



Narrabeen Lagoon Entrance Clearance Works

Review of Environmental Factors

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Executive Summary

The proposal

Northern Beaches Council proposes to undertake clearance of the sand that has accumulated in the entrance channel of Narrabeen Lagoon for flood mitigation purposes, with the excavated material to be placed on Collaroy-Narrabeen Beach.

The entrance clearance works would take place in and around the entrance channel of Narrabeen Lagoon, either side of the Ocean Street bridge:

- *East of Ocean Street* - on the southern shore of the entrance channel is Birdwood Park and the Narrabeen Surf Life Saving Club (SLSC). On the northern shore is the Lake Park car park.
- *West of the Ocean Street bridge* – the southern shore of the lagoon is residential land and the northern shore is public open space and the NRMA Sydney Lakeside Holiday Park.

The placement area on Collaroy-Narrabeen Beach is shown overpage. Within the larger placement area there are two smaller compartments – a northern area and a southern area, which are intended to be prioritised for sand placement in the first instance:

- *Northern sand replenishment area* - is located between Devitt and Stuart Streets - accessed from Mactier Street.
- *Southern sand replenishment area* – is located between Frazer Street and 1056-1058 Pittwater Road - accessed via Collaroy Beach Reserve (to the south of Frazer Street).

In addition to the entrance clearance and main sand replenishment works, minor nourishment works are also proposed for the Lake Reserve off Lagoon Street on the southern shoreline of the lagoon (using sand sourced from the clearance area).



Clearance Areas



Placement Area

Need for the proposal

Narrabeen Lagoon is an Intermittently Open and Closed Lake or Lagoon (ICOLL). Wave activity and ocean tides cause marine sand to infill the narrow channel entrance at North Narrabeen, which leads to periodic closing of the lagoon to the ocean (RHDHV, 2022). When the entrance of the lagoon is closed for longer periods of time there is a risk of socio-economic and environmental impacts to the community and the lagoon ecosystem, including:

- Increased flood levels throughout the lagoon (Cardno, 2019; RHDHV, 2022);

- Reductions in water quality for estuary ecosystem and human health and recreational amenity due to lack of tidal flushing;
- Reduced biodiversity due to lack of recruitment through the entrance.

The *Narrabeen Lagoon Floodplain Risk Management Study and Plan* (Cardno, 2019) recommended the entrance clearance works be undertaken as the highest priority flood risk mitigation option under the Plan.

Proposal objectives

The objectives of the proposal are:

- To mitigate flood risk to low-lying properties surrounding Narrabeen Lagoon; and
- To maintain or enhance beach amenity for portions of Collaroy-Narrabeen beach.

Ancillary to the main objectives, the proposal also aims to provide improved recreational access and amenity at the small beach in Lake Reserve off Lagoon Street.

Options considered

The *Narrabeen Lagoon Entrance Management Strategy* (RHDHV, 2022, the NLEMS) was prepared to review current entrance management practices and make recommendations for ongoing management. The review of medium-term entrance management options identified two preferred options:

- Option 1 – current entrance clearance practice;
- Option 2 – As above, but with increased frequency and lesser clearance volume.

Option 2 was selected as the preferred option following a successful trial during the 2023 entrance clearance works.

Another alternative in the NLEMS considered in this REF is Option 6 – Do nothing. However, Option 6 is not considered feasible due to the flood risk to the community.

Environmental impacts

The key potential environmental impacts of the proposal include:

- Short-term, localised impacts to water quality during the works;
- Traffic impacts and temporary loss of parking due to the haulage of material from the Lagoon to the beach;
- Temporary loss of public access through the works area, and resultant short-term loss of public open space for recreational usage;
- Noise impacts associated primarily with the movements of trucks transporting the sand and also associated with the clearance works in the Lagoon;
- Direct impact to a small area of macroalgae;
- Short-term impacts to biodiversity, in particular shorebirds and waders, due to noise and localised loss of habitat and water quality impacts; and
- Short-term impacts to visual amenity during the works.

It is considered that these impacts can be appropriately managed through implementation of the safeguards and mitigation measures in this REF.

The key benefits relate to the reduction in flood risk to the community and the associated reduction in socio-economic impacts of flooding.

Justification and conclusion

The need for the proposal was justified on the basis of the socio-economic benefits of reduced flood risk to the community. The assessment of environmental and social impacts has determined the proposal is not likely to have a significant impact and therefore assessment under Division 5.2 of the *Environmental Planning and Assessment Act 1979* is not required.

Glossary of Terms and Abbreviations

Term / Acronym	Abbreviation
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit (under the NP&W Act).
ASS	Acid Sulfate Soils
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
BDAR	Biodiversity Development Assessment Report
BoM	Bureau of Meteorology
CEMP	Construction environmental management plan
CMP	Coastal Management Program
Commonwealth DCCEEW	Australian Government Department of Climate Change, Energy, the Environment and Water
DPE	Former NSW Department of Planning and Environment
EIA	Environmental impact assessment
EPA	Environment Protection Authority
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)</i>
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically sustainable development.
FM Act	<i>Fisheries Management Act 1994 (NSW)</i>
KFH	Key Fish Habitat
KTP	Key Threatening Process
ICOLL	Intermittently Open and Closed Lake or Lagoon
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan.
LGA	Local Government Area
LG Act	<i>Local Government Act 1993 (NSW)</i>
MHL	Manly Hydraulics Lab
MNES	Matters of national environmental significance under the EPBC Act.
NML	Noise Management Level
NLEMS	Narrabeen Lagoon Entrance Management Strategy (RHDHV, 2022)
NP&W Act	<i>National Parks and Wildlife Act 1974 (NSW)</i>
NSW DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
NSW DPIRD	NSW Department of Primary Industries and Regional Development
PoEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
REF	Review of environmental factors
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
RHSEPP	State Environmental Planning Policy (Resilience and Hazards) 2021

Term / Acronym	Abbreviation
TISEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
SIS	Species Impact Statement
SLSC	Surf Life Saving Club
SOI	Southern Oscillation Index
SPL	Sound Power Level
TEC	Threatened Ecological Community
TfNSW	Transport for NSW
TMP	Traffic Management Plan

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1 Introduction

1.1 Proposed Activity

Northern Beaches Council proposes to undertake clearance of the sand that has accumulated in the entrance channel of Narrabeen Lagoon for flood mitigation purposes, with the excavated material to be primarily placed on Collaroy-Narrabeen Beach.

The location of the proposal is shown in **Figure 1-1** and **Figure 1-2**, and **Section 3** describes the proposal in more detail.

1.2 Proposal Location

Narrabeen Lagoon and Collaroy-Narrabeen Beach are located in the Northern Beaches local government area (LGA) in the suburbs of Narrabeen and Collaroy.

The works would be carried out on or over the land falling within the project footprint mapped in **Figure 1-1** and **Figure 1-2** and summarised in **Table 1-1**.

The entrance clearance works would take place in and around the entrance channel of Narrabeen Lagoon, either side of the Ocean Street bridge. East of Ocean Street and on the southern shore of the entrance channel is Birdwood Park and the Narrabeen Surf Life Saving Club (SLSC). On the northern shore is the Lake Park car park. West of the Ocean Street bridge, the southern shore of the lagoon is residential land and the northern shore is public open space and the NRMA Sydney Lakeside Holiday Park.

The proposed northern sand replenishment area on Collaroy-Narrabeen Beach is located between Devitt and Stuart Streets, which would be accessed from Mactier Street. Sand replenishment is also proposed for a southern sand replenishment area located between Frazer Street and 1056-1058 Pittwater Road, which would be accessed via Collaroy Beach Reserve to the south of Frazer Street.

In addition to the entrance clearance and main sand replenishment works, minor nourishment works are also proposed for the Lake Reserve off Lagoon Street on the southern shoreline of the lagoon, as indicated in **Figure 1-1** and **Figure 1-2**.

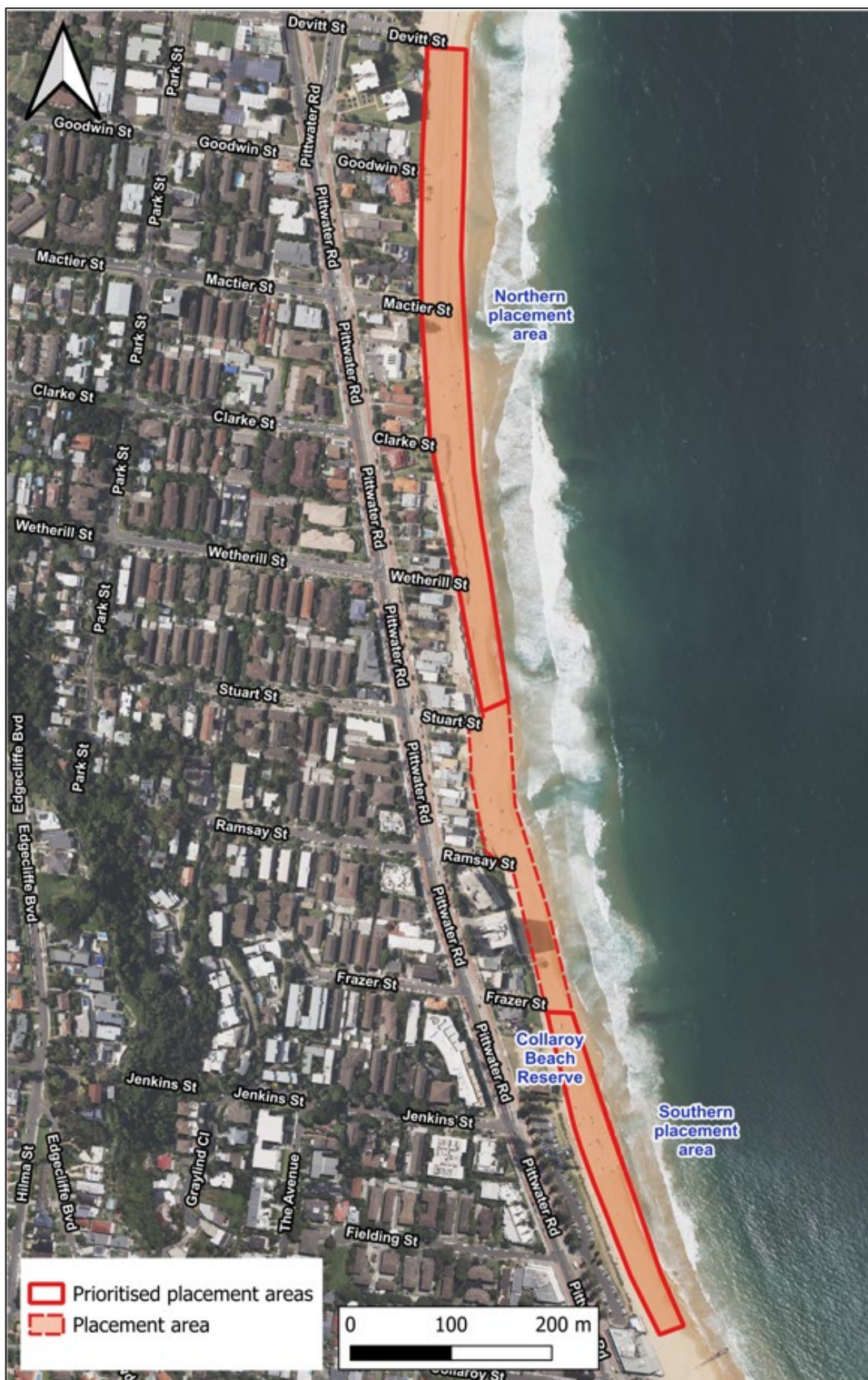
Table 1-1 Schedule of land parcels within the project area

Lot and DP	Land Tenure	Description
7069 DP 1058602	Crown land with Council as Crown land manager	Lake Park Reserve, including part of entrance channel
7301 DP 1140671	Crown land with Council as Crown land manager	Bed of the lagoon and beach down to Tourmaline Street, and including Lake Reserve
7106 DP 1058609	Crown land, Lake Park Reserve Management Trust (R49115) with Council as the Trust manager	Sydney Lakeside Holiday Park
Lot 9 Sec 63 DP 5768	Council land	Birdwood Park, Birdwood Dune

Lot and DP	Land Tenure	Description
7351 DP 1166942	Crown land with Council as Crown land manager	Collaroy-Narrabeen Beach
Lot B DP 404802	Council Community Land subject to the <i>Coastal Lands Plan of Management</i> (Warringah Shire Council, 2002)	Collaroy Beach Reserve, 1100-1102 Pittwater Road
Lot 5 Section 9 DP 5234		
Lot 4 Section 9 DP 5234		
SP66999	Privately owned land – located within the northern placement area, relevant to that portion of each lot located between the seaward limit of the vertical seawall and the lot boundary which forms part of the beach.	1/1182 Pittwater Road, Narrabeen
Lot 4 Section 17 DP7417		1178 Pittwater Road, Narrabeen
Lot 2 Section 17 DP 7417		1174 Pittwater Road, Narrabeen
SP3877		1/1172 Pittwater Road, Narrabeen
Lot 1 DP 970200		1168 Pittwater Road, Collaroy
Lot 72 DP 1011242		1166B Pittwater Road, Collaroy
Lot 71 DP 1011242		1166A Pittwater Road, Collaroy
Lot A DP 302895		1164 Pittwater Road, Collaroy
Lot B DP 302895		1162 Pittwater Road, Collaroy
Lot C DP 302895		1160 Pittwater Road, Collaroy
Lot 1 DP 1016094		1158 Pittwater Road, Collaroy
Lot B DP 313699		1154 Pittwater Road, Collaroy
Lot C DP 313699		1156 Pittwater Road, Collaroy
SP2949		1/1150 Pittwater Road, Collaroy



Figure 1-1 Proposal location – Narrabeen Lagoon



1.3 Purpose of the Report

This Review of Environmental Factors (REF) has been prepared by Rhelm Pty Ltd (Rhelm) on behalf of Northern Beaches Council (hereafter, 'Council'). For the purposes of these works, Council is both the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of this REF is to:

- Describe the proposal;
- Consider the likely impacts of the proposal on the environment and the community; and
- Identify the environmental safeguards and mitigation measures that will be implemented before and during the works.

The description of the proposal and environmental impact assessment has been prepared in accordance with the requirements of section 171 of the Environmental Planning and Assessment Regulation 2021 (the EP&A Regulation), the *Guidelines for Division 5.1 assessments* (DPE, 2022), the *NSW Fisheries Management Act 1994* (FM Act), *NSW Biodiversity Conservation Act 2016* (BC Act) and *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the REF fulfils the requirements of Section 5.5 of the EP&A Act with respect to Council's obligation to examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when evaluating:

- ***Is an EIS required?*** Whether the proposal is likely to have a significant impact on the environment and therefore whether an environmental impact statement (EIS) is required and approval should be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act;
- ***Is an SIS required?*** The significance of any impact on threatened species or endangered populations or communities listed under the BC Act and/or the FM Act, in Section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR);
- ***Is a referral required?*** The significance of any impact on Matters of National Environmental Significance (MNES) listed under the EPBC Act and the need to make a referral to the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

As outlined in **Section 8.3**, the REF concludes that neither an EIS, SIS, BDAR nor a referral to the Commonwealth is required for the proposed works.

2 Project Need and Options Considered

2.1 Need for the Proposal

Narrabeen Lagoon is an Intermittently Open and Closed Lake or Lagoon (ICOLL). Wave activity and ocean tides cause marine sand to infill the narrow channel entrance at North Narrabeen, which leads to periodic closing of the lagoon to the ocean (RHDHV, 2022). When the entrance of the lagoon is closed for longer periods of time there is a risk of socio-economic and environmental impacts to the community and the lagoon ecosystem, including:

- Increased flood levels throughout the lagoon (Cardno, 2019; RHDHV, 2022);
- Reductions in water quality for estuary ecosystem and human health and recreational amenity due to lack of tidal flushing; and
- Reduced biodiversity due to lack of recruitment through the entrance.

The *Narrabeen Lagoon Floodplain Risk Management Study and Plan* (Cardno, 2019), which evaluated flood behaviour and options to mitigate flood risk to the community, recommended the entrance clearance works be undertaken as the highest priority flood risk mitigation option under the Plan. The entrance clearance works enable effective and efficient mechanical opening of the lagoon entrance by Council during a flood event. Modelling undertaken for the Floodplain Risk Management Study demonstrated that the entrance clearance works were effective in reducing flood levels when compared to a fully shoaled entrance (Cardno, 2019). Hence the proposal seeks to manage flood risk and the associated socio-economic impacts of flooding to the community.

Depending on prevailing conditions, the entrance of the lagoon can remain open for periods of months to years following an entrance clearance operation, during which time sand infills the entrance channel until the entrance closes again (RHDHV, 2022).

Typical water quality in the lagoon entrance has been described as generally ‘good’, with the exception of periodic declines when periods of rain coincide with a closed entrance. While the entrance is open there is tidal exchange with the ocean, which flushes the lower estuary and improves water quality (RHDHV, 2022). The open entrance also permits biological exchange with the ocean, such as recruitment of fish, crustaceans and other species to the lagoon.

The improved tidal flushing is anticipated to also result in a short-term improvement in water quality for aquatic recreation in the lower estuary, a popular swimming location, and the recruitment of recreationally important species would support fishing in the lagoon.

