROM THE FORMWORK OR GROUND FACE TO THE OUTERMOST REINFORCEMENT COMPONENT.

ALL REINFORCEMENT SHALL BE FIRMLY SUPPORTED ON CONCRETE BLOCKS AT NOT GREATER THAN 1M CENTRES BOTH WAYS. CONCRETE BLOCKS SHALL BE MADE FROM CONCRETE OF THE SAME PROPERTIES TO BE POURED AROUND THE BLOCK. PLASTIC CHAIRS AND PLASTIC TIPPED MILD STEEL CHAIRS SHALL NOT BE USED.

BARS SHALL BE TIED AT ALTERNATE INTERSECTIONS.

SPLICES IN REINFORCEMENT SHALL BE MADE ONLY IN POSITIONS SHOWN OR OTHERWISE APPROVED IN WRITING BY THE SUPERINTENDENT. LAPS SHALL BE IN ACCORDANCE WITH AS 3600 AND NOT LESS THAN THE DEVELOPMENT LENGTH FOR EACH BAR.

LAP LENGTHS AND COG LENGTHS SHALL BE IN ACCORDANCE WITH AS 3600 OR AS SPECIFIED WITHIN THE DRAWINGS AND NOT LESS THAN THE DEVELOPMENT FOR EACH BAR.

LAPS ON ADJACENT BARS NOT SHOWN ON THE DRAWINGS SHAL BE STAGGERED BY THE LENGTH OF THE LAP.

JOGGLES TO BARS SHALL BE 1 BAR DIAMETER OVER A LENGTH OF 12 BAR DIAMETERS.

COG, HOOK, SPLICE, LAP, PIN AND DOWEL DIAMETERS SHALL BE IN ACCORDANCE WITH AS 1100.501-2002
BAR SHAPES ARE IN ACCORDANCE WITH AS 1100.501-2002
BENDING AND STRAIGHTENING:

- COLD BENDING: BARS CANNOT BE COLD BENT WITHOUT PRIOR APPROVAL FROM THE PROJECT STRUCTURAL ENGINEER CORRECT MINIMUM DIAMETER FORMERS ARE TO BE USED IN ACCORDANCE WITH AS 3600.
- HOT BENDING: HOT BENDING MAY ONLY BE CONDUCTED WITH THE APPROVAL OF THE PROJECT STRUCTURAL ENGINEER. HOT BENDING CAN ONLY BE PERFORMED BY A CERTIFIED WELDER. TEST CERTIFICATE OF AFFECTED AREA TO BE OBTAINED.
- STRAIGHTENING: WHEN RE-STRAIGHTENING PARTIALLY EMBEDDED BARS, DO NOT BEND OVER FORMERS OF SMALLER DIAMETER THAN PERMITTED IN AS 3600. DO NOT SUBJECT REINFORCEMENT BARS TO IMPACT IN ORDER TO STRAIGHTEN.

FORMWORK AND FINISHING

ALL CONCRETE FORMWORK AND FINISHING SHALL ACHIEVE A CLASS 3 FINISH TO AS 3610.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STRUCTURAL SUFFICIENCY OF ALL FORMWORK. FORMWORK SHALL COMPLY WITH AS 3610.
THE DESIGN CERTIFICATION, CONSTRUCTION AND PERFORMANCE OF THE FORMWORK AND FALSEWORK ARE THE RESPONSIBILITY OF THE CONTRACTOR.

DESIGN AND CONSTRUCTION AND STRIPPING TIMES SHALL COMPLY WITH AS 3610 AND AS 3600.

DURING CONSTRUCTION, APPLIED LOADS SHALL NOT EXCEED THE DESIGN CAPACITY OF THE STRUCTURE.

INSITU MEMBERS SHALL NOT BE LOADED UNTIL AT LEAST 7 DAYS AFTER A CURING PERIOD OF 7 DAYS HAS ELAPSED, UNLESS APPROVED OTHERWISE.

SANDSTONE

ACCEPTANCE OF SANDSTONE ROCK FOR THE BLOCKWORK WALLS, UNDERLAYER AND ARMOUR LAYERS SHALL SATISFY ALL OF THE FOLLOWING CRITERIA:

ALL NEW SANDSTONE SUPPLIED TO THE SITE FOR CONSTRUCTION SHALL BE FRESH OR ONLY SLIGHTLY WEATHERED, NON-FRIABLE, AND FREE FROM CRACKS, CLEAVAGE PLANES, SEAMS, CROSS-LAMINATIONS, SHALE LENSES THICKER THAN 10mm, SAND BALLS GREATER THAN 50mm DIAM., CARBONATE CONCRETIONS AND OTHER SIGNIFICANT DEFECTS WHICH COULD CONTRIBUTE TO THE ACCELERATED BREAKDOWN OF THE STONE.

IN THE CASE OF IRON BANDING WITHIN THE ROCK STRATA, THE MAXIMUM ALLOWABLE IRON BANDING THICKNESS SHALL BE 10mm, THE CONTRACTOR SHALL ENSURE THAT IF IRON BANDING IS PRESENT, THAT NO WEAKER CLAY LAYERS ARE ASSOCIATED WITH THE IRON BANDING THAT MAY CONTRIBUTE TO THE ACCELRATED BREAKDOWN OF THE STONE IN THE MARINE ENVIRONMENT.

THE SANDSTONE COMPRISING THE BLOCK WORK, ARMOUR AND UNDERLAYER ROCKS SHALL COMPLY WITH THE FOLLOWING:

- A MINIMUM PARTICLE DENSITY OF 2,200kg/m³/ TO AS 1141.6.1
- SATURATED POINT LOAD STRENGTH (IS50) ≥1.5 MPa TO AS 4133.4.1
- RESISTANCE TO SALT ATTACK SHALL EXHIBIT A MEAN PERCENTAGE LOSS OF<5% TO AS 4456.10, METHOD A
- SODIUM SOUNDNESS WEIGHT LOSS LESS THAN 5% TO AS 1141.24.

IN ADDITION FOR ROCK ARMOUR AND UNDERLAYER, THE FOLLOWING CRITERIA SHALL APPLY:

- ROCK RIP-RAP SHALL BE ROUGH AND ANGULAR.
- FOR RIP-RAP, THE ARMOUR STONE SHALL COMPRISE OF TWO LAYERS OF ROCK.
- THE RATIO OF THE MAXIMUM DIMENSION OF ANY ROCK TO THE MINIMUM DIMENSION, MEASURED AT RIGHT ANGLES TO THE MAXIMUM DIMENSION SHALL NOT EXCEED 2.5.
- ROCK SHALL CONFORM TO THE SIZE GRADING SHOWN ON THE DRAWINGS.

VARYING OF THE SOURCE OF SANDSTONE ROCK

IF THE CONTRACTOR WISHES TO VARY THE SOURCE OF ROCK, THE CONTRACTOR SHALL SUBMIT TO THE SUPERINTENDENT ADDITIONAL DOCUMENTATION AS LISTED ABOVE THAT DEMONSTRATES THAT THE ROCK FROM THE NEW SOURCE COMPLIES WITH THE REQUIREMENTS OF THE SPECIFICATION.

INFORMATION TO BE SUPPLIED DURING DELIVERY OF ROCK - THE CONTRACTOR SHALL SUPPLY TO THE SUPERINTENDENT INFORMATION DURING THE DELIVERY OF ROCK TO CONFIRM THAT THE DELIVERED MATERIAL IS CONTINUING TO MEET THE REQUIREMENTS OF THE SPECIFICATION. THE NATA REGISTERED TEST RESULTS AND OTHER DOCUMENTATION SOUGHT PRIOR TO DELIVERY SHALL BE CONFIRMED FOR EACH 1000T OF ROCK DELIVERED TO THE SITE, PRIOR TO COMMENCING THE DELIVERY.

IF THIS INFORMATION SUPPLIED TO THE SUPERINTENDENT DOES NOT COMPLY WITH THE REQUIREMENTS OF THE SPECIFICATION, THE ROCK SHALL BE REJECTED AND THE CONTRACTOR SHALL NEED TO ESTABLISH A NEW SOURCE WHICH DOES COMPLY.

SUPPLY AND STOCKPILING OF ROCK

NO ROCK SHALL BE DELIVERED TO THE SITE WITHOUT WRITTEN AUTHORISATION FROM THE SUPERINTENDENT FOLLOWING ITS CONSIDERATION OF DOCUMENTATION ON THE QUARRY SOURCE, ROCK PROPERTIES AND THE CONTRACTOR'S QUALITY CONTROL PROCEDURES.

THE CONTRACTOR SHALL MAINTAIN A DAILY LOG OF IMPORTED ROCK DELIVERED TO THE SITE. THE LOG SHALL RECORD THE REGISTRATION OF EACH SUPPLY TRUCK, ITS DATE AND TIME OF ARRIVAL ON THE SITE, THE ROCK SUPPLY DOCKET NUMBER ISSUED BY THE QUARRY PERTAINING TO THE DELIVERY AND A SIGNATURE BY A REPRESENTATIVE OF THE CONTRACTOR TO VERIFY THE INFORMATION.

DURING THE COURSE OF CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE TO THE SUPERINTENDENT EACH WEEK A COPY OF THE COMPLETED DAILY ROCK SUPPLY LOG AND THE ORIGINAL SUPPLY DOCKETS PERTAINING TO WORK UNDERTAKEN IN THE PREVIOUS WEEK. THE SUPPLY DOCKETS SHALL INCLUDE A RECORD OF LOADED TRUCK MASS.

SANDSTONE PLACEMENT

ALL ROCK WORK SHALL BE CONSTRUCTED TO THE LINES AND LEVELS SHOWN ON THE DRAWINGS, AND TO THE TOLERANCES OUTLINED IN THIS SPECIFICATION.

ROCK GRADING SHALL SATISFY THE DIMENSION CRITERIA BELOW. GRADING SHALL BE DETERMINED FROM A CUMULATIVE MASS DISTRIBUTION CURVE. THE MEDIAN REQUIREMENT WILL BE SATISFIED IF 50% OF THE UNITS EXCEED THE MEDIAN DIAMETER.

MATERIAL	MEDIAN DIAMETER D50 (mm)	DIAMETER D90 (mm)
UNDERLAYER ROCK	100	150
ARMOUR ROCK	500	600

THE METHOD OF PLACING THE ROCK SHALL BE SUCH:

- AS TO MINIMISE ITS BREAKDOWN ON HANDLING AND TO PRODUCE MINIMUM FINES.
- THAT SEGREGATION INTO SIZE CLASSES OF ROCK BE KEPT TO A MINIMUM.
- TO AVOID DAMAGE TO THE GEOTEXTILE FILTER LAYER
- ROCKS ARE WEDGED AND LOCKED TOGETHER SUCH THAT THEY ARE NOT FREE TO MOVE WITHOUT DISTURBING ADJACENT ROCKS.
- UNDERLAYER ROCKS SHALL NOT BE COMPACTED.
- UNDERLAYER ROCK SHALL BE PLACED TO ACHIEVE A DENSITY EQUIVALENT TO 'RANDOM PLACEMENT' WITH EACH ROCK HAVING AT LEAST THREE POINTS OF CONTACT WITH OTHER ROCKS IN THE SAME LAYER.
- THE APPROXIMATE DIAMETER OF VOIDS BETWEEN ARMOUR ROCK SHALL NOT EXCEED 0.5 * D/N50 AND THE UNDERLAYER SHALL NOT BE VISIBLE AT ANY LOCATION.
- THERE SHALL BE NO FREE ROCKS ON THE SURFACE OF THE ARMOUR LAYER. PIECES OF ARMOURSTONE BROKEN DURING HANDLING OR PLACING SHALL BE REMOVED IMMEDIATELY. SUBJECT TO THE APPROVAL OF THE SUPERINTENDENT, BROKEN PIECES OF ARMOURSTONE MAY BE INCLUDED IN SMALLER GRADINGS.
- SURFACE OF THE ARMOURED SLOPE SHALL PRESENT AN ANGULAR UNEVEN FACE TO THE WATER. ARMOUR ROCK SMALLER THAN THE SPECIFIED MASS GRADING SHALL NOT BE USED TO FILL VOIDS OR TO PROP LARGER ARMOUR UNITS IN ORDER TO ACHIEVE THE REQUIRED PROFILE

THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING ALL SANDSTONE ROCKS UNDAMAGED DURING CONSTRUCTION.

GEOTEXTILE FILTER FABRIC

GEOTEXTILE FILTER FABRIC IS TO BE NON-WOVEN GEOTEXTILE TO RMS R63 SPECIFICATION OR AS NOTED ON THE DRAWINGS.

GEOTEXTILE TO BE LAID ON A CONTINUOUS BED FREE OF VOIDS AND FREE OF SHARP OBJECTS TO PREVENT TEARING.

GEOTEXTILE ELEMENTS MAY BE JOINED BY EITHER OVERLAPPING OR SEWING. OVERLAP WIDTHS TO BE NO LESS THAN 1000 mm. FOR SEWING, 100 mm OVERLAP IS SUFFICIENT USING A NON-BIODEGRADABLE THREAD.

GEOTEXTILE PLACED IN WATER WILL REQUIRE BALLAST TO SECURE IT IN POSITION.

THE GEOTEXTILE FILTER SHAL BE COVERED AS SOON AS PRACTICAL. GEOTEXTILE FILTER SHAL NOT BE LEFT EXPOSED FOR MORE THAN 14 DAYS.

IF THE GEOTEXILE FILTER IS DAMAGED DURING PLACEMENT THE CONTRACTOR SHALL REMOVE AND REPLACE THE DAMAGED FILTER.

PILING AND FOUNDATIONS

PILING WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH AS 2159 AND TO THE REQUIREMENTS SPECIFIED BELOW AND ON THE DRAWINGS.

THE CONTRACTOR SHALL MAINTAIN A COPY OF AS 2159 ON SITE AT ALL TIMES DURING THE CONTRACT PERIOD.

PILES SHALL BE INSTALLED TO THE EMBEDMENT AND THE LOAD CAPACITIES SHOWN BY THE DRAWINGS IRRESPECTIVE OF WHAT FOUNDATION CONDITIONS EXIST. EMBEDMENT RELATES TO FIRM SAND OR CLAY OR SOCKETING INTO ROCK AND EXCLUDES FILL AND SOFT SILTY MATERIAL.

THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE SUPERINTENDENT IF IN THE CONTRACTOR'S OPINION, GROUND CONDITIONS VARY FROM THOSE SHOWN ON THE DRAWINGS OR INDICATED BY THE GEOTECHNICAL INVESTIGATION REPORT.
PRIOR TO INSTALLATION OF PILES THE CONTRACTOR SHALL PROBE THE PROPOSED PILE LOCATIONS IN ORDER TO ASSESS ROCK LEVELS. RESULTS OF PROBING SHALL BE MADE PROMPTLY AVAILABLE TO THE SUPERINTENDENT.

THE CONTRACTOR SHALL MAINTAIN RECORDS FOR ALL PILES AS REQUIRED UNDER THE PROVISIONS OF CLAUSE 7.7 OF AS 2159. ACCURATE RECORDS OF ROCK LEVELS AND FOUNDING LEVEL OF PILES SHALL BE KEPT AND PROVIDED TO THE SUPERINTENDENT WITHIN 2 DAYS OF INSTALLING THE PILE.

THE CONTRACTOR SHALL ENSURE THAT THE CONSTRUCTION METHOD DOES NOT OVERSTRESS ANY ELEMENT OF THE WORKS, AND IN DETERMINING HIS PROPOSED CONSTRUCTION METHOD HE SHALL GIVE DUE CONSIDERATION TO THE EFFECTS OF NOISE AND VIBRATION ON THE SURROUNDING ENVIRONMENT.

ALL PILES SHALL BE INSTALLED UNDER PERIODIC INSPECTION OF THE SUPERINTENDENT. THE CONTRACTOR SHALL GIVE ONE WORKING DAY'S NOTICE OF HIS INTENTION TO CONSTRUCT THE PILES SO THAT THE SUPERINTENDENT CAN ARRANGE FOR ATTENDANCE.

THE CONTRACTOR SHALL MAINTAIN RECORDS FOR EACH PILE CONSTRUCTED ACCORDING TO THE PROVISIONS OF AS 2159.
PILE INSTALLATION TOLERANCES SHALL BE AS FOLLOWS UNLESS OTHERWISE APPROVED:

- VARIATION OF SPECIFIED POSITION IN PLAN - ± 50mm AT TOP OF PILE
- VARIATION FROM VERTICALITY - 1 IN 75
- VARIATION IN SPECIFIED ELEVATION OF TOP OF PILES - ± 10mm
- VARIATION IN PILE DIAMETER - NOT LESS THAN THAT SHOWN ON THE DRAWINGS.

ANY PILE DAMAGED DURING THE EXECUTION OF THE WORK OR WHICH DOES NOT COMPLY WITH REQUIREMENTS SHALL BE RECTIFIED AS ADVISED BY THE SUPERINTENDENT.

D5 FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.02	27.08.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.06.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.06.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

NOTES AND CONSTRUCTION SPECIFICATIONS
SHEET 2 OF 2

Level 14, 56 Berry Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
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Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

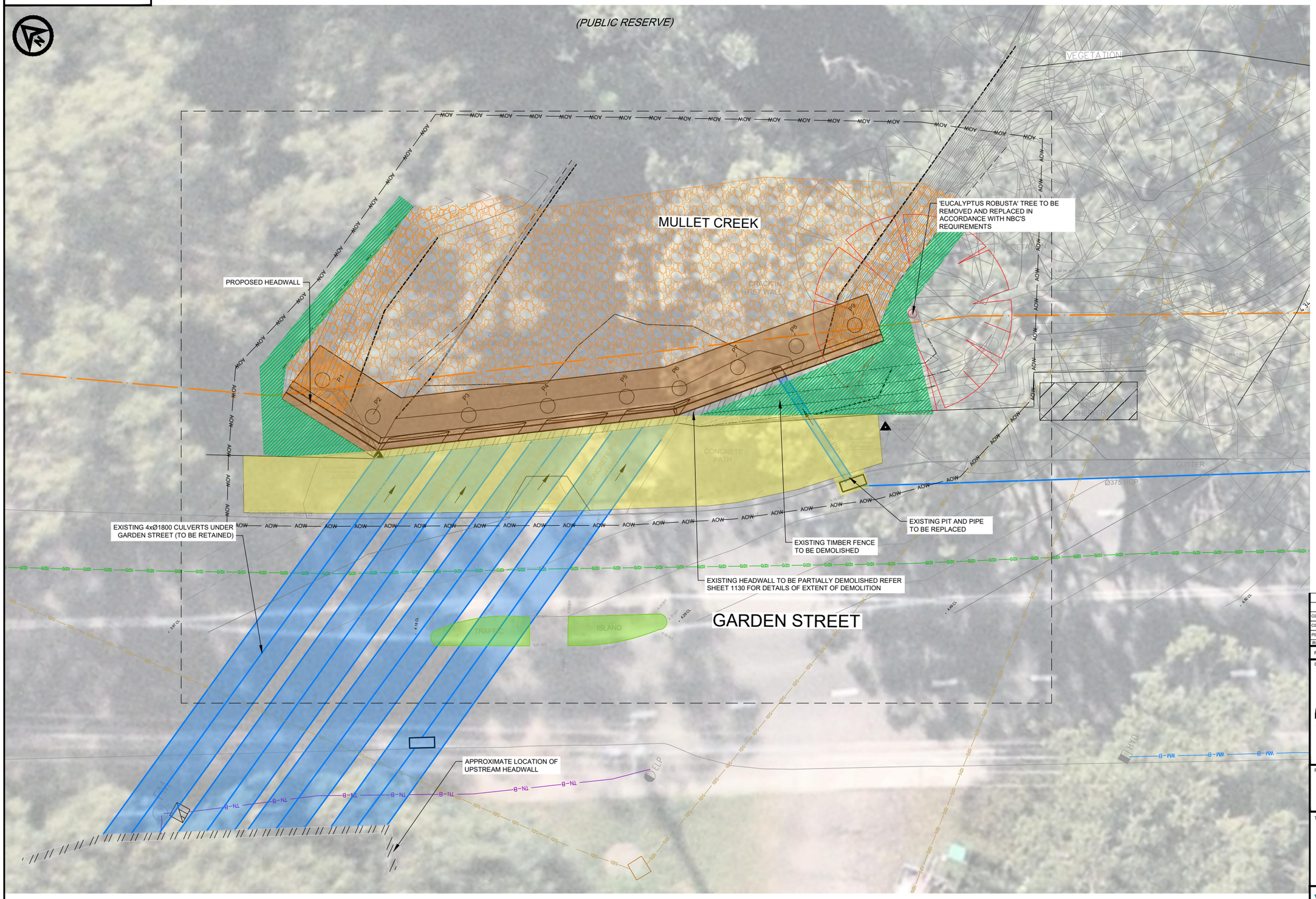
DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

REF.
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1003	D5	C01.02

DRAWING No.
PA2317-RHD-00-XX-DR-ME-1101

DO NOT SCALE



LEGEND:

- ROCK SCOUR PROTECTION
- VEGETATION
- EXTENT OF PROPOSED HEADWALL AND APRON
- REINSTATED SHARED PATH/ROADWAY
- REINSTATED TRAFFIC ISLAND
- AOW — AREA OF WORKS
- CADASTRAL BOUNDARY

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.02	27.06.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.06.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.06.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

GENERAL ARRANGEMENT PLAN

Royal HaskoningDHV
Enhancing Society Together

Level 14, 56 Berry Street
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Tel +61 2 88545000
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DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.06.2021

REF.
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1101	D5	C01.02

AUSTRALIAN HEIGHT DATUM

D5 FOR CONSTRUCTION

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1:150(A3) 1:75(A1)

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DRAWING No.
PA2317-RHD-00-XX-DR-ME-1110

DO NOT SCALE

(PUBLIC RESERVE)

MULLET CREEK

CREEK FLOW

GARDEN STREET

CRACK IN CONCRETE APRON

CRACK IN RET WALL

CONCRETE APRON

RETAINING WALL

TIMBER

CONCRETE PATH

CONCRETE KERB

CONCRETE PIPE Ø1800

TRAFFIC ISLAND

VEGETATION

BUS STOP SHELTER

GUTTER

Ø375 RCP

EXISTING BUS STOP SHELTER

EXISTING JEMENA
75MM 300KPA GAS LINE

EXISTING 4X Ø1800 CULVERTS UNDER
GARDEN STREET

APPROXIMATE LOCATION OF
UPSTREAM HEADWALL

LEGEND:

- STORMWATER (QL-A)
- STORMWATER PIT (QL-A)
- EXISTING CONTOURS
- GAS (QL-D)
- SEWER (QL-D)
- SEWER PIT (QL-A)
- WATER (QL-B)
- TELECOMMUNICATION (QL-B)
- CADASTRAL BOUNDARY
- TOP OF BANK
- BOTTOM OF BANK
- EXISTING HEADWALL
- HYD WATER HYDRANT
- ELP ELECTRIC LIGHT POLE
- BENCHMARK
- FM FLOOD MONITOR (QL-D)

NOTE:

1. UNDERGROUND SERVICE SURVEY QUALITY LEVELS ARE AS SHOWN ON SURVEY LINETYPES
2. SERVICES AS SHOWN BASED ON INFORMATION PROVIDED BY SURESEARCH DATED MAY 20'.

AUSTRALIAN HEIGHT DATUM

D5 FOR CONSTRUCTION

1.5 0 1.5 3.0 4.5 6.0 7.5m

1:150(A3) 1:75(A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.02	27.08.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.06.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.06.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

EXISTING
SURVEY AND SERVICES
PLAN

Royal HaskoningDHV
Enhancing Society Together

Level 14, 56 Berry Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
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Email: project.admin.australia@rhdhv.com
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DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

REF.
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1110	D5	C01.02

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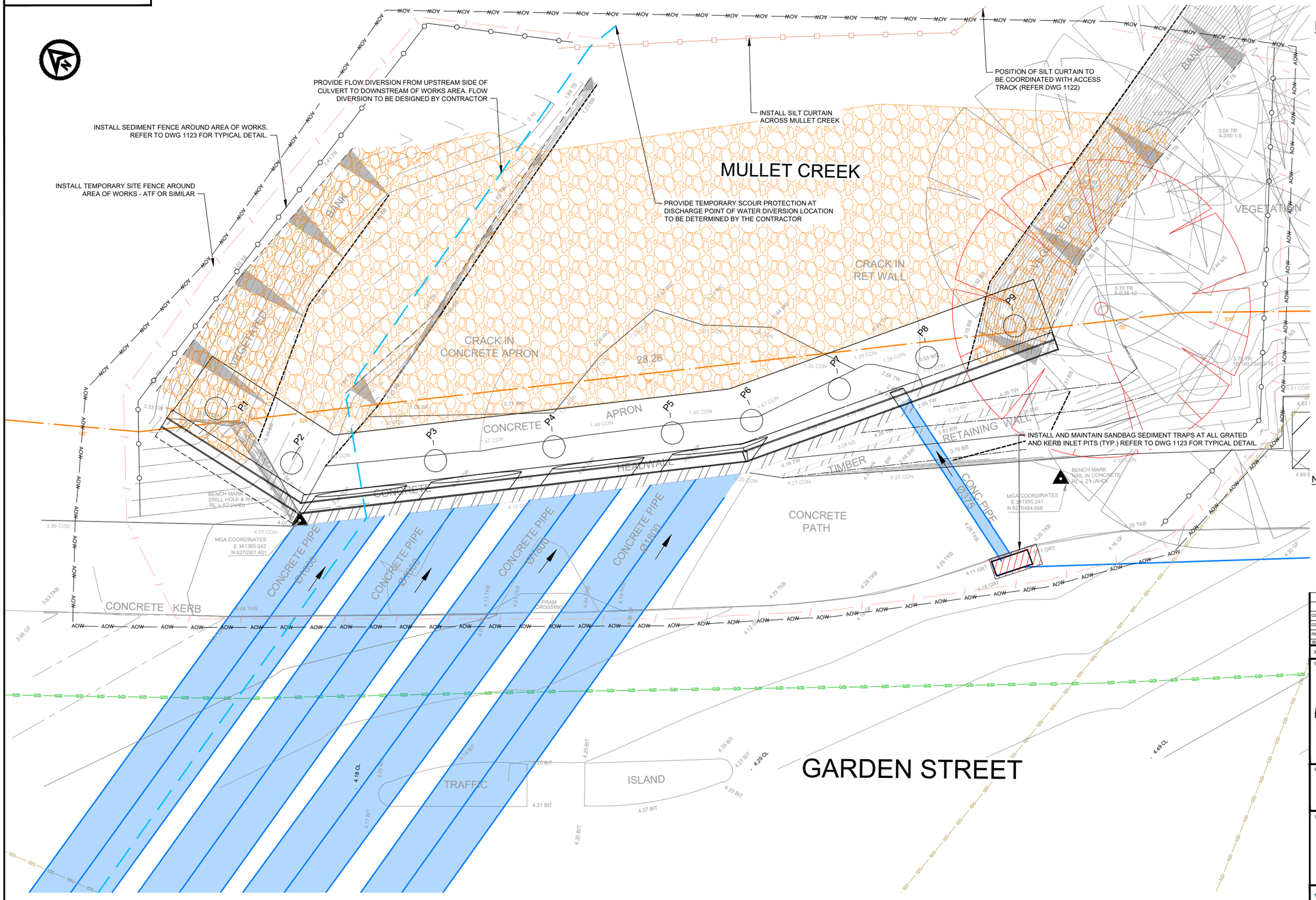
DRAWING No.
PA2317-RHD-00-XX-DR-ME-1121

DO NOT SCALE



LEGEND:

- SILT CURTAIN
- SEDIMENT FENCE
- SITE FENCE
- AOW — AREA OF WORKS
- FLOW DIVERSION
- CADASTRAL BOUNDARY

NOTE:

1. DEWATERING/FLOW DIVERSION INCLUDING STAGING OF THE WORKS TO BE DESIGNED AND MANAGED BY THE CONTRACTOR
2. FENCING TO BE INSTALLED AS REQUIRED TO PREVENT ACCESS TO SITE THROUGH UPSTREAM END OF CULVERTS
3. REFER SHEET 1122 FOR SITE ACCESS AND MATERIAL STOCKPILE DETAILS

REV	DATE	DESCRIPTION	BY	CHK	APP
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P01.03	04.06.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

EROSION AND SEDIMENT CONTROL PLAN

Royal HaskoningDHV
Enhancing Society Together

Level 14, 56 Berry Street
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DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

REF.
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1121	D5	C01.02

AUSTRALIAN HEIGHT DATUM

D5 FOR CONSTRUCTION

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DRAWING No.
PA2317-RHD-00-XX-DR-ME-1122

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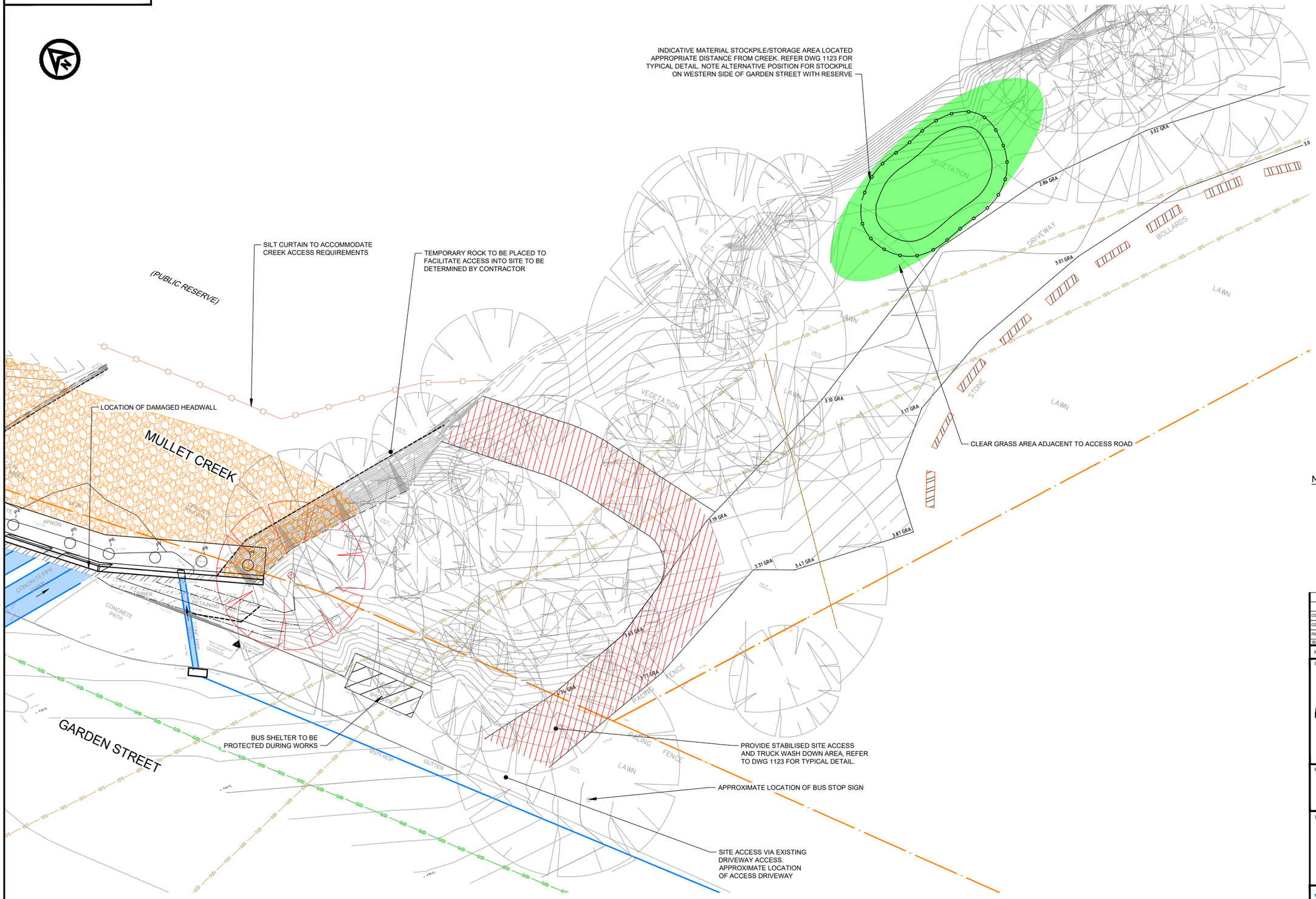

LEGEND:

- STOCKPILE/STORAGE AREA
- PROPOSED ACCESS PATH TO AREA OF WORKS
- EXISTING STONE BOLLARD

NOTE:

1. SUGGESTED ALIGNMENT ONLY OF SITE ACCESS SHOWN. TO BE DETERMINED BY CONTRACTOR.
2. ACCESS ONLY SUITABLE FOR SMALL (< 6m) ARTICULATED DUMP TRUCK EXCAVATION SIMILAR.