Collaroy-Narrabeen Beach, the location of the proposed placement of the cleared sand from the lagoon entrance, is an open coast beach subject to a high wave energy environment. The volume of sand on the beach fluctuates both in the short term, due to erosion events and in the longer term, due to beach rotation associated with cycles of El Niño-La Niña. Further, there is evidence of a long term recession trend of 0.05 m/yr (NBC, 2016). When the beach is in an eroded state, public access to or along the beach is difficult and can present a public safety risk (NBC, 2016). The placement of the sand material cleared from the lagoon entrance on Collaroy-Narrabeen Beach is, where feasible, targeted at sections of the beach that are more eroded. Hence, the sand placement seeks to improve the visual and recreational amenity of the beach for users.

The entrance clearance works have historically been undertaken every three to five years, most recently in 2023. A summary of past entrance clearance operations is provided in the NLEMS (RHDHV, 2022). The amount of material cleared has varied, typically ranging from 30,000 to 70,000 m³.

With respect to the proposed minor nourishment works along the foreshore of Lake Reserve on Lagoon Street, the shoreline has been undergoing change over a period of time associated with successive high flow events, resulting in loss of vegetation and further bank destabilisation. This has adversely affected recreational amenity at the small beach that is a popular local swimming spot. In 2021 Council undertook foreshore stabilisation works, placing cobbles and undertaking minor nourishment; however, the beach has continued to erode. The proposed sand placement at the beach is intended to provide improved amenity and access between the foreshore and water at this location. These works are ancillary to the entrance clearance works.

2.2 Proposal Objectives

While the primary objective of the proposed entrance clearance works is for flood mitigation, additional benefits include improved beach amenity at the proposed sand placement sites and improved water quality while the lagoon entrance is open.

The objectives of the proposal are:

- To mitigate flood risk to low-lying properties surrounding Narrabeen Lagoon; and
- To maintain or enhance beach amenity.

The proposal is consistent with the objectives of the *Lagoon Entrance Management Operational Management Standard* (EM-OMS 455). A recent review of the management of Narrabeen Lagoon entrance conducted by Royal Haskoning-DHV (RHDHV, 2022) also recommended continuation of the periodic entrance clearance operations.

In addition, the Narrabeen Lagoon entrance clearance works are identified as Action O7 in the *Collaroy-Narrabeen Beach and Fishermans Beach Coastal Zone Management Plan* (NBC, 2016).

2.3 Alternatives Considered

The *Narrabeen Lagoon Entrance Management Strategy* (RHDHV, 2022) was prepared to review current entrance management practices and make recommendations for ongoing management. The review of medium-term entrance management options included consideration of the following options:

- Option 1 – Entrance clearance (as per historical practice, once every 3 – 5 years);
- Option 2 – As per Option 1, but undertaken every two years and adopting lesser clearance volume, with clearance of the western shoal prioritised;
- Option 3 – Mobile sand pumping, large volume;
- Option 4 – Mobile sand pumping, more regularly with a smaller volume; and
- Option 5 – Installation of low flow pipes.

Another alternative considered in this REF is Option 6 – Do nothing. However, Option 6 is not considered feasible due to the flood risk to the community.

The evaluation of Options 1 to 5 presented in RHDHV (2022) considered:

- Capital and operating costs;
- Reduction of flood risk to property;

- Social impacts; and
- Environmental impacts.

Option 1 was recommended as an ongoing medium term management strategy, provided factors such as beach rotation are taken into account.

Under certain circumstances, when the entrance channel is well established and the beach has rotated in an anti-clockwise direction to minimise beach width at the entrance, Option 2 may be feasible and was recommended for a trial. The 2023 works were undertaken during a period when Collaroy-Narrabeen Beach had rotated in an anti-clockwise direction such that the northern portion of beach was narrower than had been the case at other times. The works were considered successful, with the lagoon entrance remaining open until February 2025. As such Option 2 has been identified as the preferred option for the proposal.

Options 3 and 4 are not recommended based on current capital and operational costs (RHDHV, 2022). Option 5 is not recommended as it may not be feasible due to the presence of a rock shelf under the entrance (RHDHV, 2022).

The options evaluation also considered potential placement areas on Collaroy-Narrabeen Beach. The key constraint to beach placement is access for trucks delivering the sand from the entrance. Options considered include:

- Option A – Placement via Mactier Street. This is the only access that has a signalised intersection with Pittwater Road that enables safe right-hand turns out of Mactier Street and back to the lagoon entrance. Hence it was the preferred access point; and
- Option B – Placement via Collaroy Beach Reserve. The Reserve south of Frazer Street is not accessed via an intersection controlled by traffic signals, and therefore the only safe truck movements would be left-in, left-out movements. This would necessitate trucks turning left out of the Reserve onto Pittwater Road and returning to the lagoon entrance by completing a loop via Anzac Avenue, Seaview Parade, Ocean Grove and Pittwater Road. While it provides for safe truck movements, it would likely have some traffic and noise impacts on residents and businesses located on roads comprising the loop.

For the entrance clearance works, Option A was identified as the preferred option, noting Option B is also feasible. Hence, the proposal considers Mactier Street as the main access point for the beach placement works and the Reserve to the south of Frazer Street as a secondary alternative.

With respect to the delineation of the placement area on Collaroy-Narrabeen Beach, a relatively broad area has been identified (refer **Figure 1-2**) to provide for flexibility at the time of implementation, noting the high potential for changes in beach volume to occur between time of preparation of this REF and the works being undertaken. The key consideration in selection of specific stretches of beach within this broader area is the beach volume. Other considerations include:

- Provision of sufficient buffer from the Aquatic Reserve to the south;
- Availability of access for trucks to deliver sand to the beach; and
- Cost of placing the sand (which is related to distance from the beach access point to the placement location).

2.4 Preferred Option

Considering both Options 1 and 2 and noting also the successful trial of Option 2 for the 2023 entrance clearance works, Council determined to proceed with Option 2 as the preferred option for the entrance clearance operation with Option A – Mactier Street preferred as the main beach access. Option B – Collaroy Beach Reserve is included as an alternative access (if required).

3 Description of the Proposal

3.1 The Proposal

3.1.1 Entrance Clearance Works

Design plans and sections of the proposed entrance clearance (prepared by Baird Australia) are provided in **Appendix A**.

The rationale for the design was to remove as much of the clean marine sand that had accumulated in the flood tide shoals since the previous entrance clearance works in 2023 with the excavation focussing on the western shoal and adopting a channel configuration through the eastern shoal. The intent of this approach is to seek to prolong the period of entrance open conditions following the works.

The core design specifications adopted were:

- Relatively gentle batter slopes at the edge of the works (1V:6H);
- A smooth bed profile that minimises 'holes' (i.e. deeper areas) that may lead to water quality issues;
- Provision of buffers adjacent to built assets to avoid undermining of those assets (15 m buffer from the Ocean Street bridge abutments and a 10 m buffer from the rock revetment along the northern shoreline east of the Ocean Street bridge); and
- Provision of a 10 m buffer from seagrass located in the Lagoon in the vicinity of the works (refer **Section 6.5**).

The clearance works propose the removal of 14,700 m³ and 7,800 m³ west and east of the Ocean Street bridge (respectively), summing to a total of 22,500 m³ of marine sand to be removed from the entrance channel (**Figure 3-1**). In the event the works program and budget permits, an additional volume of marine sand of up to 7,500 m³ would be excavated from the east of the bridge in the additional part of the footprint indicated with a dashed blue line in **Figure 3-1**, with a potential maximum excavation for the proposal of 30,000 m³. For purposes of this assessment, it has been assumed that the potential upper limit of 30,000 m³ would be cleared from the entrance.

The material excavated from the lagoon entrance would be transported via truck to Collaroy-Narrabeen Beach. The beach would be accessed via one of two designated access points and the sand placed in accordance with the design (refer **Appendix A**). The two access points for trucks delivering sand to the placement area are:

- Mactier Street, which is the preferred location for delivery of sand; and
- Via Collaroy Beach Reserve south of Frazer Street. Trucks would drive into the Reserve off Pittwater Road and would be able to turn within the Reserve and exit the site onto Pittwater Road. This access point would likely only be used during periods of low traffic (i.e. outside the AM and PM peak periods).

Within the larger placement area there are two smaller compartments – a northern placement area and a southern placement area (refer **Figure 1-2**). While the larger placement area provides flexibility as to where sand would be placed on the beach as required to address low beach volumes at the time the works are undertaken, for purposes of this REF it has been assumed that the northern and southern placement areas would be prioritised for sand placement in the first instance:

- The northern placement area extends from Devitt Street to Stuart Street and would be accessed via Mactier Street (refer **Figure 1-2**). This is the priority placement, with the majority of the excavated

material (assume up to 24,000 m³) planned to be transported to this area for placement primarily between Devitt and Clarke Streets, and the remainder between Clarke and Stuart Streets;

- The southern placement area (refer **Figure 1-2**) would only be used in the event the clearance works in the lagoon are able to achieve a greater volume of material (i.e. >24,000 m³) from the additional clearance area. If so, access to the southern placement area would be via Collaroy Beach Reserve and this access point would only be used during low traffic periods (i.e. outside of AM and PM peak periods for traffic).

Sand may be placed in proximity to the seaward boundaries of private properties on Collaroy-Narrabeen Beach. Direct engagement with affected landowners will be undertaken, consistent with the approach used in previous entrance clearance projects.

Care would be taken to avoid damaging stairs, seawalls, handrails, vegetation berms, residential gardens and fences.

3.1.2 Lake Reserve Works

The minor nourishment works for the foreshore of Lake Reserve would be undertaken at the location indicated in **Figure 3-1**. The placement of around 300 m² of sand would generally be in accordance with the typical cross-section provided in **Figure 3-2**. Access to the shoreline would be achieved via Lagoon Street via the Reserve.

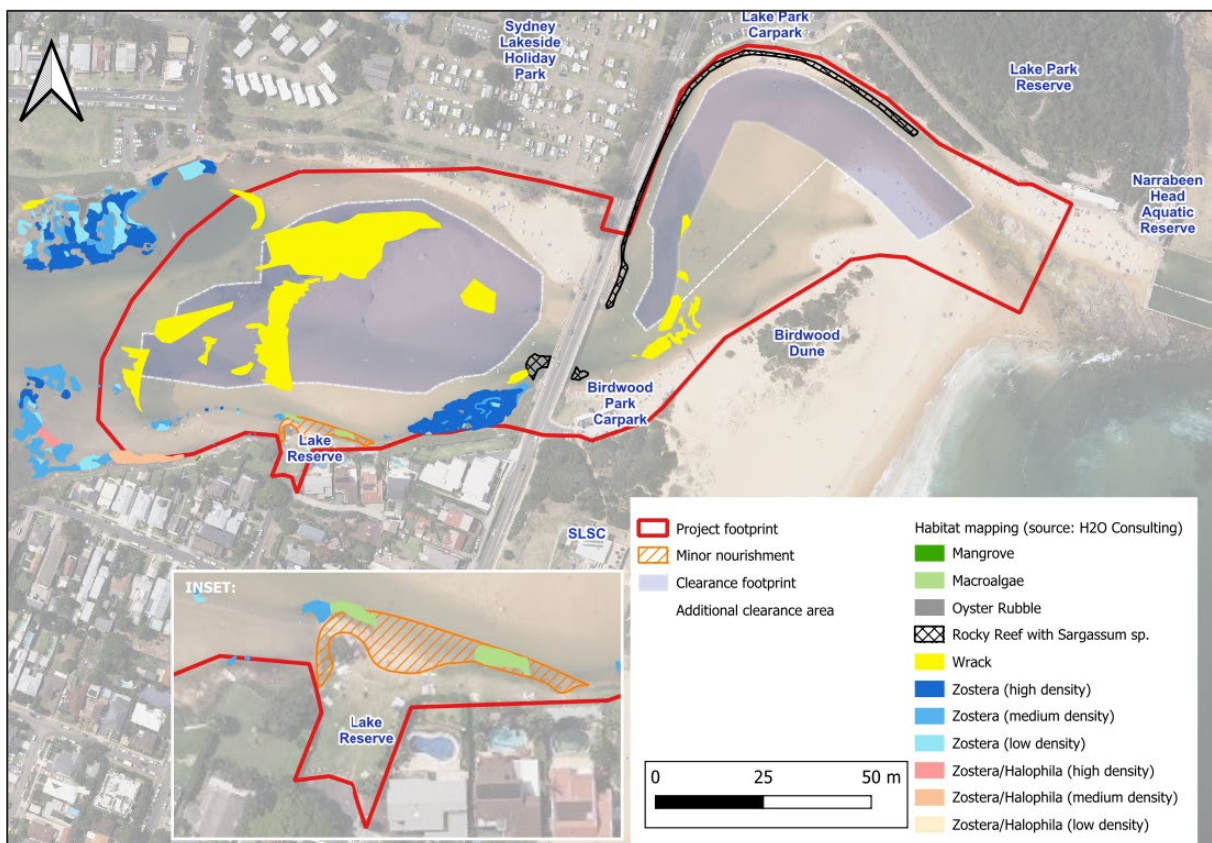


Figure 3-1 Proposal footprint

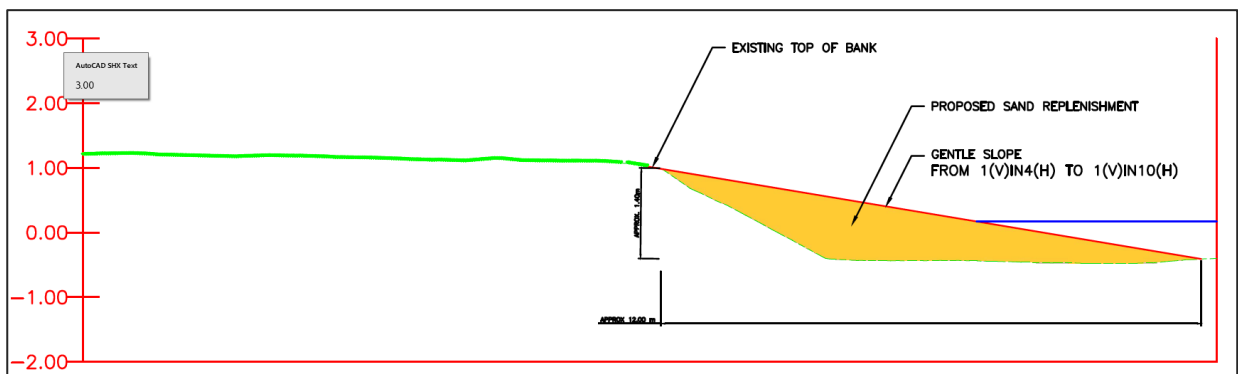


Figure 3-2 Lake Reserve shoreline nourishment works – typical cross-section (source: Northern Beaches Council; vertical axis units are in mAHD)

3.2 Works Methodology

With respect to the entrance clearance works, an indicative works methodology is described below and would be finalised upon selection of a preferred Contractor. The description below provides for flexibility in the method of conducting the entrance clearance works by excavator or by cutter suction dredging.

The works would be staged as described in the sub-sections below.

Stage 1 – Site Establishment

Stage 1 would involve the following activities:

- Obtain necessary approvals, permits and licences;
- Establish main site compound / staging area in Birdwood Park car park;
- Delivery of plant and equipment to the site compound;
- Implement environmental safeguards, including silt curtains and traffic controls;
- Establish stockpile / de-watering area(s); and
- Artificially close the lagoon entrance (if required).

Once engaged, the Contractor would prepare a Construction Environmental Plan (CEMP) prior to commencement. Once the CEMP has been approved by Council, the Contractor would establish the main works compound in the Birdwood Park car park, to include a site office, parking area, plant and equipment compound, and a bunded stockpile / de-watering area for excavated material.

Depending on the final works method developed by the Contractor, another site compound may be established on the northern shoreline of the lagoon on the small beach immediately west of the Ocean Street bridge to enable mobilisation of equipment (e.g. excavator and/or dredger) and/or stockpiling and de-watering of material (**Figure 3-1**).

The works area would be fenced and the required environmental safeguards and traffic controls would be established at this time.

If not already closed, the lagoon entrance would be artificially closed with a sand berm prior to the commencement of Stage 2. The purpose of closing the entrance would be to stabilise lagoon water levels (at around 0.6 mAHD, but no less than 0.4 mAHD) to facilitate the works while ensuring seagrasses remain submerged, and to prevent the transport of any suspended material out of the lagoon during

the works. The closure of the entrance with the sand berm will be undertaken under favourable conditions and as instructed by Council.

Stage 2 – Construction Phase

Stage 2 would involve the following activities:

- Undertake entrance clearance works east and west of the Ocean Street bridge via either traditional excavation with an excavator or cutter suction dredge. The former would require establishment of a working area formed of sand in the entrance channel for the excavator to work from and excavated material would be loaded onto a truck and transported to the stockpile area. Where a cutter suction dredge is used the material would be pumped through a pipe network to a dewatering basin;
- Removal of wrack (refer **Figure 3-1**) from the dredge area as required to minimise the amount of foreign material excavated with the marine sand;
- Stockpiling of excavated material for de-watering. The stockpiling area / de-watering basin would be located at the base of the Birdwood Park dune;
- Sieving of excavated material that may exceed the specifications for placement on the beach and either offsite disposal or beneficial re-use of the excess material (as appropriate). The material is to be sieved prior to transport to the placement area(s) such that it does not contain any shells or rocks;
- An excavator would load trucks with de-watered sediment and transport to Mactier Street (or the secondary access point) at Collaroy-Narrabeen Beach; and
- Transfer of sand from the Mactier Street access point (or the secondary access point) via tracked bulldozer (or similar) to the designated placement areas.

The entrance clearance works would commence in the western shoal and then progress to the eastern shoal.

Where excavators are used, a working area comprised of sand may need to be established in the entrance channel to enable the excavator to travel out further from the natural shoreline (e.g. see **Figure 3-3**). With this approach, excavation would likely proceed from east to west up to the Ocean Street Bridge. A similar approach would then be adopted for the western shoal.