AUSTRALIAN HEIGHT DATUM | **D5 FOR CONSTRUCTION**

1.0 0 1.0 2.0 3.0 4.0 5.0m

1:100 (A3) 1:50 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
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REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

SITE ACCESS AND TEMPORARY STOCKPILE AREAS

Royal HaskoningDHV
Enhancing Society Together
Level 14, 56 Berry Street
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Tel +61 2 88545000
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Email: project.admin.australia@rhdhv.com
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DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

REF
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1122	D5	C01.02

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PA2317-RHD-00-XX-DR-ME-1123

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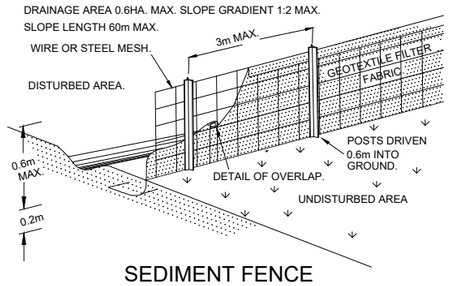
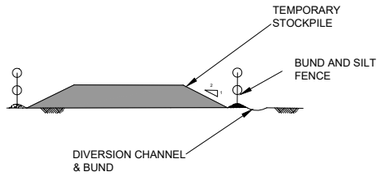
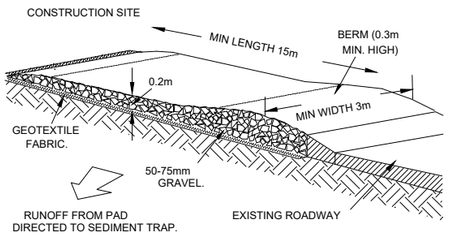


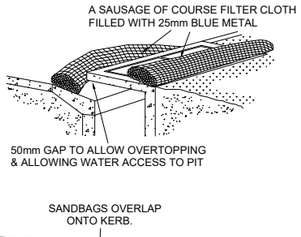
SEDIMENT FENCE

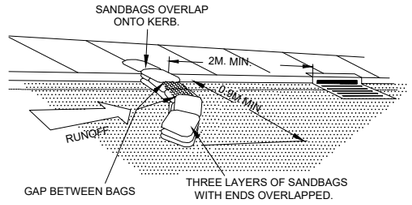


TYPICAL STOCKPILE

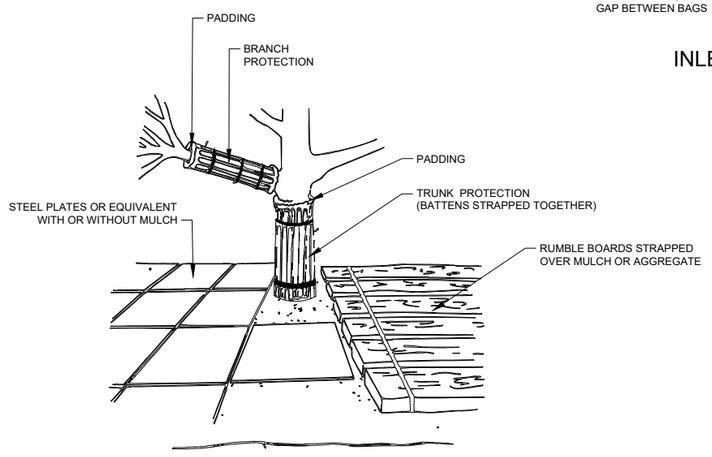


TEMPORARY CONSTRUCTION EXIT

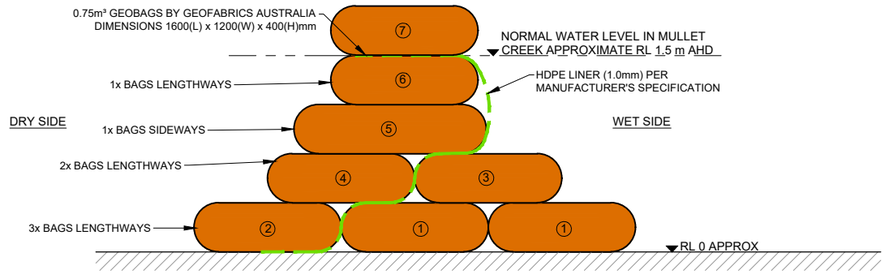




INLET SEDIMENT TRAPS



TREE PROTECTION DETAIL



TEMPORARY SAND FILLED GEO-BAG COFFER DAM WALL
(ALIGNEMNT TO BE DETERMINED BY CONTRACTOR
BASED ON STAGING OF THE WORKS)

① → ⑦ STAGING OF GEO-BAG PLACEMENT
IN ORDER TO SECURE HDPE LINER

D5 FOR CONSTRUCTION

SOIL EROSION AND SEDIMENT CONTROL

1. THESE PLANS SHALL BE USED AS A GUIDE. ALL EROSION AND SEDIMENT CONTROLS SHALL BE IN ACCORDANCE WITH
   a. COUNCILS EROSION AND SEDIMENT CONTROL POLICY
   b. THE CONTRACTORS EMP FOR THE WORKS.
   c. THE 'BLUE BOOK' LANDCOM 2004, 4th EDITION.
2. ALL SEDIMENT AND EROSION CONTROLS SHALL BE CHECKED WEEKLY AND IMMEDIATELY AFTER RAINFALL. SEDIMENT BUILD UP TO BE REMOVED AND CONTROLS REPAIRED WHERE NECESSARY.
3. SOIL AND SEDIMENT CONTROL DEVICES SHALL BE TO THE STANDARD RECOMMENDED BY THE NSW DEPARTMENT OF HOUSINGS 'BLUE BOOK' TITLED "MANAGING URBAN STORMWATER AND CONSTRUCTION – VOLUME 1", 4TH EDITION 2004.
4. THE CONTRACTOR SHALL REGULARLY MAINTAIN ALL SEDIMENT AND EROSION CONTROL DEVICES AND REMOVE ACCUMULATED SEDIMENT FROM SUCH DEVICES BEFORE 50% CAPACITY IS USED. ALL THE ACCUMULATED SEDIMENT SHALL BE RE-SPREAD OR REMOVED IN ACCORDANCE WITH THE SUPERINTENDENTS INSTRUCTIONS. THE DEVICES SHALL BE MAINTAINED BY THE CONTRACTOR UNTIL SUCH TIME AS THE DISTURBED AREAS HAVE BEEN REHABILITATED TO A CONDITION SATISFACTORY TO THE SUPERINTENDENT.
5. THE CONTRACTOR SHALL MAINTAIN ALL RE-VEGETATED AREAS INCLUDING WATERING AND FERTILISING UNTIL SUCH TIME AS THE VEGETATION HAS STABILIZED (MINIMUM TIME IS AT LEAST UNTIL THE END OF THE WORKS).
6. THE CONTRACTOR SHALL ENSURE TEMPORARY CONTROLS DO NOT DAMAGE EXISTING STRUCTURES, KERBING, PAVEMENT OR SUBGRADES.
7. VEHICULAR ACCESS TO THE SITE SHALL BE CONTROLLED THROUGH THE ACCESS POINTS IDENTIFIED. VEHICLES NOT REQUIRED IN THE PERFORMANCE OF THE WORKS SHALL BE PARKED OFF SITE AWAY FROM DISTURBED AREAS.
8. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED PRIOR TO SITE DISTURBANCE TO THE EXTENT THAT THIS CAN BE PRACTICALLY ACHIEVED.
9. PUBLIC ROADS ARE TO BE SWEPT FREE OF DEBRIS RESULTING FROM CONSTRUCTION ACTIVITIES. SWEEPING SHALL BE UNDERTAKEN AT A MINIMUM TWICE MONTHLY OR AS DIRECTED BY THE SUPERINTENDENT.
10. THE CONTRACTOR SHALL TAKE CARE NOT TO DISTURB ANY PORTION OF THE SITE OTHER THAN IN THE IMMEDIATE AREA OF WORKS. NOMINATED UNDISTURBED AREAS SHALL BE BARRICADED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
11. DRAINAGE INLET PROTECTION TO BE PROVIDED FROM THE COMMENCEMENT OF THE EXCAVATION.
12. PROTECTTION SHALL BE PROVIDED TO ALL TREES WITHIN THE AREA OF WORKS NOMINATED FOR RETENTION.
13. NO DISTURBED AREA SHALL REMAIN DENUDED FOR A PERIOD LONGER THAN 20 DAYS.
14. THE CONTRACTOR MUST ENSURE THE SUITABILITY AND INTEGRITY OF ALL WORKS AT THE END OF EACH DAYS WORK.
15. ALL REASONABLE AND PRACTICABLE MEASURES MUST BE TAKEN TO ENSURE STORMWATER RUNOFF FROM ACCESS ROADS AND STABILIZED ENTRY/EXIT SYSTEMS, DRAINS TO AN APPROPRIATE SEDIMENT CONTROL DEVICE.
16. SEDIMENT DEPOSITED OFF SITE AS A RESULT OF ON-SITE ACTIVITIES MUST BE COLLECTED AND THE AREA CLEANED/REHABILITATED AS SOON AS REASONABLE AND PRACTICABLE.
17. CONCRETE WASTE AND CHEMICAL PRODUCTS, INCLUDING PETROLEUM AND OIL-BASED PRODUCTS, MUST BE PREVENTED FROM ENTERING ANY INTERNAL OR EXTERNAL WATER BODY, OR ANY EXTERNAL DRAINAGE SYSTEM, EXCLUDING THOSE ON-SITE WATER BODIES SPECIFICALLY DESIGNED TO CONTAIN AND/OR TREAT SUCH MATERIAL. APPROPRIATE MEASURES MUST BE INSTALLED TO TRAP THESE MATERIALS ONSITE.
18. STOCKPILES OF ERODIBLE MATERIAL MUST BE PROVIDED WITH AN APPROPRIATE PROTECTIVE COVER (SYNTHETIC OR ORGANIC) IF THE MATERIALS ARE LIKELY TO BE STOCKPILED FOR MORE THAN 10 DAYS.
19. MEASURES USED MUST BE APPROPRIATE FOR ALL WORKING HOURS, OUT OF HOURS, WEEKENDS, PUBLIC HOLIDAYS, AND DURING ANY OTHER SHUTDOWN PERIODS.
20. ALL MATERIALS REMOVED FROM EROSION AND SEDIMENT CONTROL DEVICES DURING MAINTENANCE, OR DECOMMISSIONING, WHETHER SOLID OR LIQUID, MUST BE DISPOSED OF IN A MANNER THAT DOES NOT CAUSE ANY ONGOING EROSION OR POLLUTION HAZARD.
21. THE CONTRACTOR IS WHOLLY RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF FLOW DIVERSION AND DEWATERING REQUIREMENTS.

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.02	27.08.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
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P01.03	04.06.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

EROSION AND SEDIMENT CONTROL DETAILS

Royal HaskoningDHV
Enhancing Society Together
Level 14, 56 Berry Street
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Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

REF.
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1123	D5	C01.02

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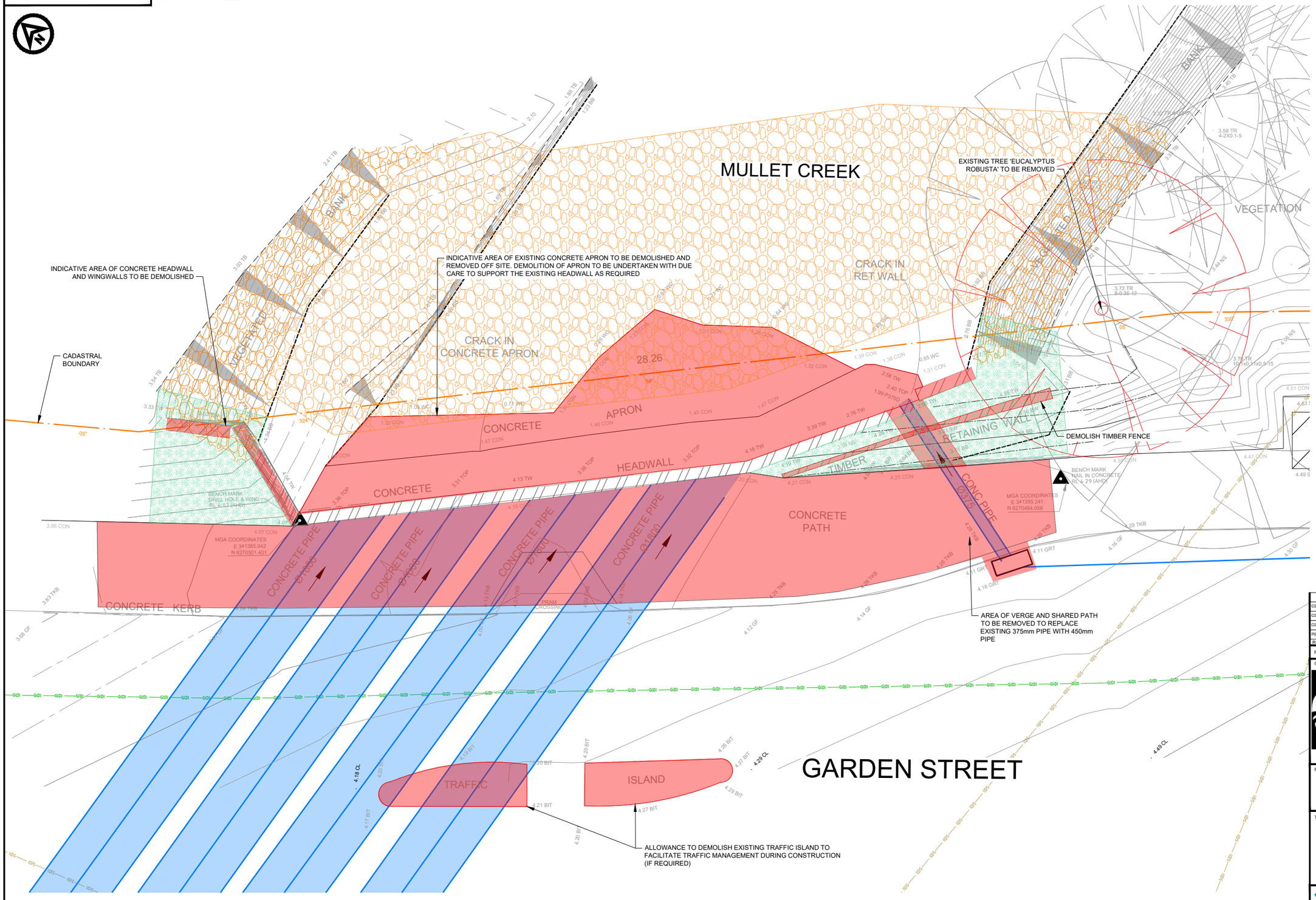
DRAWING No.
PA2317-RHD-00-XX-DR-ME-1130

DO NOT SCALE



LEGEND:

- TO BE DEMOLISHED
- DESIGN CONTOURS
- VEGETATION CLEARING
- EXISTING TREE TO BE RETAINED
- EXISTING TREE TO BE REMOVED

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.03	08.09.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.02	27.08.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.06.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.06.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

DEMOLITION AND VEGETATION REMOVAL PLAN

Royal HaskoningDHV
Enhancing Society Together

Level 14, 56 Berry Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	08.09.2021

REF.
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1130	D5	C01.03

AUSTRALIAN HEIGHT DATUM

D5 FOR CONSTRUCTION

1.0 0 1.0 2.0 3.0 4.0 5.0m

1:100 (A3) 1:50 (A1)

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DRAWING No.
PA2317-RHD-00-XX-DR-ME-1150

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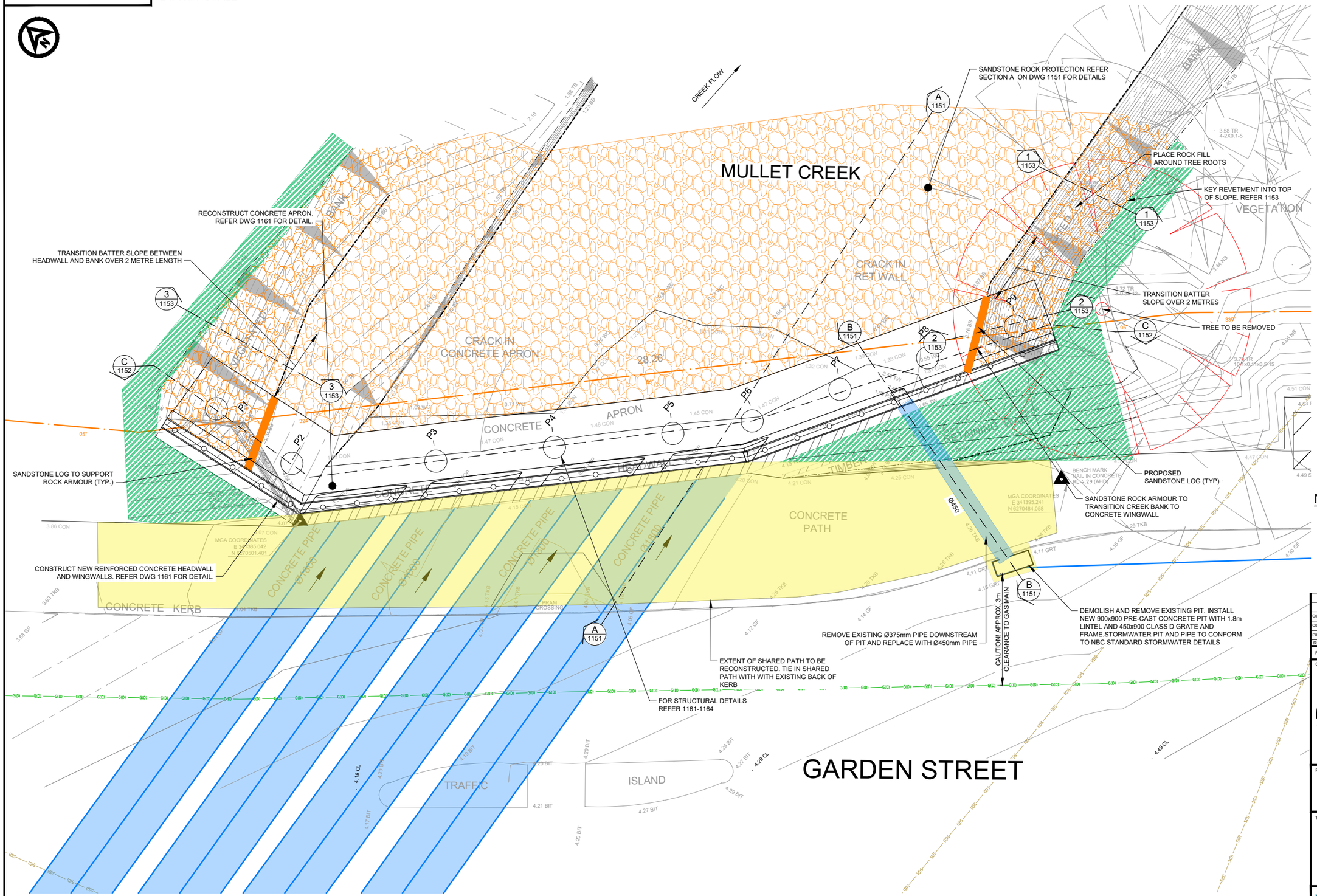

LEGEND:

- DESIGN CONTOURS
- SANDSTONE ROCK ARMOUR
- REVEGETATION REFER SHEET 1181 FOR DETAIL
- REINSTATED SHARED PATH/ROADWAY
- PROPOSED MONORAIL HANDRAIL AND TWO RAIL FENCE
- EXISTING TREE TO BE RETAINED
- EXISTING TREE TO BE REMOVED

NOTE:

1. REFER SHEET 1181 FOR REINSTATEMENT DETAILS.
2. REFER SHEET 1161-1164 FOR STRUCTURAL DETAILS

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.02	27.04.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.04.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.01.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

SITEWORKS PLAN

Royal HaskoningDHV
Enhancing Society Together

Level 14, 56 Berry Street
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Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

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PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1150	D5	C01.02

1.0 0 1.0 2.0 3.0 4.0 5.0m
1:100 (A3) 1:50 (A1)

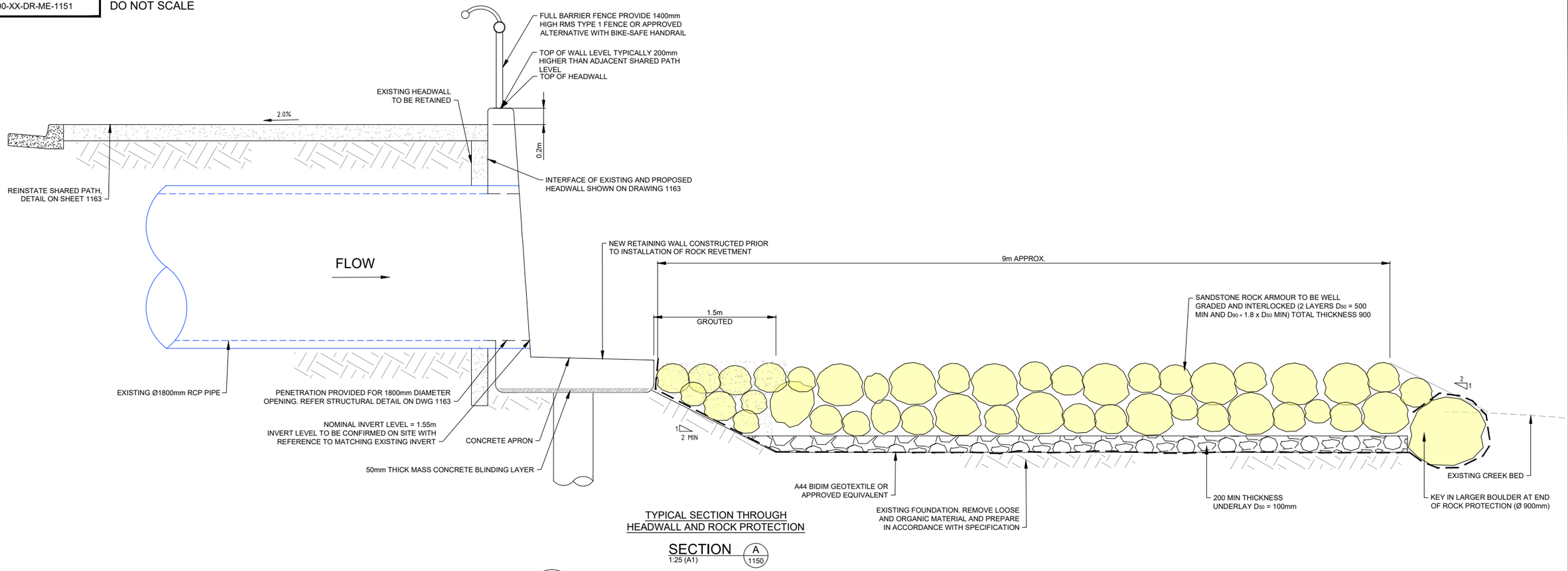
AUSTRALIAN HEIGHT DATUM

D5 FOR CONSTRUCTION

C:\USERS\920269\BOX\PA2317 RLGARDENSTHW\PA2317 RLGARDENSTHW WIP\E11 WORKING DRAWINGS\PA2317-GARDEN-ST

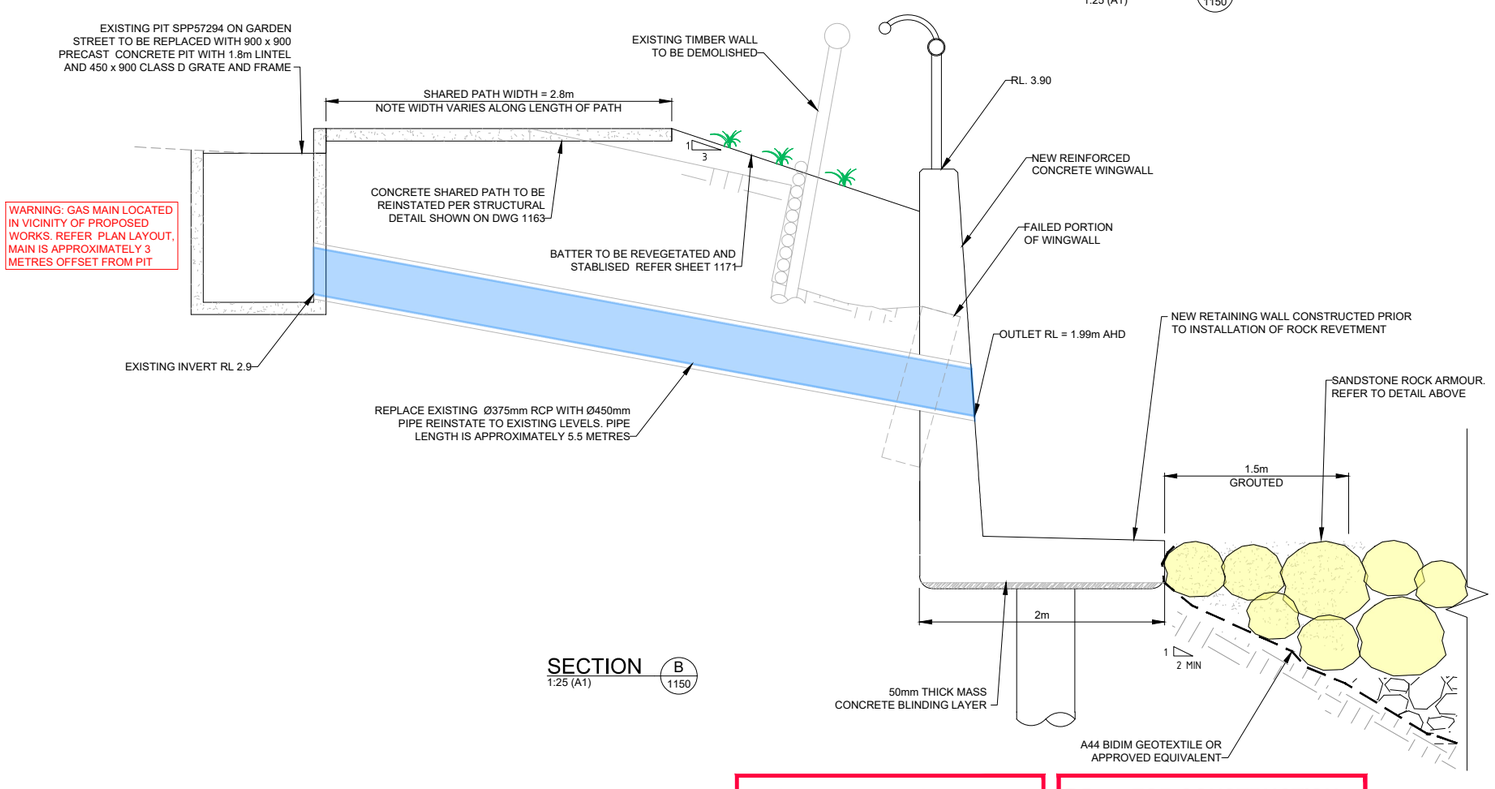
DRAWING No.
PA2317-RHD-00-XX-DR-ME-1151

DO NOT SCALE



TYPICAL SECTION THROUGH
HEADWALL AND ROCK PROTECTION

SECTION A 1150
1:25 (A1)