Figure 3-3 View of previous entrance clearance works – traditional excavation methodology (source: RHDHV, 2022)

Where a cutter suction dredge is used, the dredge would likely be mobilised from the boat ramp next to Lakeside Park. The dredge is to start in the western shoal and progress to the eastern shoal. Due to the fact that the cutter suction dredge sucks up a slurry of sand and water, the material is likely to be wetter and require more de-watering compared to the mobile excavation methodology. **Figure 3-4** shows the cutter suction dredge (left) being used in the 2021 clearance works. The image to the right shows the excavator loading a truck from the de-watering basin and site compound in the right background. **Figure 3-5** shows an alternative approach used in the 2023 works, whereby the dredging is undertaken using a barge. The pipeline that carries the slurry from the dredged area, under the bridge and to the dewatering area is visible in the photo.



Figure 3-4 View of entrance clearance works – cutter suction dredge methodology (source: SCS, 2022)



Figure 3-5 View of entrance clearance works – excavator mounted dredge (source: Northern Beaches Council)

Following de-watering and sieving, the material would be loaded by excavator from the stockpile / de-watering area on to trucks for transport south along Ocean Street and Pittwater Road to Mactier Street. The truck would reverse to the end of Mactier Street and dump the sand onto the beach. From this point a bulldozer would transfer the sand to the desired placement area in accordance with the design. **Figure 3-6** shows the dumped sand being loaded (left) for transport along the beach for placement (right). The beach replenishment would likely start in the northern-most extent of the northern placement area, working south.



Figure 3-6 View of sand placement on Collaroy-Narrabeen Beach (source: RARE Environmental)

At the conclusion of the entrance clearance works the lagoon entrance will be opened by the Contractor by excavating a pilot channel in accordance with the methodology detailed in the *OMS 455 LAGOON – Lagoon Entrance Management* (Warringah Council, 2013) or as directed by Council.

Stage 3 – Post-Construction Phase:

The post-construction phase activities would involve:

- Site demobilisation;
- Restoration of the works area as required; and
- Mechanical opening of the lagoon entrance.

Silt curtains will be removed once any suspended sediments have settled following the completion of works.

In this phase the works compounds would be dis-established and plant and machinery demobilised from the lagoon and beach placement worksites. The worksites would be restored to their pre-works condition, rectifying any damage as required.

3.3 Works Compound and Ancillary Areas

The main site compound / staging area in the Birdwood Park car park (refer **Figure 3-1**) will comprise:

- A site office;
- Stockpiling / dewatering area; and
- Materials storage.

The site will be fenced to prevent public access and would be used for overnight storage of plant and machinery.

A second staging area for mobilisation of machinery and/or stockpiling / dewatering material may be required on the northern shoreline of the lagoon immediately to the west of the Ocean Street bridge.

3.4 Construction Hours and Duration

The works would be restricted to standard construction hours as follows:

- Monday to Friday 7am to 6pm;
- Saturdays from 8am to 1pm.

The works would largely be undertaken Monday to Friday, although some Saturday works may be necessary, such as to undertake emergency works (e.g. opening the lagoon entrance berm or securing the site in advance of adverse weather or flooding). No work would be undertaken on Sundays or public holidays.

It is anticipated that the works would take around 12 to 16 weeks. The works would be undertaken outside the peak holiday period (i.e. Summer school holidays).

3.5 Plant, Equipment and Machinery

The plant and equipment to be used would depend on the chosen works methodology, but may include any or all of the following:

- Cutter suction dredge with generator (assume mounted on barge);
- 23T or larger excavators (one to three, depending on the chosen methodology);
- Dump trucks;
- D65 bulldozer;
- Front end loader;
- Bogie tippers; and
- Light construction vehicles travelling to the site, or between work areas, each day.

3.6 Traffic Management and Access

Works traffic would be managed in accordance with the *Traffic Management Plan* (TTPP, 2025; **Appendix B**). Further information on the expected truck movements, haulage routes and potential impacts on local traffic and access is provided in **Section 6.4**.

4 Statutory and Planning Framework

This section provides a review of the statutory and planning framework for the proposal and considers the provisions of relevant environmental planning policies and other legislation.

4.1 NSW Environmental Planning and Assessment Act 1979

4.1.1 State Environmental Planning Policies

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

Chapter 2 of the TISEPP aims to enable the effective delivery of infrastructure across the State.

Clause 2.56 of the TISEPP permits development on any land for the purpose of flood mitigation works to be carried out by or on behalf of a public authority without consent. As per clause 2.56(2), “A reference in this section to development for the purpose of flood mitigation work includes a reference to development for any of the following purposes if the development is in connection with flood mitigation work—

- (a) construction works,
- (b) routine maintenance works,
- (c) environmental management works.”

Clause 2.165 permits development on any land for purposes of waterway or foreshore management activities (which includes beach nourishment) to be carried out by or on behalf of a public authority without consent. Clause 2.165(3) defines the following as 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 erosion,
- (d) environmental management works.”

This clause applies to both the beach replenishment activity and the minor shoreline nourishment at Lake Reserve.

As the proposed entrance clearance works are a flood mitigation activity undertaken under the *Narrabeen Lagoon Floodplain Risk Management Study and Plan* (Cardno, 2019), and both the beach replenishment and minor shoreline nourishment at Lake Reserve are foreshore management activities, and the works are to be carried out by Council, the proposal can be assessed under Division 5.1 of the EP&A Act. Development consent is not required.

Sections 2.10 to 2.15 of the TISEPP contains provision for public authorities to consult with local Councils and other public authorities prior to the commencement of certain types of development. Consultation as required under the TISEPP is discussed in **Section 5**.

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

The proposal would be undertaken on land falling within the Coastal Environment and Coastal Use Areas coastal management areas mapped under the RHSEPP. The provisions of Divisions 3 and 4 of the RHSEPP are not relevant to the proposed activity as it does not require consent. Nonetheless, the related provisions have effectively been addressed in this REF.

There is no coastal vulnerability area mapping for the locality; however, the proposal footprint would be within land vulnerable to coastal hazards. The impact of the proposal on coastal hazards is discussed in **Section 6.1**.

Division 5 of the RHSEPP contains general provisions relating to development in the coastal zone. Section 2.12 provides that development consent must not be granted on land within the coastal zone unless the consent authority is satisfied that the proposed development is not likely to increase the risk of coastal hazards on that land or other land. The proposed works are not anticipated to increase the risk of coastal hazards. The placement of sand on Collaroy-Narrabeen Beach would increase the beach volume, thereby providing an improved erosion buffer for adjacent development (albeit a minor improvement). Similarly, the placement of sand on the eroding shoreline at Lake Reserve would provide an improved erosion buffer.

Section 2.13 requires that the consent authority take into consideration the relevant provision of any certified CMP that applies to the land. The Narrabeen Lagoon entrance clearance works are identified as Action O7 in the *Collaroy-Narrabeen Beach and Fishermans Beach Coastal Zone Management Plan* (NBC, 2016). Although the transition period for CMPs has now expired and the CZMP is no longer considered 'certified', it is noted that the entrance clearance works are therefore wholly consistent with the adopted Plan for Collaroy-Narrabeen Beach.

Under Section 2.16(2) of the RHSEPP, beach nourishment may be carried out by or on behalf of a public authority without consent.

4.1.2 Local Environmental Plans

While the proposal is located in the Northern Beaches LGA, both the Warringah and Pittwater Local Environmental Plans (LEPs) apply to the proposed activity.

Under the Warringah LEP 2011, the bed of the lagoon is zoned W1 – Natural Waterways and Collaroy-Narrabeen Beach and Collaroy Beach Reserve are zoned RE1 – Public Recreation. The construction compound and ancillary work areas are also located on land zoned RE1. The seaward portion of Lake Reserve within which the minor nourishment works would be undertaken is zoned W1 – Natural Waterways.

Under the Pittwater LEP 2014, a portion of the bed of the lagoon located east of the Ocean Street bridge is zoned W1 – Natural Waterways and a small corner of the lagoon entrance where the temporary berm would be constructed is located on land zoned RE1.

The compatibility of the proposal with the objectives of these zones is discussed in **Table 4-1**. The proposal is consistent with the land use zonings.

As the proposal is permitted without consent under the TISEPP, the consent provisions of the LEPs do not apply to the project.

Table 4-1 Land use zonings

Zoning	Objectives
Warringah LEP 2011	
W1 – Natural Waterways	<p>The objectives of this zone are:</p> <ul style="list-style-type: none"> To protect the ecological and scenic values of natural waterways.

Zoning	Objectives
	<ul style="list-style-type: none"> To present development that would have an adverse effect on the natural values of waterways in this zone. To provide sustainable fishing industries and recreational fishing. <p>As detailed in Section 2, by opening the lagoon entrance, the proposal would improve tidal flushing and enable recruitment of recreationally fished species. The adverse impacts of the proposal would be short-term and it is considered they could be appropriately managed provided the safeguards and mitigation measures identified in this REF are implemented.</p>
RE1 – Public Recreation	<p>The objectives of this zone are:</p> <ul style="list-style-type: none"> To enable land to be used for public open space or recreational purposes. To provide a range of recreational settings and activities and compatible land uses. To protect and enhance the natural environment for recreational purposes. To protect, management and restore public land that is of ecological, scientific, cultural or aesthetic value. To present development that could destroy, damage or otherwise have an adverse effect on those values. <p>As detailed in Section 2, the proposal provides for improved recreational amenity through improved water quality while the lagoon entrance remains open and via increased beach volume on Collaroy-Narrabeen Beach.</p>
Pittwater LEP 2014	
W1 – Natural Waterways	<p>The objectives of this zone are:</p> <ul style="list-style-type: none"> To protect the ecological and scenic values of natural waterways. To present development that would have an adverse effect on the natural values of waterways in this zone. To provide sustainable fishing industries and recreational fishing. To ensure development does not adversely impact on the natural environment or obstruct navigation of the waterway. To provide opportunities for private access to the waterway where these do not cause unnecessary impact to public access to the foreshore. <p>As detailed in Section 2, by opening the lagoon entrance, the proposal would aid tidal flushing and enable recruitment of recreationally fished species. The adverse impacts of the proposal would be short-term and it is considered they could be appropriately managed provided the safeguards and mitigation measures identified in this REF are implemented. Impacts on navigation would be short-term.</p>
RE1 – Public Recreation	<p>The objectives of this zone are:</p> <ul style="list-style-type: none"> To enable land to be used for public open space or recreational purposes. To provide a range of recreational settings and activities and compatible land uses. To protect and enhance the natural environment for recreational purposes. To allow development that does not substantially diminish public use of, or access to, public open space resources. To provide passive and active public open spaces resources, and ancillary development, to meet the needs of the community. <p>As detailed in Section 2, the proposal provides for improved recreational amenity through improved water quality while the lagoon entrance remains open and via increased beach volume on Collaroy-Narrabeen Beach. Adverse impacts on the use of, or access to, public open space would be short-term.</p>

4.2 Other Relevant NSW Legislation

Table 4-2 lists the NSW legislation relevant to the proposal or the land on which the proposed works would be undertaken.

Table 4-2 Other relevant NSW legislation

Legislation and Application	Relevance to the Proposal
<p>Crown Land Management Act 2016: to provide for the ownership, use and management of the Crown land of New South Wales, to provide clarity concerning the law applicable to Crown land, to require environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown land, to provide for the consistent, efficient, fair and transparent management of Crown land for the benefit of the people of NSW, and to provide for the management of Crown land having regard to the principles of Crown land management.</p>	<p>The tenure of the land within the proposal footprint is described in Table 1-1. The subject land that is Crown land under the care and control of Council. Under section 3.21 of the Act, Councils manage Crown land as if it were public land under the LG Act. Council has ongoing permission to manage Crown land and no landowners' consent is required.</p> <p>Collaroy-Narrabeen Beach is subject to the <i>Coastal Lands Plan of Management</i> (hereafter, 'the PoM'; Warringah Shire Council, 2002) and is categorised under the PoM as 'Natural Area: Foreshore'. In accordance with Section 35 of the LG Act, Community Land must be managed in accordance with the plan of management applicable to the land. Clauses 36E and 36N (respectively) provide core objectives for management of land categorised as 'Natural Area' and 'Foreshore'. The proposed sand placement works are considered consistent with the core objectives of clause 36E in that the works would <i>'provide for community of and access to the land in such a manner as will minimise and mitigate any disturbance caused by human intrusion.'</i></p> <p>Notwithstanding, Council maintains a Crown Lands Licence (no. 565952) for lagoon entrance clearance works (including the beach replenishment works), for which it pays an annual fee.</p>
<p>Local Government Act 1993 (LG Act): to provide a framework for the system of local government in NSW that is sustainable, flexible and effective, set out the responsibilities and powers of councils, councillors and other persons and bodies that constitute the system of local government, to provide for the democratic election of governing bodies of Councils, to facilitate engagement with the local community.</p>	<p>Collaroy Beach Reserve at 1100-1102 Pittwater Road is Community Land owned by Council that is also subject to the <i>Coastal Lands Plan of Management</i> (Warringah Shire Council, 2002).</p> <p>The subject land is categorised under the PoM as 'Park'. Clause 36G of the LG Act provides core objectives for management of community land categorised as a park. The proposed short-term use of the Reserve for the construction works are not considered inconsistent with these core objectives, provided the Reserve is returned to its pre-works condition and use.</p> <p>Under the 'Objective: To protect and enhance natural environmental qualities' within the action plan contained in the PoM is Action 9, which states: <i>'In respect of the Collaroy Narrabeen Coastline Management Plan this plan specifically authorises...any works required to implement any part of such Plans...'</i></p> <p>As discussed in Section 2.2, the proposed works comprise an action under the Coastal Zone Management Plan (NBC, 2016), which supersedes the</p>

Legislation and Application	Relevance to the Proposal
	Coastline Management Plan. Hence, it is assumed Action 9 of the PoM is still relevant and that the use of the Reserve as an access point for the sand placement works is consistent with the PoM.
Roads Act 1993: provides for the construction and maintenance of public roads. Requires consent to dig up, erect a structure or carry out work in, on or over a road.	Pittwater Road is State Road under the care and control of TfNSW, and all other roads to be used by construction vehicles are local roads managed by Council. An approval under Section 138 of the <i>Roads Act 1993</i> would not be required for the works.
Fisheries Management Act 1994 (FM Act): provides for the protection of fishery resources and values for current and future generations. Makes it an offence to harm fisheries and resources without an appropriate assessment, inclusion of safeguards and/or the appropriate permissions to carry out certain work.	Under Part 7 of the FM Act, section 200(1) requires that a local government authority obtain a permit prior to carrying out dredging or reclamation work. The entrance clearance and beach replenishment works would meet the definition of dredging and reclamation under the Act. A section 205 permit is required if the proposed works involve harm to marine vegetation including mangroves, seagrasses, macroalgae or any other marine vegetation declared by the regulations to be marine vegetation. With respect to the proposed removal of wrack from the clearance area (refer Section 3.1.1), it is noted that the NSW Fisheries <i>Policy and guidelines for fish habitat conservation and management</i> (Fairfull, 2013), wrack is considered marine vegetation. The guidelines state that a person or organisation that wishes to gather or remove quantities of wrack exceeding 20 kg/day must apply for a permit under s.205 of the FM Act. Further, the proposed minor nourishment works at Lake Reserve would result in direct impact to two small areas of macroalgae (Figure 3-1). This would also comprise harm to marine vegetation, necessitating a permit under s.205 of the FM Act. However, the design of the proposal has avoided direct impacts to (live) seagrass and a permit for harm to seagrass is not required. Indirect impacts to seagrass would be managed in accordance with the mitigation measures in this REF. There are no Endangered species or populations listed under the FM Act or the related Cth EPBC Act that are likely to occur in the proposal footprint.
Biodiversity Conservation Act 2016 (BC Act): provides for a strategic approach to conservation in NSW. It includes provisions for risk-based assessment of native plant and animal impacts, including a Biodiversity Assessment Method (BAM) to assess the impact of actions on threatened species, threatened ecological communities and their habitats.	Under the BC Act, an assessment of significance must be completed to determine the significance of impacts to threatened species, populations and/or communities or their habitat. As discussed in Section 6.5 , there are 9 species of marine birds and shorebirds listed under the BC Act that are considered to have a moderate to high likelihood of occurrence in the study area. However, Assessments of Significance (refer Appendix G) concluded the proposal is unlikely to significantly impact

Legislation and Application	Relevance to the Proposal
	Threatened species and neither a BDAR nor an SIS is required.
Biosecurity Act 2015: The object of this Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.	Reporting and managing biosecurity risks in the marine environment is considered a general biosecurity duty under the Act. The marine pest species, <i>C. taxifolia</i> , is not present within the proposal area. Safeguards are recommended to minimise the spread/import of <i>C. taxifolia</i> as a result of the proposal (refer Section 6.5).
Protection of the Environment Operations Act 1997 (PoEO Act): focuses on environmental protection and provisions for the reduction of water, noise and air pollutions and the storage, treatment and disposal of waste. Introduces licencing provisions for scheduled activities that are of a nature and scale that have potential to cause environmental pollution. Also includes measures to limit pollution and manage waste.	The proposal would not involve the undertaking or carrying out of a scheduled activity. There is a duty to report pollution incidents under section 148 of the PoEO Act. If the safeguards and mitigation measures in this REF are implemented and monitored, there is unlikely to be any material harm to the environment or pollution of water, noise or air (refer to Section 6). These include controls to manage the risk of sediment resuspension, accidental spills or releases of fuel, hydraulic fluids or other contaminants to the environment.
Marine Pollution Act 2012: sets out provisions to prevent pollution in the marine environment.	The proposal is unlikely to result in any oil, noxious liquids, pollutant, sewage or garbage discharge as controlled under this Act, providing relevant safeguards and mitigation measures in this REF are implemented (refer to Section 6).
Contaminated Land Management Act 1997: Must report to EPA if contaminated land is encountered during the works that meets the duty to report contamination requirements under section 60 of this Act. Aims to establish a process for investigating and (where appropriate) remediating land that the EPA considers to be contaminated significantly enough to require regulation under Division 2 of Part 3. The Act aims to set out accountabilities for managing contamination if the EPA considers the contamination is significant enough to require regulation under Division 2 of Part 3.	As discussed in Section 6.2 , there is a low likelihood of encountering contaminated material during the entrance clearance works because the material to be excavated from the lagoon entrance is expected to comprise clean marine sand. Safeguards have been included in the event suspected contaminated material is encountered during the works.
Heritage Act 1977: provides for the protection of conservation of buildings, works, maritime heritage (wrecks), archaeological relics and places of heritage value through their listing on various State and local registers. Makes it an offence to harm any non-Aboriginal heritage values without permission.	The proposal is unlikely to impact any State heritage listed sites (refer Section 6.7).
National Parks and Wildlife Act 1974 (NP&W Act): provides for the protection of Aboriginal heritage values, national parks and ecological values. Makes	A search of the Aboriginal Heritage Information Management System (AHIMS) indicates two sites near the project footprint, neither of which are likely to be adversely impacted by the proposal (refer Section 6.7).