SECTION B 1150
1:25 (A1)

NOTE:

1. REFER SHEET 1162 FOR STRUCTURAL DETAILING. REINFORCEMENT NOT SHOWN

AUSTRALIAN HEIGHT DATUM | **D5 FOR CONSTRUCTION**

5.0 0 5.0 1.0 1.5 2.0 2.5m
1:50 (A3) 1:25 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.02	27.08.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.06.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.06.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

SITEWORKS SECTIONS
SHEET 1 OF 3

Level 14, 56 Berry Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

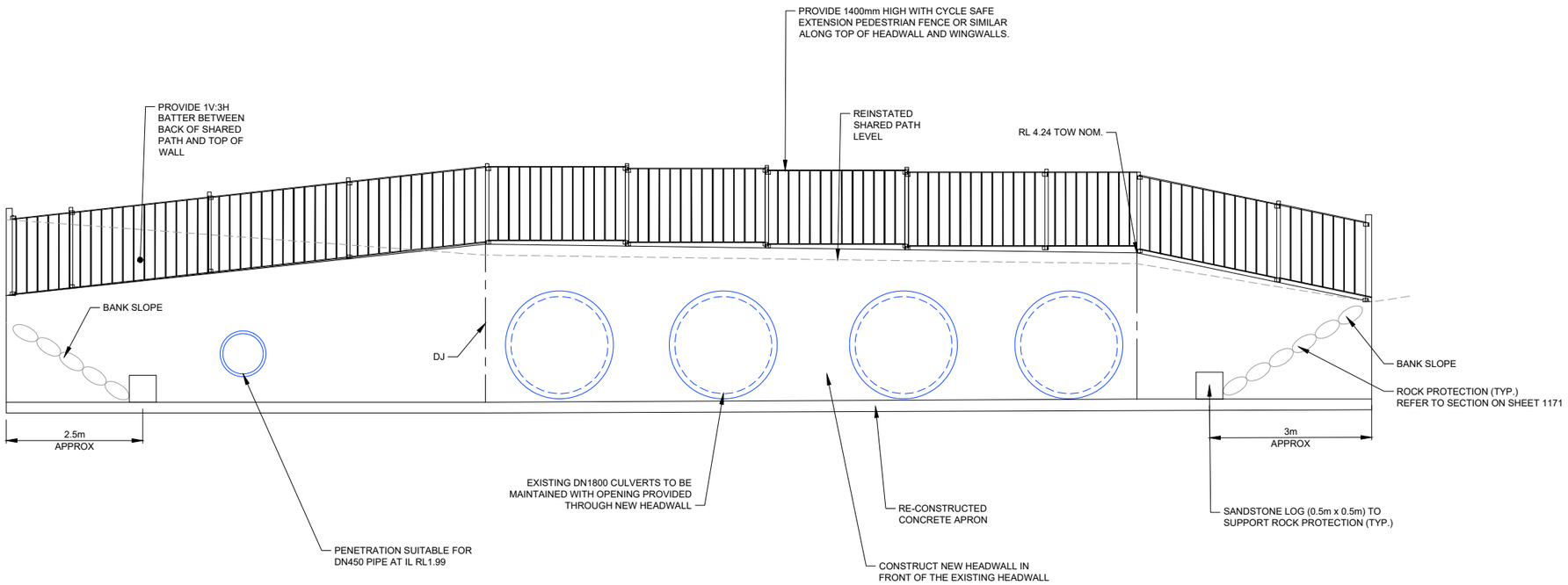
REF
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1151	D5	C01.02

C:\USERS\920269\BOX\PA2317 RLGARDENSTHW\PA2317 RLGARDENSTHW WIP\E11 WORKING DRAWINGS\PA2317-GARDEN-ST

DRAWING No.
PA2317-RHD-00-XX-DR-ME-1152

DO NOT SCALE



ELEVATON C
1:50 (A1)

NOTE:

1. FOR SETOUT DIMENSIONS AND LEVELS OF NEW HEADWALL REFER SHEET 1161

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.02	27.04.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.04.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.04.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

SITEWORKS SECTIONS
SHEET 2 OF 3

Royal HaskoningDHV
Enhancing Society Together
Level 14, 56 Berry Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99250960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

REF
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1152	D5	C01.02

AUSTRALIAN HEIGHT DATUM

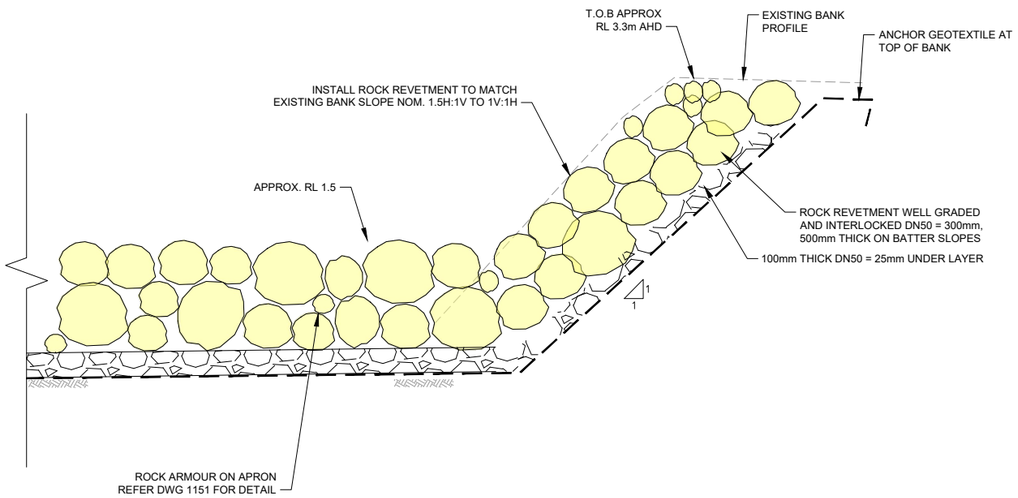
D5 FOR CONSTRUCTION

1.0 0 1.0 2.0 3.0 4.0 5.0m
1:100 (A3) 1:50 (A1)

C:\USERS\920269\BOX\PA2317 RLGARDENSTHW\PA2317 RLGARDENSTHW WIP\E11 WORKING DRAWINGS\PA2317-GARDEN-ST

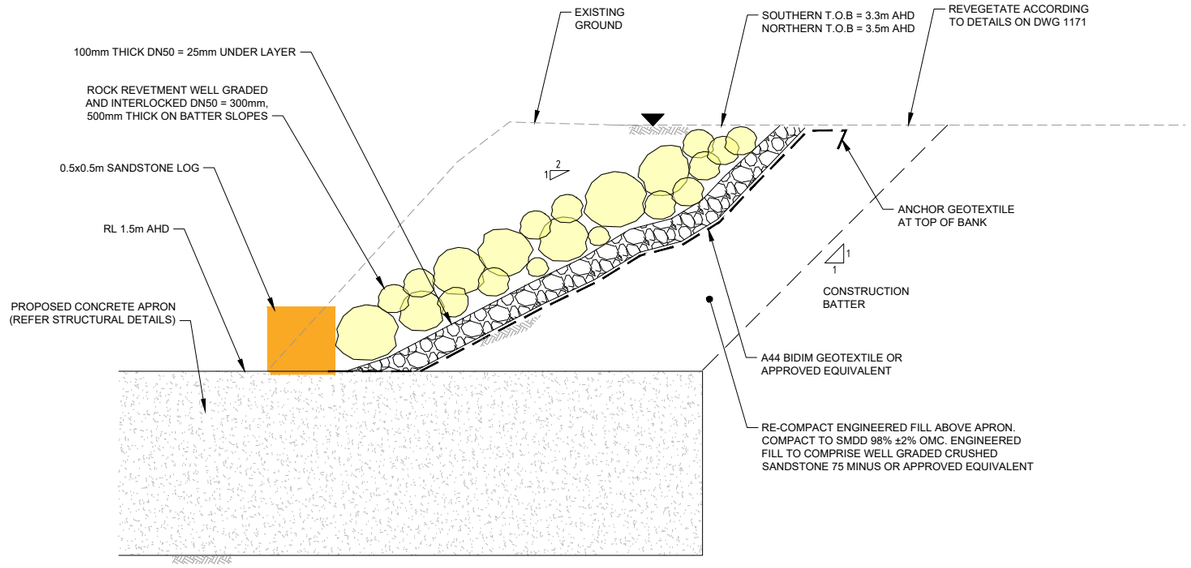
DRAWING No.
PA2317-RHD-00-XX-DR-ME-1153

DO NOT SCALE



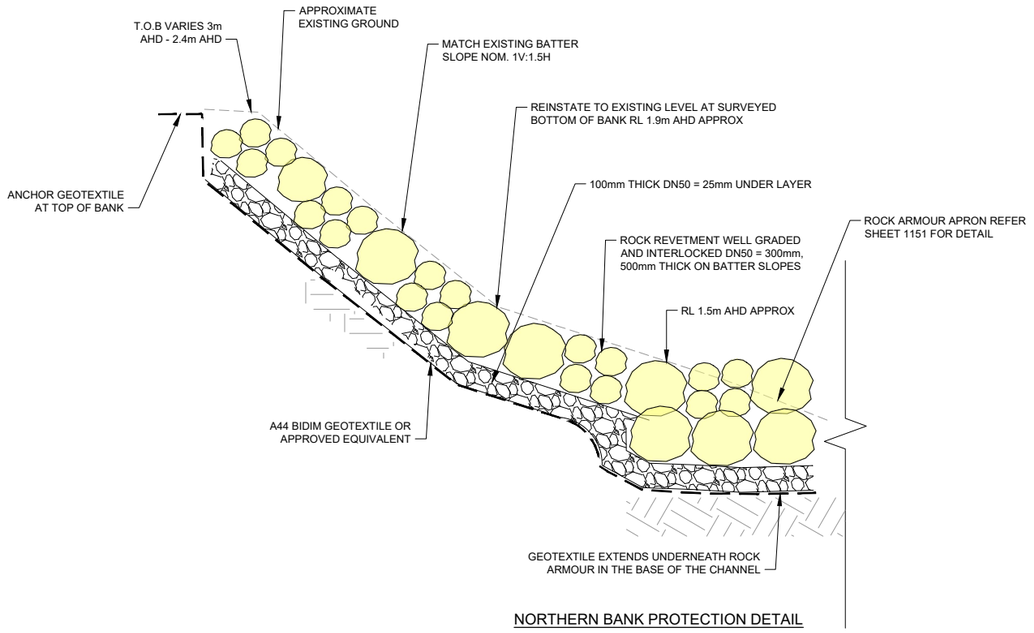
SOUTHERN BANK PROTECTION DETAIL

SECTION 1
1:25 (A1) 1150



DETAIL OF BANK PROTECTION AT CONCRETE APRON - FOR BOTH WINGWALLS

SECTION 2
1:25 (A1) 1150



NORTHERN BANK PROTECTION DETAIL

SECTION 3
1:25 (A1) 1150

NOTE:

1. REINFORCEMENT NOT SHOWN FOR CLARITY.

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.02	27.04.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.04.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.04.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

SITEWORKS SECTIONS
SHEET 3 OF 3

Level 14, 56 Berry Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
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Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

REF.
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1153	D5	C01.02

5.0 0 5.0 1.0 1.5 2.0 2.5m

1:50 (A3) 1:25 (A1)

AUSTRALIAN HEIGHT DATUM **D5 FOR CONSTRUCTION**

C:\USERS\920269\BOX\PA2317 RLGARDENSTHW\PA2317 RLGARDENSTHW WIP\E11 WORKING DRAWINGS\PA2317-GARDEN-ST

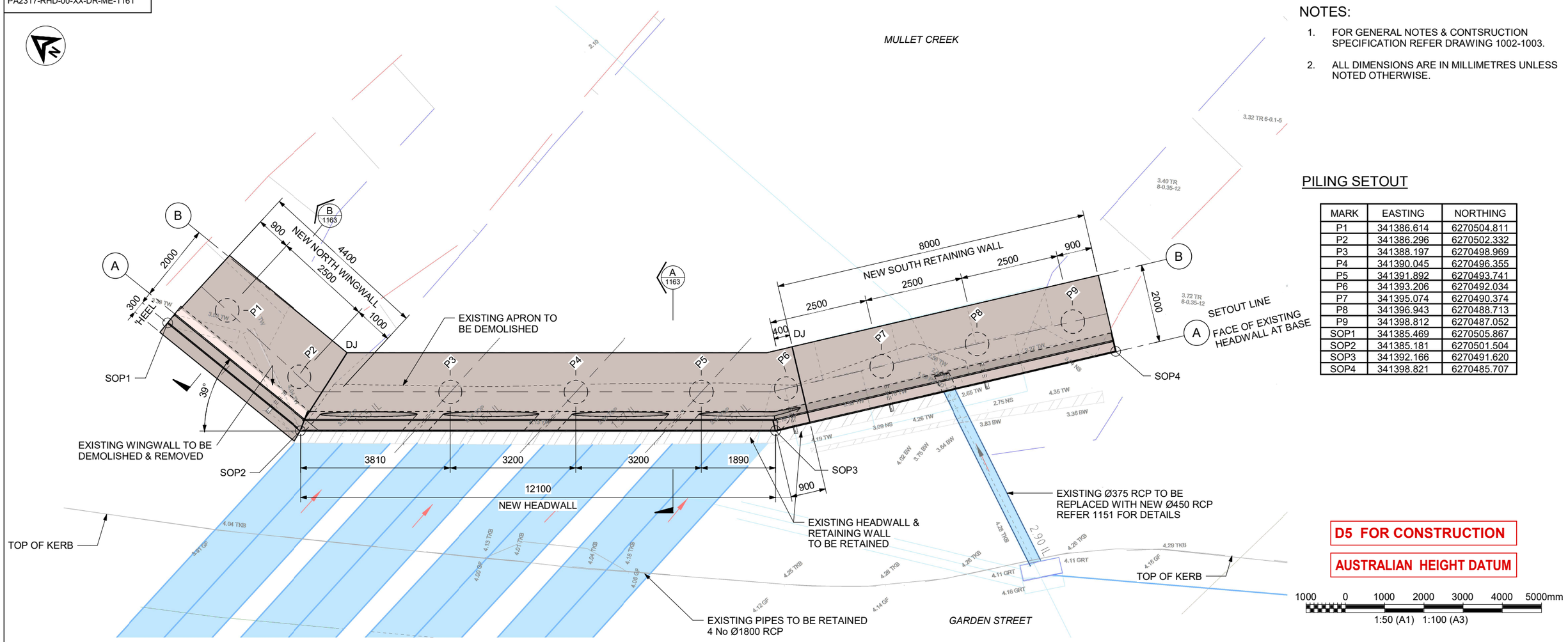
PA2317-RHD-00-XX-DR-ME-1161

NOTES:

1. FOR GENERAL NOTES & CONTSRUCTION SPECIFICATION REFER DRAWING 1002-1003.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

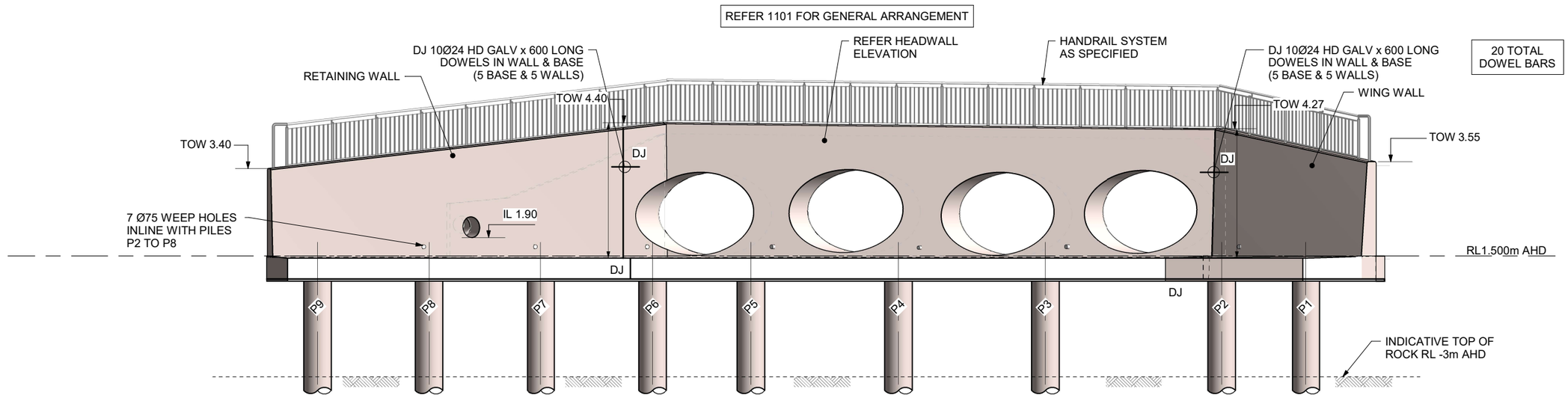
PILING SETOUT

MARK	EASTING	NORTHING
P1	341386.614	6270504.811
P2	341386.296	6270502.332
P3	341388.197	6270498.969
P4	341390.045	6270496.355
P5	341391.892	6270493.741
P6	341393.206	6270492.034
P7	341395.074	6270490.374
P8	341396.943	6270488.713
P9	341398.812	6270487.052
SOP1	341385.469	6270505.867
SOP2	341385.181	6270501.504
SOP3	341392.166	6270491.620
SOP4	341398.821	6270485.707



DOWNSTREAM WALL ARRANGEMENT

1 : 50(A1)



WALL ELEVATION

1 : 50(A1)

D5 FOR CONSTRUCTION

AUSTRALIAN HEIGHT DATUM

1000 0 1000 2000 3000 4000 5000mm

1:50 (A1) 1:100 (A3)

REV	DATE	DESCRIPTION	BY	CHK	APR
C01.02	31.08.2021	ISSUED FOR CONSTRUCTION	SGB	KM	AM
C01.01	11.06.2021	ISSUED FOR CONSTRUCTION	SC	KM	AM

REVISIONS

CLIENT: northern beaches council

PROJECT: GARDEN STREET HEADWALL REPLACEMENT

TITLE: STRUCTURAL DETAILS HEADWALL ARRANGEMENT

Royal HaskoningDHV
Enhancing Society Together
Level 14
56 Berry Street
North Sydney NSW 2060, Australia
Tel +61 2 8854 5000
Email info@rhdhv.com
www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
JPC	MGA56 GDA94	AHD	31.08.2021

REF: PA2317 Garden St Headwall.rvt

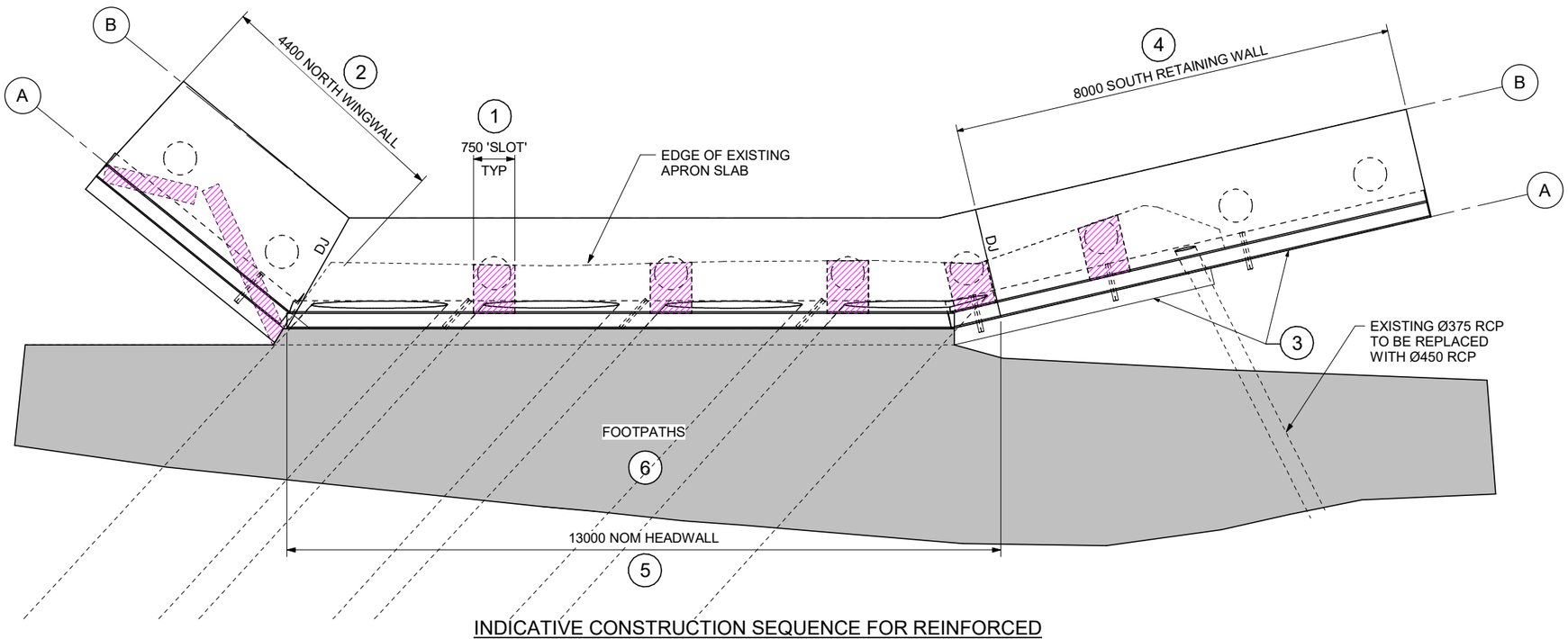
DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1161	D5	C01.02

C:\Users\220000\Box\PA2317 RL\Garden St\HW WIP\E11 Working Drawings\PA2317 Garden St Headwall.rvt

PA2317-RHD-00-XX-DR-ME-1162

NOTES:

1. FOR GENERAL NOTES & CONTSRUCTION SPECIFICATION REFER DRAWING 1002-1003.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.



INDICATIVE CONSTRUCTION SEQUENCE FOR REINFORCED CONCRETE HEADWALL

1 : 50(A1)

NOTE: LOCATE AND PROTECT ALL EXISTING SERVICES PRIOR TO EXCAVATION

1. LOCALLY BREAKOUT 750 WIDE 'SLOTS' IN THE EXISTING APRON SLABS. INSTALL BORED PILES THROUGH THE APRON SLABS, PRIOR TO ANY DEMOLITION OF REMAINING APRON.
2. DEMOLISH AND EXCAVATE AT NORTH END AS REQUIRED TO CONSTRUCT THE NEW 4400 LONG WINGWALL.
3. PARTIALLY DEMOLISH ANY UNSTABLE OR BROKEN SECTIONS OF EXISTING RETAINING WALL AT SOUTH END AND EXCAVATE AS REQUIRED TO INSTALL THE NEW Ø450 RCP. PROVIDE TEMPORARY SUPPORT AS REQUIRED FOR WORKING IN THIS AREA
4. CONSTRUCT THE NEW SOUTH RETAINING WALL (8000 LONG TO DJ).
5. DEMOLISH EXISTING FOOTPATH AND APRON AND EXCAVATE AS REQUIRED TO CONSTRUCT THE NEW HEADWALL (13000 LONG).
6. INSTALL ROCK REVETMENT INCLUDING GEOTEXTILE AND UNDERLAY
7. CONSTRUCT THE FOOTPATHS AND Ø450 PIPE AND PIT IN GARDEN ST.
8. REVEGETATION AND MAKE GOOD ANY OTHER WORKS

D5 FOR CONSTRUCTION

AUSTRALIAN HEIGHT DATUM

1000 0 1000 2000 3000 4000 5000mm

1:50 (A1) 1:100 (A3)

REV	DATE	DESCRIPTION	BY	CHK	APR
C01.02	31.08.2021	ISSUED FOR CONSTRUCTION	SGB	KM	AM
C01.01	11.06.2021	ISSUED FOR CONSTRUCTION	SC	KM	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

STRUCTURAL DETAILS
CONSTRUCTION SEQUENCE

Level 14,
56 Berry Street
North Sydney NSW 2060, Australia
Tel +61 2 8854 5000
Email info@rhdhv.com
www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
	MGA56 GDA94	AHD	31.08.2021

REF.
PA2317 Garden St Headwall.rvt

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1162	D5	C01.02

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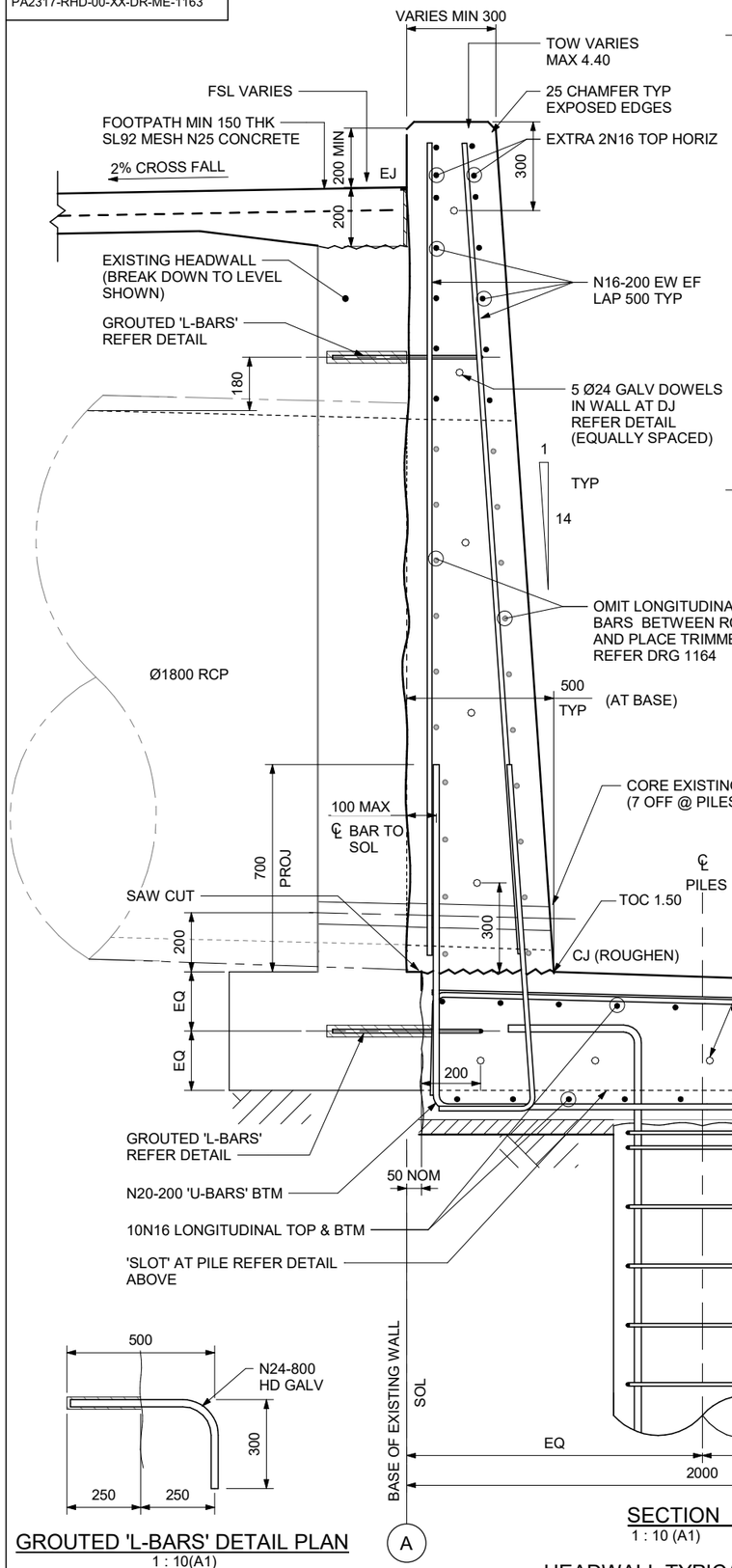
PA2317-RHD-00-XX-DR-ME-1163