Legislation and Application	Relevance to the Proposal
it an offence to harm Aboriginal objects, places or sites without permission.	An Aboriginal Heritage Impact Permit (AHIP) is not required for the proposal.

As noted in **Section 4.1.1**, the proposal is located within the Coastal Use Area and Coastal Environment Area under the RHSEPP. The RHSEPP gives effect to the objectives of the *Coastal Management Act 2016*.

Table 4-3 Objectives under clauses 8 and 9 of the *Coastal Management Act 2016*

Objectives	Relevance to the Proposal
<i>8(2)(a) to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity</i>	The proposal would not significantly impact coastal environmental values and the natural processes of coastal waters. The entrance to the lagoon would likely remain open for a period of time before slowly closing. As an ICOLL, periodic opening of the entrance occurs naturally, albeit likely less regularly than occurs due to the entrance clearance works. Biological diversity and ecosystem integrity are unlikely to be impacted.
<i>8(2)(b) to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change</i>	The proposal would generally have a net neutral impact to coastal waters and estuaries. There would be a short-term improvement in lagoon water quality due to tidal flushing when the entrance is open.
<i>8(2)(c) to maintain and improve water quality and estuary health</i>	The proposal would result in short to medium-term water quality improvements in the lower estuary and would assist in maintaining the estuarine ecology. Provided the safeguards and mitigation measures in Section 6 are implemented, negligible adverse impacts are anticipated.
<i>8(2)(d) to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons</i>	The proposal would support social values of the estuary through improved water quality for aquatic recreation. It would also enhance amenity of Collaroy-Narrabeen Beach and Lake Reserve through improved beach volume. No impacts to cultural values are anticipated.
<i>8(2)(e) to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place</i>	The proposal would result in short to medium-term modifications to the natural features of the entrance channel of Narrabeen Lagoon and to the Collaroy-Narrabeen Beach sand replenishment area, however these would be short to medium-term and within the range of natural fluctuation within these systems.
<i>8(2)(f) to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms</i>	The proposal would provide improved public access over the tidal range along Collaroy-Narrabeen Beach in the sand replenishment zone.
<i>9(2)(a) to accommodate both urbanised and natural stretches of coastline. (i) the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast, and</i>	The proposal does not involve building works.
<i>(ii) adverse impacts of development on cultural and built environment heritage are avoided or mitigated, and</i>	There would be no impact on cultural and built environmental heritage.

Objectives	Relevance to the Proposal
<i>(iii) urban design, including water sensitive urban design, is supported and incorporated into development activities, and</i>	Urban design is not relevant to the works proposed.
<i>(iv) adequate public open space is provided, including for recreational activities and associated infrastructure, and</i>	During the works there would be impact on public open space used for recreational purposes.
<i>(v) the use of the surf zone is considered</i>	The proposal would have negligible, short-term impacts on the immediate surf zone near the lagoon entrance. No impacts on the Surfing Reserve are anticipated.
<i>9 (2)(b) to accommodate both urbanised and natural stretches of coastline.</i>	N/A

4.3 Commonwealth Legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the EPBC Act a referral to the Australian Government is required for proposed *‘actions that have the potential to significantly impact on MNES or the environment of Commonwealth land’*. These are considered in **Section 6.5** and **Appendix C** of the REF.

The assessment of the proposal’s impact on MNES and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant MNES or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water (Commonwealth DCCEEW) under the EPBC Act.

4.3.2 Native Title Act 1993

The *Native Title Act 1993* recognises and protects native title. There are no active native claims for the Northern Beaches LGA.

4.4 Confirmation of Statutory Position

The proposal is categorised as development for the purpose of for the purpose of flood mitigation works and is being carried out by or on behalf of a public authority. Under section 2.56 of the TISEPP, the proposal is permissible without consent. The proposal is not State significant infrastructure and is subject to environmental impact assessment under Division 5.1 of the EP&A Act.

Accordingly, Northern Beaches Council is the determining authority for the proposal, with this REF fulfilling the obligation under section 5.5 of the EP&A Act *‘to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity’*.

5 Consultation

Division 2.10 of the TISEPP details the consultation requirements relating to activities falling under the SEPP. The proposal triggers the notification requirements under Sections 2.10 and 2.12 in relation to:

- Development with impacts on council-related infrastructure or services; and
- Development with impacts on flood liable land.

However, Section 2.17(b) states that Sections 2.10-2.15 do not apply with respect to development that would require notice of the intention to carry out development to a council or public authority that is carrying out the development.

Under Section 2.13, a public authority must not carry out development on flood liable land that may be carried out without development consent unless the authority has given written notice of the intention to carry out the development to the NSW State Emergency Service (NSW SES). The NSW SES was contacted via email on 26 March 2025 and response was received on 16 April 2025.

Engagement was also undertaken with the Aboriginal Heritage Office (AHO) in relation to potential impacts to Aboriginal cultural heritage, who provided a response on 31 March 2025.

A copy of the responses from the NSW SES and the AHO are provided in **Appendix D**. The key points raised by each party are summarised in **Table 5-1**.

Table 5-1 Consultation Summary

Matter Raised	Response
NSW SES	
<p><i>The NSW SES has reviewed the proposed upgrade and the flood risk information available (e.g. Northern Beaches Local Flood Plan 2021, Narrabeen Lagoon Flood Study 2013 and Narrabeen Lagoon Floodplain Risk Management Study and Plan 2019 etc.). We note that the Narrabeen Lagoon Floodplain Risk Management Study has identified that the most effective structural option for the Narrabeen Lagoon floodplain is the continuation of the sand clearance from above and below Ocean Street Bridge as a flood mitigation measure. Based on this review, the NSW SES provides the following advice:</i></p> <ul style="list-style-type: none"> • <i>Ensure workers and people using the road during and after the upgrades are aware of the flood risk, for example through site inductions, by using signage and other flood information tools.</i> • <i>Consider closing the worksite and securing all materials and equipment prior to the start of the working day if there is a risk of riverine flooding, on receipt of advice from the Bureau of Meteorology (BoM), or when other evidence leads to an expectation of flooding. During site works, check the BoM website prior to start of the workday for any Severe Thunderstorm or Severe Weather Warnings that may result in flash flooding of the area.</i> <p><i>In addition, if the construction phase of the upgrades causes disruption to the operation of local roads, this may impact the ability for emergency vehicles to use these routes. The NSW SES requests that notification be provided where there are likely to be significant delays in the operation of the roads affected by the upgrades.</i></p>	<p>Noted.</p> <p>Refer to mitigation measure CP3 in Section 6.1.3, which addresses this requirement.</p> <p>Refer to mitigation measures CP2, CP3 and CP5 in Section 6.1.3, which address this requirement.</p> <p>Refer to mitigation measure TA14 in Section 6.4.3, which addresses this requirement.</p>

Matter Raised	Response
AHO	
<p><i>The Aboriginal Heritage Office has reviewed previous projects in this area for this kind of activity.</i></p> <p><i>As it involves removing sand from areas where there is no known Aboriginal heritage potential, and depositing it in similar contexts, the Aboriginal Heritage Office does not foresee any Aboriginal heritage issues.</i></p> <p><i>The sites you note are not in the proposed areas. Unfortunately AHIMS data is old. The AHO has much more recent monitoring information and can confirm the sites would not be affected.</i></p>	<p>Noted. Reference is made to Section 6.7 of this REF.</p>

6 Environmental Impact Assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal. All aspects of the environment potentially impacted upon by the proposal are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act, and
- The factors specified in the guidelines *Is an EIS required?* (DUAP, 1996) and as required under section 171(1) of the EP&A Regulation. The factors specified in section 171(2) of the EP&A Regulation are also considered in **Appendix C**.

A series of safeguards and mitigation measures are provided to address the potential impacts of the proposal. These are summarised in **Section 7.2**.

6.1 Coastal Processes

6.1.1 Existing Environment

Narrabeen Lagoon

Narrabeen Lagoon is an ICOLL with a catchment of around 55 km². The entrance channel naturally closes due to the gradual movement of sand into the entrance channel as a result of wave activity and longshore currents, as well as tidal flows. The volume of sand moved into the entrance channel is generally larger than the volume transported out of the entrance on the ongoing tide, resulting in the formation of a large flood tide shoal that closes the lagoon off from the ocean (RHDHV, 2022). As such, Collaroy-Narrabeen Beach effectively comprises a closed sediment compartment.

The conceptual model presented in **Figure 6-1** illustrates the coastal processes resulting in formation of the flood tide delta.

When the entrance is closed the lagoon water levels are a function of the entrance berm level, catchment inflows, direct rainfall and losses via evaporation and/or via seepage through the berm. Catchment inflows can cause the lagoon water levels to rise sufficient to overtop the berm, which then initiates a process of scouring out of the berm to form a channel connecting the lagoon water body and the ocean (Cardno, 2019).

The depth of scour is limited by a rock shelf under the entrance.

A survey undertaken on behalf of Council by CMS Surveyors in May 2015, when the entrance channel was in an eroded state, captured spot levels for the rock shelf, as shown in a copy of the plan provided in **Appendix E**.

Geophysical investigations were undertaken in February 2025 with the purpose of gathering more information on the depth of the rock under the entrance channel. The findings are reported in *Narrabeen Lagoon – Geophysical Report* (Macquarie Geotechnical [MacGeo], 2025a).

The estimated depths (inferred from the geophysical data) to rockhead (from the surface) identified via those investigations are mapped in **Figure 6-2**.



Figure 6-1 Conceptual model of coastal processes at the entrance of Narrabeen Lagoon (source: RHDHV, 2022)

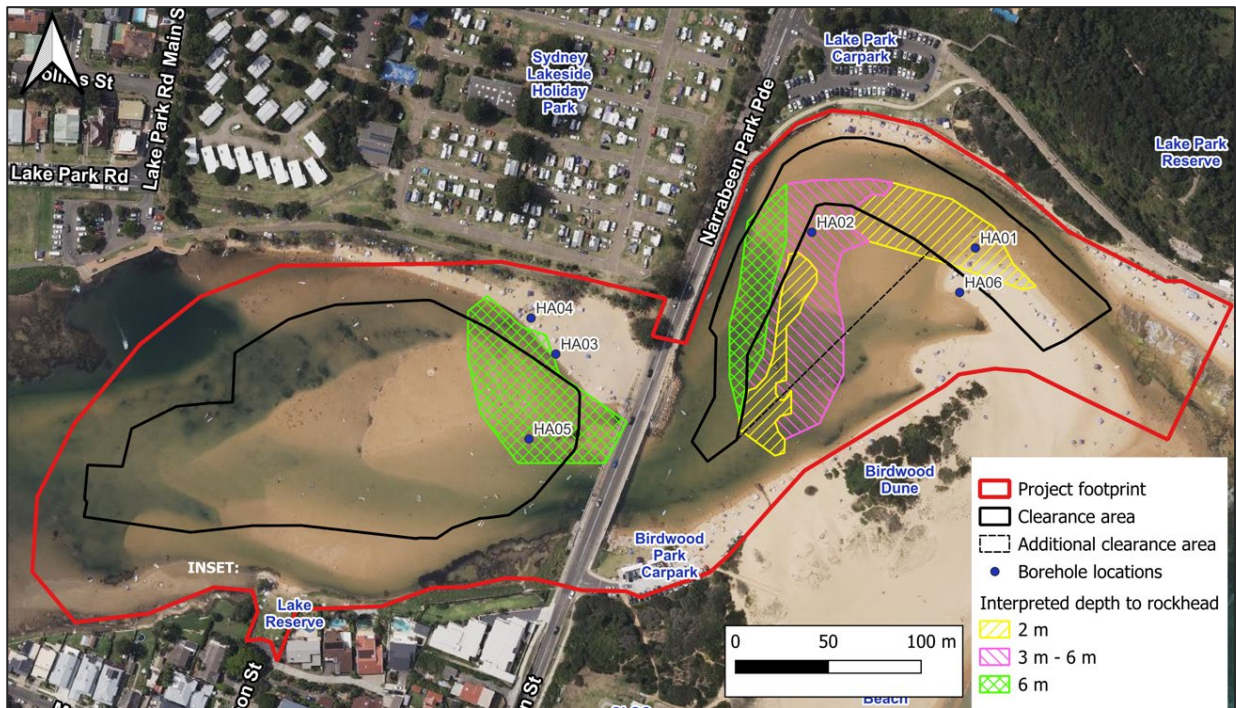


Figure 6-2 Borehole Locations and Inferred depth to rockhead (relative to sand surface levels on 7 February 2025; after: Mac Geo, 2025a)

With respect to Lake Reserve, a review of Nearmap aerial imagery suggests that the shoreline at this location has been eroding since around 2010, with resultant loss of vegetation further contributing to erosion. The 2010, 2015 and 2025 shoreline positions are mapped for the subject site in **Figure 6-3**, and aerial imagery for the corresponding period is provided in **Figure 6-4**. The erosion appears to be episodic and the result of high flow events (minor floods) that have occurred in the Lagoon. It is apparent that the progressive loss of shoreline vegetation has reduced the resilience of the shoreline. In 2022 Council attempted to arrest the shoreline recession via placement of cobbles on the point in the western extent of the proposed nourishment footprint and associated nourishment works. However, the erosion has continued to the present day and appears to be ongoing.