N40 CONC
70 COVER WALLS
80 COVER FOOTING
70 COVER PILES

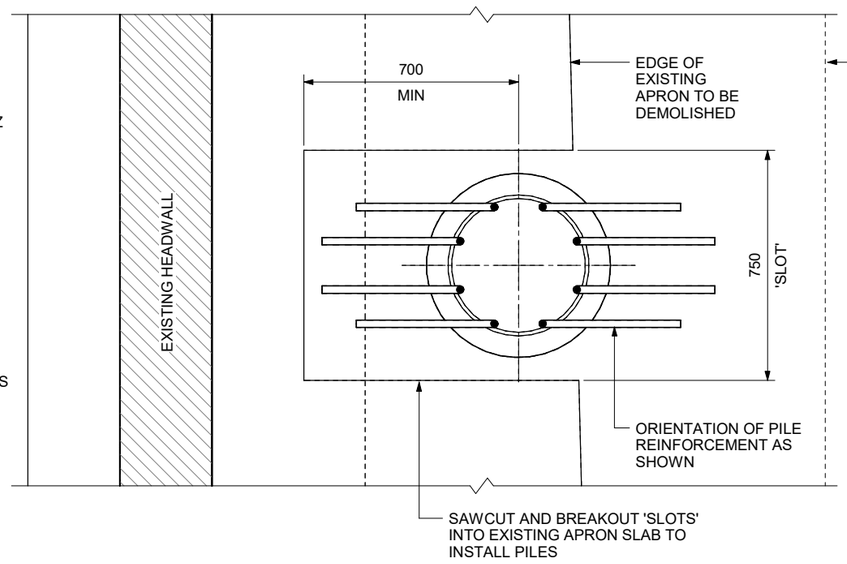
SOCKET MIN 600 INTO LOW TO MEDIUM STRENGTH ROCK & FOUND ON MEDIUM STRENGTH ROCK (CLASS IV) PILE DESIGN CAPACITY IS 600kN (ULS)

NOTE: BASED ON ONE BOREHOLE INDICATIVE TOP OF ROCK RL -3m AHD APPROX

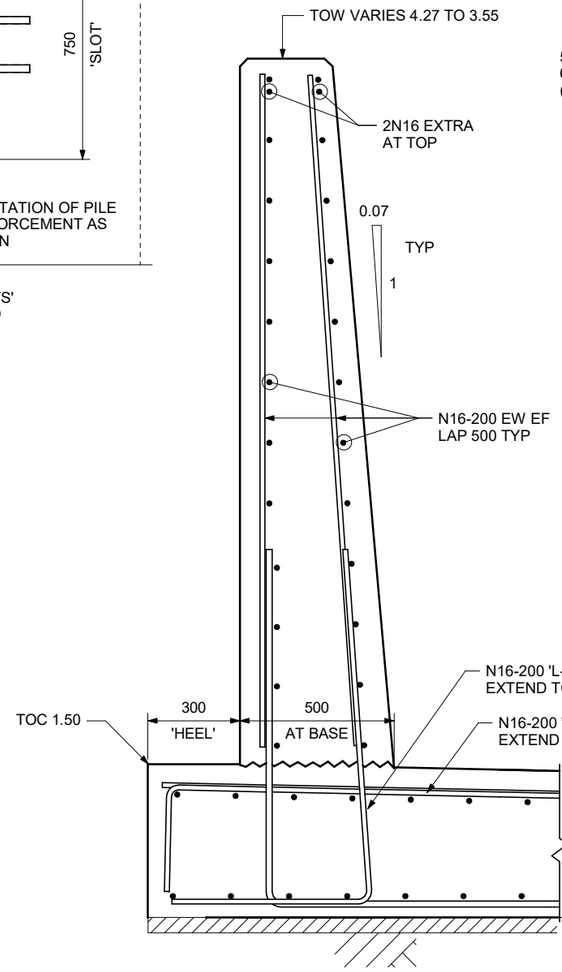
GROUTED 'L-BARS' DETAIL PLAN
1 : 10(A1)

SECTION A 1161
1 : 10 (A1)

HEADWALL TYPICAL SECTION
RETAINING WALL SIMILAR



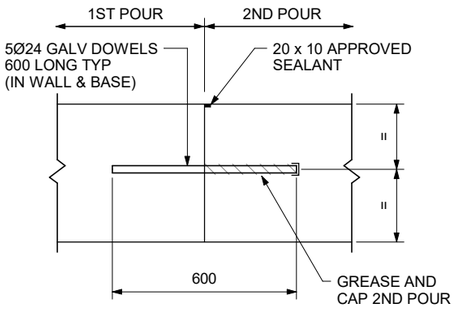
'SLOT' AT PILE DETAIL - PARTIAL PLAN
1 : 10(A1)



SECTION B 1161
1 : 10 (A1)

WINGWALL FOOTING DETAIL

REINFORCEMENT AS PER SECTION A UNO



TYPICAL DOWEL JOINT (DJ) DETAIL
1 : 10(A1)

NOTES:

1. FOR GENERAL NOTES & CONTSRUCTION SPECIFICATION REFER DRAWING 1002-1003.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

D5 FOR CONSTRUCTION

AUSTRALIAN HEIGHT DATUM

200 0 200 400 600 800 1000mm
1:10 (A1) 1:20 (A3)

REV	DATE	DESCRIPTION	BY	CHK	APR
C01.02	31.08.2021	ISSUED FOR CONSTRUCTION	SGB	KM	AM
C01.01	11.06.2021	ISSUED FOR CONSTRUCTION	SC	KM	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

STRUCTURAL DETAILS
REINFORCEMENT
SHEET 1 OF 2

Level 14,
56 Berry Street
North Sydney NSW 2060, Australia
Tel +61 2 8854 5000
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www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
JPC	MGA56 GDA94	AHD	31.08.2021

REF.
PA2317 Garden St Headwall.rvt

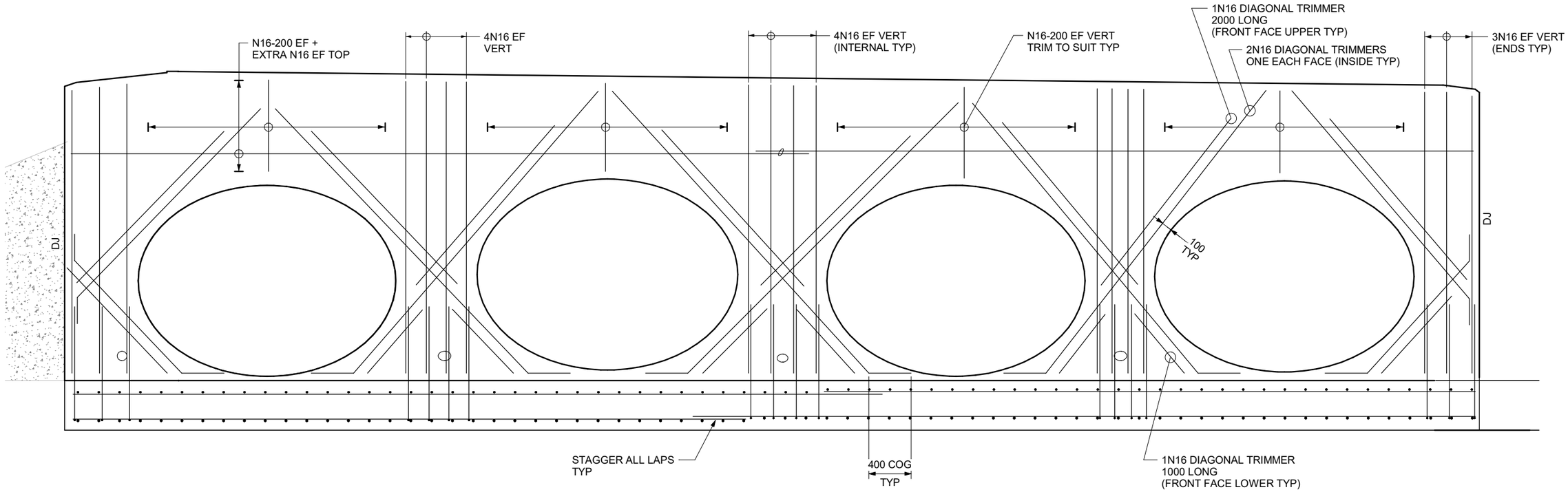
DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1163	D5	C01.02

C:\Users\220000\Box\PA2317 RL\Garden St\WIP\E11 Working Drawings\PA2317 Garden St Headwall.rvt

PA2317-RHD-00-XX-DR-ME-1164

NOTES:

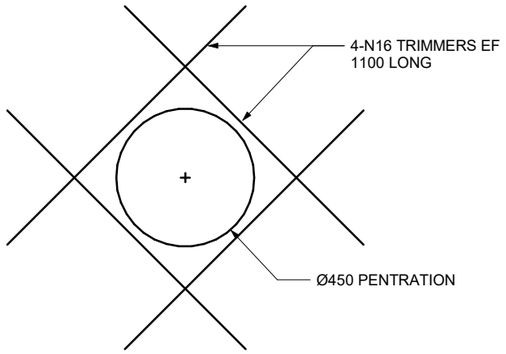
1. FOR GENERAL NOTES & CONTSRUCTION SPECIFICATION REFER DRAWING 1002-1003.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.



HEADWALL REINFORCEMENT ELEVATION

1 : 20(A1)

NOTE: PILE SHAPE SHOWN DUE TO ALIGNMENT OF PIPE RELATIVE TO HEADWALL



450 RCP TRIMMER BAR DETAIL

1 : 10(A1)

D5 FOR CONSTRUCTION

AUSTRALIAN HEIGHT DATUM

400 0 400 800 1200 1600 2000mm

1:20 (A1) 1:40 (A3)

200 0 200 400 600 800 1000mm

1:10 (A1) 1:20 (A3)

REV	DATE	DESCRIPTION	BY	CHK	APR
C01.02	31.08.2021	ISSUED FOR CONSTRUCTION	SGB	KM	AM
C01.01	11.06.2021	ISSUED FOR CONSTRUCTION	SC	KM	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

STRUCTURAL DETAILS
REINFORCEMENT
SHEET 2 OF 2

Level 14,
56 Berry Street
North Sydney NSW 2060, Australia
Tel +61 2 8854 5000
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www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
	MGA56 GDA94	AHD	31.08.2021

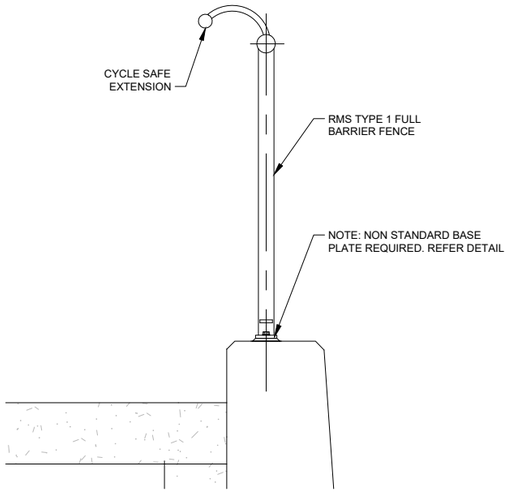
REF.
PA2317 Garden St Headwall.rvt

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1164	D5	C01.02

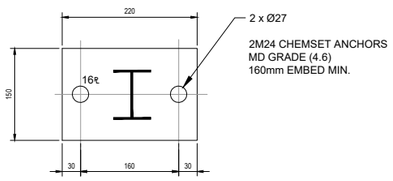
C:\Users\22000\Box\PA2317 RLGardenStHW\PA2317 RLGardenStHW WIP\E11 Working Drawings\PA2317 Garden St Headwall.rvt

DRAWING No.
PA2317-RHD-00-XX-DR-ME-1171

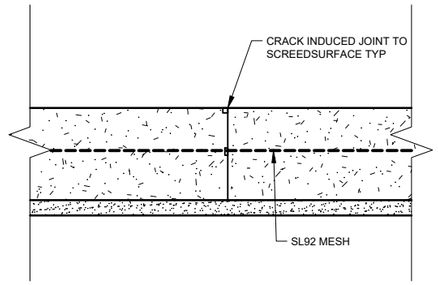
DO NOT SCALE



SAFETY HANDRAIL SECTION
1:10 (A1)

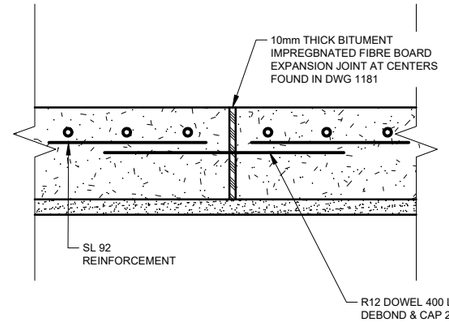


BASE PLATE DETAIL
1:5 (A1)



SHARED PATH TOOL JOINT
1:5 (A1)

REFER SECTION A ON DWG 1163 FOR DETAIL OF PROPOSED SHARED PATH



SHARED PATH EXPANSION JOINT
1:5 (A1)

REFER SECTION A ON DWG 1163 FOR DETAIL OF PROPOSED SHARED PATH

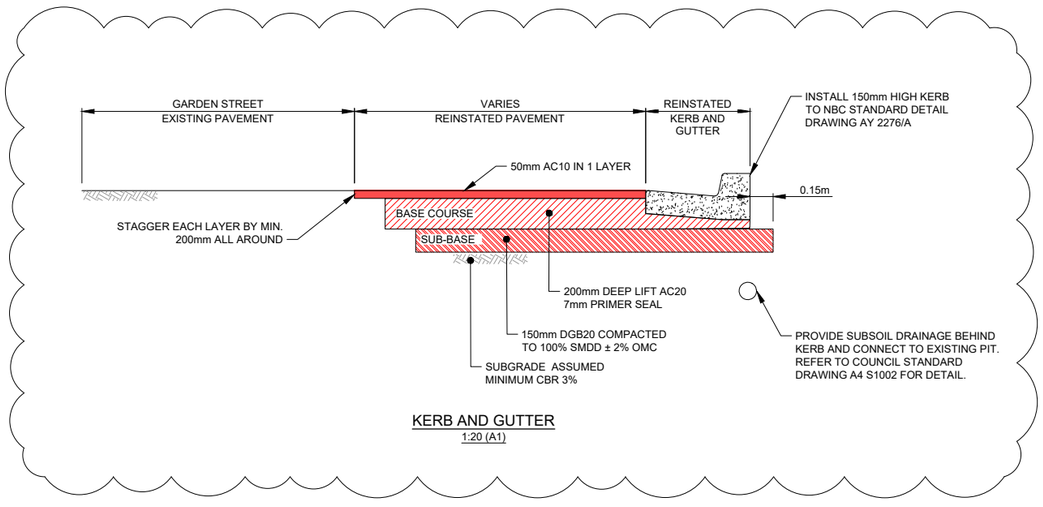
NOTE:

1. THE BUSHLAND ASSET MANAGER FOR WARRIEWOOD WETLANDS HAS ADVISED THE FOLLOWING DENSITIES FOR PLANTING:
   8 X FORB FERN SEDGE GROUNDCOVER PER M2
   4 X SHRUB/SMALL TREES PER M2
   3 X SWAMP MAHOGANY (EUCALYPTUS ROBUSTA) PER 5/10 M2

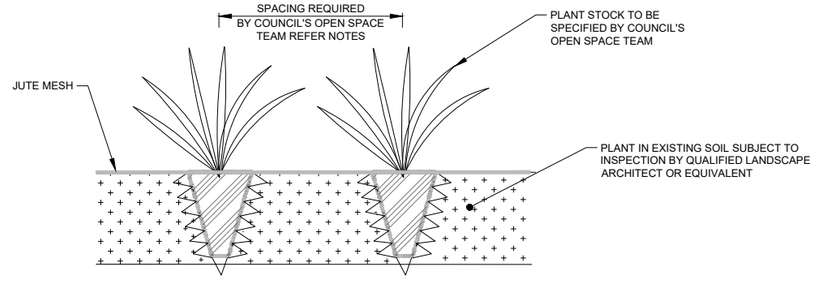
FORBS SEDGES FERNS COULD INCLUDE:
GAHNIA CLARKEI, PTERIDIUM ESCULENTUM, HYPOLEPIS MUELLERI, CALOCHLAENA DUBIA, DIANELLA CAERULEA, VIOLA HEDERACEA, IMPERATA CYLINDRICA

SMALL TREE SHRUBS COULD INCLUDE:
LIVISTONA AUSTRALIS, SYZYGIUM SMITHII, ELAEOCARPUS RETICULATUS, GLOCHIDION FERDINANDI AND MELALEUCA LINARIIFOLIA/M. STYPHELIOIDES.

INCLUDED FOR REFERENCE ONLY IF REQUIRED.



KERB AND GUTTER
1:20 (A1)



REVEGETATION DETAIL
1:10 (A1)

0.1 0 0.1 0.2 0.3 0.4 0.5m
1:10 (A3) 1:5 (A1)

0.4 0 0.4 0.8 1.2 1.6 2.0m
1:40 (A3) 1:20 (A1)

0.2 0 0.2 0.4 0.6 0.8 1.0m
1:20 (A3) 1:10 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.02	27.04.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.04.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.06.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

CIVIL, DRAINAGE AND REVEGETATION DETAILS

Royal HaskoningDHV
Enhancing Society Together
Level 14, 56 Berry Street
North Sydney NSW 2060
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Tel +61 2 88545000
Fax +61 2 99250960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

REF.
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1171	D5	C01.02

AUSTRALIAN HEIGHT DATUM

D5 FOR CONSTRUCTION

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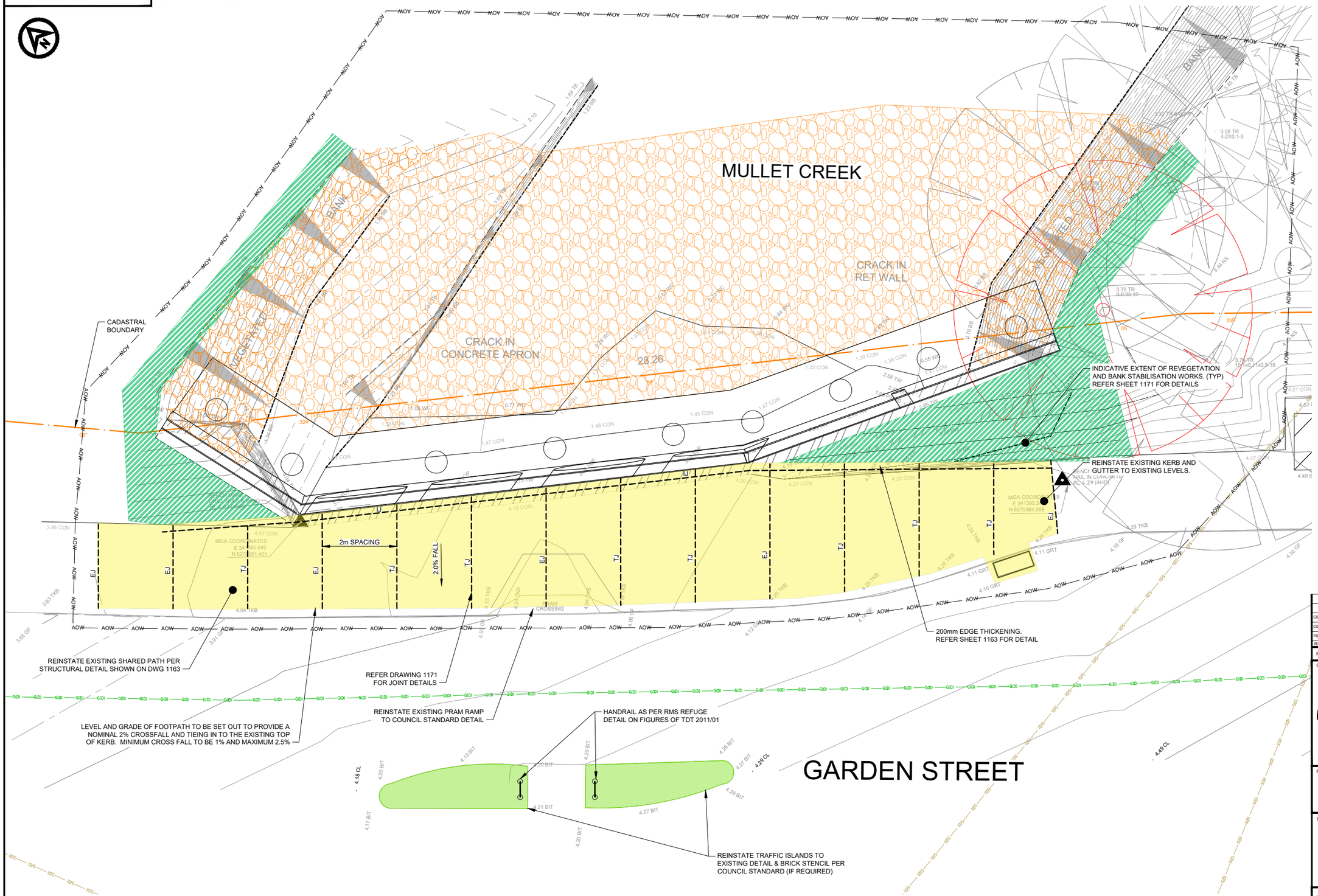
DRAWING No.
PA2317-RHD-00-XX-DR-ME-1181

DO NOT SCALE



NOTES:

1. REFER COUNCIL STANDARD DRAWING A4 7284 FOR PRAM RAMP DETAILS.
2. ALL REINSTATEMENT WORKS TO BE UNDERTAKEN FOLLOWING COUNCIL'S DEVELOPMENT ENGINEERING MINOR WORKS SPECIFICATION APRIL 2010.

TJ = TOOL JOINT
EJ = EXPANSION JOINT

REV	DATE	DESCRIPTION	BY	CHK	APP
C01.02	27.08.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
C01.01	11.06.2021	ISSUED FOR CONSTRUCTION	VD	ML	AM
P01.03	04.06.2021	ISSUED FOR REVIEW AND COMMENT	VD	ML	AM

REVISIONS

CLIENT

northern beaches council

PROJECT

GARDEN STREET
HEADWALL REPLACEMENT

TITLE

REINSTATEMENT
PLAN & DETAILS

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North Sydney NSW 2060
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Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
VD	MGA ZONE 56	AHD	27.08.2021

REF.
PA2317-GARDEN-ST

DRAWING No.	SUITABILITY	REVISION
PA2317-RHD-00-XX-DR-ME-1181	D5	C01.02

AUSTRALIAN HEIGHT DATUM | D5 FOR CONSTRUCTION

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Appendix D – Ecological Impact Assessment (Niche Environment & Heritage)

Excellence in your environment

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Culvert Works

Ecological Impact Assessment

Prepared for Royal Haskoning | 30 April 2021

Document control

Project number	Client	Project manager	LGA
6290	Royal haskoning	Matthew Russell	Northern Beaches

Version	Author	Review	Status	Date
D1	Christie Chapman	Sian Griffiths	Draft	5 January 2021
D2	Christie Chapman	Matthew Russell	Draft	9 January 2021
D3	Christie Chapman	Royal haskoning	Draft	9 January 2021
R0	Christie Chapman		Final	23 March 2021
R1	Christie Chapman		Final	29 April 2021

Niche Environment and Heritage Pty Ltd (ACN 137 111 721)
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1. The proposal

Northern Beaches Council propose to repair the damaged section of concrete headwall and wingwall via replacement of downstream headwall and new rock scour protection rock apron surrounding an existing culvert along Garden Street, Warriewood, at the crossing of Mullet Creek, less than 100 m to the north of the intersection between Irrawong Road and Garden Street (Lot 100 / DP 1127710, Lot 7084 / DP1051167). (the proposal, Figure 1, Plate 1, Annex 1).

The current existing headwall of the Garden Street Culvert will be repaired with a new concrete retaining wall, leaving the existing 450 mm pipe outlet at its current location.

The proposed works will involve the following:

- Demolishing and reconstructing entire concrete headwall and wingwall.
- Install rock protection downstream from the structure for a distance of approx. 10 metres.
- Reconstruction of footpath and installation of handrail along the extent of new wingwall.
- Removal of 0.0039 ha of vegetation to form an access track.
- Removal of one mature tree.

A 13 m long, 3 m wide access track will need to be installed between the damaged wingwall and an existing unsealed access track behind the bus top (Figure 1). This will result in 39 m^2 (0.0039 ha) of vegetation clearing. Mature and hollow-bearing trees will not be removed for the access track.

Plate 1. Damaged headwall to be repaired

2. Methods

Niche Environment and Heritage Pty Ltd (Niche) were commissioned by RHDHV to undertake an ecological assessment to ensure no threatened flora species or habitat features would be impacted by the proposal. An inspection was conducted by Christie Chapman from Niche on the 2nd February 2021 (see Figure 1).

The edges of Mullet Creek and the adjacent vegetation to be modified by the proposal were inspected. Any threatened flora species or habitat features were identified, with relevant GPS coordinates taken.

2.1 Database searches and literature review

Relevant databases were reviewed prior to field survey to inform survey design. Database searches within the locality (a 5 km radius around the Study Area) were conducted in 29 January 2021 to identify threatened biodiversity and migratory species with known occurrences in the locality. The following databases and literature were used for this purpose:

- NSW Department of Planning, Industry and Environment (DPIE) BioNet, Atlas of NSW Wildlife (DPIE 2020a).
- Australian Department of Agriculture, Water and the Environment EPBC Act Protected Matters Report (DAWE 2020a).
- Species Profile and Threats Database (DAWE 2020b).
- Threatened Species Profiles for threatened species, endangered populations and threatened ecological communities (TECs) listed under the BC Act (DPIE 2020b).

Existing vegetation mapping was examined prior to the field survey (OEH 2016) to determine the vegetation communities likely to be present in the locality.

2.2 Field surveys

A site assessment was undertaken to verify existing vegetation mapping, including the presence of TECs, and determine flora and fauna habitat of the Study Area. As this was primarily a habitat-based assessment, targeted threatened species surveys were not undertaken.

The site assessment was undertaken on 2 February 2021 by Christie Chapman.

2.2.1 Rapid Data Points (RDPs)

A Rapid Data Point (RDP) was completed within proximity to the proposed works to determine characteristics of the vegetation cover present. Data collected included:

- Overstorey dominants
- Midstorey dominants
- Understorey dominants
- Groundcover dominants
- Structure
- Photo.

2.2.2 Fauna habitat assessment

Fauna habitat characteristics and parameters that were assessed near the proposed works included:

- Dominant vegetation, composition and structure
- Composition of ground layer (bare earth, litter etc.)

- Presence and relative abundance of key habitat features (e.g. tree hollows, large logs, rocky features, flowering resources, aquatic features)
- Condition and disturbance factors
- Vegetation age structure.

2.2.3 Opportunistic threatened flora survey

Random meanders for threatened flora and fauna habitat were undertaken in the bushland surrounding the proposed culvert works.

2.3 Threatened flora and fauna likelihood of occurrence

A list of subject threatened flora and fauna within the locality was determined from the database searches detailed in Section 0. The list of potentially impacted species (candidate species) was determined from consideration of this list. In order to adequately determine the relevant level of assessment to apply to potentially affected species, further analysis of the likelihood of those species occurring within the Study Area was completed. Five categories for 'likelihood of occurrence' were attributed to threatened biodiversity after considering the number and proximity of known records, presence or absence of preferred habitat types (e.g. native vegetation types), the mobility of the species, field survey results and professional judgement. The categories are outlined in Table 1. Species considered further in formal assessments of significance (BC Act, EPBC Act) were those in the 'Known', 'High' or 'Moderate' categories and where impacts for the species could reasonably occur from the Project. Species listed as having a 'Low' or 'None' likelihood of occurrence are those for which there is limited, or no habitat present within the Study Area.

Table 1: Likelihood of occurrence criteria

Likelihood rating	Threatened flora criteria	Threatened and migratory fauna criteria
Known	The species was observed within the Study Area.	The species was observed within the Study Area.
High	It is likely that a species inhabits or utilises habitat within the Study Area.	It is likely that a species inhabits or utilises habitat within the Study Area.
Moderate	Potential habitat for a species occurs within the Study Area. Adequate field survey would determine if there is a 'high' or 'low' likelihood of occurrence for the species within the Study Area.	Potential habitat for a species occurs within the Study Area and the species may occasionally utilise that habitat. Species unlikely to be wholly dependent on the habitat present within the Study Area.
Low	It is unlikely that the species inhabits the Study Area.	It is unlikely that the species inhabits the Study Area. If present at the site, the species would likely be a transient visitor. The Study Area contains only very common habitat for this species which the species would not rely on for its on-going local existence.
None	The habitat within the Study Area is unsuitable for the species.	The habitat within the Study Area is unsuitable for the species.

2.4 Consultation

Niche Environment and Heritage consulted with Northern Beaches Council who advised of historic use of the culvert by Threatened Little Bentwing-bat (*Miniopterus australis*) and Southern Myotis (*Myotis Macropus*). As such Niche have conducted an assessment of significance and provided recommendation for management.

3. Results

3.1 Vegetation

3.1.1 Existing vegetation mapping

Vegetation within the locality is mapped as the Plant Community Types (PCTs) (OEH, 2016, Figure 1):

- PCT 1795 *Swamp Mahogany / Cabbage Tree Palm - Cheese Tree - Swamp Oak tall open forest on poorly drained coastal alluvium in the Sydney basin*.
- Urban Exotic / Native.