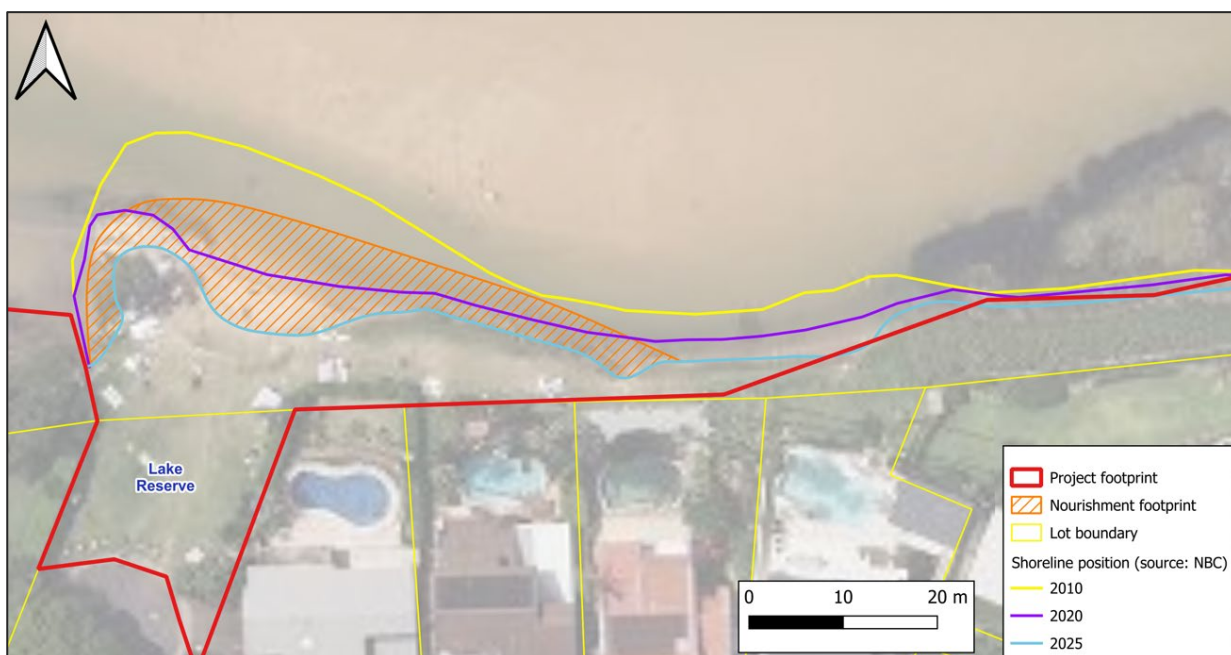


Figure 6-3 Progress of shoreline erosion at Lake Reserve

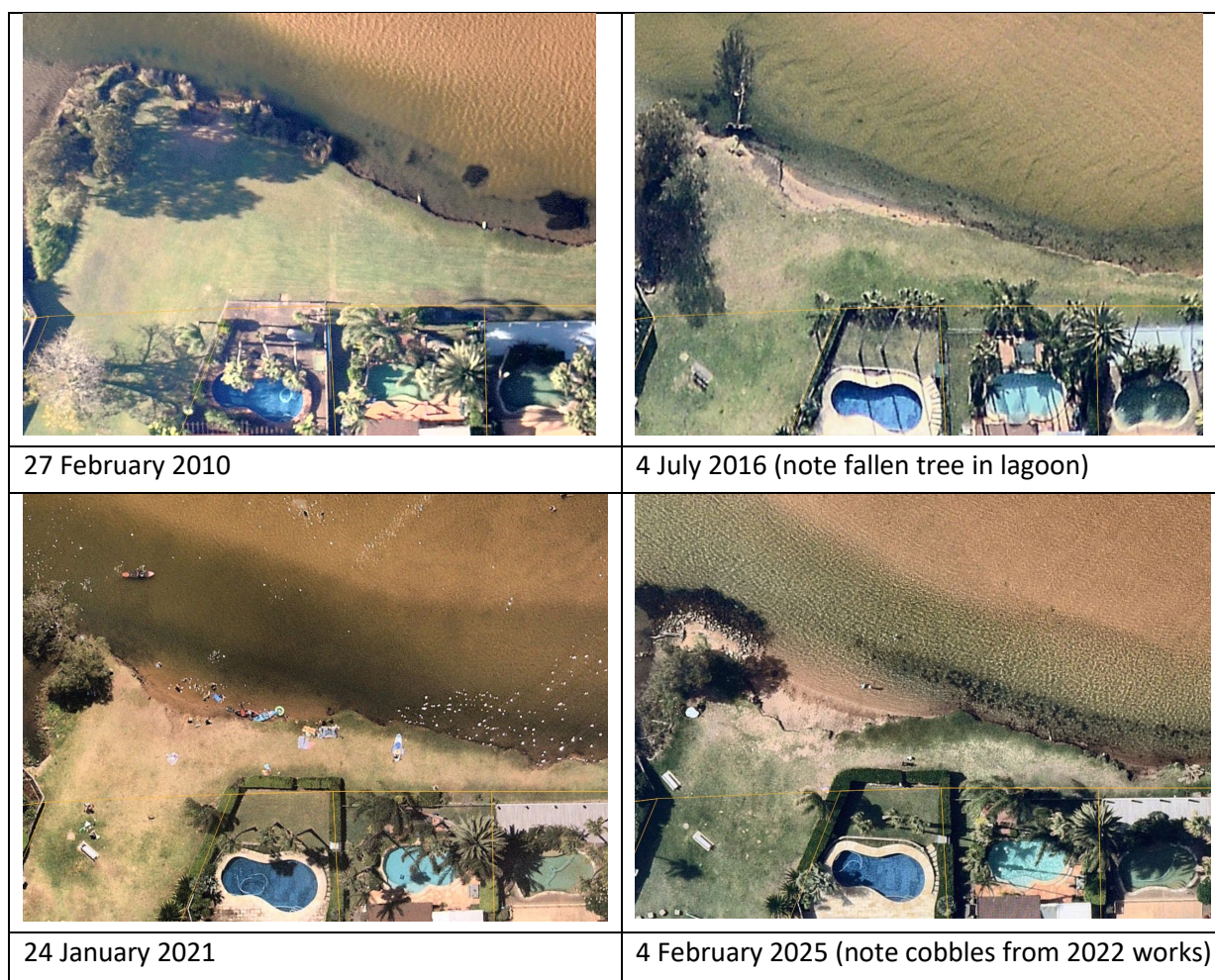


Figure 6-4 Aerial photographs showing progress of shoreline change at Lake Reserve February 2010 to February 2025 (source: Nearmap)

When the entrance is open, lagoon water levels are influenced by ocean tides. As the entrance gradually shoals with sand, the tidal influence decreases. When the lagoon is open, water levels in the tidal portions of the estuary are maintained at 0.2-0.4 mAHD (RHDHV, 2022). However, water levels would also be subject to other processes, such as wave activity, elevated ocean water levels (storm surge and wave setup) during a coastal storm.

Cardno (2019) report that flooding of low-lying land around Narrabeen Lagoon occurs after heavy rain in the catchment and/or elevated ocean water levels (whether due to storm surge or king tides). When the entrance of the lagoon is closed for longer periods of time there is a significant risk of socio-economic and environmental impacts to the community due to increased flood levels throughout the lagoon (Cardno, 2019; RHDHV, 2022).

Historically the entrance was predominantly closed (RHDHV, 2022); however, since 1975 Northern Beaches Council has managed the entrance of the lagoon to mitigate flood risk to the community through mechanical opening of the entrance if it is closed at the time a flood occurs. The other key activity undertaken is the periodic entrance clearance works (i.e. as per the proposal), which serve to increase the frequency and duration of entrance opening for flood mitigation purposes (RHDHV, 2022). The entrance is now predominantly open.

The *Narrabeen Lagoon Floodplain Risk Management Study and Plan* (Cardno, 2019), which evaluated flood behaviour and options to mitigate flood risk to the community, recommended entrance clearance works be undertaken as the highest priority flood risk mitigation option under the Plan.

Collaroy-Narrabeen Beach

Collaroy-Narrabeen Beach is an open coast beach subject to a high wave energy environment. Beach volumes fluctuate due to erosion events and beach rotation associated with cycles of El Niño-La Niña, in addition to which there is long term recessionary trend of 0.05 m/yr (Haskoning Australia, 2016).

The *Coastal Zone Management Plan and Coastal Management Program Scoping Study* (Haskoning Australia, 2016; cited Rhelm & Baird, 2021) describes the coastal processes and hazards affecting Collaroy-Narrabeen Beach. The coastal hazards include:

- Beach erosion - Storm bite for the design storm is estimated at 250 m³/m north of Frazer Street, reducing to 200 m³/m at Collaroy Services Beach Club, and reducing to 150 m³/m south of Collaroy SLSC;
- Beach rotation – The beach responds to changes in the Southern Oscillation Index (SOI), accreting at the northern end during El Niño (negative SOI) with erosion in the south. This process reverses under La Niña conditions (positive SOI) with erosion occurring more in the north and accretion at the southern end;
- Shoreline recession – Rates of shoreline recession have been estimated at a long-term recession of 0.05 m/year, with an additional 0.04 m/year estimated for sea level rise;
- Coastal inundation – Wave runup levels of 6-8 mAHD can occur and overtop the dune crest levels at locations, including south of Devitt Street, and in particular south of Stuart Street near Collaroy SLSC and Collaroy Services Beach Club.

There is therefore considerable risk to built and natural assets from coastal hazards. There are coastal protection works of some form along the entire length of Collaroy-Narrabeen Beach from Devitt Street to the Collaroy ocean pool.

The Birdwood Dune is an important morphological feature, stabilising the position of the entrance channel, limiting wind-blown sand transport into the lagoon, and protecting the lagoon from wave washover, thereby protecting the Ocean Street bridge and adjacent foreshore (RHDHV, 2022).

6.1.2 Potential Impacts

Narrabeen Lagoon

During the works, the lagoon water levels would be stabilised to around 0.4-0.6 mAHd by the construction of an artificial sand berm across the entrance (using lagoon sand). The berm would be removed following the completion of the works and the entrance opened. As discussed above, the entrance of the lagoon tends to remain open for a couple of years following an entrance clearance operation, during which time sand gradually infills the entrance channel until the entrance closes again (RHDHV, 2022). During this time there is tidal exchange with the ocean, with the tidal range decreasing gradually as the entrance is filled with sand.

There is a risk of a flood or coastal storm event during construction. Should a flood event occur, it may be necessary to remove the berm and mechanically open the entrance for flood mitigation purposes in accordance with EM-OMS 455, or in a larger flood event the entrance may open naturally. If a coastal storm were to occur, there would be a risk of wave overtopping of the artificial berm and propagation of storm surge into the lagoon. In a large event the artificial berm could be breached. Both of these circumstances would present a risk to safety for construction personnel and there is a risk of mobilisation of plant and machinery. However, given the relatively short duration of the works, this risk is considered low.

Where the bedrock is in proximity to the dredge profile, the levels are shown in relation to the invert of the dredge profile in the drawings provided in **Appendix A**, with bedrock located within 0.3-1.0 m of the bed invert of the dredge profile in the region of Sections 5-10. No damage to the rock shelf under the entrance is anticipated provided the Contractor takes into account the inferred rock shelf levels. Similarly, the works have been offset 10 m from the revetment on the northern shoreline of the entrance channel to avoid the risk of undermining of this structure.

The use of the foreshores for movement of vehicles and machinery during the works has potential to cause erosion and sedimentation into the waterway.

The entrance clearance works would involve the removal of sand from the entrance channel with the intent of improving the hydraulic efficiency of the entrance with respect to conveyance of flood flows. Modelling undertaken for the Floodplain Risk Management Study demonstrated that the entrance clearance works were effective in reducing flood levels when compared to a fully shoaled entrance (Cardno, 2019). Even after the completion of the works when the entrance closes again, the mechanical opening of the entrance by Council during a flood are more successful as a result of the clearance works (RHDHV, 2022). Hence the proposal reduces flood risk and the associated socio-economic impacts of flooding to the community.

While the entrance remains open there would be an increased risk of storm surge propagating up the lagoon during a large coastal storm, although this risk would decrease over time as the entrance gradually closes. Storm surge recently was observed ingressing to the Lagoon in late March/early April 2025, with water levels up to nearly 1.4 mAHd observed and persisting over a number of days, with the lagoon entrance fully open (see **Figure 6-5**).

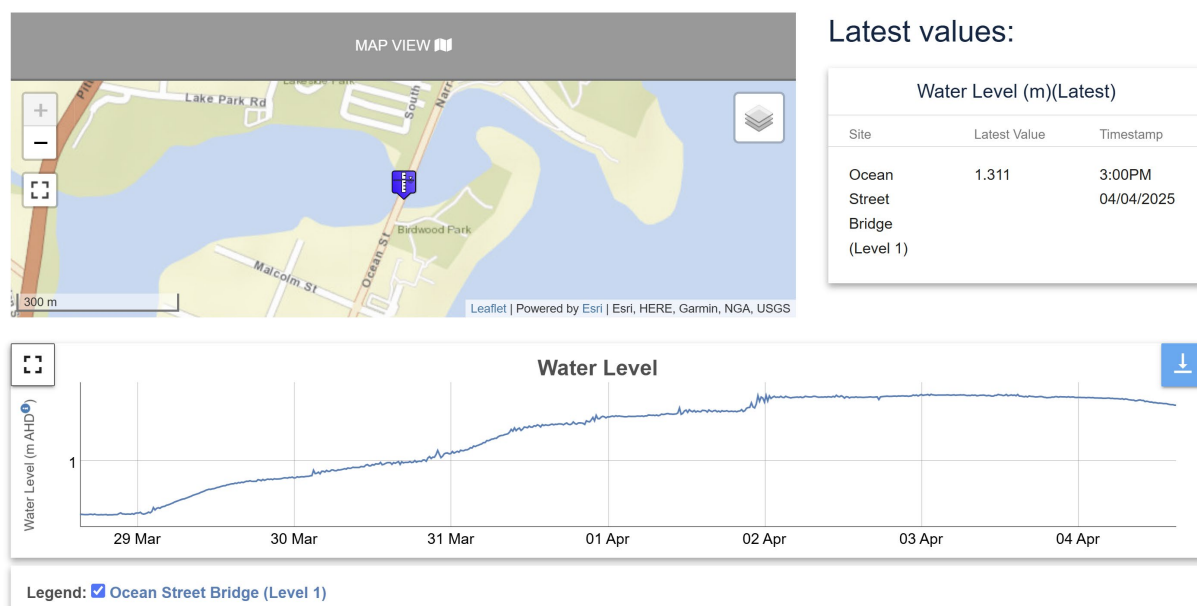


Figure 6-5 Water Level at Ocean Street Bridge (Source: MHL, <https://mhl.nsw.gov.au/Station-213408D>, accessed 4 April 2025)

Changes to the lagoon hydrodynamics arising from the altered bathymetry also have potential to occur, with potential to impact bed and/or bank stability. This risk has been mitigated to a degree through the design of the works, with the configuration of the works taking into account the main flow paths, providing a consistent bed profile, and by adopting batter slopes of 1H:6V (i.e. flatter than the natural angle of repose of sand).

Collaroy-Narrabeen Beach

As noted in **Section 6.1.1**, the sand proposed for clearing from the lagoon entrance originated from Collaroy-Narrabeen Beach and is therefore effectively being transported back to its point of origin.

Based on the proposed clearance volumes, an average of 34.1 m³/m (and up to 36.4 m³/m) of sand would be placed on the beach between Devitt and Stuart Street. This additional sand would have the effect of increasing the volume of sand in this section of the beach, thereby increasing the buffer width to accommodate sand transport offshore during a smaller coastal erosion event. However, it is anticipated that the sand would be mobilised due to cross-shore and longshore sediment transport processes, resulting in re-distribution following initial placement. The rate of transport would depend upon the conditions after completion of the works.

There is a risk of a coastal storm occurring during the works, with resultant wave attack and beach erosion presenting a risk to construction personnel, plant and machinery at the placement site. In addition, any sand that had been placed on the beach at the time the storm occurs could be transported offshore. Depending on the size of the storm event, it would be gradually transported back onshore once the storm has passed.

There is also potential for the movement of trucks and machinery along the beach to cause localised erosion and sedimentation, as well as compaction of the beach sands.

6.1.3 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise the potential impacts of the proposal coastal processes:

- CP1 - A temporary berm would be established across the lagoon entrance, with a crest height set at approximately 2 mAHd (unless otherwise instructed by Council's Site Superintendent), to maintain the lagoon water level of not less than 0.4 mAHd for the duration of the works and prevent waves and tides impacting the works.
- CP2 - Local weather and marine forecasts provided by the Bureau of Meteorology (BoM) would be monitored daily for the duration of the works, as would lagoon water levels as measured at the Ocean Street bridge gauge (station ID 213408D) maintained by MHL.
- CP3 - An Incident Response Plan shall be prepared as part of the CEMP, to include consideration of catchment floods and coastal storms. All construction personnel will be inducted in the Plan.
- CP4 - In the event of a forecast high rainfall/flood event or big ocean swells, plant and equipment is to be relocated to higher ground.
- CP5 - In the event of a catchment flood during the works:
 - Works are to cease immediately and all plant and equipment secured or moved to higher ground,
 - A mechanical breakout is to be implemented under the direction of Council in accordance with EM-OMS 455, and
 - A temporary berm is to be re-established at the lagoon entrance as soon as possible following the breakout event to facilitate the completion of the works.
- CP6 – The Contractor is to review the available entrance survey and inferred depth to rockhead and take caution not to damage.

The Contractor's CEMP will detail when and how the entrance should be opened and closed.

6.2 Soils and Sediments

6.2.1 Existing Environment

With reference to the NSW Seamless Geology map, the site is underlain by the geological units outlined in **Table 6-1** and shown in **Figure 6-6**.

Table 6-1 Geological units (after: Mac Geo, 2025b)

Geological Symbol	Stratigraphic Unit	Lithology
QH_ecw	Channel Deposits	Fine- to medium-grained lithic-carbonate-quartz sand (marine-deposited), silt, clay, shell, gravel.
QH_bd, Q_bb	Coastal deposits	Marine-deposited and aeolian-reworked coastal sand dunes, shell and shell material, polymictic gravel.
QH_bf	Coastal deposits	Fine- to medium-grained quartz-lithic sand, silt, clay, gravel, shell.
Tngn	Narrabeen Group	Interbedded laminite, shale and sandstone; white quartz to quartz-lithic, very fine- to medium-grained sandstone; minor shale breccia and pebble polymictic conglomerate (at base of sandstone units); minor red clays.



Figure 6-6 Geological map (source: MinView portal, accessed 6/01/2025)

A geotechnical investigation was undertaken in February 2025 (Mac Geo, 2025b), involving analysis of material recovered from six boreholes at the locations indicated in **Figure 6-2**. The borehole results indicated that the sediments in the entrance channel are alluvial deposits comprised primarily of medium grained sand with silt and traces of shell fragments. Borehole HA02, which is located east of the Ocean Street, was characterised as silt with sand in the soil profile at 0.5 m depth. This is consistent with the 2023 entrance clearance works, where alluvial sediments were encountered above the design dredge depth, and the Contractor ‘chased’ clean sand outside of the designated dredged area (Rhelm, 2024).

Rocks and boulders were also encountered east of Ocean Street Bridge during the 2023 entrance clearance works, likely associated with slumping of the rock revetment on the northern shoreline and/or materials which were potentially mobilised during high flow events over 2022 (Rhelm, 2024).

A review of the Acid Sulfate Soils (ASS) mapping prepared under the Warringah LEP 2000 (WLEP2000; refer Figure 6-6) shows that the proposed works intersect areas of the lagoon entrance mapped as ASS Class 1, Class 4 and Class 5. The proposed beach replenishment area intersects areas mapped ASS Class 4 and Class 5. However, testing of the material recovered from the six boreholes during the geotechnical investigations did not identify any actual or potential ASS (Mac Geo, 2025b).

A search of the EPA’s contaminated land registers conducted on 26 February 2025 did not identify any contaminated sites within the project footprint.

As the material within the clearance footprint / dredge profile has accumulated in the entrance channel since the 2023 clearance works, it is expected to comprise clean marine sand.