PCT 1795 aligns with the Threatened Ecological Community (TEC) know as Swamp Sclerophyll Forest on Coastal Floodplains, listed as an Endangered Ecological Community (EEC) under the BC Act. There is no equivalent TEC listed under the EPBC Act.

3.1.2 Validated vegetation mapping

Plant species recorded during the field surveys are listed in Annex 2 and the RDP is shown in Figure 1. The vegetation recorded in the Study Area was considered to be in poor condition given the high level of disturbance and occurrence of weeds.

The vegetation present in proximity to the proposed works was consistent with existing mapping. Key indicator species for Swamp Sclerophyll Forest on Coastal Floodplains (DECC 2007) such as *Eucalyptus robusta* (Swamp Mahogany), *Glochidion ferdinandi* (Cheese Tree), *Livistona australis* (Cabbage Tree Palm), *Acacia longifolia* (Coastal Wattle), *Gahnia clarkei* (Tall Saw-Sedge), and *Pteridium esculentum* (Bracken) were recorded during the field survey (Annex 2).

The vegetation to be cleared for the proposed 3 m wide access track includes 0.0039 ha of Swamp Sclerophyll Forest on Coastal Floodplains. The vegetation to be disturbed is mostly invasive groundcover species, along with native and invasive understorey and midstorey species. As mentioned in Section 1, the mature and hollow-bearing trees will be retained for the track. Species recorded in the RDP are outlined in Annex 2, including ten invasive species.

3.1.3 Threatened flora

Fifty threatened flora species listed under the BC Act and/or the EPBC Act were considered as subject species (Figure 2). Of the 50 flora subject species, two were considered to have a moderate or higher likelihood of occurrence within the locality: *Persicaria elatior* and *Melaleuca biconvexa*.

No threatened flora were recorded in proximity to the works during the field survey. The majority of the habitats present in the Study Area were modified, being directly adjacent to a footpath, bus stop and road, as well as the culvert. The potential habitat present within the Study Area was considered unsuitable for these threatened flora species.

As the proposal will not impact threatened flora species, they do not need to be considered further.

3.1.4 Threatened ecological communities

The vegetation present in proximity to the proposed works was consistent with existing mapping; PCT 1795 which aligns with the TEC Swamp Sclerophyll Forest on Coastal Floodplains. The potential impacts of the proposal, 0.0039 ha disturbance on native vegetation and habitats, are minor. Assessments of Significance (BC Act) for Swamp Sclerophyll Forest on Coastal Floodplains have been completed in Annex 4. The Project is not likely to result in a significant impact on any TECs listed under the BC Act.

3.2 Fauna

3.2.1 General fauna habitat

The proposed works occur within a disturbed roadside and urban environment. A pedestrian pathway is present directly next to the proposed culvert works area, along with the large culvert to be repaired (Plate 2).

The canopy present in proximity to the proposed culvert works area provided limited sheltering and foraging habitat. One hollow-bearing tree was present in proximity to the proposed works.

The mature tree to be removed did not contain any hollows. Woodland habitat provides a wide range of food and shelter for vertebrate fauna. Trees from the family Myrtaceae (mostly *Eucalyptus spp*.) generally dominate the upper canopy in these areas and supply direct (foliage, nectar, exudates) and indirect food (arthropods) for a range of vertebrates, particularly birds and arboreal mammals. The removal of this mature tree will not significantly reduce the foraging habitat availability within the locality (Plate 4).

The shrub and ground layer was predominantly open, providing limited shelter (Plate 3). The sparse to absent shrub layer in most areas is likely due to the urban location and human activities in and around the Study Area and passage through the vegetation to Mullet Creek. Leaf litter and fallen logs were absent. No rocks were present in the Study Area. The understorey and groundcover vegetation provide limited shelter and foraging resources.

The vegetation to be cleared includes 0.0039 ha of mostly invasive groundcover species, along with native and invasive understorey and midstorey species. No mature or hollow-bearing trees would be impacted by the proposal.

3.2.2 Threatened fauna

Sixty-nine threatened fauna species listed under the BC Act and/or the EPBC Act were considered as subject species (excluding marine species; Annex 3 Likelihood of Occurrence table; Figure 3). Of the 69 fauna subject species, six were considered to have a moderate or higher likelihood of occurrence within the locality: Greater Broad-Nosed Bat, Grey-Headed Flying Fox, Southern Myotis, Large Bentwing Bat, Little Bentwing Bat, Black Bittern and Grey Flacon.

The bushland adjacent to the proposed works is not likely to support habitat for threatened fauna. The threatened species listed above may pass through the area, however sheltering and foraging habitat is limited to absent. Threatened fauna are not considered to be dependent on the habitats present within the Study Area. The 0.0039 ha of vegetation to be disturbed will not result in any impacts to threatened fauna or their habitat. As the proposal will not impact threatened fauna species, they do not need to be considered further.

The proposed culvert works will involve the demolition and reconstruction of the concrete headwall, causing vibrations which has the potential to disturb microbats roosting in the culvert. If bats are present, there is no real potential for direct impacts as the works are not within areas determined as potential roosting habitat sites (inside of culvert). Indirect impacts such as minor to moderate vibration levels may affect roosting bats should they be present. If there are sufficient indirect impacts (such as vibration or noise) microbats may come out of torpor and attempt to move to other parts of the bridge or to other areas in the locality. It is considered unlikely that such disruption would lead to mortality, however there is some chance of this occurring via increased predation risk if bats are flying during the day. Increased stress and metabolic requirements may also cause minor impacts to bat health. Despite some potential impacts, indirect impacts from the proposed works are considered overall to be minor, being short term.

Assessments of Significances (AoS) have been performed for Little Bentwing Bat and Southern Myotis (Annex 4 Assessment of Significance).

3.2.3 Key Fish Habitat

The proposed works are not located within any Key Fish Habitat (KFH), identified in the Key Fish Habitat maps by DPI Fisheries. Therefore, no KFH will be impacted by the proposal and a Fisheries Permit is not required to be prepared under Parts 2 or 7 under the *Fisheries Management Act 1994*.

Plate 2. Locality of proposed works

Plate 3. Groundcover and understory near proposed works

Plate 4. Mature tree to be removed.

4. Recommendations

Measures to avoid/ mitigate impacts include:

- Clearing would be restricted to the shrub and ground layer. Native vegetation outside of the proposed access track would not be cleared. All mature and hollow-bearing trees will be retained, except for the single tree nominated for removal.
- Sediment and erosion control is required to be installed and maintained during construction.
- Waste material is not to be left on site once the works have been completed.
- An emergency spill kit is to be kept on site at all times. All staff are to be made aware of the location of the spill kit and trained in its use.
- Revegetation planning should consider providing foraging and sheltering resources for native fauna in addition to the aesthetic appeal for the community.
- Weed control should be considered across the Study Area to prevent further spread of the weeds present.
- Site inspection before commencement of works (as close a feasible) to be undertaken by an appropriately qualified ecologist to determine presence of microbats. Work can commence if no microbats are present.
- Works should be undertaken outside of the likely torpor period during colder months (April to September).
- Personnel should be wary of and monitor potential microbat activity and stop works if bats are observed flying from underneath the works area.
- If bat activity is detected, the level of activity should be noted (i.e. attempts made to estimate the number of bats flying) and advice sought from Council or other appropriately qualified ecologists as to development of an appropriate management process prior to recommencing works.

5. References

DAWE (2020a) Commonwealth Protected Matters Search Tool for MNES. Department of Agriculture, Water and the Environment, Australian Government, Canberra. https://www.environment.gov.au/epbc/protected-matters-search-tool (accessed February 2021).

DAWE (2020b) Species Profile and Threats Database. Department of Agriculture, Water and the Environment, Australian Government, Canberra.

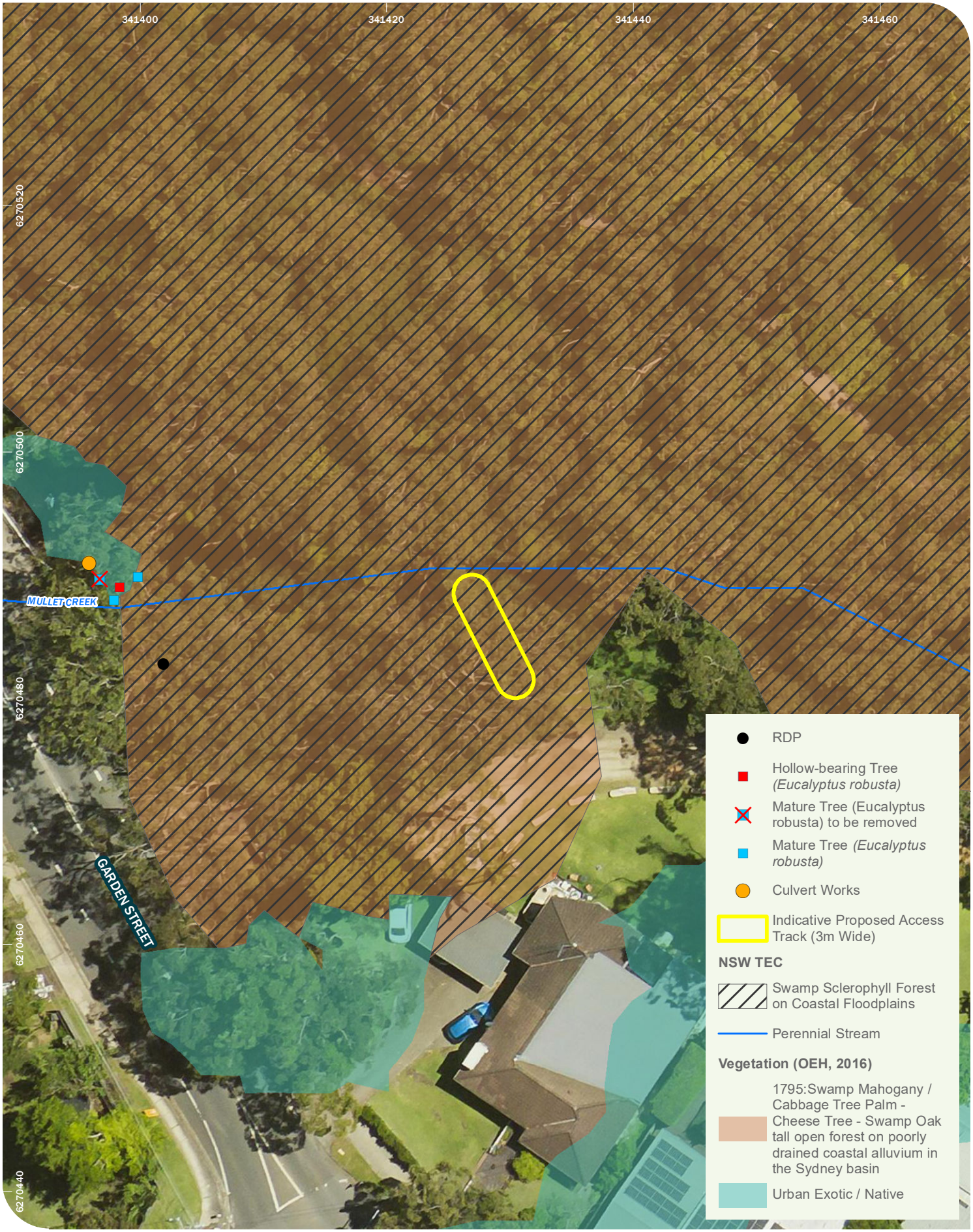
DPIE (2020a) BioNet Atlas of NSW Wildlife. Office of Environment and Heritage, Sydney. Accessed January 2021.

DPIE (2020b) Threatened Species Profiles for threatened species, endangered populations and threatened ecological communities. Department of Planning, Industry and Environment.

Department of Environment and Climate Change (DECC), 2007. Swamp Sclerophyll Forest on Coastal Floodplains.

OEH, 2016. The Native Vegetation of the Sydney Metropolitan Area. Department of Planning, Industry and Environment.

Figures



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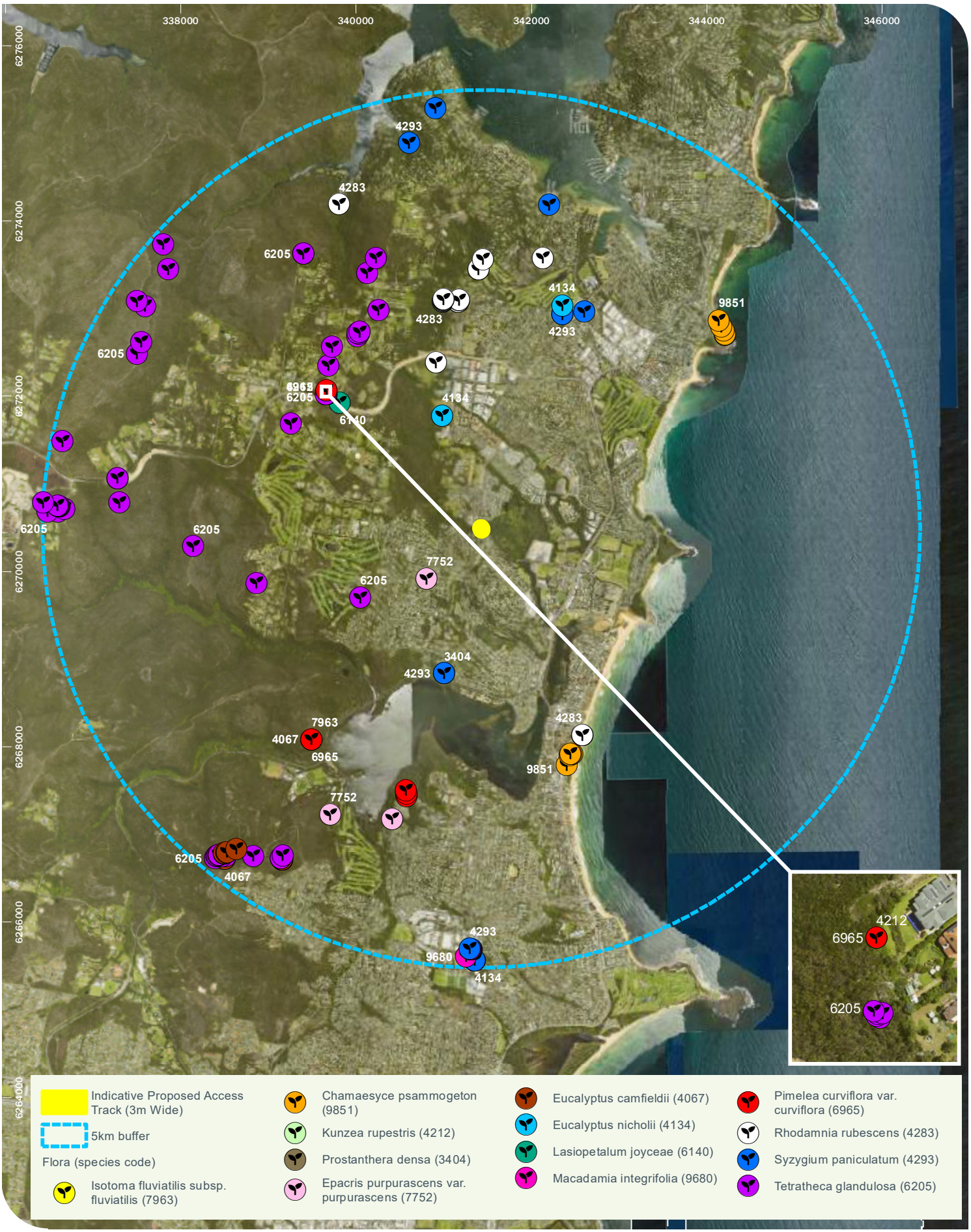
GDA 1994 MGA Zone 56

Vegetation Community and Habitat Features

Culvert works – Ecological Assessment

Niche PM: Matthew Russell
Niche Proj. #: 6290
Client: Royal Haskoning DHV

Figure 1



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GDA 1994 MGA Zone 56

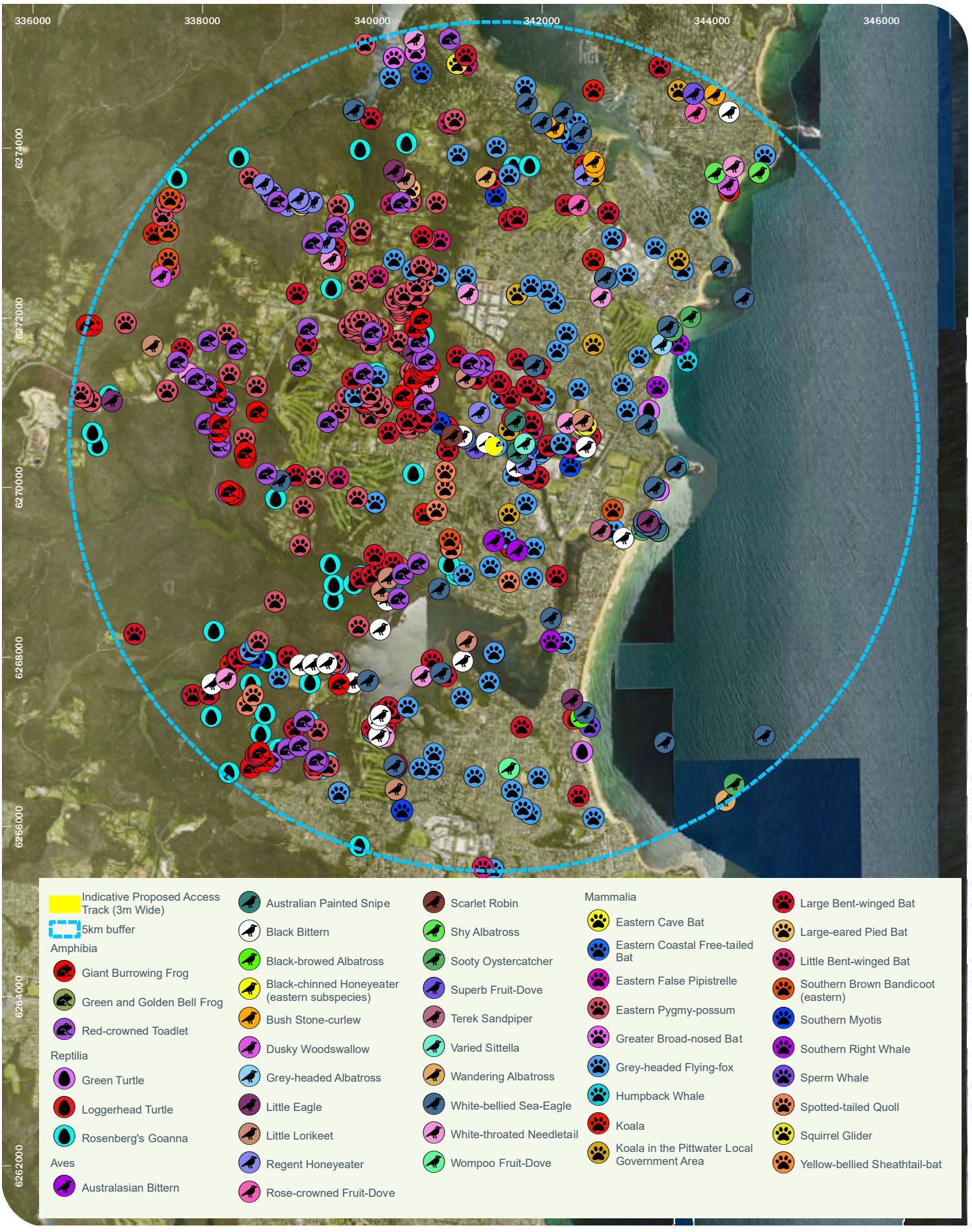
Threatened Flora previously recorded within 5 km of the Study area

Culvert works – Ecological Assessment

Sensitive species not displayed

Niche PM: Matthew Russell
Niche Proj. #: 6290
Client: Royal Haskoning DHV

Figure 2



Indicative Proposed Access Track (3m Wide)

5km buffer

Amphibia

- Giant Burrowing Frog
- Green and Golden Bell Frog
- Red-crowned Toadlet

Reptilia

- Green Turtle
- Loggerhead Turtle
- Rosenberg's Goanna

Aves

- Australasian Bittern
- Australian Painted Snipe
- Black Bittern
- Black-browed Albatross
- Black-chinned Honeyeater (eastern subspecies)
- Bush Stone-curlew
- Dusky Woodswallow
- Grey-headed Albatross
- Little Eagle
- Little Lorikeet
- Regent Honeyeater
- Rose-crowned Fruit-Dove
- Scarlet Robin
- Shy Albatross
- Sooty Oystercatcher
- Superb Fruit-Dove
- Terek Sandpiper
- Varied Sittella
- Wandering Albatross
- White-bellied Sea-Eagle
- White-throated Needletail
- Wompoo Fruit-Dove

Mammalia

- Eastern Cave Bat
- Eastern Coastal Free-tailed Bat
- Eastern False Pipistrelle
- Eastern Pygmy-possum
- Greater Broad-nosed Bat
- Grey-headed Flying-fox
- Humpback Whale
- Koala
- Koala in the Pittwater Local Government Area
- Large Bent-winged Bat
- Large-eared Pied Bat
- Little Bent-winged Bat
- Southern Brown Bandicoot (eastern)
- Southern Myotis
- Southern Right Whale
- Sperm Whale
- Spotted-tailed Quoll
- Squirrel Glider
- Yellow-bellied Sheathtail-bat

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GDA 1994 MGA Zone 56

Threatened Fauna previously recorded within 5 km of the Study area

Culvert works – Ecological Assessment

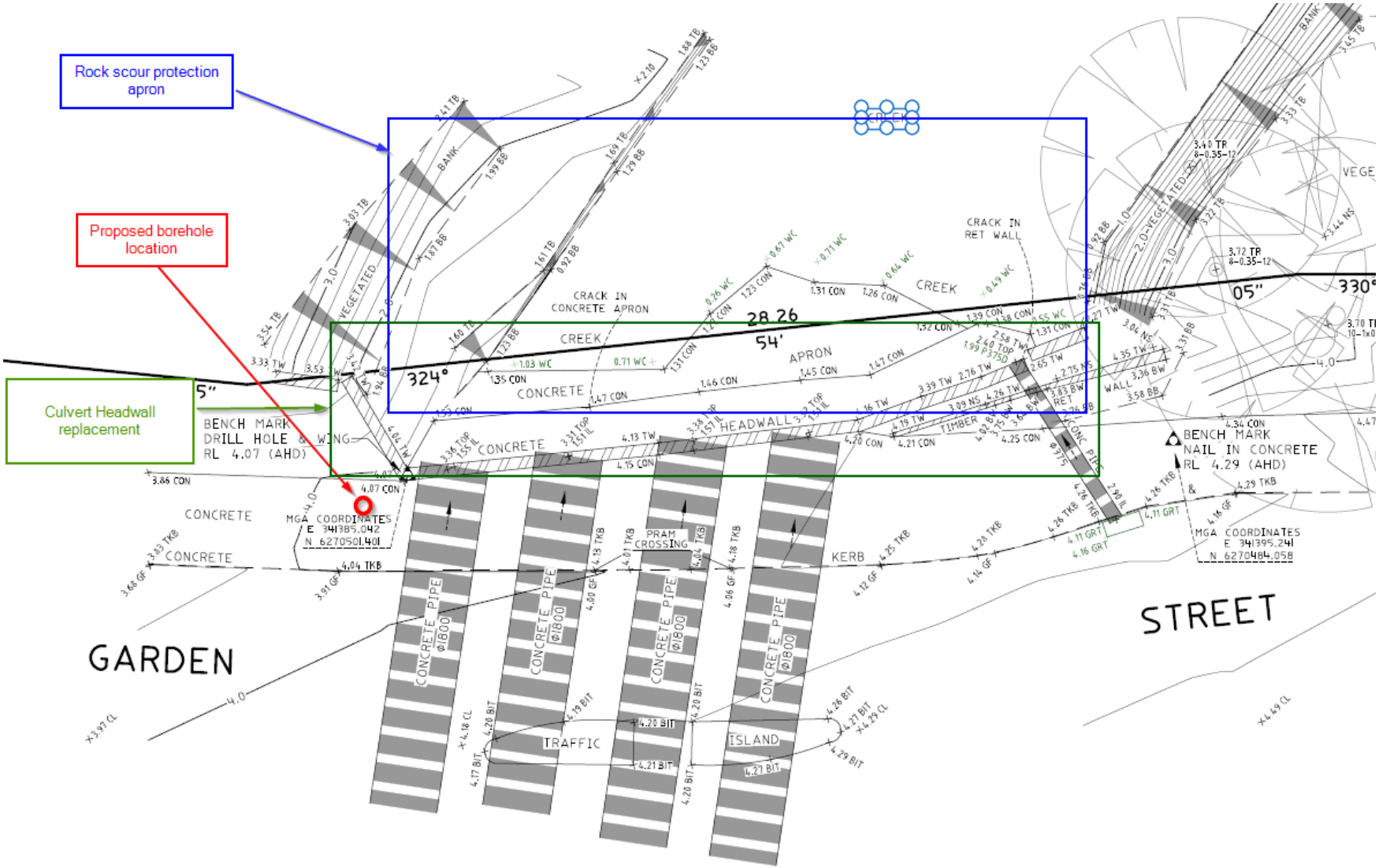
Sensitive species not displayed

Niche PM: Matthew Russell
Niche Proj. #: 6290
Client: Royal Haskoning DHV

Figure 3

Australia latest: Imagery @ Metro map /Australia latest

Annex 1 Diagram of proposed works



Annex 2 Rapid Data Point

Location (Latitude & Longitude)	OS Height	OS cover	OS species	MS Height	MS cover	MS species	US Height	US cover	US species	GC Height	GC cover	GC species
-33.6937746, 151.2888156	30 - 40 m	25 %	*Eucalyptus robusta*	5 - 20 m	40 %	*Ficus coronata*, *Acacia longifolia*, *Glochidion ferdinandi*, *Pittosporum undulatum*, *Erythrina crista-galli**, *Homalanthus populifolius*, *Livistona australis*	1 - 3 m	30 %	*Pteridium esculentum*, *Cassia pendula**	0 - 1 m	90 %	*Stephania japonica var. japonica**, *Solanum nigrum**, *Tradescantia fluminensis**, *Entolasia marginata*, *Gahnia sieberiana*, *Glycine clandestina*, *Cardiospermum grandiflorum**, *Ipomoea cairica**, *Thunbergia alata**, *Sida rhombifolia**, *Conyza bonariensis**

OS = Overstorey, MS = Midstorey, US = Understorey, GC = Groundcover

*=exotic species, + = Weed of National Significance (WoNS) (absent)

Annex 3 Likelihood of Occurrence table[1]

Scientific Name	Common Name	BC Act	EPBC Act	Habitat	Likelihood of occurrence
Acacia bynoeana	Bynoe's Wattle	E	V	Grows mainly in heath and dry sclerophyll forest in sandy soils. Mainly south of Dora Creek-Morisset area to Berrima and the Illawarra region, west to the Blue Mountains, also recorded from near Kurri Kurri in the Hunter Valley and from Morton National Park.	**Low** – no suitable habitat within Study Area.
Acacia pubescens	Downy Wattle	V	V	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.	**Low** – no suitable habitat within Study Area.
Acacia terminalis subsp. terminalis	Sunshine Wattle	E	E	Very limited distribution, mainly in near-coastal areas from the northern shores of Sydney Harbour S to Botany Bay, with most records from the Port Jackson area and the eastern suburbs of Sydney. Coastal scrub and dry sclerophyll woodland on sandy soils. Habitat is generally sparse and scattered.	**Low** – no suitable habitat within Study Area.
Ancistrachne maidenii		V	-	Restricted to northern Sydney, around St Albans - Mt White - Maroota - Berowra areas and to the Shannon Creek area south-west of Grafton. Habitat requirements appear to be specific, with populations occurring in distinct bands in areas associated with a transitional geology between Hawkesbury and Watagan soil landscapes. Grows in dry sclerophyll forest on sandstone-derived soils.	**Low** – no suitable habitat within Study Area.
Anthochaera phrygia	Regent Honeyeater	CE	E, M	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. The distribution of the species has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some year's flocks converge on flowering coastal woodlands and forests.	**Low** – no suitable habitat within Study Area.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	Dusky woodswallows are widespread in eastern, southern and south western Australia. The species occurs throughout most of New South Wales, 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 groundcover of grasses or sedges and fallen woody debris.	**Low** – no suitable habitat within Study Area.
Asterolasia buxifolia		E	-	Known from a single site at a granite outcrop in the riparian zone of the Lett River. Apparently restricted to dense riparian scrub along rocky watercourses with a granitic substrate.	**Low** – no suitable habitat within Study Area.
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	**Low** – no suitable habitat within Study Area.