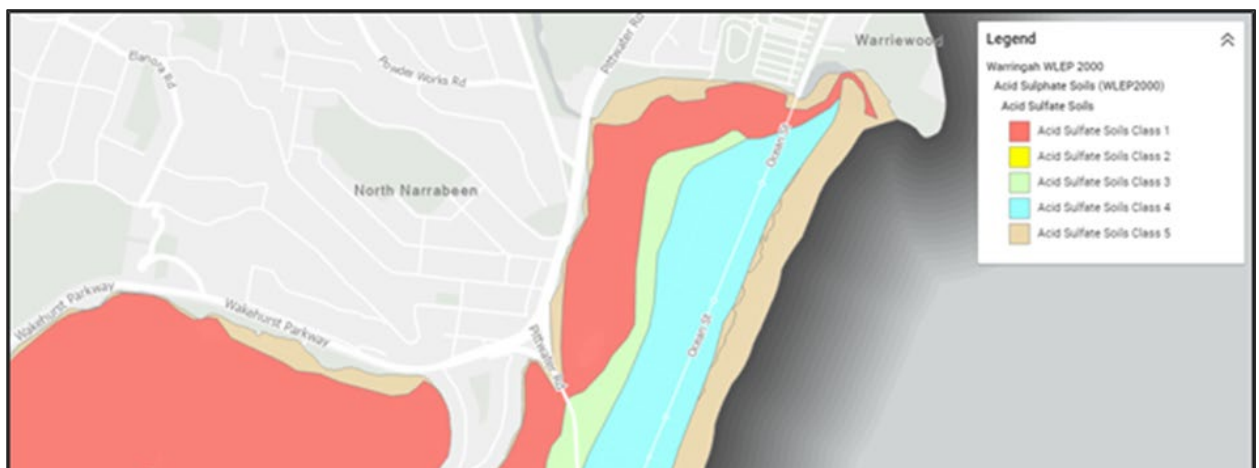


Figure 6-7 Acid sulfate soils mapping (source: WLEP 2000)

6.2.2 Potential Impacts

The proposed clearance works are not expected to encounter any contaminated material or ASS.

There is a low risk of encountering some fluvial material that may be of a colour and/or sediment grain size that is unsuitable for the beach placement works. In the event a small amount of fluvial material is excavated from the entrance channel, it is anticipated that it would be generally well mixed with the clean marine sand, although it is likely to have a darker colour. Upon placement of the excavated material on the beach, it is anticipated that any finer fluvial material would be washed out of the coarser sand relatively quickly.

There is also potential for shells, rocks and other unsuitable material to be contained within the excavated material, which would be unsuitable for placement on Collaroy-Narrabeen Beach.

The risk of encountering larger rocks associated with the revetment along the northern shoreline east of the Ocean Street bridge or the bridge abutments has been reduced by adopting an offset from these structures for the clearance area footprint of around 10-15 m.

There is also a risk of erosion from the stockpile area and sedimentation of the waterway, or aeolian transport of excavated material. However, with suitable controls to be implemented by the contractor, these are unlikely to pose an issue.

No operational phase impacts on soils or benthic sediments are anticipated.

6.2.3 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise the potential impacts of the proposal to soils and sediments:

- SS1 - The depth of excavation shall be progressively monitored during the works to ensure it conforms to the design. Monitoring shall be undertaken via hydrosurvey of the clearance area by a registered hydrosurveyor undertaken immediately prior to the commencement of works, at least once during the works and once immediately following the completion of works. The survey should be undertaken by the Contractor, but independently verified by Council.
- SS2 - The CEMP shall identify the steps to be taken in the event of over-excavation.

- SS3 – The excavated material shall be de-watered and sieved to ensure the material meets Council’s specifications for placement and does not incorporate any rock, shell or other material that may represent a hazard to beach users once placed on Collaroy-Narrabeen Beach.
- SS4 - In the event material other than clean marine sands are encountered during the clearance works, a field pH test should be undertaken to test for ASS. If the field testing confirms the presence of Actual or Potential ASS, the material will be managed in accordance with the Acid Sulfate Soil Manual (ASSMAC, 1998).
- SS5 - In the event suspected contaminated material is encountered during the works, works shall cease immediately, the material contained and Council’s Project Manager contacted to determine a suitable course of action, to include as a minimum, laboratory testing of the material.
- SS6 - An Erosion and Sediment Control Plan (ESCP) is to be prepared and implemented in accordance with Landcom (2004) Managing Urban Stormwater – Soils and Construction – Volume 1 (the ‘Blue Book’). Erosion and sediment controls will be checked and maintained on a regular basis and records of such inspections kept and provided upon request.
- SS7 - Movement of excavated material is not to be undertaken during periods of high rainfall or high wind.
- SS8 - Visual monitoring of local water quality (e.g. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls.
- SS9 - Stockpiles for de-watering of excavated material would be suitably bunded and water discharged back into the lagoon monitored visually for high suspended sediments loads.

6.3 Surface Water Quality

6.3.1 Existing Environment

Three sites in Narrabeen Lagoon are monitored by Council with support from the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW). The water quality and ecosystem health monitoring program has been ongoing since 2010, tracking two key indicators: algae (chlorophyll-a concentrations) and water clarity (or turbidity). The historical water quality grades for Narrabeen Lagoon are presented in **Table 6-2**, where the grades are as follows:

- A - excellent;
- B – good;
- C – fair;
- D – poor; and
- E – very poor.

Table 6-2 Historical water quality grades for Narrabeen Lagoon (source: NSW DCCEEW, 2025a)

Year	Algae	Water clarity	Overall grade
2023-24	D	B	C
2022-23	B	C	B
2021-22	B	A	B
2020-21	A	B	B
2019-20	C	B	B
2018-19	B	C	B
2017-18	C	C	C

Historically the water quality of the larger Narrabeen Lagoon has been rated fair to good. Typical water quality in the lagoon entrance has been described as generally ‘good’, with the exception of periodic declines when periods of rain coincide with a closed entrance. While the entrance is open there is tidal exchange with the ocean, which flushes the lower estuary and improves water quality (RHDHV, 2022).

There are also NSW DCCEEW Beachwatch monitoring locations at Birdwood Park, North Narrabeen Beach and Collaroy Beach. The Beachwatch program evaluates water quality for recreational users by analysing bacteriological data as an indicator of faecal contamination. The annual grades for the years 2012-2024 is shown for each of these three sites in **Figure 6-8**. The *State of the Beaches Report 2023-2024* (NSW DCCEEW, 2024) gave a Beach Suitability Grade of Poor for the Birdwood Park swimming area within the Lagoon, indicating that the site is susceptible to faecal contamination, particularly after rain and occasionally during dry conditions. The North Narrabeen Beach and Collaroy Beach both had a Beach Suitability Grade of Good and were considered suitable for swimming most of the time.

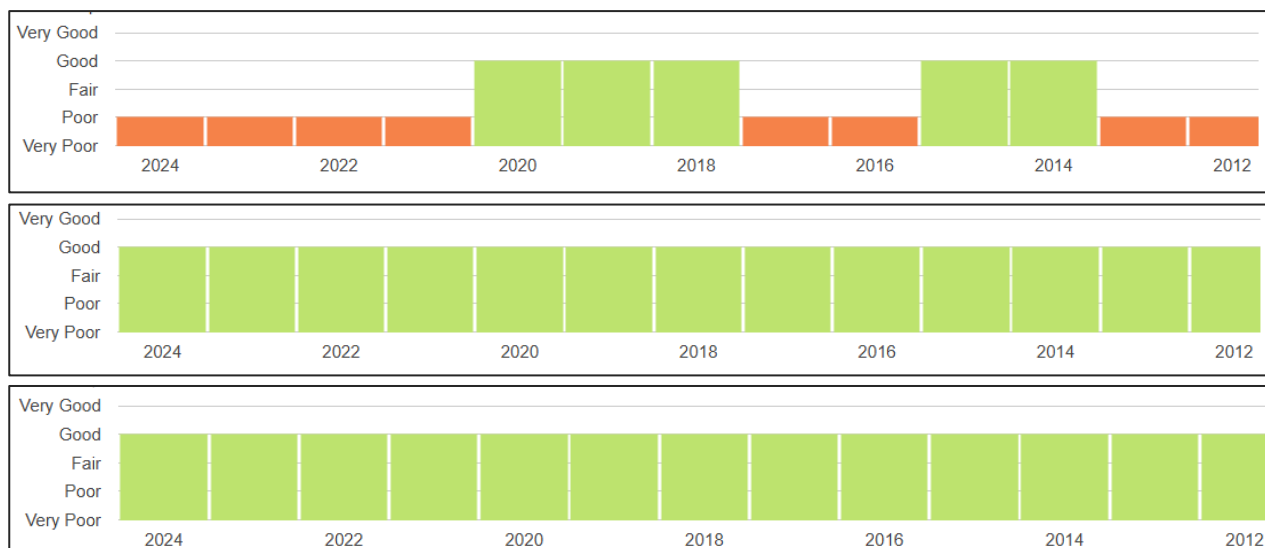


Figure 6-8 Annual State of the Beaches grades for Narrabeen Lagoon (Birdwood Park; top), North Narrabeen Beach (middle) and Collaroy Beach (bottom) (source: NSW DCCEEW, 2025b)

6.3.2 Potential Impacts

There is potential for water quality impacts to arise during the entrance clearance works in relation to:

- Suspension of bed sediments during the excavation/dredging works, leading to localised increases in turbidity;
- Localised increases in turbidity associated with the minor nourishment works along the Lake Reserve shoreline;
- Increased turbidity in the entrance channel associated with discharges from the dewatering area;
- Increased turbidity due to erosion from stockpiles in wet weather;
- Accidental spills or leaks of oil, fuels and/or hydraulic fluids from excavators (or dredge), trucks and other plant and machinery used for the clearance works or for the sand placement on the beach.

In the operational phase it is expected that water quality in the entrance channel would be improved due to the re-introduction of tidal flows following the completion of the works.

6.3.3 Safeguards and Mitigation Measures

In addition to those mitigation measures relating to erosion and sediment control listed in **Section 6.2.3**, the following measures and safeguards will be adopted to minimise the potential impacts of the proposal on water quality:

- WQ1 - Silt curtains are to be installed around any sensitive marine habitats (i.e. seagrasses) prior to the commencement of work. The silt curtains will be monitored and maintained for the duration of the works as required to contain any suspended sediments.
- WQ2 - Re-fuelling of plant and equipment, or any other activity with potential to result in an accidental spill, is to be undertaken in an impervious bunded area away from drainage lines.
- WQ3 - Any re-fuelling of plant or machinery or storage of hazardous materials on barges (or vessels) is to occur in a double-bunded area.
- WQ4 - An emergency spill kit is to be kept on site at all times and maintained throughout the works. The spill kit must be of an appropriate type for the volume and type of substances to be used during the works. Spill kits for barges (if required) must be specific for working in the marine environment.
- WQ5 - The Incident Response Plan prepared as part of the CEMP shall include measures to respond to and manage 'pollution incidents' as defined in the PoEO Act (e.g. accidental spills) and address the requirements of Part 5.1 of the PoEO Act with respect to the duty to notify pollution incidents to the NSW EPA. All construction personnel will be inducted in the Plan.
- WQ6 - In the event of a pollution incident, Council's Superintendent is to be notified as soon as practicable.
- WQ7 - Emergency contacts will be recorded in the CEMP and kept in readily accessible places in vehicles, vessels and at the site office. All workers will be advised of these contact details and procedures.
- WQ8 - All works personnel will be trained in the use of the spill kits kept on site.
- WQ9 - Vehicles, vessels and plant will be properly maintained and regularly checked for leaks of fuel or other fluids.
- WQ10- No vehicle or vessel wash down will occur on the site.

6.4 Traffic, Navigation and Access

This section has been informed by the Traffic Management Plan (TMP) prepared by TTPP (2025; refer **Appendix B**).

6.4.1 Existing Environment

Road Network

The road network surrounding the proposed works footprint is summarised below:

- Pittwater Road is a two-way divided State Road (MR164) with three traffic lanes in each direction. Pittwater Road is a dual carriageway, with the width of each carriageway measuring approximately 10m. A bus lane is provided in the southbound direction in the AM between 6am – 10am, and in the northbound direction in the PM between 3pm – 7pm. Parking is generally permitted outside of these hours. The posted speed limit is 60 – 70km/h. It has several signalised intersections and a 40km/h school zone between Mactier Street and Robertson Street.
- Ocean Street is a two-way local collector road with one traffic lane in each direction and on-street parking on both sides of the road. The width of the carriageway is approximately 12.6m, providing enough space for on-street parking and cycle lanes on both sides of the road. It has a posted speed limit of 50km/h. St Joseph’s Catholic Primary School is also located on this street with a school zone 40km/h limit between Wellington Street and Waterloo Street.
- Walsh Street is a two-way local road with one traffic lane in each direction. Walsh Street is a residential area between Collins Street and Pittwater Road. The width of the carriageway is approximately 10.9m, providing enough space for on-street parking on both sides of the road. It has a posted speed limit of 50km/h and is a shared on-road cycle route. Walsh Street is left turn entry only from Pittwater Road and left turn exit only into Pittwater Road. The street is signposted with “No Truck 3t and Over” signage between Collins Street and Narrabeen Park Parade in the eastbound direction only.
- Mactier Street is a two-way no-through local access street to the east of Pittwater Road. Traffic signals are provided at this intersection of Mactier Street / Pittwater Road, which will assist the turning movements at the intersection. It has a posted speed limit of 50km/h. The width of the carriageway is approximately 12.8m. The road provides unrestricted on-street parking spaces for approximately 10 cars.
- Ocean Grove is a two-way road with a carriageway width of approximately 11m between Pittwater Road and Seaview Parade. Kerb-side parking is permitted on both sides of Ocean Grove. Traffic signals are provided at the intersection of Ocean Grove / Pittwater Road, which will assist the turning movements at this intersection. The speed limit on Ocean Grove is 50km/h.
- Seaview Parade is a two-way road connecting Ocean Grove with Anzac Avenue. It has a carriageway width of approximately 12m with kerb-side parking on both sides of the road. The intersection of Seaview Parade / Anzac Avenue is a priority-controlled intersection with Anzac Avenue being the major road.
- Anzac Avenue is a two-way no through road to the east of Pittwater Road. Traffic signals are provided at the intersection of Anzac Avenue / Pittwater Road, which will assist the turning movements at the intersection. The width of the carriageway is about 12m with kerb-side parking on both sides of the road. It has a posted speed limit of 50km/h.
- Frazer Street is a two-way no through road to the east of Pittwater Road. The intersection between Pittwater Road and Frazer Street permits all turning movements except U-turns. The road provides unrestricted parking for approximately three cars.

- Lagoon Street is a two way street with a 50km/h speed limit running from Albert Street in the south to its terminus in a cul de sac at Lake Reserve. On-street parking is available on both sides of the street. A private road east off the cul de sac provides access to 147a, 147, 149 and 151 Lagoon Street.

Traffic Volumes

The nearest traffic counter station available on Transport for NSW (TfNSW) Traffic Volume Viewer webpage (TfNSW, 2025a) is Station 55049 located on Pittwater Road about 20 m north of Jenkins Street. At this location, Average Annual Daily Traffic (AADT) volumes for 2025 are summarised in **Table 6-3**. The AADT for weekdays, the AM and PM peaks are plotted in **Figure 6-9**, **Figure 6-10** and **Figure 6-11** (respectively), broken down by light and heavy vehicles. Of the total traffic movements on weekdays, 9.6% are heavy vehicles, dropping to 6.2% on weekends.