[1] Data source: Atlas = NSW BioNet Atlas; PMST = Commonwealth Protected Matters Search Tool.
Marine species have been excluded as there is no marine habitat within the Study Are
E = Endangered; V = Vulnerable, CE = Critically Endangered, EP = Endangered Population, M = Migratory.

				which is wholly within a conservation reserve. Occurs on Hawkesbury sandstone in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest.	
Boronia umbellata		V	V	Grows as an understorey shrub in and around gullies in wet open forest.	**Low** – no suitable habitat within Study Area.
Botaurus poiciloptilus	Australasian Bittern	E	E	The Australasian Bitterns is widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes and spikerushes.	**Low** – no suitable habitat within Study Area.
Burhinus grallarius	Bush Stone-curlew	E	-	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east, it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights.	**Low** – no suitable habitat within Study Area.
Caladenia tessellata	Thick-lip Spider Orchid	E	V	The Tessellated Spider Orchid is found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct.	**Low** – no suitable habitat within Study Area.
Calidris ferruginea	Curlew Sandpiper	E	-	The Curlew Sandpiper is distributed around most of the coastline of Australia. It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes, and lagoons on the coast and sometimes the inland	**Low** – no suitable habitat within Study Area.
Callistemon linearifolius	Netted Bottle Brush	V	-	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.	**Low** – no suitable habitat within Study Area.
Callocephalon fimbriatum	Gang-gang Cockatoo	V	-	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.	**Low** – no suitable habitat within Study Area.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	Inhabits forest with low nutrients, characteristically with key *Allocasuarina* spp. Tends to prefer drier forest types with a middle stratum of Allocasuarina below Eucalyptus or Angophora. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead. Endangered population in the Riverina.	**Low** – no suitable habitat within Study Area.
Camarophyllopsis kearneyi		E	-	Its occurrence appears to be limited to the Lane Cove Bushland Park. Does not produce above-ground fruiting structures all year but may be present only as non-reproductive hyphal structures below ground.	**Low** – no suitable habitat within Study Area.
Cercartetus nanus	Eastern Pygmy-possum	V	-	Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Will often nest in tree hollows but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows. Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5ha area over a 5-month period.	**Low** – no suitable habitat within Study Area.

Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range. Can also be found on the edges of rainforests and in wet sclerophyll forests. This species roosts in caves and mines in groups of between 3 and 37 individuals.	**Low** – no suitable habitat within Study Area.
Chamaesyce psammogeton		E	-	Found sparsely along the coast from south of Jervis Bay (at Currarong, Culburra and Seven Mile Beach National Park) to Queensland (and Lord Howe Island). Populations have been recorded in Wamberal Lagoon Nature Reserve, Myall Lakes National Park and Bundjalung National Park. Grows on fore-dunes and exposed headlands, often with Spinifex sericeus.	**Low** – no suitable habitat within Study Area.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	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 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.	**Low** – no suitable habitat within Study Area.
Cryptostylis hunteriana	Leafless Tongue-orchid	V	V	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. 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*).	**Low** – no suitable habitat within Study Area.
Cynanchum elegans	White-flowered Wax Plant	E	E	Recorded from rainforest gullies scrub and scree slopes from the Gloucester district to the Wollongong area and inland to Mt Dangar.	**Low** – no suitable habitat within Study Area.
Daphoenositta chrysoptera	Varied Sittella	V	-	Inhabits wide variety of dry eucalypt forests and woodlands, usually with either shrubby under storey or grassy ground cover or both, in all climatic zones of Australia. Usually in areas with rough-barked trees, such as stringybarks or ironbarks, but also in paperbarks or mature Eucalypts with hollows.	**Low** – no suitable habitat within Study Area.
Darwinia biflora		V	V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas. The northern, southern, eastern and western limits of the range are at Maroota, North Ryde, Cowan and Kellyville, respectively. Occurs on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone. The vegetation structure is usually woodland, open forest or scrub-heath.	**Low** – no suitable habitat within Study Area.
Darwinia peduncularis		V	-	Occurs as local disjunct populations in coastal NSW with a couple of isolated populations in the Blue Mountains. It has been recorded from Brooklyn, Berowra, Galston Gorge, Hornsby, Bargo River, Glen Davis, Mount Boonbourwa and Kings Tableland. Usually grows on or near rocky outcrops on sandy, well drained, low nutrient soil over sandstone.	**Low** – no suitable habitat within Study Area.
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E	Spotted-tailed Quoll are found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	**Low** – no suitable habitat within Study Area.

Deyeuxia appressa		E	E	A highly restricted NSW endemic known only from two pre-1942 records in the Sydney area (Herne Bay, Saltpan Creek, off the Georges River, south of Bankstown and Killara, near Hornsby). Almost nothing is known about the species' habitat and ecology. Flowers spring to summer and is mesophytic (grows in moist conditions).	**Low** – no suitable habitat within Study Area.
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.	**Low** – no suitable habitat within Study Area.
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	Mainly found on shallow, permanent, freshwater terrestrial wetlands, and surrounding marginal vegetation, including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters, as well as extending into adjacent grasslands, paddocks and open savannah woodlands. They also forage within or around estuaries and along intertidal shorelines, such as saltmarshes, mudflats and sandflats, and mangrove vegetation.	**Low** – may pass through the Study Area but would not be dependent on the habitat within the Study Area.
Erythrotriorchis radiatus	Red Goshawk	CE	-	The Red Goshawk occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia.	**Low** – no suitable habitat within Study Area.
Esacus magnirostris	Beach Stone-curlew	CE	-	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. Beach Stone-curlews are 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.	**Low** – no suitable habitat within Study Area.
Eucalyptus camfieldii	Heart-leaved Stringybark	V	V	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace Area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. 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.	**Low** – no suitable habitat within Study Area.
Eucalyptus nicholii	Narrow-leaved Black Peppermint	V	V	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock. Seedling recruitment is common, even in disturbed soils, if protected from grazing and fire.	**Low** – no suitable habitat within Study Area.
Eucalyptus scoparia	Wallangarra White Gum	E	V	In NSW it is known from only three locations near Tenterfield. Found in open eucalypt forest and woodland on well-drained granite hilltops, slopes and rocky outcrops, typically at high altitudes. At lower elevations can occur in less rocky soils in damp situations.	**Low** – no suitable habitat within Study Area.
Falco hypoleucos	Grey Falcon	E	-	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. Also occurs near wetlands where surface water attracts prey.	**Moderate**
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high. Two observations have been made of roosts in stem holes of living eucalypts. There is debate about whether or not this species moves to lower altitudes during winter, or whether they remain sedentary but enter torpor. This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites.	**Low** – no suitable habitat within Study Area.

Genoplesium baueri	Bauer\'s Midge Orchid	E	E	Grows in dry sclerophyll forest and moss gardens over sandstone. Flowers February to March. Has been recorded between Ulladulla and Port Stephens. Currently the species is known from just over 200 plants across 13 sites. The species has been recorded in Berowra Valley Regional Park, Royal National Park and Lane Cove National Park and may also occur in the Woronora, O'Hares, Metropolitan and Warragamba Catchments.	**Low** – no suitable habitat within Study Area.
Genoplesium plumosum	Tallong Midge Orchid	CE	E	Occurs exclusively in heathland, generally dominated by violet kunzea, common fringe-mytre and parrot-peas. Grows on very shallow soils or within mosses on sandstone conglomerate shelves. Plants exists only as a dormant tuber for much of the year, with leaves or fruiting stems dying back in winter. Reproduces by seed and has no mechanism for vegetative reproduction.	**Low** – no suitable habitat within Study Area.
Glossopsitta pusilla	Little Lorikeet	V	-	Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.	**Low** – no suitable habitat within Study Area.
Grammitis stenophylla	Narrow-leaf Finger Fern	E	-	Moist places, usually near streams, on rocks or in trees, in rainforest and moist eucalypt forest.	**Low** – no suitable habitat within Study Area.
Grantiella picta	Painted Honeyeater	V	V	Inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) 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*.	**Low** – no suitable habitat within Study Area.
Grevillea caleyi		E	E	Restricted to an 8 km square area around Terrey Hills, approximately 20 km north of Sydney. Occurs 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. All sites occur on the ridgetop between elevations of 170 to 240m asl, in association with laterite soils and a vegetation community of open forest, generally dominated by *Eucalyptus sieberi* and *Corymbia gummifera*. Commonly found in the endangered Duffys forest ecological community.	**Low** – no suitable habitat within Study Area.
Grevillea juniperina subsp. juniperina		V	-	Endemic to Western Sydney, centred on an area bounded by Blacktown, Erskine Park, Londonderry and Windsor with outlier populations at Kemps Creek and Pitt Town. Recorded from Cumberland Plain woodland, Castlereagh Ironbark woodland, Castlereagh Scribbly Gum woodland and Shale-Gravel Transition forest. Grows on reddish clay to sandy soils derived from Wianamatta Shale and Tertiary alluvium (often with shale influence), typically containing lateritic gravels.	**Low** – no suitable habitat within Study Area.
Grevillea parviflora subsp. supplicans		E	-	Occurs in heathy woodland associations on skeletal sandy soils over massive sandstones. This taxon is strongly associated with clay-capped ridged of the Lucas Heights and Faulconbridge soil landscapes, but that it is quite restricted within these areas, suggesting it has a preference for yellow clays with periodically impeded drainage.	**Low** – no suitable habitat within Study Area.
Grevillea shiressii		V	V	Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils.	**Low** – no suitable habitat within Study Area.
Haliaeetus leucogaster	White-bellied Sea-Eagle	-	M	Inhabits coastal and near coastal areas, building large stick nests, and feeding mostly on marine and estuarine fish and aquatic fauna.	**Low** – no suitable habitat within Study Area.
Haloragodendron lucasii		E	E	Occurs on Hawkesbury Sandstone in moist sandy loam soil. The species prefers sheltered aspects and inhabits gentle slopes below cliff lines near creeks in low open woodland or open forest. Its distribution is correlated with high soil moisture and phosphorus levels.	**Low** – no suitable habitat within Study Area.

Heleioporus australiacus	Giant Burrowing Frog	V	V	The Giant Burrowing Frog has been recorded breeding in a range of water bodies associated with more sandy environments of the coast and adjacent ranges from the Sydney Basin south the eastern Victoria. It breeds in hanging swamps, perennial non-flooding creeks and occasionally permanent pools, but permanent water must be present to allow its large tadpoles time to reach metamorphosis.	**Low** – no suitable habitat within Study Area.
Hibbertia puberula		E	-	Occurs on sandy soil often associated with sandstone. Flowering time is October to November.	**Low** – no suitable habitat within Study Area.
Hibbertia superans		E	-	Flowering time is July to December. The species occurs on sandstone ridgetops often near the shale-sandstone boundary. Occurs in both open woodland and heathland, and appears to prefer open disturbed areas, such as tracksides.	**Low** – no suitable habitat within Study Area.
Hieraaetus morphnoides	Little Eagle	V	-	Most abundant in lightly timbered areas with open areas nearby. Often recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. May nest in farmland, woodland and forest in tall trees.	**Low** – may pass through the Study Area but would not be dependent on the habitat within the Study Area.
Hirundapus caudacutus	White-throated Needletail	-	M	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges.	**Low** – may pass through the Study Area but would not be dependent on the habitat within the Study Area.
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Occurs almost exclusively in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they spend most of the year sheltering in and under rock crevices and exfoliating rock. However, some individuals will migrate to tree hollows to find shelter during hotter parts of summer.	**Low** – no suitable habitat within Study Area.
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E	-	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.	**Low** – no suitable habitat within Study Area.
Ixobrychus flavicollis	Black Bittern	V	-	Usually found on coastal plains below 200 m. Often found along timbered watercourses, in wetlands with fringing trees and shrub vegetation. The sites where they occur are characterized by dense waterside vegetation.	**Moderate**
Kunzea rupestris		V	V	Grows in shallow depressions on large flat sandstone rock outcrops. Characteristically found in short to tall shrubland or heathland.	**Low** – no suitable habitat within Study Area.
Lasiopetalum joyceae		V	V	Grows in heath on sandstone.	**Low** – no suitable habitat within Study Area.
Lathamus discolor	Swift Parrot	E	E	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	**Low** – no suitable habitat within Study Area.
Leptospermum deanei		V	V	woodland on lower hill slopes or near creeks. Sandy alluvial soil or sand over sandstone. Occurs in riparian scrub, woodland and open forest.	**Low** – no suitable habitat within Study Area.

Litoria aurea	Green and Golden Bell Frog	E	V	Inhabits a very wide range of water bodies including marshes, dams and streams, particularly those containing emergent vegetation such as bullrushes or spikerushes. It also inhabits numerous types of man-made water bodies including quarries and sand extraction sites. Optimum habitat includes waterbodies that are un-shaded, free of predatory fish such as Plague Minnow, have a grassy area nearby and diurnal sheltering sites available.	**Low** – no suitable habitat within Study Area.
Lophoictinia isura	Square-tailed Kite	V	-	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW 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 100km2. 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.	**Low** – no suitable habitat within Study Area.
Macadamia tetraphylla		V	V	Confined chiefly to the Richmond and Tweed Rivers in north-east NSW, extending just across the border into Queensland. Found in subtropical rainforest, usually near the coast.	**Low** – no suitable habitat within Study Area.
Macquaria australasica	Macquarie Perch		E	Recent research indicates that there may be at least two distinct forms of Macquarie Perch, one from the western rivers (Murray-Darling Basin form) and one from the eastern rivers (the Shoalhaven and Hawkesbury-Nepean systems) (the coastal form). The species has also been stocked or translocated into a number of reservoirs including Talbingo, Cataract and Khancoban reservoirs and translocated into streams including the Mongarlowe River. Macquarie Perch are found in both river and lake habitats; especially the upper reaches of rivers and their tributaries	**Low** – no suitable habitat within Study Area.
Macropus parma	Parma Wallaby	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 Queensland border. Preferred habitat is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest.	**Low** – no suitable habitat within Study Area.
Melaleuca biconvexa	Biconvex Paperbark	V	V	Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north.	**Moderate**
Melaleuca deanei	Deane\'s Paperbark	V	V	Grows in wet heath on sandstone in coastal districts from Berowra to Nowra.	**Low** – no suitable habitat within Study Area.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	In NSW it is widespread, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond and Clarence River areas. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions, though it is very rare in the latter.	**Low** – no suitable habitat within Study Area.
Micronomus norfolkensis	Eastern Freetail-bat	V	-	Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species' habits.	**Low** – no suitable habitat within Study Area.
Microtis angusii	Angus's Onion Orchid	E	E	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 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 EEC under the TSC Act and ranges from open forest to low open forest and rarely woodland.	**Low** – no suitable habitat within Study Area.

Miniopterus australis	Little Bentwing-bat	V	-	Coastal north-eastern NSW and eastern Queensland. Little Bent-wing Bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel 100s km from feeding home ranges to breeding sites. Little Bent-wing Bat has a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.	**Moderate**
Miniopterus orianae oceanensis	Large Bentwing-bat	V	-	Eastern Bent-wing Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	**Moderate**
Mixophyes balbus	Stuttering Frog	E	V	Associated with streams in dry sclerophyll and wet sclerophyll forests and rainforests of more upland areas of the Great Dividing Range of NSW and down into Victoria. Breeding occurs along forest streams with permanent water where eggs are deposited within nests excavated in riffle zones by the females and the tadpoles swim free into the stream when large enough to do so. Outside of breeding, individuals range widely across the forest floor and can be found hundreds of metres from water	**Low** – no suitable habitat within Study Area.
Myotis macropus	Southern Myotis	V	-	The Large-footed Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	**Moderate**
Neophema pulchella	Turquoise Parrot	V	-	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, 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. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	**Low** – no suitable habitat within Study Area.
Ninox connivens	Barking Owl	V	-	Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country.	**Low** – no suitable habitat within Study Area.
Ninox strenua	Powerful Owl	V	-	Occupies wet and dry eucalypt forests and rainforests. Can occupy both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. It is most commonly recorded within red turpentine in tall open forests and black she-oak within open forests. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm.	**Low** – no suitable habitat within Study Area.
Numenius madagascariensis	Eastern Curlew	-	CE, MA, M	A primarily coastal distribution. Found in all states, particularly the north, east, and south-east regions including Tasmania. Rarely recorded inland. Mainly forages on soft sheltered intertidal sand flats or mudflats, open and without vegetation or cover. Breeds in the northern hemisphere.	**Low** – no suitable habitat within Study Area.
Pandion cristatus	Eastern Osprey	V	M, MA	Found right around the Australian coastline, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water.	**Low** – no suitable habitat within Study Area.
Perameles nasuta	Long-nosed Bandicoot, North Head	EP	-	*P. nasuta* has been reliably reported as occurring on North Head, in an area bounded by North Head, Cannae Point, Manly Point and Blue Fish Point.	**Low** – no suitable habitat within Study Area.

Persicaria elatior		V	V	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	**Moderate**
Persoonia hirsuta	Hairy Geebung	E	E	Distributed from Singleton in the north, along the east coast to Bargo in the south and the Blue Mountains to the west. A large area of occurrence, but occurs in small populations, increasing the species's fragmentation in the landscape. Found in sandy soils in dry sclerophyll open forest, woodland and heath on sandstone. Usually present as isolated individuals or very small populations. Probably killed by fire (as other *Persoonia* spp. are) but will regenerate from seed.	**Low** – no suitable habitat within Study Area.
Persoonia mollis subsp. maxima		E	E	Occurs in sheltered aspects of deep gullies or on the steep upper hillsides of narrow gullies on Hawkesbury Sandstone. These habitats support relatively moist, tall forest vegetation communities, often with warm temperate rainforest influences. Flowers are likely to be pollinated predominantly by native bees. Self-pollination is usually unsuccessful.	**Low** – no suitable habitat within Study Area.
Petalura gigantea	Giant Dragonfly	E	-	The Giant Dragonfly is found along the east coast of NSW from the Victorian border to northern NSW. It is not found west of the Great Dividing Range. There are known occurrences in the Blue Mountains and Southern Highlands, in the Clarence River catchment, and on a few coastal swamps from north of Coffs Harbour to Nadgee in the south. Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence.	**Low** – no suitable habitat within Study Area.
Petauroides volans	Greater Glider	-	V	The Greater Glider occurs in eucalypt forests and woodlands. The Greater Glider occurs in eucalypt forests and woodlands. The species nests in hollows and are typically found in older forests. Generally, the home range for the greater glider is between 0.7-3 hectares and tends to have a population density of 0.01-5 individuals per hectare. The home ranges of females can overlap with males and females however for the males the home ranges never overlap.	**Low** – no suitable habitat within Study Area.
Petaurus australis	Yellow-bellied Glider	V	-	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south. Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	**Low** – no suitable habitat within Study Area.
Petaurus norfolcensis	Squirrel Glider	V	-	Generally, occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow bearing trees and a mix of eucalypts, banksias and acacias. There is only limited information available on den tree use by Squirrel gliders, but it has been observed using both living and dead trees as well as hollow stumps. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked. Endangered population in the Wagga Wagga LGA.	**Low** – no suitable habitat within Study Area.
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices.	**Low** – no suitable habitat within Study Area.
Petroica boodang	Scarlet Robin	V	-	The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from the coast to the inland slopes. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs.	**Low** – no suitable habitat within Study Area.
Phascolarctos cinereus	Koala	V	V	Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall.	**Low** – no suitable habitat within 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.	**Low** – no suitable habitat within Study Area.
Polytelis swainsonii	Superb Parrot	V	V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. Inhabits box-gum, box-cypress-pine and boree woodlands and river red gum forest.	**Low** – no suitable habitat within Study Area.
Potorous tridactylus tridactylus	Long-nosed Potoroo	V	V	Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy.	**Low** – no suitable habitat within Study Area.
Prasophyllum fuscum	Tawny Leek-orchid	CE	V	Tawny Leek-orchid is confined to the Blue Mountains, Hawkesbury sandstone, and the Burrawang district, NSW. This species grows on the margins of swamps at moderate altitudes, about 500–700 m above sea level. Tawny Leek-orchid grows in wet low heathland on gentle slopes, in brown silty loam or in moist heath, often along seepage lines. The species can also be found in grasslands with scattered low Leptospermum and rushes, in silty peat loam, or in boggy soils in open heath, sometimes in running water or at the ecotone between grassy woodland-forest and swamps.	**Low** – no suitable habitat within Study Area.
Prostanthera densa		V	V	Villous Mintbush is generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	**Low** – no suitable habitat within Study Area.
Prostanthera junonis		E	E	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.	**Low** – no suitable habitat within Study Area.
Prostanthera marifolia		CE	CE	Occurs in localised patches in 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.	**Low** – no suitable habitat within Study Area.
Prototroctes maraena	Australian Grayling	-	V	Historically, this species occurred in coastal streams from the Grose River Valley, southwards through NSW, Vic. and Tas. It also occasionally occurred high upstream in the Snowy R. A single juvenile specimen was collected from Lake Macquarie in 1974. This species spends only part of its lifecycle in freshwater. The Tambo River population inhabits a clear, gravel-bottomed stream with alternating pools and riffles, and granite outcrops. It has also been associated with clear, gravel-bottomed habitats in the Mitchell & Wonnangatta Rivers but was present in a muddy-bottomed, heavily silted habitat in the Tarwin R.	**Low** – no suitable habitat within Study Area.
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	V	-	In NSW the Eastern Chestnut Mouse mainly occurs north from the Hawkesbury River area as scattered records along to coast and eastern fall of the Great Dividing Range extending north into Queensland. There are however isoltaed records in the Jervis bay area. In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. In the tropics it is more an animal of grassy woodlands. Optimal habitat appears to be in vigorously regenerating heathland burnt from 18 months to four years previously. By the time the heath is mature, the larger Swamp Rat becomes dominant, and Eastern Chestnut Mouse numbers drop again.	**Low** – no suitable habitat within Study Area.

Pseudomys novaehollandiae	New Holland Mouse	-	V	The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland understorey, and vegetated sand dunes.	**Low** – no suitable habitat within Study Area.
Pseudophryne australis	Red-crowned Toadlet	V	-	Occurs on wetter ridge tops and upper slopes of sandstone formations on which the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks that feed into larger semi-perennial streams. After raining these creeks are characterised by a series of shallow pools lined by dense grasses, ferns and low shrubs and usually contain leaf litter for shelter. Eggs are terrestrial and laid under litter, vegetation or rocks where the tadpoles inside will reach a relatively late stage of development before waiting for flooding waters before hatching will occur.	**Low** – no suitable habitat within Study Area.
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost although some individuals may travel up to 70 km.	**Moderate**
Ptilinopus magnificus	Wompoo Fruit-dove	V	-	Distributed north of the Hunter River in NSW on the coast and coastal ranges. Inhabits rainforest, monsoon forest, adjacent eucalypt forest and brush box forest.	**Low** – no suitable habitat within Study Area.
Ptilinopus regina	Rose-crowned Fruit-dove	V	-	Coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. Vagrants are occasionally found further south to Victoria. 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.	**Low** – may pass through the Study Area but would not be dependent on the habitat within the Study Area.
Ptilinopus superbus	Superb Fruit-dove	V	-	The Superb Fruit-dove occurs principally from north-eastern in Queensland to north-eastern NSW. It is much less common further south, where it is largely confined to pockets of suitable habitat as far south as Moruya. There are records of vagrants as far south as eastern Victoria and Tasmania. Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	**Low** – may pass through the Study Area but would not be dependent on the habitat within the Study Area.
Rhizanthella slateri	Eastern Australian Underground Orchid	V, EP (Great Lakes)	E	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. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore, usually located only when the soil is disturbed. 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.	**Low** – no suitable habitat within Study Area.
Rhodamnia rubescens	Scrub Turpentine	CE	-	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of *R. rubescens* typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	**Low** – no suitable habitat within Study Area.
Rostratula australis	Painted Snipe	E	E, MA	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowell, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin. 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.	**Low** – no suitable habitat within Study Area.

Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	**Low** – no suitable habitat within Study Area.
Sarcochilus hartmannii	Hartman's Sarcochilus	V	V	From the Richmond River in northern NSW to Gympie in south-east Queensland. Favours cliff faces on steep narrow ridges supporting eucalypt forest and clefts in volcanic rock from 500 to 1,000 m in altitude.	**Low** – no suitable habitat within Study Area.
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m. In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat. This species roosts in hollow tree trunks and branches.	**Moderate**
Senecio spathulatus	Coast Groundsel	E	-	Coast Groundsel occurs in Nadgee Nature Reserve (Cape Howe) and between Kurnell in Sydney and Myall Lakes National Park (with a possible occurrence at Cudmirrah). In Victoria there are scattered populations from Wilsons Promontory to the NSW border. Coast Groundsel grows on primary dunes.	**Low** – no suitable habitat within Study Area.
Stagonopleura guttata	Diamond Firetail	V	-	Feeds exclusively on the ground, on ripe and partly ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Found in grassy eucalypt woodlands, including box-gum woodlands and snow gum woodlands. Also occurs in open forest, mallee, natural temperate grassland, and in secondary grassland derived from other communities.	**Low** – no suitable habitat within Study Area.
Syzygium paniculatum	Magenta Lilly Pilly	E	V	Found only in NSW, in a narrow, linear coastal strip from Bulahdelah to Conjola State forest. On the south coast the species occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral rainforest. On the central coast it occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities	**Low** – no suitable habitat within Study Area.
Tetratheca glandulosa		V	V	Associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone bench. Soils are generally shallow, consisting of a yellow, clayey-sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Vegetation structure varies from heaths and scrub to woodlands-open woodlands, and open forest.	**Low** – no suitable habitat within Study Area.
Tetratheca juncea		V	V	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest-woodland with a mixed shrub understorey and grassy groundcover. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape. Cryptic species that requires survey in September-October.	**Low** – no suitable habitat within Study Area.
Thesium australe	Austral Toadflax	V	V	Grows in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland. Grows on kangaroo grass tussocks but has also been recorded within the exotic coolatai grass.	**Low** – no suitable habitat within Study Area.
Triplarina imbricata	Creek Triplarina	E	E	Found only in a few locations in the ranges south-west of Glenreagh and near Tabulam in north-east NSW. Along watercourses in low open forest with water gum.	**Low** – no suitable habitat within Study Area.
Tyto novaehollandiae	Masked Owl	V	-	Inhabits a diverse range of wooded habitat that provide tall or dense mature trees with hollows suitable for nesting and roosting. Mostly recorded in open forest and woodlands adjacent to cleared lands. Nest in hollows, in trunks and in near vertical spouts or large trees, usually living but sometimes dead. Nest hollows are usually	**Low** – no suitable habitat within Study Area.

				located within dense forests or woodlands. Masked owls' prey upon hollow-dependent arboreal marsupials, but terrestrial mammals make up the largest proportion of the diet.	
Tyto tenebricosa	Sooty Owl	V	-	Often found in tall old-growth forests, including temperate and subtropical rainforests. In NSW mostly found on escarpments with a mean altitude less than 500 metres. Nests and roosts in hollows of tall emergent trees, mainly eucalypts often located in gullies. Nests have been located in trees 125 to 161 centimetres in diameter.	**Low** – no suitable habitat within Study Area.
Varanus rosenbergi	Rosenberg's Goanna	V	-	This species is a Hawkesbury-Narrabeen sandstone outcrop specialist. Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests.	**Low** – no suitable habitat within Study Area.
Vespadelus troughtoni	Eastern Cave Bat	V	-	The Eastern Cave Bat is 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. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. 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.	**Low** – no suitable habitat within Study Area.
Wilsonia backhousei	Narrow-leafed Wilsonia	V	-	In NSW Narrow-leaf Wilsonia is found on the coast between Mimosa Rocks National Park and Wamberal north of Sydney. This is a species of the margins of salt marshes and lakes.	**Low** – no suitable habitat within Study Area.

Annex 4 Assessment of Significance

Swamp Sclerophyll Forest on Coastal Floodplains – Endangered Ecological Community	
a) In the case of a threatened species, whether the action proposed 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	n/a
b) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: i. 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 ii. 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	The action proposed will not have an adverse effect on either the extent or composition of Swamp Sclerophyll Forest on Coastal Floodplains such that its local occurrence is placed at risk of extinction as only previously disturbed areas which are highly modified by weed invasion and adjoining urban land use will be cleared.
c) In relation to the habitat of a threatened species, population or ecological community: i. The extent to which habitat is likely to be removed or modified as a result of the action proposed, and ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	**Extent of impact on habitat** Only up to 0.0039 ha of Swamp Sclerophyll Forest on Coastal Floodplains have the potential to be impacted by the proposal. This represents less than 0.0000046 % of the local occurrence of mapped Swamp Sclerophyll Forest in the locality. **Habitat fragmentation** No habitat fragmentation would occur as no mature vegetation will be removed within the locality. Only a small amount (0.0039 ha) of vegetation on the edge of the patch has the potential to be impacted. The Project would not increase the fragmentation of any areas of Swamp Sclerophyll Forest. **Importance of habitat to be impacted** The area of Swamp Sclerophyll Forest to be impacted is minimal compared with habitat available in the locality, which reduces the overall importance of the vegetation impacted by this proposal. Further, the area to be impacted occurs adjacent to existing urban development and is highly modified by edge effects and weed invasion. Therefore, the impacts on Swamp Sclerophyll Forest as described above are **unlikely to have long-term negative consequences for the local occurrence of Swamp Sclerophyll Forest**.
d) Whether the action proposed is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)	No areas of outstanding biodiversity value would be affected by the proposed works either directly or indirectly.

Swamp Sclerophyll Forest on Coastal Floodplains – Endangered Ecological Community	
e) Whether the action proposed constitutes or is part of a Key Threatening Process (KTP) or is likely to result in the operation of, or increase the impact of, a KTP	The Project has the potential to increase the impact of the following KTP listed in NSW: • Invasion of native plant communities by exotic weeds (e.g., perennial grasses) – there is a risk that weeds may be introduced into the community during the works. The Project is not likely to exacerbate the occurrence of exotic weeds, provided weed management is undertaken during clearing to minimise introduction and spread of weed species, in accordance with Section 4 of this report (Recommendations). • Clearing of 0.0039 ha of native vegetation - this will have negligible effects on the overall community as it is subject to previous disturbance as it is along a busy roadside.
Conclusion	The local occurrence of Swamp Sclerophyll Forest is unlikely to be significantly impacted by the proposal as: • Impact on extent and composition of local occurrence will not occur (conclusion from C above); • No important habitat will be affected (conclusion from D above); • Consistency with recovery plan (conclusion from E above).

Little Bentwing-bat (*Miniopterus australis)* and Southern Myotis (*Myotis Macropus)* - Vulnerable

Distribution

Little Bentwing-bat: Coastal north-eastern NSW and eastern Queensland. The Little Bentwing-bat is an insectivorous bat that roost in caves, in old mines, in tunnels, under bridges, or in similar structures. They breed in large aggregations in a small number of known caves and may travel hundreds of kilometres from feeding home ranges to breeding sites. They have a preference for moist eucalypt forest, rainforest or dense coastal banksia scrub where it forages below the canopy for insects.

Southern Myotis: The Southern Myotis is found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage.

Habitat requirements

Both species roost in caves, in old mines, in tunnels, under bridges, or in similar structures.

Survey/records within the site and surrounds and impact summary

Both species recorded in proximity to site (Bionet Atlas records)

Assessment of significance

Non-significant impact

Criteria		Address of Criteria
b. 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 proposed development or activity is unlikely 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 proposed culvert works will involve the demolition and reconstruction of the concrete headwall, causing vibrations which has the potential to disturb microbats roosting in the culvert. If bats are present, there is no real potential for direct impacts as the works are not within areas determined as potential roosting habitat sites (inside of culvert). Indirect impacts such as minor to moderate vibration levels may affect roosting bats should they be present. If there are sufficient indirect impacts (such as vibration or noise) microbats may come out of torpor and attempt to move to other parts of the bridge or to other areas in the locality. It is considered unlikely that such disruption would lead to mortality, however there is some chance of this occurring via increased predation risk if bats are flying during the day. Increased stress and metabolic requirements may also cause minor impacts to bat health. Despite some potential impacts, indirect impacts from the proposed works are considered overall to be minor, being short term.
c. in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	e. 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 f. 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,	N/A

g. in relation to the habitat of a threatened species or ecological community:	iv. the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and v. 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 vi. 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,	iv. No habitat is to be removed or altered as a result of the proposed activity. v. The area of habitat is unlikely to become fragmented or isolated from other areas of habitat as a result of the proposed activity. Due to the current locality of the habitat (in a residential area and likely unavailable during high water levels) the habitat being shortly affected is not causing gaps in the habitat structure. vi. The importance of the habitat to be removed and modified will not impact or effect the long-term survival of the ecological community in the locality. If bats are present, there is no real potential for direct impacts as the works are not within areas determined as potential roosting habitat sites (inside of culvert).
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),		No areas of Outstanding Biodiversity Value fell within the areas to be cleared or potentially impacted by the proposal after review of the Biodiversity Values Map (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap).
h. 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.		The following Key Threatening Processes (KTPs) are known to exist or have the potential to be exacerbated by the proposal: ▪ Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands. This KTPs would be mitigated through on-site management (e.g. waste disposal). The purpose of the proposed activities is to improve flow regime.

Conclusion: It is recommended that RHDHV adopts practises that minimise the potential for and manage risks of impacts from interactions:

- Site inspection before commencement of works (as close a feasible) to be undertaken by an appropriately qualified ecologist to determine presence of microbats. Work can commence if no microbats are present.
- Works should be undertaken outside of the likely torpor period during colder months (April to September).
- Personnel should be wary of and monitor potential microbat activity and stop works if bats are observed flying from underneath the works area.
- If bat activity is detected, the level of activity should be noted (i.e. attempts made to estimate the number of bats flying) and advice sought from Council or other appropriately qualified ecologists as to development of an appropriate management process prior to recommencing works.

Given implementation of these practices, the proposal is unlikely to result in a significant impact on the Southern Myotis or Little-Bentwing Bat.

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Terrestrial
Freshwater
Marine and coastal
Research and monitoring
Wildlife Schools and training

Heritage management
Aboriginal heritage
Historical heritage
Conservation management
Community consultation
Archaeological, built and landscape values

Environmental management and approvals
Impact assessments
Development and activity approvals
Rehabilitation
Stakeholder consultation and facilitation
Project management

Environmental offsetting
Offset strategy and assessment (NSW, QLD, Commonwealth)
Accredited BAM assessors (NSW)
Biodiversity Stewardship Site Agreements (NSW)
Offset site establishment and management
Offset brokerage
Advanced Offset establishment (QLD)

Appendix E – Aboriginal Objects Due Diligence Assessment (Niche Environment and Heritage)

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Ecology and biodiversity
Heritage management
Environmental management and approvals
Environmental offsetting

Aboriginal Objects Due Diligence Assessment
Garden Street Headwall
Warriewood, NSW

Northern Beaches Council

Prepared for Royal Haskoning DHV

Prepared by Niche Environment and Heritage | 31 March 2021

A leading independent specialist environmental and heritage consultancy

niche
Environment and Heritage

31 March 2021

Ms Jenny Pickles
Team Leader and Principle Consultant
Royal Haskoning DHV
Rivers and Water Management
Via email: jenny.pickles@rhdhv.com

Dear Ms Pickles,

Re: Garden Street Headwall, Warriewood – Aboriginal Objects Due Diligence Assessment

Based on this assessment, it is unlikely that Aboriginal objects have survived within the Activity Area due to a high level of disturbance and modification from current land uses. The land modification practices associated with land clearing, the construction of the existing headwall, wingwall, road bridge and associated utilities has disrupted the ground surface to such an extent that the possibility of *in situ* deposits is considered low.

No Aboriginal heritage constraints were identified for the proposed activity and no further investigation or impact assessment is required.

The *Due Diligence Code of Practice for the Protection of Aboriginal objects in NSW* states that where a desktop and visual inspection has occurred and concluded that Aboriginal objects are unlikely to occur, an Aboriginal Heritage Impact Permit (AHIP) application will not be necessary. The proposed activity as assessed in this report, may therefore proceed with caution without the need for a further Aboriginal Cultural Heritage Assessment (ACHA) or AHIP.

It is recommended that:

- All site workers and contractors should be inducted to the area and informed of their obligations in ensuring the protection of Aboriginal Objects under the *National Parks and Wildlife Act 1974*.
- In the unlikely event that any Aboriginal Objects are found, all activities with the vicinity of the Object(s) must stop. A temporary fence is to be erected around the Aboriginal cultural heritage site, with a buffer zone of at least 10 metres around the known edge. An appropriately qualified archaeologist is to be engaged to assess the findings, and notification is to be provided to Heritage NSW (Aboriginal Cultural Heritage Regulation) in the Department of Premier and Cabinet. Works should not proceed without advice from Heritage NSW or an appropriately qualified archaeologist.
- In the unlikely event that suspected human remains are encountered during construction, all work in the area that may cause further impact, must cease immediately and:
  - The location, including a 20 m curtilage, should be secured using barrier fencing to avoid further harm.
  - The NSW Police must be contacted immediately.
  - No further action is to be undertaken until the NSW Police provide written notification to Council and the nominated Contractor.
  - If the skeletal remains are identified as Aboriginal, Council and the nominated Contractor or their agent must contact: Heritage NSW, previously known as the Office of Environment and Heritage (OEH), Enviroline on 131 555; and representatives of the Metropolitan Local Aboriginal Land Council (MLALC).
  - No works are to continue until Heritage NSW provides written notification to the proponent or their Agent.

Please do not hesitate to contact me should you have any questions or would like to clarify details of this assessment.

Yours sincerely,

Wade Goldwyer
Heritage Consultant
Niche Environment and Heritage

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1. Introduction

1.1 The proponent and project background

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Royal Haskoning DHV (RHDHV) to undertake a desktop Aboriginal Objects Due Diligence Assessment (DD) to inform a Review of Environmental Factors (REF) for the proposed Culvert Works at Garden Street, Warriewood (hereafter referred to as the Activity Area) (Figure 1, Figure 2).

1.2 The Activity Area

The Activity Area is along Garden Street, Warriewood, at the crossing of Mullet Creek, less than 100 m to the north of the intersection between Irrawong Road and Garden Street (Lot 100 / DP 1127710, Lot 7084 / DP1051167).

1.3 The proposed activity

The current existing headwall of the Garden Street Culvert will be repaired with a new concrete retaining wall, leaving the existing 375 mm pipe outlet at its current location.

The proposed works will involve the following:

- Demolition and reconstruction of the entire headwall and wingwall,
- Installing a new rock protection downstream from the structure for a distance of approximately 10 m.
- Replacing damaged 375 mm stormwater outlet through the wingwall, along its existing alignment,
- Removal of concrete apron,
- Construction of sandstone rock armour,
- Reconstruction of footpath,
- Installation of handrail along the extent of new wingwall,
- Removal of 0.0039 ha of vegetation to form an access track (13 m x 3 m),
- Removal of one mature tree.

1.4 Statutory controls

The National Parks and Wildlife Act 1974 (NPW Act), administered by the Department of Premier and Cabinet, Heritage NSW (formerly Office of Environment and Heritage), is the primary legislation for the protection of some aspects of Aboriginal cultural heritage in New South Wales (NSW). Part 6 of the NPW Act provides specific protection for Aboriginal Objects and declared Aboriginal places by establishing offences of harm.

The NPW Act states that a person who exercises due diligence, in determining that their actions will not harm Aboriginal Objects, has a defence against prosecution if they later unknowingly harm an Aboriginal Object without an AHIP.

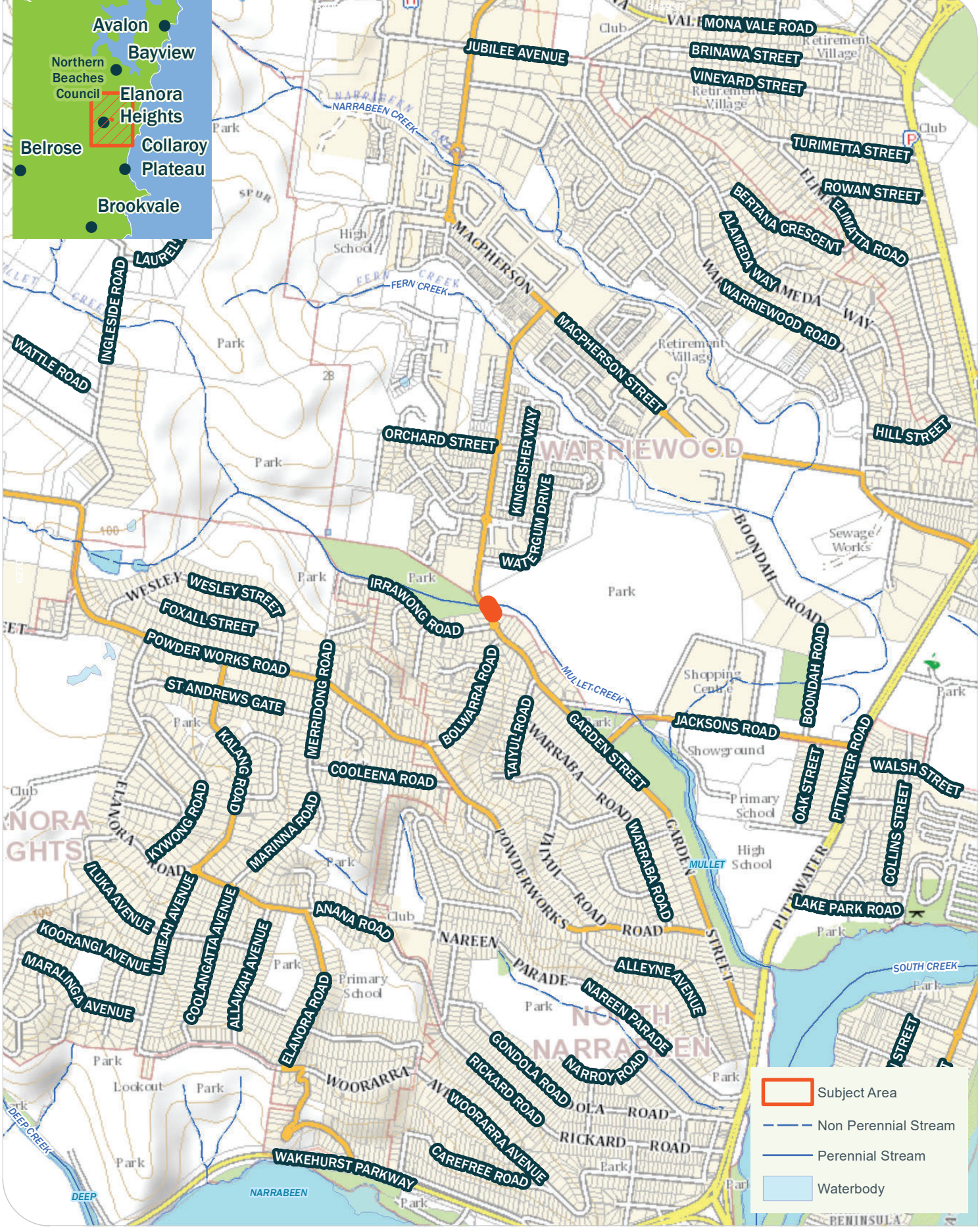
The Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (DECCW 2010) sets out a process for individuals and organisations to follow to determine whether an Aboriginal Object will be harmed by an activity, whether further investigation is needed, and whether that harm requires an AHIP (Figure 3).

1.5 Objectives

The aim of this assessment is to identify whether Aboriginal objects and/or places are present or are likely to occur within or in close proximity to the Activity Area and, whether they may be harmed by the proposed works. This information helps assist in the mitigation of Aboriginal heritage in ascertaining whether or not further investigation is required.

1.6 Assessment methodology

This DD follows the due diligence process outlined in the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW, 2010) and seen in Figure 3.



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GDA 1994 MGA Zone 56

Niche PM: Matthew Russell
Niche Proj. #: 6290
Client: Royal Haskoning DHV

Location Map

Culvert Works Warriewood Headwall

Figure 1

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Niche PM: Matthew Russell
Niche Proj. #: 6290
Client: Royal Haskoning DHV

Location of the Subject Area
Culvert Works Warriewood Headwall

Figure 2

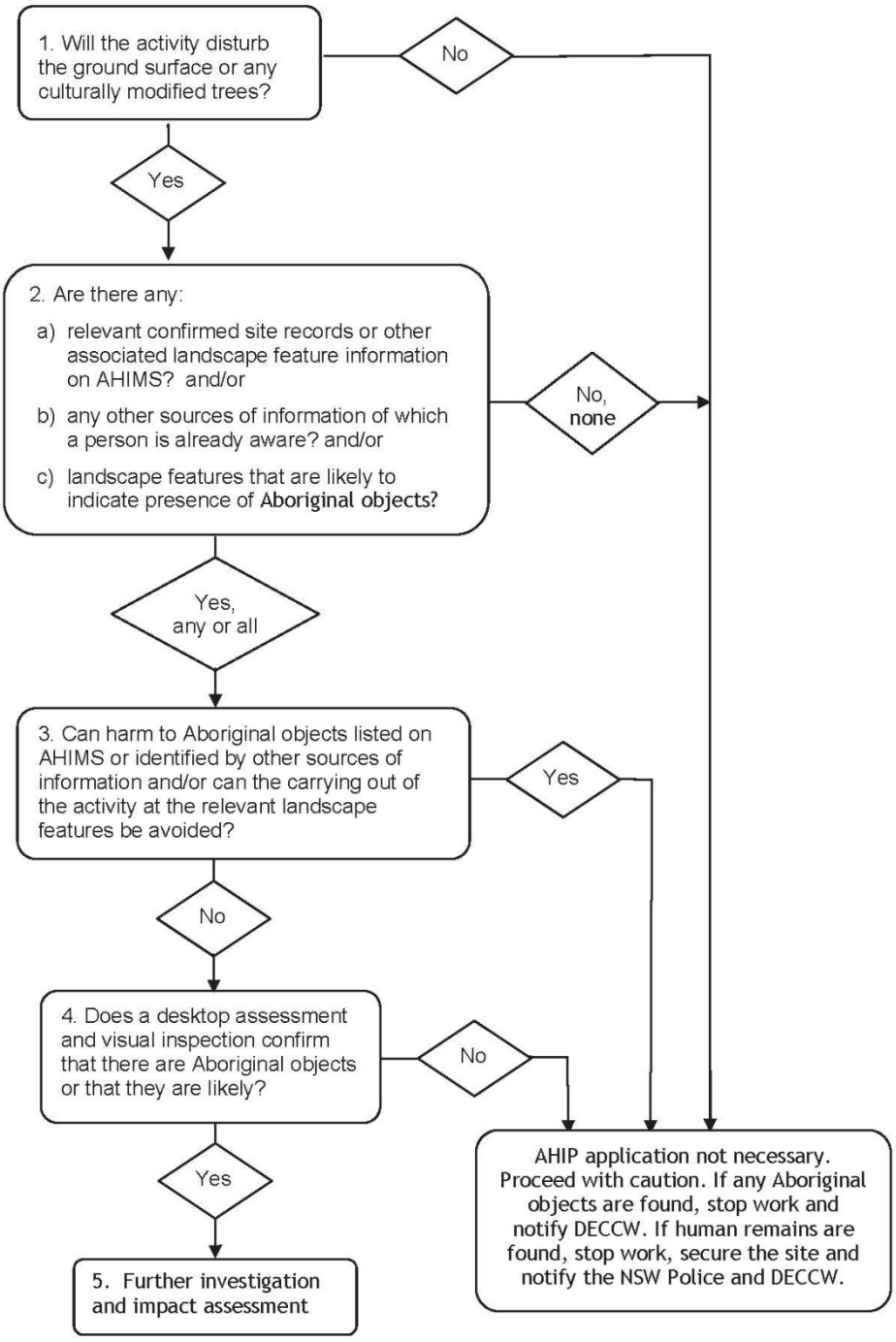

Figure 3: The due diligence assessment process

2. Environmental Context

2.1 Topography, landforms and hydrology

The Activity Area is located within the Sydney Basin Bioregion. The Activity Area is approximately 6 m above sea level.

2.2 Geology and soils

Warriewood sits within the Hornsby Plateau on Hawkesbury Sandstone. The Activity Area is a part of the Warriewood landscape group and Watagan landscape group. Soils within the Warriewood landscape group consist of sandy humus podzols and dark, mottled siliceous sands overlying acidic peats (extending to depths of 1.5 m), and underlain by podzols and pale siliceous sands (Figure 4). Soils within the Watagan landscape group consists of siliceous sands and yellow podzolic soils on sandstone (extending to depths of 2 m), underlain by podzolic soils on shale (extending to depths of 2 m).

In 2019 a geotechnical borehole investigation was carried out within the Activity Area. The deposit along the existing road embankment is highly disturbed from the construction of the headwall and associated infrastructure, such as the wingwall, the road and utilities. The disturbed deposit consists of gravelly sand (poorly to moderately compacted) (Douglas Partners 2019:2 & 3).

The deposit in front of the headwall apron is underlain by unconsolidated sand, silt and clay and is approximately 1.2 m deep (Douglas Partners 2019:2).

The deposit along the edge of Mullet Creek consists of alluvium overlying residual soil with sandstone at approximately -2.5 m AHD. (Douglas Partners 2019:2).

2.3 Vegetation

The Activity Area includes species from Swamp Sclerophyll Forest on Coastal Floodplains (DECC 2007) such as Eucalyptus robusta (Swamp Mahogany), *Glochidion ferdinandi* (Cheese Tree), *Livistona australis* (Cabbage Tree Palm), *Acacia longifolia* (Coastal Wattle), *Gahnia clarkei* (Tall Saw-Sedge), and *Pteridium esculentum* (Bracken).

The vegetation to be cleared for the proposed 3 m wide access track includes 0.0039 ha of Swamp Sclerophyll Forest on Coastal Floodplains. The vegetation to be disturbed is mostly invasive groundcover species, along with native and invasive understorey and midstorey species. The mature and hollow-bearing trees will be retained. There is only one mature tree that will be removed however, this tree did not contain any hollows.

2.4 Past land use and disturbance

The original inhabitants of the Warriewood landscape were the Garigal/ Caregal clan of the Kuringai (Guringai) (Betteridge Consulting, 2017, and Kelleher Nightingale Consulting, 2016). Following the arrival of Europeans in 1788, introduced diseases had decimated many Aboriginal communities living within and surrounding the Sydney Basin. The Carigal Clan were impacted by the smallpox epidemic particularly around 1789 (Betteridge Consulting, 2017).

The Pittwater landscape was settled in the latter 1800s. European settlement in Pittwater was established soon after Governor Hunter surveyed Broken Bay in 1796. Principal means of transport was by ship (Australian Travel and Tourism Network n.d.).

In 1829, in the land that now comprises of Warriewood, James Jenkins was granted 350 acres of land and established Cabbage Tree Hill farm. The land was later farmed by the McPherson family and by 1906 the land was subdivided and sold in residential and farm blocks (Northern Beaches Council).

In the early twentieth century the Warriewood farming district expanded and was commonly known as 'Glass City', due to the valley being covered in approximately 3,500 glass houses. From the 1960s onwards, the use of the land for farming purposes declined. By 1991, the State Government permitted the subdivision of the land and by 2000, the rural landscape had transformed to a suburb (Northern Beaches Council).

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Soil Landscapes and Hydrology in the Local Area

Culvert Works Warriewood Headwall

Niche PM: Matthew Russell
Niche Proj. #: 6290
Client: Royal Haskoning DHV

Figure 4

3. Aboriginal Objects due diligence assessment

Is the proposed activity a low impact activity as defined by the Regulation?

No.

The activity is not a low impact activity as defined under section 80B of the National Parks and Wildlife Regulation 2009 ('the Regulation') because:

- It involves the complete replacement of the headwall,
- The demolishment of timber fence line and existing concrete apron,
- The construction of a sandstone rock armour and footpath and associated handrail,
- The installation of a new access track.

Step 1 - Will the activity disturb the ground surface or any culturally modified trees?

Yes.

The proposed activity involves excavation works and therefore has the potential to disturb Aboriginal objects.

The site inspection confirmed that there are no cultural modified trees in the Activity Area and therefore there is no potential for disturbance.

Step 2a - Are there any relevant confirmed site records or other associated landscape feature information on AHIMS (or other heritage registers)?

Yes.

Heritage Registers

AHIMS

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) was conducted on the 14 January 2021 (AHIMS Client Service ID # 561263) over an area centred on the Activity Area (Lat, Long From: -33.7138, 151.2579 - Lat, Long To : -33.672, 151.324) with a 50 m buffer. See Attachment 1 for details of the search and Aboriginal cultural heritage sites within the search area.

Forty-five Aboriginal cultural heritage sites are located within the AHIMS search area. There are no recorded Aboriginal sites within 200 m of the Activity Area. Table 1 provides information about each of the Aboriginal cultural heritage sites located within, or nearby to the Activity Area.

Within the wider local area, Art (pigment or engraved) (n=30), Artefacts (n=4) and Artefact and Shell (n=4) were the most common site types within the AHIMS register(Figure 5). It must be noted that care should be taken when using the AHIMS database to reach conclusions about site prevalence or distribution. The distribution of registered sites does not reflect patterns of occupation, but rather is often indicative of survey coverage and conditions.

Table 1: Summary of AHIMS site features within 50 m buffer of the Activity Area

Site features	Total
Art (Pigment or Engraved)	30
Artefact	4
Burial	1
Artefact and Shell	4
Grinding Groove	2
Art (Pigment or Engraved) and Water Hole	1
Art (Pigment or Engraved) and Artefact	1
Art (Pigment or Engraved) and Grinding Groove	1
Grinding Groove and Water Hole	1
Total	**45**

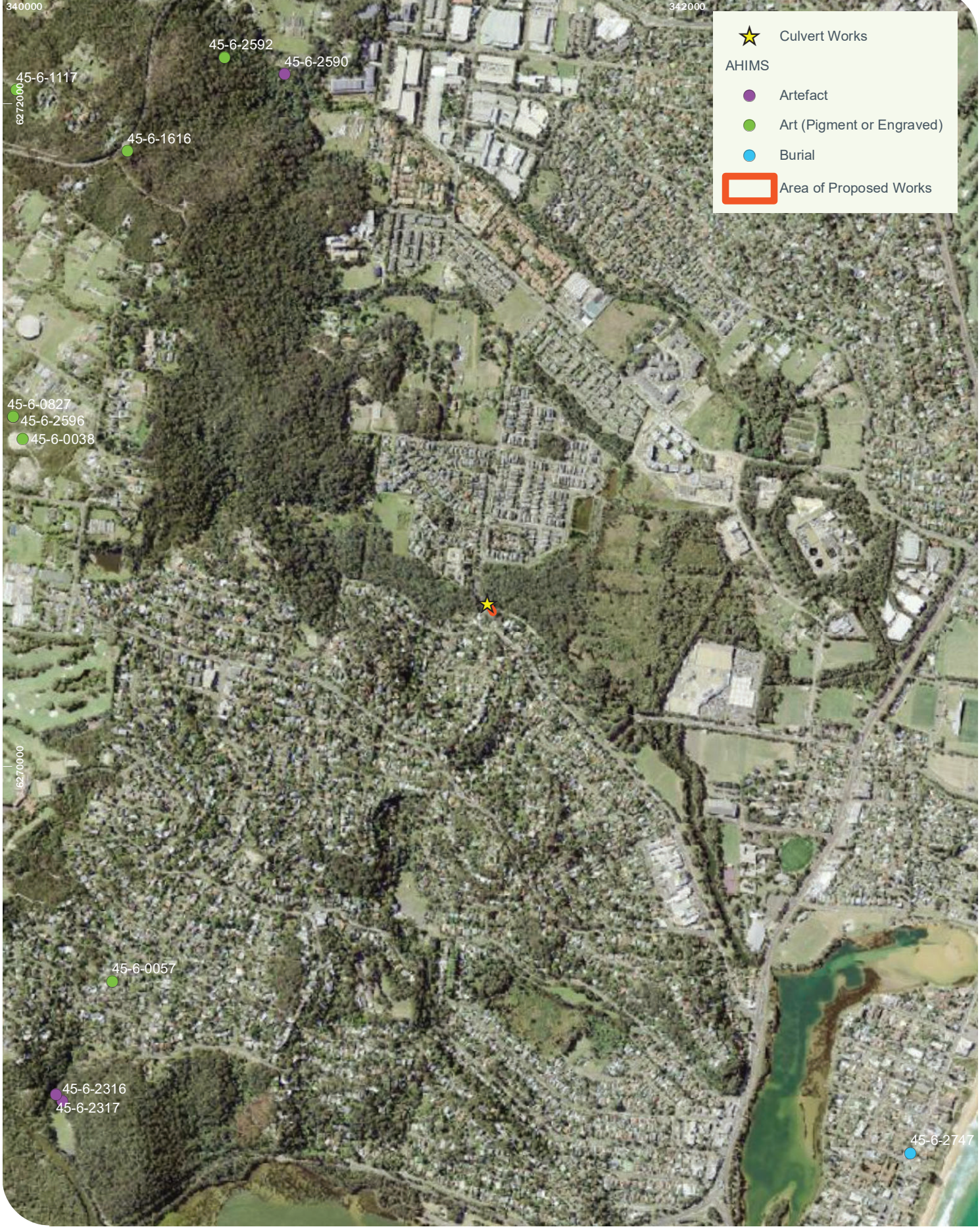
Other heritage registers

Searches of the World Heritage Database, the Commonwealth Heritage List, National Heritage List, State Heritage Register, State Heritage Inventory, the Pittwater Local Environmental Plan (LEP) (2014) and the Pittwater Development Control Plan (DCP) (2021) were conducted on 3 February 2021.

The searches identified no historic heritage items within the Activity Area. The searches identified three historic heritage items within 1 km of the Activity Area, Warriewood Wetland (ID: 2270516), "federation Cottage" (ID: 2270337) and Memorial in bus shelter (ID: 2270429).

Table 2: Listed heritage items in proximity to the Activity Area

Heritage Register	Items in the Activity Area	Items nearby to the Activity Area
World Heritage Database	No items	No items
Commonwealth Heritage List	No items	No items
National Heritage List	No items	No items
State Heritage Register	No items	No items
State Heritage Inventory	No items	No items
Schedule 5 of the LEP	No items	• Warriewood Wetland- Warriewood (ID: 2270516), located 10 m east from the Activity Area. • Federation Cottage- Warriewood (ID: 2270337), located 900 m north east from the Activity Area • Memorial in bus shelter- Warriewood (ID: 2270429), located 900 m north east from the Activity Area
Development Control Plan	No items	No items



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Location of AHIMS Sites and Heritage Items
Culvert Works Warriewood Headwall

Niche PM: Matthew Russell
Niche Proj. #: 6290
Client: Royal Haskoning DHV

Figure 5

Previous heritage assessments within or relevant to the Activity Area

There has been no previous archaeological assessment conducted within the Activity Area. The following heritage assessments have occurred in the region of the Activity Area.