Table 6-3 AADT volumes for 2025 for Pittwater Road (Station 55049) (source: TfNSW, 2025a)

Direction of travel	AADT by direction of travel	Total AADT
Weekday		
Northbound	<ul style="list-style-type: none"> • Light vehicles – 14,446 • Heavy vehicles – 1,672 	<ul style="list-style-type: none"> • 16,118 • 10.3% heavy vehicles
Southbound	<ul style="list-style-type: none"> • Light vehicles – 12,759 • Heavy vehicles – 1,208 	<ul style="list-style-type: none"> • 13,976 • 8.6% heavy vehicles
Weekend		
Northbound	<ul style="list-style-type: none"> • Light vehicles – 13,572 • Heavy vehicles – 978 	<ul style="list-style-type: none"> • 14,550 • 6.7% heavy vehicles
Southbound	<ul style="list-style-type: none"> • Light vehicles – 12,466 • Heavy vehicles – 733 	<ul style="list-style-type: none"> • 13,199 • 5.5% heavy vehicles

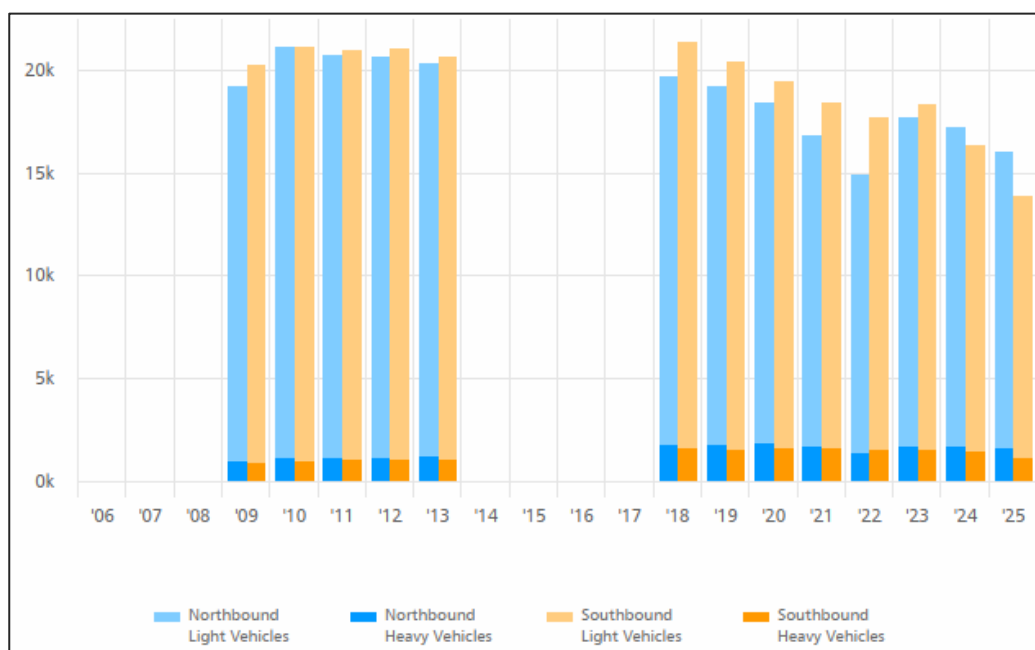


Figure 6-9 Weekday AADT volumes for Pittwater Road (Station 55049) (source: TfNSW, 2025a)

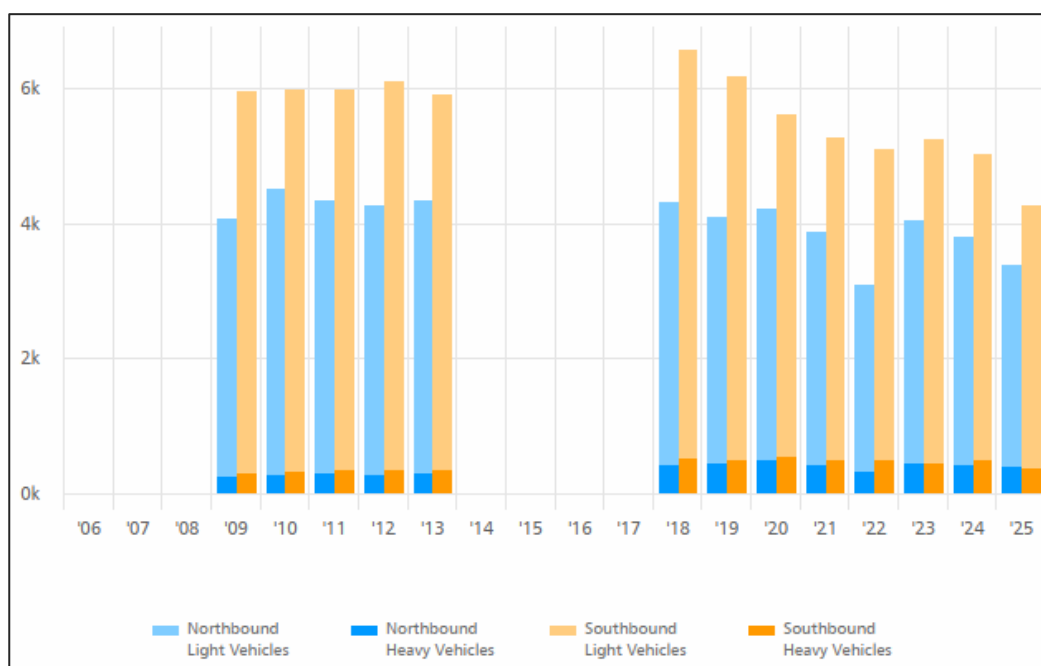


Figure 6-10 AM Peak AADT volumes for Pittwater Road (Station 55049) (source: TfNSW, 2025a)

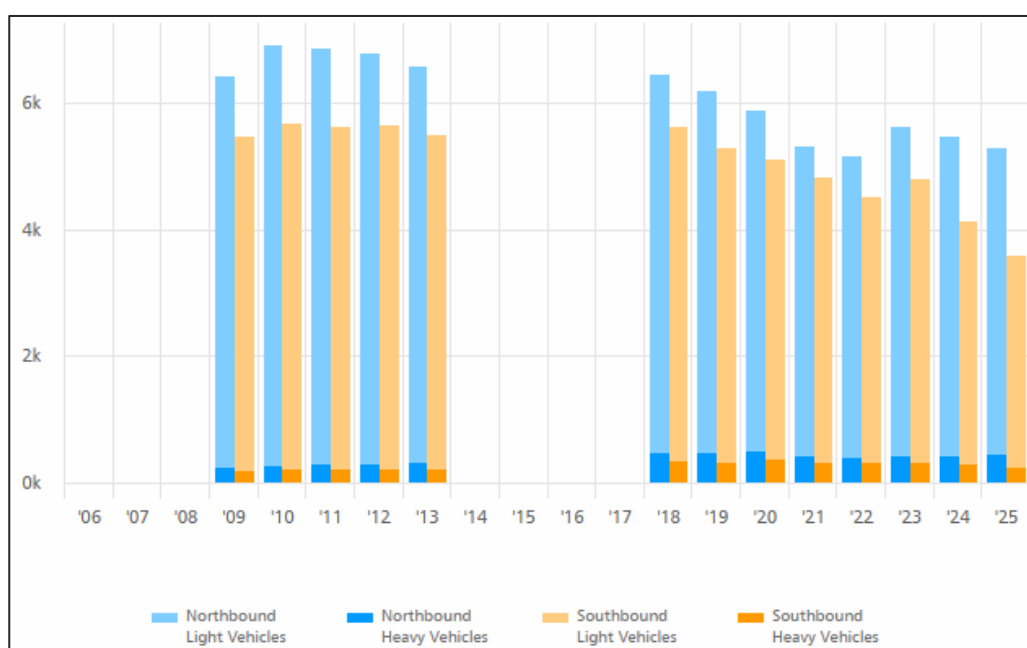


Figure 6-11 PM Peak AADT volumes for Pittwater Road (Station 55049) (source: TfNSW, 2025a)

Public Transport

There are several bus services that run through the project locality, as listed in **Table 6-4**. **Figure 6-12** maps the bus routes.

Bus route 155 between Frenchs Forest and Bayview is the only bus service which operates along Ocean Street and Narrabeen Park Parade, Narrabeen. Bus stops are located every 200-300m along Ocean Street at Albemarle Street, Octavia Street, Emerald Street and Malcolm Street. The frequency of Route 155 on

weekdays is once every 25-35 minutes during morning and evening peak hours, and once every hour outside of the peak. The service runs once every hour on weekends and public holidays.

Several bus routes also run north-south on Pittwater Road, including Bus Routes 182, 185, 181X, 190X and 199, as well as B-Line Bus Routes B1 and BN1. Route 181X also travels partly along the southern end of Ocean Street between Waterloo Street and Pittwater Road.

Table 6-4 Existing bus services (source: Transport for NSW)

Bus route	Route description	Frequency of services
155	Bayview Garden Village to Narrabeen and Frenchs Forest	25-35 minutes during AM/PM peak periods. Hourly during off-peak.
181X	Narrabeen to City Wynyard (Express)	10 min during AM peak and 20-30 minutes during PM Peak. Does not run in off-peak period.
182	Mona Vale to Narrabeen	10 minutes during AM/PM peak periods. Hourly during off-peak.
185	Mona Vale to Narrabeen via Warriewood Valley	10 minutes during the evening peak period. 30 minutes during off-peaks.
190X	Avalon Beach to City Wynyard (Express)	10-15 minutes during morning/evening peak periods. Does not run off-peak
199	Palm Beach to Manly via Mona Vale & Dee Why	10-15 minutes



Figure 6-12 Bus routes servicing the project locality (after: TfNSW, 2025b)

Active Transport Network

There is provision for pedestrians with footpaths located on both sides of Ocean Street near Narrabeen Lagoon. Pedestrian access is also achievable along the lagoon foreshores either side of the Ocean Street bridge, with connectivity from Birdwood Park to Collaroy-Narrabeen Beach.

Pittwater Road and Ocean Street are part of a regional cycle network. There is an off-road shared user path on the western side of Pittwater Road. There is an on-road cycling lane on both sides of Ocean Street from Pittwater Road to Malcolm Street.

Well-establish pedestrian infrastructure is provided surrounding the site. The area surrounding Narrabeen Lagoon Entrance is a popular destination for pedestrians. The pedestrian infrastructure provides good connectivity to the surrounds.

A number of off-road cycle paths and dedicated on-road cycle lanes are provided within the vicinity. The existing and proposed cycleway network is shown in **Figure 6-13**.

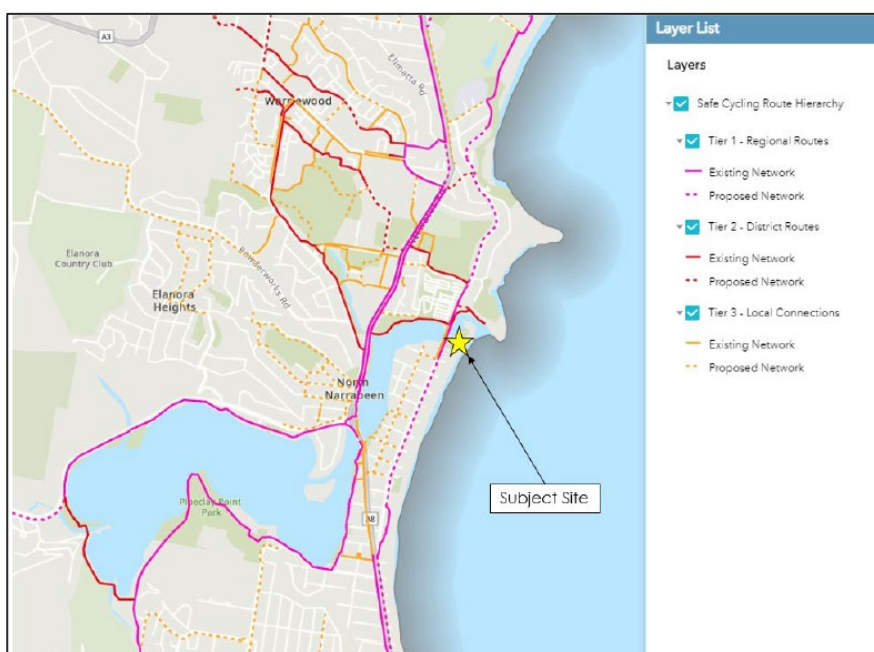


Figure 6-13 Existing and proposed cycling network (source: NBC, 2020)

Beach Access

There are beach accessways for pedestrians at the end of Devitt Street, Goodwin Street, Mactier Street, Clarke Street, Wetherill Street, Stuart Street, and Frazer Street, as well as via Collaroy Beach Reserve. Some properties located between Goodwin and Stuart Street also have direct beach access. Pedestrian access is also available along the beach, provided there is sufficient volume of sand and the erosion scarp (if present) is not too high. After coastal erosion events access can be difficult and unsafe due to presence of steep and high erosion scarps along the beach and some beach accessways may not be usable under these conditions (NBC, 2016).

There is a boat ramp located on the northern shoreline of the lagoon west of the Coastal Environment Centre. Navigation in the entrance channel of Narrabeen Lagoon is limited by the water depths and clearance under the Ocean Street bridge. Boating is generally limited to parts of the lagoon west of the Ocean Street bridge, except for small craft (e.g. kayaks, paddleboards and dinghies).

6.4.2 Potential Impacts

It is anticipated that the workforce would be relatively small at around five to ten workers on site at any given time. The Birdwood Park construction compound would be used for parking of light vehicles related to construction and staff would be encouraged to carpool. The amount of light vehicle traffic associated with construction is expected to be negligible.

Haulage Routes

Construction vehicles would be loaded with sand at the site compound at Birdwood Park carpark or the stockpile area on the north-western side of the Narrabeen Lagoon Bridge. The primary haulage route for loaded trucks travelling to the Mactier Street beach access point and unloaded trucks returning to Birdwood Park is shown in **Figure 6-14**. The primary route used the majority of the time for transport of excavated sand from the lagoon to the beach would be via Ocean Street, Narrabeen Park Parade, Walsh Street, Pittwater Road and Mactier Street.

For the potential alternative unloading area at Collaroy Beach Reserve, vehicle access to the Reserve is restricted to a left-in and left-out turn from/onto Pittwater Road. Trucks would enter the Reserve and have sufficient room to turn and exit the Reserve, re-entering traffic on Pittwater Road. It is proposed that empty trucks exiting from the Reserve onto Pittwater Road southbound would perform a loop movement via Anzac Avenue, Seaview Parade, Ocean Grove and Pittwater Road to travel north back to the Birdwood Park Carpark or the stockpile area on the north-western side of Narrabeen Lagoon Bridge. The haulage routes for trucks taking material to the Collaroy Beach Reserve access point are shown in **Figure 6-15**.

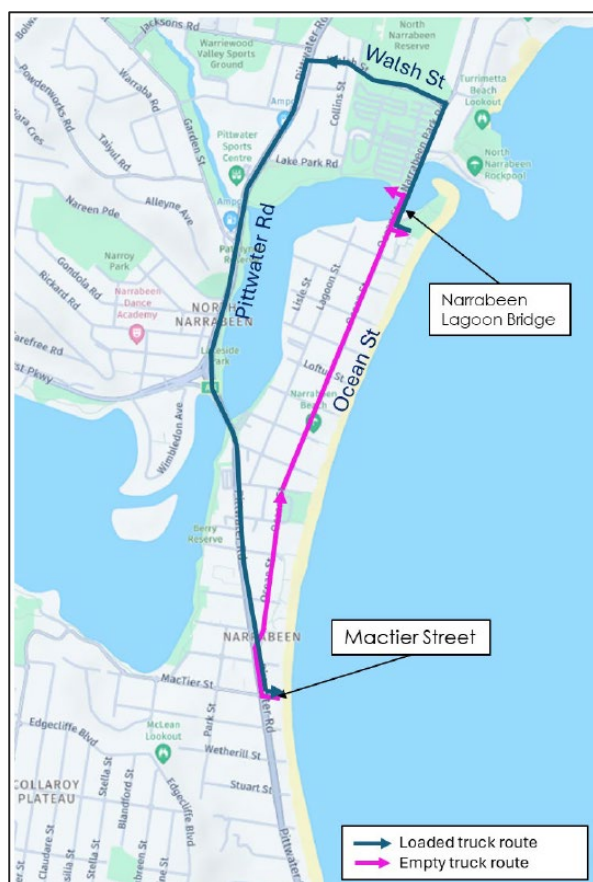


Figure 6-14 Primary truck haulage route (source: TTPP, 2025)

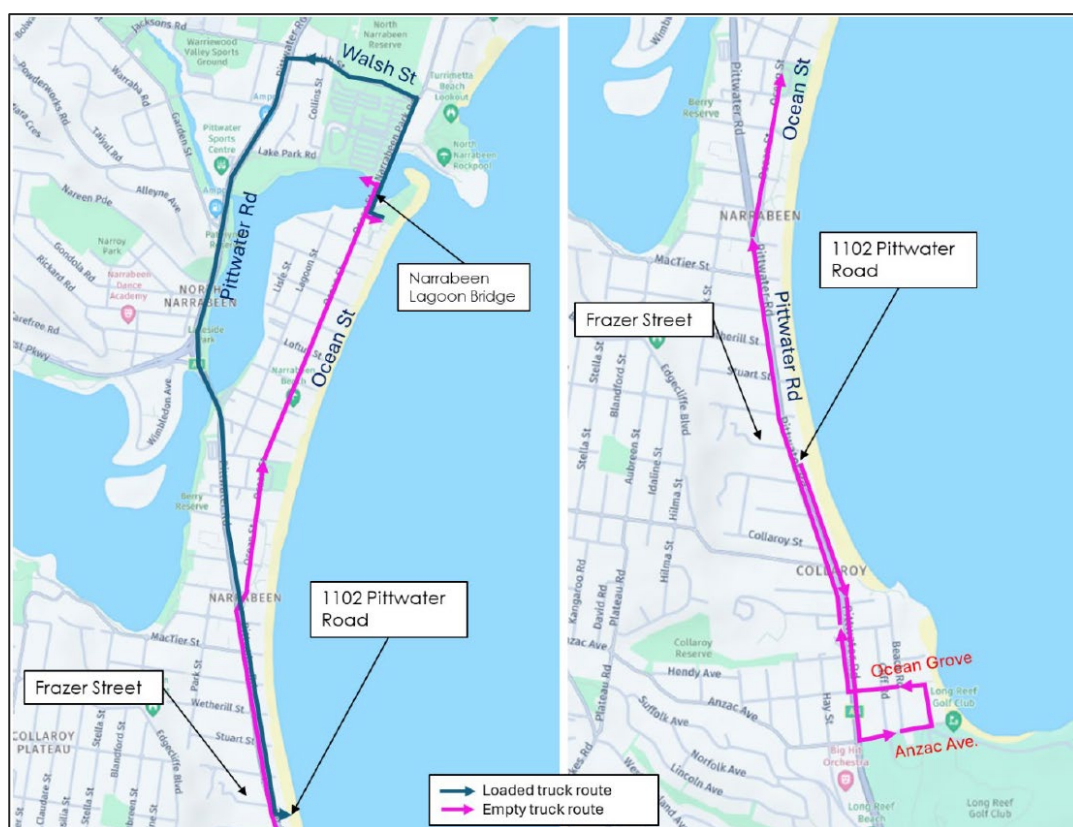


Figure 6-15 Alternative truck haulage route to Collaroy Beach Reserve (source: TTPP, 2025)

Truck Layover Area

Based on previous experience, it was found that a truck layover area was required due to the ability to only unload one truck at a time. Therefore, trucks are to use a truck layover area (on the haulage route) if there is waiting required before access the beach front at Mactier Street is available (or Collaroy Beach Reserve).