Table 3: Previous heritage assessments within the region of the Activity Area

Author	Title	Relevance to Activity Area
Kelleher Nightingale Consulting Pty Ltd 2016	Ingleside Precinct: Aboriginal Heritage Assessment. Report to Department of Planning and Environment, Pittwater Council and UrbanGrowth NSW.	This precinct planning assessment examines the Ingleside Precinct in the north east Sydney, which is approximately 4.8 km west-south west from the Activity Area. The assessment identified a total of 25 Aboriginal sites within the Ingleside Precinct. The majority of sites consisted of rock engraving, with a small number of grinding grooves and rock shelters with art and archaeological deposits. All of the documented sites were determined to be of high Aboriginal cultural heritage significance. All 25 of the Aboriginal sites recorded have strong attachment to the local RAPS. The assessment recommended all sites be avoided from future developments. Further assessment and continued consultation with registered Aboriginal stakeholders would be required where proposed activities may harm Aboriginal Objects or Aboriginal places.
Niche 2013	Aboriginal Objects Due Diligence Assessment North Narrabeen Beach Reserve Master Plan Landscaping Works	This project assessed an area of proposed works in Narrabeen, approximately 6km south of the Activity Area. The landform of the assessment was very similar to the Activity Area considered for this assessment, such as on a foreshore, hind-dune system, with varying depths of introduced fill overlying intact subsurface deposits. The assessment concluded that the proposed works could be undertaken if contained to a depth of 1.5 m and within the introduced deposits. It was recommended that further assessment would be required should the proposed impact intrude into levels of intact deposit.
Niche 2011	Salvation Army Housing, 23 Fisher Road, Dee Why - Aboriginal Heritage Due Diligence Assessment.	This archaeological assessment was prepared for proposed housing development at 23 Fisher Road, which is located approximately 8.6 km south-south west from the Activity Area. The assessment concluded that Aboriginal objects were not found on site and the proposed works were able to proceed with caution in accordance with standard regulations and procedures. AHIMS searches found that there were no registered sites within 300m of the area.
Kelleher Nightingale Consulting Pty Ltd 2015	Mona Vale Road Upgrade Terry Hills to Ingleside: Aboriginal Cultural Heritage Constraints Mapping and Archaeological Survey Report. Report to Roads and Maritime Services NSW.	This archaeological survey report was conducted for upgrades to Mona Vale Road, located approximately 6 km west-south west from the Activity Area. The survey found 2 Aboriginal sites (MVRW 1 and AHIMS site #45-6-1228). This survey involved an analysis of Aboriginal site types and frequency within and surrounding Mona Vale Road. Rock Engravings are the dominant types with a frequency of 84.62%.

Author	Title	Relevance to Activity Area
		The site prediction model predicts that the current Activity Area is more likely to have site types reflective of open artefact scatters / isolated finds as the area consists of high visibility and exposure. The proposed activity had been given approval to continue works as the two Aboriginal sites were avoided from the impact of the proposed activities.
Lough, J. 1981	N.P.W.S Coversheet for Archaeological Report: 162 Mona Vale Road.	Survey report for 162 Mona Vale Road was undertaken by Department of Main Roads for proposed upgrades to Mona Vale Road. 162 Mona Vale Road is located approximately 4.8 km west-south west from the Activity Area. Previous archaeological studies of the area support the predicted site types from the area, i.e. rock engravings, grinding grooves and rock shelters. This coversheet does not specify the frequencies of the Aboriginal cultural heritage sites. There were no sites located within the area of proposed works as it contained unsuitable conditions for rock art.

Step 2b - Are there any other sources of information which the author is aware of?

Yes.

In 1993 an Aboriginal heritage study was carried out in relation to the Warriewood and Ingleside area of Sydney, known as the Release Area. The Release Area consists of a large study area approximately 1100 ha, which includes the Warriewood Wetlands.

This assessment produced a predictive model for Aboriginal cultural heritage sites across the Warriewood landscape. The predictive model indicates the following patterns:

- Large numbers of shelter sites with occupational deposit/art remain to be recorded, occurring long sandstone outcrops
- Grinding grooves are likely to be found along watercourses where sandstone forms the creek beds, as well as on sandstone exposures
- Engravings are typically located on ridgetops
- Open artefact scatters could be located along the flats adjacent to creek lines. The headwaters of creek lines have high potential
- Middens and/or artefact scatters may occur along the fringes of the Quarternary alluvium or on the alluvium. However, past disturbances (i.e. intensive farming activities) have reduced this likelihood to low (Koettig, M. 1993:38).

An additional site survey was conducted within the Warriewood Wetlands. There were no Aboriginal cultural heritage sites located with predictions indicating that there is no subsurface archaeological material within the wetland (Koettig, M. 1993:21). The predictive model did however indicate that the most likely places used for camping would have been around the edges of the Warriewood Wetland along the alluvium flats (Koettig, M. 1993:19).

Step 2c - Are there landscape features that are likely to indicate the presence of Aboriginal Objects?

Yes.

Based on the desktop assessment above (Section 2, Steps 2a and 2b), the Activity Area contains the following landscape features that are likely to indicate the presence of Aboriginal objects, as identified by the Due Diligence Code of Practice:

• within 200m of waters

The Pittwater DCP 2021 also confirms that there is archaeological potential along watercourses (Eco Logical Australia 1993:2). The Activity Area is located along the edge of the Warriewood Wetland and contains alluvial soils along the edges of Mullet Creek. These landscape features would indicate a high potential for surface and subsurface Aboriginal objects however, most of the Activity Area has been impacted from previous disturbances which have reduced the likelihood of Aboriginal objects to low, such as land clearing, the construction of the existing headwall, wingwall, road bridge and associated utilities.
The only area likely to have subsurface archaeological potential is the edge of Mullet Creek where the access track will be installed. That being said, there are no excavation works proposed in this area and therefore will not impact any potential subsurface archaeological deposits.

If any of the proposed works were to change to include excavations in any alluvial deposits on the edges of Mullet Creek, then further management protocols would need to be followed in accordance with the management requirements of the Aboriginal heritage study. The following level of assessment must be undertaken with regards to excavations on alluvium:

- If any development impacts alluvium marked as archaeologically sensitive, then the Development Application may be approved with the provision that all excavation works be monitored by a qualified archaeologist. If any archaeological material is found then further investigation will be required (Koettig, M. 1993:46).

Step 3 - Can the harm or the activity be avoided?

Not applicable.

The desktop assessment indicates that Aboriginal Objects are unlikely to occur within the Activity Area due to the high degree of disturbance. The disturbance footprint of the proposed access track will not impact any potential subsurface archaeological deposits in alluvium as it will involve vegetation clearance and the provision of temporary material to make the access track trafficable.

As the proposed activity is confined to areas that have been previously disturbed there is no compelling reason to move or avoid the activity.

Step 4 - Does a desktop assessment confirm that there are Aboriginal Objects or that they are likely?

No

The desktop assessment and visual inspection concluded that there is little to no potential for Aboriginal Objects to occur within the Activity Area.

The desktop assessment and visual inspection concluded that there are no known Aboriginal cultural heritage sites near the Activity Area and that the Activity Area has undergone significant ground disturbances from the construction of the existing headwall, wingwall, road bridge and associated utilities. The Activity Area therefore has a low probability of containing Aboriginal Objects.

Site inspection details

The site inspection was completed on Friday 26 March 2021 by Wade Goldwyer (Heritage Consultant, Niche). The site was inspected on foot and primarily targeted the edges of Mullet Creek. Visibility within the Activity Area varied depending on the setting. The constructed areas had good visibility of 95-100% due to cleared ground cover (Plate 1).

The edges of Mullet Creek had a poor visibility of 30% due to vegetation coverage (Plate 2-Plate 4). The entire Activity Area was found to be extensively disturbed from vegetation clearing, the installation of the headwall, wingwall, road bridge and associated infrastructure.

Due to recent rainfall and steep creek edges, Mullet Creek was full of water and it was deemed unsafe to access.

During the site inspection there were no Aboriginal objects found in the Activity Area.

Plate 1: General view of the road bridge overlying the headwall, looking N.

Plate 2: General view of Activity Area where access track will be installed, looking N.

Plate 3: General view of the southern edge of Mullet Creek, looking NW.

Plate 4: General view along proposed access track showing vegetation cover and refuse piles, looking SE.

Step 5 - Further investigations and impact assessment

No

Aboriginal Objects are unlikely to be present due to the high degree of disturbance from the construction of the existing headwall, wingwall, road bridge and associated utilities. The only area to contain subsurface archaeological potential is the alluvium along the edges of Mullet Creek however, the proposed works will not impact the alluvium.

No further investigation or impact assessment is required.

4. Conclusions and Recommendations

On the basis of this assessment, it is unlikely that Aboriginal objects have survived within the Activity Area due to a high level of disturbance and modification from land uses. The land modification practices associated with the construction of the existing headwall, wingwall, road bridge and associated utilities within the Activity Area has disrupted the ground surface to such an extent that the possibility of *in situ* deposits is considered low.

No Aboriginal heritage constraints were identified for the proposed activity and no further investigation or impact assessment is required.

The *Due Diligence Code of Practice for the Protection of Aboriginal objects in NSW* states that where a desktop and visual inspection has occurred and concluded that Aboriginal Objects are unlikely to occur, an Aboriginal Heritage Impact Permit (AHIP) application will not be necessary. The proposed activity may therefore proceed with caution without the need for a further Aboriginal Cultural Heritage Assessment (ACHA) or AHIP.

It is recommended that:

- All site workers and contractors should be inducted to the area and informed of their obligations in ensuring the protection of Aboriginal Objects under the *National Parks and Wildlife Act 1974.*
- In the unlikely event that any Aboriginal Objects are found, all activities with the vicinity of the Object(s) must stop. A temporary fence is to be erected around the Aboriginal cultural heritage site, with a buffer zone of at least 10 metres around the known edge. An appropriately qualified archaeologist is to be engaged to assess the findings, and notification is to be provided to Heritage NSW (Aboriginal Cultural Heritage Regulation) in the Department of Premier and Cabinet. Works should not proceed without advice from Heritage NSW or an appropriately qualified archaeologist.
- In the unlikely event that suspected human remains are encountered during construction, all work in the area that may cause further impact, must cease immediately and:
  - The location, including a 20 m curtilage, should be secured using barrier fencing to avoid further harm.
  - The NSW Police must be contacted immediately.
  - No further action is to be undertaken until the NSW Police provide written notification to Council and the nominated Contractor.
  - If the skeletal remains are identified as Aboriginal, Council and the nominated Contractor or their agent must contact: Heritage NSW, previously known as the Office of Environment and Heritage (OEH), Enviroline on 131 555; and representatives of the Metropolitan Local Aboriginal Land Council (MLALC).
  - No works are to continue until Heritage NSW provides written notification to the proponent or their Agent.

5. References

Australian Travel and Tourism Network n.d. The History of Pittwater Peninsula. Available at http://www.atn.com.au/pittwater/history.htm

Betteridge Consulting 2017 Mona Vale General Cemetery, 107 Mona Vale Road, Mona Vale, NSW: Conservation Management Plan. Report to Northern Beaches Council

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Niche 2013, Aboriginal Heritage Due Diligence Assessment North Narrabeen Beach Reserve Master Plan Landscaping Works. Report to Warringah Council.

Northern Beaches Council, *Pittwaters Past- Warriewood*, accessed on 3 January 2021, lh-warriewood.pdf (nsw.gov.au)

Kelleher Nightingale Consulting Pty Ltd 2015 Mona Vale Road Upgrade Terry Hills to Ingleside: Aboriginal Cultural Heritage Constraints Mapping and Archaeological Survey Report. Report to Roads and Maritime Services NSW.

Kelleher Nightingale Consulting Pty Ltd 2016 Ingleside Precinct: Aboriginal Heritage Assessment. Report to Department of Planning and Environment, Pittwater Council and UrbanGrowth NSW.

Koettig, M. 1993 *Ingleside/Warriewood Urban Land Release: Aboriginal Heritage Study*. Report to Pittwater Council.

Warringah Development Control Plan 2000.

Warringah Local Environmental Plan 2011.

Attachment 1 – AHIMS Extensive Search

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 6290- Basic Search 2

Client Service ID : 561263

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-6-2590	BR1;Boundary Road, Ingleside;	AGD	56	340680	6271900	Closed site	Valid	Artefact : -	Shelter with Deposit	3893
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA)					**Permits**		
45-6-2592	BR2;Burrawang Ridge Estate, Healesville;	AGD	56	340500	6271950	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	3893
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA)					**Permits**		
45-6-2316	GA-3;Deep Creek Reserve;	AGD	56	340010	6268800	Closed site	Valid	Artefact : -	Shelter with Deposit	2227
	Contact	**Recorders**	Robert "Ben" Gunn					**Permits**		
45-6-2317	GA-4;Deep Creek Reserve;	AGD	56	339990	6268820	Closed site	Valid	Artefact : -	Shelter with Deposit	2227
	Contact	**Recorders**	Robert "Ben" Gunn					**Permits**		
45-6-2520	Ingleside Rd 1	GDA	56	339626	6272246	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	Mr.Kelvin Officer,Kelleher Nightingale Consulting Pty Ltd,Miss.Kristen Taylor					**Permits**		
45-6-2528	Lane Cove Road 1;	GDA	56	339576	6272177	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	Mr.Kelvin Officer,Kelleher Nightingale Consulting Pty Ltd,Miss.Kristen Taylor					**Permits**		
45-6-1117	Foleys Hill Art	GDA	56	339975	6272042	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	Mr.R Taplin,Kelleher Nightingale Consulting Pty Ltd,Miss.Kristen Taylor					**Permits**		
45-6-1381	Foleys Hill;	AGD	56	340641	6272646	Open site	Not a Site	Art (Pigment or Engraved) : -, Water Hole : -	Not an Aboriginal Site,Rock Engraving,Water Hole/Well	
	Contact	**Recorders**	ASRSYS					**Permits**		
45-6-1226	Mona Vale Beach; Midden	AGD	56	343776	6272435	Open site	Valid	Shell : -, Artefact : -	Midden	
	Contact	**Recorders**	Alan Heath					**Permits**		
45-6-1229	Deep Creek	AGD	56	338900	6269800	Open site	Not a Site	Art (Pigment or Engraved) : -	Not an Aboriginal Site	
	Contact	**Recorders**	A Heath					**Permits**		
45-6-0827	Foleys Hill;Ingleside	GDA	56	339965	6271055	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	Young,Ms.Lisa Campbell,Mr.Phil Hunt					**Permits**		
45-6-0828	Foleys Hill; Ingleside	GDA	56	339898	6271129	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	Young,Ms.Lisa Campbell,Kelleher Nightingale Consulting Pty Ltd,Kelleher Nightinga					**Permits**		
45-6-0738	QP5;Narrabeen Head;	AGD	56	343040	6269450	Open site	Valid	Artefact : -, Shell : -	Midden,Open Camp Site	1263
	Contact	**Recorders**	Doctor.Jo McDonald,Smith					**Permits**		

Report generated by AHIMS Web Service on 14/01/2021 for Wade Goldwyer for the following area at Lat, Long From : -33.7138, 151.2579 - Lat, Long To : -33.672, 151.324 with a Buffer of 50 meters. Additional Info : To inform archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 45

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-6-0110	Narrabeen;	AGD	56	339489	6268424	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	Fred McCarthy					**Permits**		
45-6-0112	Turimetta Head;	AGD	56	343330	6269940	Closed site	Valid	Shell : -, Artefact : -	Shelter with Midden	1263
	Contact	**Recorders**	Metro Water Sewerage Drainage Board					**Permits**	3735	
45-6-0038	Mclean Street Ingleside	AGD	56	339890	6270800	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	832
	Contact	**Recorders**	Denis Byrne,Doctor.Jo McDonald					**Permits**	6	
45-6-0052	Monash Country Club;Elanora Heights;	AGD	56	339190	6270810	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	1333
	Contact	**Recorders**	Warren Bluff					**Permits**		
45-6-1616	Mona Vale Road	GDA	56	340310	6271857	Closed site	Valid	Art (Pigment or Engraved) : -, Artefact : -	Shelter with Art,Shelter with Deposit	510,3893
	Contact	**Recorders**	Margrit Koettig,Doctor.Jo McDonald,Kelleher Nightingale Consulting Pty Ltd,Miss.K					**Permits**		
45-6-0057	Elanora;Narrabeen Golf Links;	AGD	56	340160	6269161	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	371,2212
	Contact	**Recorders**	University of Sydney					**Permits**		
45-6-0844	Foleys Hill;	AGD	56	339278	6272162	Open site	Valid	Grinding Groove : -, Art (Pigment or Engraved) : -	Axe Grinding Groove,Rock Engraving	
	Contact	**Recorders**	ASRSYS					**Permits**		
45-6-0869	Foleys Hill;	AGD	56	339780	6272350	Open site	Valid	Grinding Groove : -, Water Hole : -	Axe Grinding Groove,Water Hole/Well	
	Contact	**Recorders**	ASRSYS					**Permits**		
45-6-0058	Elanora;Narrabeen Golf Links;	AGD	56	339699	6269335	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	371,1333,2212
	Contact	**Recorders**	University of Sydney					**Permits**		
45-6-0059	Narrabeen;Elanora;	AGD	56	339337	6269145	Closed site	Valid	Artefact : -	Shelter with Deposit	371,2212
	Contact	**Recorders**	University of Sydney					**Permits**		
45-6-0060	Terrey Hills;DC/U2:F;	AGD	56	339416	6269787	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	371,2212
	Contact	**Recorders**	University of Sydney					**Permits**		
45-6-0061	Terrey Hills;DC/U2:E;	AGD	56	339416	6269790	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	371,2212
	Contact	**Recorders**	University of Sydney					**Permits**		

Report generated by AHIMS Web Service on 14/01/2021 for Wade Goldwyer for the following area at Lat, Long From : -33.7138, 151.2579 - Lat, Long To : -33.672, 151.324 with a Buffer of 50 meters. Additional Info : To inform archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 45

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 6290- Basic Search 2

Client Service ID : 561263

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-6-0062	Narrabeen;Elanora;	AGD	56	339520	6269149	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	2212
	Contact	**Recorders**	University of Sydney					**Permits**		
45-6-0065	Terrey Hills;Deep Creek;Elanora Heights;DC/MR:A;	AGD	56	339010	6270070	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	2212
	Contact	**Recorders**	University of Sydney					**Permits**		
45-6-0066	Terrey Hills;Gunsom Trig Station;	AGD	56	339190	6269840	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	1333
	Contact	**Recorders**	Ms.Lisa Campbell					**Permits**		
45-6-0067	Terrey Hills;Gunson Trig Station;	AGD	56	339340	6269920	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	Young,University of Sydney,Ms.Lisa Campbell					**Permits**		
45-6-0068	Gunson Trig. Station (Terrey Hills)	AGD	56	339550	6269280	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	371,1026,1333, 2212
	Contact	**Recorders**	University of Sydney					**Permits**		
45-6-0069	Foleys Hill (Elanora Heights)	AGD	56	338860	6270280	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	371,1026,2212
	Contact	**Recorders**	Ms.Lisa Campbell					**Permits**		
45-6-0071	Foley's Hill Ingleside Group 144	GDA	56	339336	6272084	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	510
	Contact	**Recorders**	Margrit Koettig,Young,I.M Sim,Kelleher Nightingale Consulting Pty Ltd,Kelleher Nig					**Permits**		
45-6-0072	Foley's Hill Ingleside; Group 144	GDA	56	339570	6272138	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	I.M Sim,Kelleher Nightingale Consulting Pty Ltd,Miss.Kristen Taylor					**Permits**		
45-6-0095	Foley's Hill;Powderworks Road;Group 144;	AGD	56	339201	6271429	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	Ms.Lisa Campbell					**Permits**		
45-6-0098	Foley's Hill;Powderworks Road;Group 45;	GDA	56	338752	6271092	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	1333
	Contact	**Recorders**	Fred McCarthy					**Permits**		
45-6-0101	Sugarloaf Hill, Foley's Hill 2	AGD	56	338920	6271789	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	Ms.Lisa Campbell					**Permits**		
45-6-0826	Foleys Hill	GDA	56	339730	6271129	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	371
	Contact	**Recorders**	Young,Ms.Lisa Campbell,Mr.Phil Hunt,Kelleher Nightingale Consulting Pty Ltd,Miss					**Permits**		
45-6-1635	Sugarloaf Hill 3	AGD	56	338450	6270860	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	J Cressbrook					**Permits**		
45-6-2747	Ocean - Octavia Street Burial	AGD	56	342568	6268642	Open site	Valid	Burial : -		

Report generated by AHIMS Web Service on 14/01/2021 for Wade Goldwyer for the following area at Lat, Long From : -33.7138, 151.2579 - Lat, Long To : -33.672, 151.324 with a Buffer of 50 meters. Additional Info : To inform archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 45

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 6290- Basic Search 2

Client Service ID : 561263

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Doctor.Jo McDonald					**Permits**	2162	
45-6-2596	AB-1;?;	GDA	56	339965	6271055	Open site	Valid	Art (Pigment or Engraved) : -	Rock Engraving	
	Contact	**Recorders**	A Boleyn,Mr.Phil Hunt,Kelleher Nightingale Consulting Pty Ltd,Miss.Kristen Taylor					**Permits**		
45-6-1227	Mona Vale Beach;	AGD	56	343836	6272405	Open site	Valid	Shell : -, Artefact : -	Midden	
	Contact	**Recorders**	Alan Heath					**Permits**		
45-6-3024	Foley's Hill, Ingleside, Group 144 - PITT 110	GDA	56	339321	6272053	Open site	Valid	Art (Pigment or Engraved) : 5		
	Contact	**Recorders**	Kelleher Nightingale Consulting Pty Ltd,Aboriginal Heritage Office,Miss.Kristen Tay					**Permits**		
45-6-3101	Foleys Hill, Ingleside Pitt 110	GDA	56	339319	6272050	Open site	Valid	Art (Pigment or Engraved) : 1		
	Contact	**Recorders**	Mr.Phil Hunt					**Permits**		
45-6-3208	Ingleside 3	GDA	56	339776	6271801	Open site	Valid	Art (Pigment or Engraved) : -		
	Contact	**Recorders**	Mr.Mark Rawson,Kelleher Nightingale Consulting Pty Ltd					**Permits**		
45-6-3210	Ingleside 2	GDA	56	339902	6272093	Open site	Valid	Art (Pigment or Engraved) : -		
	Contact	**Recorders**	Mr.Mark Rawson,Kelleher Nightingale Consulting Pty Ltd					**Permits**		

Report generated by AHIMS Web Service on 14/01/2021 for Wade Goldwyer for the following area at Lat, Long From : -33.7138, 151.2579 - Lat, Long To : -33.672, 151.324 with a Buffer of 50 meters. Additional Info : To inform archaeological assessment. Number of Aboriginal sites and Aboriginal objects found is 45

Appendix F – Consultation with National Resources Access Regulator, Fisheries and Sydney Buses

Monica Laut

From: Sarah Conacher <sarah.conacher@dpi.nsw.gov.au>
Sent: Tuesday, 20 July 2021 2:13 PM
To: Edward Shum
Cc: Sadiya King
Subject: TRIMMED: RE: Permit for headwall and apron at Mullet Creek - Garden St

Yes, that's correct Edward. No Part 7 Fisheries permit is required for these works because this section of the creek is not mapped as key fish habitat.

I would like to work with Council in the future to look at removing obstructions to fish passage in Mullet Creek. Culverts could be made fish-friendly to enable fish to move up and down stream.

Kind regards,
Sarah

Sarah Conacher | Fisheries Manager – Coastal Systems Unit
NSW Department of Primary Industries | Fisheries
12 Shirley Rd, Wollstonecraft NSW
ALL MAIL TO: DPI Fisheries, Attn: R. Philps,1243 Bruxner Hwy, Wollongbar NSW 2477
T: 02 8437 4981 | M: 0419 314 437| E: sarah.conacher@dpi.nsw.gov.au

DPI Fisheries acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for Elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

From: Edward Shum <Edward.Shum@northernbeaches.nsw.gov.au>
Sent: Tuesday, 20 July 2021 11:05 AM
To: Sarah Conacher <sarah.conacher@dpi.nsw.gov.au>
Cc: Sadiya King <sadiya.king@northernbeaches.nsw.gov.au>
Subject: RE: Permit for headwall and apron at Mullet Creek - Garden St

Hi Sarah,

Thanks for your time over the phone just now.

This just serves to record our conversation that as this part of Mullet Creek is not mapped as key fish habitat, Part 7 Fisheries Permit is NOT required for these works. Thank you.

Kind Regards,

Edward Shum
Project Manager - Stormwater

Stormwater, Floodplain Engineering
t 02 8495 5378 **m** 0468 569 250
edward.shum@northernbeaches.nsw.gov.au
northernbeaches.nsw.gov.au

From: Edward Shum
Sent: Tuesday, 6 July 2021 1:00 PM
To: 'Sarah Conacher' <sarah.conacher@dpi.nsw.gov.au>
Cc: Sadiya King <Sadiya.King@northernbeaches.nsw.gov.au>
Subject: RE: Permit for headwall and apron at Mullet Creek - Garden St

Hi Sarah,

I have left a message to your mobile earlier, trying to touch base with you on this permit application.

Your email reply below refers – am I right to say that as this part of Mullet Creek is not mapped as key fish habitat, Part 7 Fisheries Permit is NOT required for these works, while it is suggested that a gauze/mesh be placed over the pump intake with an aperture 2mm or less for any dewatering work?

Appreciated if we could please have a short chat to go through some of the details in this application lodged by our Consultant Royal HaskoningDHV and ensure the correctness of our understanding. Thanks.

Kind Regards,

Edward Shum
Project Manager - Stormwater

Stormwater, Floodplain Engineering
t 02 8495 5378 **m** 0468 569 250
edward.shum@northernbeaches.nsw.gov.au
northernbeaches.nsw.gov.au

northern beaches council

From: Sarah Conacher <sarah.conacher@dpi.nsw.gov.au>
Sent: Friday, 2 July 2021 12:30 PM
To: Edward Shum <Edward.Shum@northernbeaches.nsw.gov.au>
Subject: Permit for headwall and apron at Mullet Creek - Garden St

Hi Edward,

Thank you for your permit application for headwall and apron replacement at Mullet Creek - Garden St, Narrabeen.

This part of Mullet Creek is not mapped as key fish habitat, so Part 7 Fisheries Permit is required for these works. We do ask that for any dewatering work, you place a gauze/mesh over the pump intake with an aperture 2mm or less. This will reduce the amount of juvenile fish and egg that are destroyed in the pump.

Kind regards,
Sarah

Sarah Conacher | Fisheries Manager – Coastal Systems Unit
NSW Department of Primary Industries | Fisheries
12 Shirley Rd, Wollstonecraft NSW
ALL MAIL TO: DPI Fisheries, Attn: R. Philps,1243 Bruxner Hwy, Wollongbar NSW 2477
T: 02 8437 4981 | M: 0419 314 437| E: sarah.conacher@dpi.nsw.gov.au

PERMIT APPLICATION FORMS & FISH HABITAT POLICIES AVAILABLE AT:
https://www.dpi.nsw.gov.au/fishing/habitat/protecting-habitats/toolkit

Submit permit applications via email to: ahp.central@dpi.nsw.gov.au

Turnaround times: from date of receipt of application, please allow up to 28 days for Land Owners Consent, Permits and Consultations. Please allow up to 40 days for Integrated Development Applications.

DPI Fisheries acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for Elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

Northern Beaches Council

Monica Laut

From: Anisul Afsar <anisul.afsar@nrar.nsw.gov.au>
Sent: Monday, 12 April 2021 12:28 PM
To: Monica Laut
Subject: V18/1021-36#48 - Inquiry for reconstruction of headwall over Mullet Creek

Hi Monica,

I called on your mobile, but unable to talk. In response to your inquiry for reconstruction of headwall over Mullet Creek and requirements of water supply work approval and/or use approval, please see below advice/s:

- You may require Controlled Activity Approval (CAA) from NRAR as this work is in the waterfront land (within 40M from the bank of the Creek). Please visit the link below for more details of CAA requirements and application form.
- https://www.industry.nsw.gov.au/water/licensing-trade/approvals/controlled-activities
- Government authority including Council is exempt from CAA.
- No water supply work approval or water use approval is required because reconstruction of headwall may not extraction of water.

Kind Regards

Dr Anisul Afsar
Water Regulation Officer (East)
Natural Resources Access Regulator | Department of Planning, Industry and Environment
T 02 8838 7561 | **M** 0402 398 419 | **E** Anisul.Afsar@nrar.nsw.gov.au
4 Parramatta Square, 12 Darcy St, Parramatta, NSW 2150 I Locked Bag 5022, Parramatta, NSW 2124
https://www.industry.nsw.gov.au/natural-resources-access-regulator
www.dpie.nsw.gov.au

The Department of Planning, Industry and Environment acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

Monica Laut

From: STA Customer Feedback <customer_feedback@sta.nsw.gov.au>
Sent: Wednesday, 10 March 2021 3:23 PM
To: Monica Laut
Subject: State Transit Customer Feedback Case No: 01218567 [ref:_00D28HSVA._5000K2MNqaX:ref]

Dear Monica.

Thank you for your feedback regarding construction works occurring at the creek crossing on Garden Street, Warriewood received by State Transit dated 9th March 2021.

I have forwarded your feedback on to our Regional Customer Operations manager for their information and further action.

Thank you for taking the time to bring this matter to our attention.

Kind regards

Mark
Customer Relations, Corporate
State Transit

Traffic incidents and special events can impact your travel. Find out what's happening across the bus network with 24/7 live service updates on Twitter. Go to transportnsw.info/twitter to follow your service.

ref:_00D28HSVA._5000K2MNqaX:ref