An appropriate truck layover area has been identified on the southern side of Walsh Street between Narrabeen Park Parade and Collins Street. At this location, Walsh Street is approximately 11m wide with plenty of on-street parking available and no adjacent residences. It is recommended that additional signage be provided to inform truck and other road users to use caution in this area. If a temporary truck zone is required on Walsh Street, an application for the truck zone will be submitted to Council for approval.

No trucks are permitted to wait on Pittwater Road in the bus lane just prior to Mactier Street, as Pittwater Road is a state road with high traffic volumes and regular bus services.

Mactier Street Work Area

Parking would be adversely impacted in the Mactier Street work area for the duration of construction. Signage will be provided for the designated unloading area on Mactier Street to advise the public not to park within the work area during the clearance period. Neighbouring properties will be notified by letter to inform residents of the works in Mactier Street and the temporary change of parking controls. The site manager to liaise with Council Ranger to enforce temporary work zones.

Construction Traffic Impact Assessment

It is anticipated that up to 30,000m³ of sand would be excavated and transported from Narrabeen Lagoon to Collaroy-Narrabeen Beach. A similar sized transportation truck (12 tonne bogie tipper truck) would be used during the 2025 clearance works. This sized truck was used for haulage during the 2023 clearance works.

It is estimated that approximately 4,900 laden truck movements would be required to transport 30,000m³ of sand during the clearance works. Assuming the scheduled duration of 14 weeks (77 full working days), this equates to approximately 60 - 65 laden truck movements per weekday or an average of six laden truck movements per hour. However, it is noted that efficiency and productivity can be improved through additional truck movements per day and thus enable completion of works within a shorter timeframe, which has potential to result in up to around 120 truck movements per day. Around 300m² of sand would also be transported to Lake Reserve for the minor nourishment works, travelling via Ocean Street, Malcolm Street and Lagoon Street, translating into a total of approximately 48 truck movements. Alternatively, the material for Lake Reserve could be transferred via a floating pipeline and a fluidised pump arrangement, or via barge.

Based on a review of the existing traffic volumes on the road network, the impact assessment in the TMP (TTPP, 2025) concluded that there was sufficient volume in the road network to accommodate the construction vehicle movements.

Temporary fencing would be used around the construction compound and works site perimeter providing separation between the construction site and the footpath. Pedestrian movements on the footpath along the site frontages would be maintained at all stages. Site personnel would assist construction vehicles as they arrive or depart the site to manage safe vehicle interactions with pedestrians. Pedestrians would have right of way at all times.

Pedestrian access to Collaroy-Narrabeen Beach would also be disrupted due to fencing of the works area. However, there are other alternative accessways that pedestrians could use to divert around the beach placement area.

Nearby cycling activity would not be impacted by the proposed construction works.

Access to the subject site and neighbouring sites by emergency vehicles would not be affected by the works as the roads and footpath would be unaffected. Emergency protocols on the site would include a requirement for site personnel to assist with emergency access from the street.

Liaison would be maintained with police and emergency services agencies throughout the construction period and a 24-hour contact would be made available for 'out-of-hours' emergencies and access.

There would be no impact on access for emergency vehicles to neighbouring properties as a result of the proposed construction activities.

Navigation Impacts

Swimmers, vessels and small water craft would not be permitted to transit the works area during the construction phase, with access prohibited from the upstream extent of the works area to the lagoon entrance. This would be a short term impact on waterway users for the duration of the works only.

There would be no adverse impacts on traffic, navigation or access in the operational phase. The entrance clearance works would have a short to medium-term benefit for vessels and small watercraft navigating

the entrance channel through improved under-keel clearance. There would also be improved beach volume at the Lake Reserve beach and at the sand placement area on Collaroy-Narrabeen Beach, providing a medium term improvement in access along the beach and from the beach accessways to the water for beach users. However, there would be a slight change to navigation arising from the minor nourishment works where boats may normally travel close to the southern bank. As is currently the case, any vessels navigating this area would need to be aware of changes in condition.

6.4.3 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise the potential impacts of the proposal on traffic, navigation and access:

- TA1 – The Contractor would prepare a TMP based on their proposed construction methodology and program and in accordance with the TMP and accompanying Traffic Guidance Schemes (TTPP, 2025) included as Appendix B to this REF. The Contractors TMP would be subject to review and approval to Council prior to commencement of works and would be implemented as part of the CEMP. Monitoring in the form of weekly inspections of construction vehicle activities would be undertaken to monitor conformance with the TMP, focussing on:
 - Safe movement of traffic and pedestrians,
 - Signage and barriers are clearly visible,
 - Construction roads support safe working and driving,
 - Safety of persons and property in and around the work sites.

Traffic will be monitoring on the road network, including construction vehicle movements entering and departing the work site.

- TA2 – All construction personnel and subcontractors working on-site will undergo a site inspection, which will include the routes to/from the site, on-street parking, and other requirements of the TMP.
- TA3 - Council will seek a relaxation of the three tonne load limit on Walsh Street from the Traffic Management Committee to enable trucks to use this route during construction.
- TA4 - The community engagement plan would be prepared and implemented as specified in **Section 6.8.3**. In the event the additional clearance area is to be excavated and the volume of truck movements and/or duration of construction is increased, prior notification would also be provided to the community.
- TA5 - All construction vehicles will enter and exit the site in a forward direction, and all loading/unloading shall be undertaken on-site during the approved work hours. Construction vehicles shall radio/call the site office on approach to the site to ensure that space is available within the site loading area. The queuing or marshalling of construction vehicles shall not be permitted on public roads other than at the approved layover area. Other protocols would be in place to ensure:
 - site inductions are implemented for construction workers,
 - heavy vehicle drivers shall adhere to the nominated transport routes,
 - heavy vehicle drivers and construction workers are aware of pedestrians and cyclists in the vicinity of the site,
 - drivers shall be aware of the existing sign posted speed limits.
- TA6 - All loaded trucks arriving at and departing from the work areas are required to have an effective cover over their load for the duration of the journey. The load cover may be removed only upon arrival at the destination. Care must be taken to ensure that all loose debris from vehicles and wheels are

removed prior to exiting the work areas. Street sweepers will be used where required. Any sand tracked onto the road shall be removed as soon as is practicable.

- TA7 - Signage will be erected notifying the public of parking changes in the affected locations.
- TA8 - Trucks are not permitted to park in side streets where they will block access for local residents.
- TA9 - Where possible, truck operators should not use engine brakes near residences areas. All trucks must be fitted with audible reversing alarms. However, to minimise disturbance to neighbouring residents, reversing should be minimised on site where possible.
- TA10 - The works areas will be fenced to prohibit public access during construction.
- TA11 - Where access for pedestrians or cyclists is impacted, suitable alternative, safe access will be provided.
- TA12 - Where possible, public access to the waterway and for navigation is to be maintained during the works.
- TA13 - Appropriate signage will be provided to notify waterway users of the exclusion area during construction.
- TA14 - Liaison would be maintained with police and emergency services agencies throughout the construction period and a 24-hour contact would be made available for 'out-of-hours' emergencies and access.

6.5 Biodiversity

This chapter summarises the outcomes of the biodiversity impact assessment undertaken by H2O Consulting.

6.5.1 Methodology

The methodology adopted by H2O Consulting is summarised below.

Threatened Species Searches

Relevant databases were searched during March 2025, applying a ~10 km radius around the project area to identify threatened biodiversity, migratory species and MNES that may potentially occur in the Narrabeen locality around the project area. The following databases and information sources were searched:

- Bionet Atlas of NSW Wildlife (last 20 years) (NSW Environment and Heritage, 2025);
- NSW DPI Fisheries Threatened Species Lists (NSW DPI, 2025a);
- EPBC Act Protected Matters Report tool (DCCEEW, 2025); and
- Atlas of Living Australia (FM Act listings only) (ALA, 2025).

Threatened Species Assessment

The threatened species assessment was undertaken by desktop review of 'sightings', assessment of the habitat in the study area, and determining the likelihood of occurrence of each species using the criteria outlined in **Table 6-5**. Species considered further were those in the 'Known', 'High' and 'Moderate' categories and where impacts on the species from the proposed works are considered to possibly or likely occur. For those species with a moderate or higher likelihood of occurrence within the study area, which have potential of being impacted were identified for further assessment through a 5 / 7 Part Test and/or Impact Assessment criteria.

Table 6-5 Likelihood of occurrence criteria

Likelihood of occurrence	Criteria
Known	<ul style="list-style-type: none"> The species was observed within the study area. The species is known to inhabit the study area.
High	<ul style="list-style-type: none"> It is likely that the species utilises habitat or resources that are abundant or in good condition within the study area. The species is known or likely to visit the study area during regular seasonal movements or migrations.
Moderate	<ul style="list-style-type: none"> The species has infrequently been recorded previously in the Study Area or similar habitats in the locality. The study area contains potential marginal and/or modified habitat and resources for the species, which it may occasionally utilise. The species is unlikely to maintain sedentary populations but may seasonally use resources within the study area opportunistically or during migrations.
Low	<ul style="list-style-type: none"> The species has not been recorded previously in the study area or similar habitats in the locality. The study area is beyond the current distribution range of the species. If present in the study area the species would likely be a transient visitor. The study area contains only very marginal habitat for the species, which would not be relied upon for its on-going local existence.
Unlikely	<ul style="list-style-type: none"> The species is highly restricted to certain geographical areas not including the study area. The habitat within the study area is unsuitable for the species.

Existing Ecological Mapping

Mapping of existing ecological features important to this assessment was reviewed using the following tools:

- Fisheries NSW Spatial Data Portal – Mapping of Estuarine Macrophytes, Aquaculture, Marine Protected Areas, Key Fish Habitats and Resilience and Hazards SEPP layers (NSW DPI, 2025b);
- NSW DPI Estuarine Habitat Dashboard (NSW DPI, 2025c);
- Various recent aerial imagery captures (Nearmap 2024 and 2025); and
- Habitat mapping data collected in the lower Narrabeen Lagoon during previous investigations for clearance works, including seagrass habitat mapping (H2O Consulting Group, 2023).

A review of the potential environmental constraints identified via these maps was undertaken. These data sources were also considered in developing habitat maps.

Site Investigations

Site investigations were undertaken by H2O Consulting on 6 February 2025. The site investigations included survey and visual inspection of the seabed throughout the project area and surrounding benthic, subtidal, intertidal and shoreline habitats within the study area (i.e. including a 50-60 m buffer around the proposed clearance areas located on the east and west side of Ocean Street Bridge, the minor nourishment area, and the placement areas at Collaroy-Narrabeen Beach). The site survey was undertaken on the 5

February 2025 on a rising tide (1.4 m High Tide at 236 PM) with the lagoon open and a low to moderate water level during the survey. Data recorded during investigations included:

- Inspection and description of general habitat within and adjacent to the proposal footprint;
- Description of intertidal flora and fauna present;
- Description of subtidal flora and fauna present;
- Opportunistic, diurnal observations of marine fauna including marine birds; and
- Verification and mapping of macrophytes (e.g. seagrasses).

Site investigations included surveys of benthic habitat to identify and map any seagrasses or other sensitive communities; for example, macroalgae. Verification of seabed habitat was conducted using a combination of in situ measurements from known fixed points using a differential GPS receiver, with 30-70 cm accuracy, and visual observations using a snorkel mask or bathyscope.

Habitat Mapping

Habitat mapping focused on marine vegetation within the study area. Existing ecological habitat mapping and recent aerial imagery were verified in situ with visual snorkeller and wader observations. Data collected included:

- Habitat Type (seagrass, soft sediment, rock/reef/rubble, macroalgae, wrack);
- Seagrass Bed Species Composition (*Zostera* sp., *Halophila* sp., and *Zostera/ Halophila* (mixed));
- Seagrass Density, including recording of low, medium and high as per King and Barclay (1986, refer **Table 6-6**); and
- Macroalgae Types, with care to record occurrences of *Caulerpa taxifolia*.

Field survey effort inside the study area consisted of collection of in situ verification points to inform and update mapping, collected using differential GPS (DGPS) (with a typical accuracy or <10 cm) and a customised GIS-based form within the Field Maps Application. Data was imported into GIS-based mapping software and created into shapefiles and polygons based on interpretation of the following data sources:

- In situ habitat verification data;
- Existing seagrass distribution mapping in Narrabeen Lagoon (H2O Consulting Group, 2023);
- Existing estuarine macrophyte mapping (NSW DPI, 2025b); and
- Recent aerial imagery (Nearmap, 2025).

Table 6-6 Density and patchiness categories for seagrass (after: King and Barclay, 1986)

Attribute	Description
Density	
Low	Sparse growth, up to 15% cover
Medium	Moderate growth, 15 – 50% cover
High	Abundant growth, greater than 50% cover
Patchiness	
Clumps	Individual strands or clumps (less than 1 m ²)
Patches	Patches of between 1 and 5 m ²
Beds	An area of relatively continuous seagrass greater than 5 m ²

Limitations

Fauna surveys included an assessment of habitat values present within the study area and was limited to observations of seasonal species present at the time of survey. Habitat assessments are conservative, defaulting to assume presence where there is insufficient knowledge to determine otherwise.

Numerous threatened species of fauna are seasonal in geographical distribution and/or may be transient in nature. For instance, some migratory bird species may be seen only at certain times of the year as they migrate to more significant nearby sites, while other fauna are only present during certain seasons (e.g. migration patterns or seasons).

The density and coverage of seagrass will change seasonally and/or in response to weather events. Weather events that result in high levels of sediment mobilisation and subsequent sedimentation may smother and cover shorter seagrasses such as *Zostera* beds. Seagrass may increase in coverage during summer months and retract in coverage and density during winter months.

This impact assessment is limited to aquatic flora and fauna (including marine birds and shorebirds). Additional habitat descriptions of terrestrial/shoreline vegetation communities have been provided and general recommendations provided. However, this assessment does not include for detailed impact assessment of terrestrial biodiversity values.

6.5.2 Existing Environment

There are no biodiversity stewardship sites or Areas of Outstanding Biodiversity Value located within the proposal footprint. A review of the Biodiversity Values (BV) Map shows BV mapped land on the beach located on the northern shoreline west of the bridge and portion of the entrance channel east of the bridge, both of which are classified as biodiverse riparian land.

Threatened Biodiversity and MNES

Searches of the Bionet database identified sightings data for 58 listings relevant under the BC and EPBC Acts within a ~10 km radius of the project area (refer **Figure 6-17**). These included:

- 48 threatened marine birds and/or shorebirds;
- Five threatened marine mammals; and
- Five threatened marine reptiles.

Review of threatened species listings under the FM Act that may occur in the study area, or wider locality (catchment or adjacent waters), identified the following listings relevant to this study (marine or estuarine waters within 10 km of the study area; see **Figure 6-16**):

- Four threatened sharks and rays; and
- Three threatened fish.

The EPBC Protected Matters Search Tool report identified the following MNES relevant to this study (i.e. marine/estuarine species or those that use marine/estuarine habitat) within ~10 km radius of the Study Area (**Appendix F**):

- 43 listed threatened species;
- 58 listed migratory species; and
- Two Threatened Ecological Communities (TECs).

Of the Commonwealth listed threatened and/or migratory species and communities, the following were identified for consideration as part of this assessment:

- 49 marine birds and shorebirds;
- Eight marine mammals;
- Five marine turtles;
- Nine sharks and rays;
- Six fish;
- One invertebrate; and
- Two TECs.

In addition to the above, the EPBC Protected Matters Search Tool identified 83 protected marine species that include certain species of fish, along with some marine birds, reptiles and mammals. A total of 15 marine mammals were identified as part of protected listings for cetaceans (**Appendix F**).

In total 72 marine birds and shorebirds (including waders), 11 marine mammals, five marine reptiles, nine sharks and rays, seven fish, one invertebrate and two TECs which are considered threatened and/or migratory species were identified to require further consideration.

A summary of the threatened and migratory species considered as part of this assessment, along with consideration of their likelihood of occurrence, is provided in **Appendix G**. Those species that have a moderate or higher likelihood of occurrence in the locality and potential to be impacted by the proposal are listed in **Table 6-7**.

Table 6-7 Threatened species that may potentially be impacted by the proposal (source: H2O Consulting)

Species name	Statutory listing*		No. records	Likelihood of occurrence
	BC Act	EPBC Act		
<i>Ardenna pacifica</i> (Wedge-tailed Shearwater)	P	MA, MI, J	13	Moderate
<i>Ardenna tenuirostris</i> (Short-tailed Shearwater)	P	MA, MI, C, J, K	74	High
<i>Calidris acuminata</i> (Sharp-tailed Sandpiper)	P	MA, MI, C, J, K, B	6	Moderate
<i>Calidris ferruginea</i> (Curlew Sandpiper)	CE, P	CE, MA, MI, C, J, K, B	3	Moderate
<i>Haematopus fuliginosus</i> (Sooty Oystercatcher)	V, P	-	17	Moderate
<i>Haematopus longirostris</i> (Pied Oystercatcher)	E, P	-	2	Known
<i>Haliaeetus leucogaster</i> (White-bellied Sea-eagle)	V, p	-	74	Moderate
<i>Limosa lapponica</i> (Bar-tailed Godwit)	P	MA, MI, C, J, K, B	11	Moderate
<i>Pandion cristatus</i> (Eastern Osprey)	E, P	-	53	Moderate
<i>Chelonia mydas</i> (Green Turtle)	V, P	V, MA, MI	25	Moderate

*Key: P = Protected, V = Vulnerable, E = Endangered, CE = Critically Endangered, MA = Marine, MI = Migratory, C = CAMBA, J = JAMBA, K = ROKAMBA

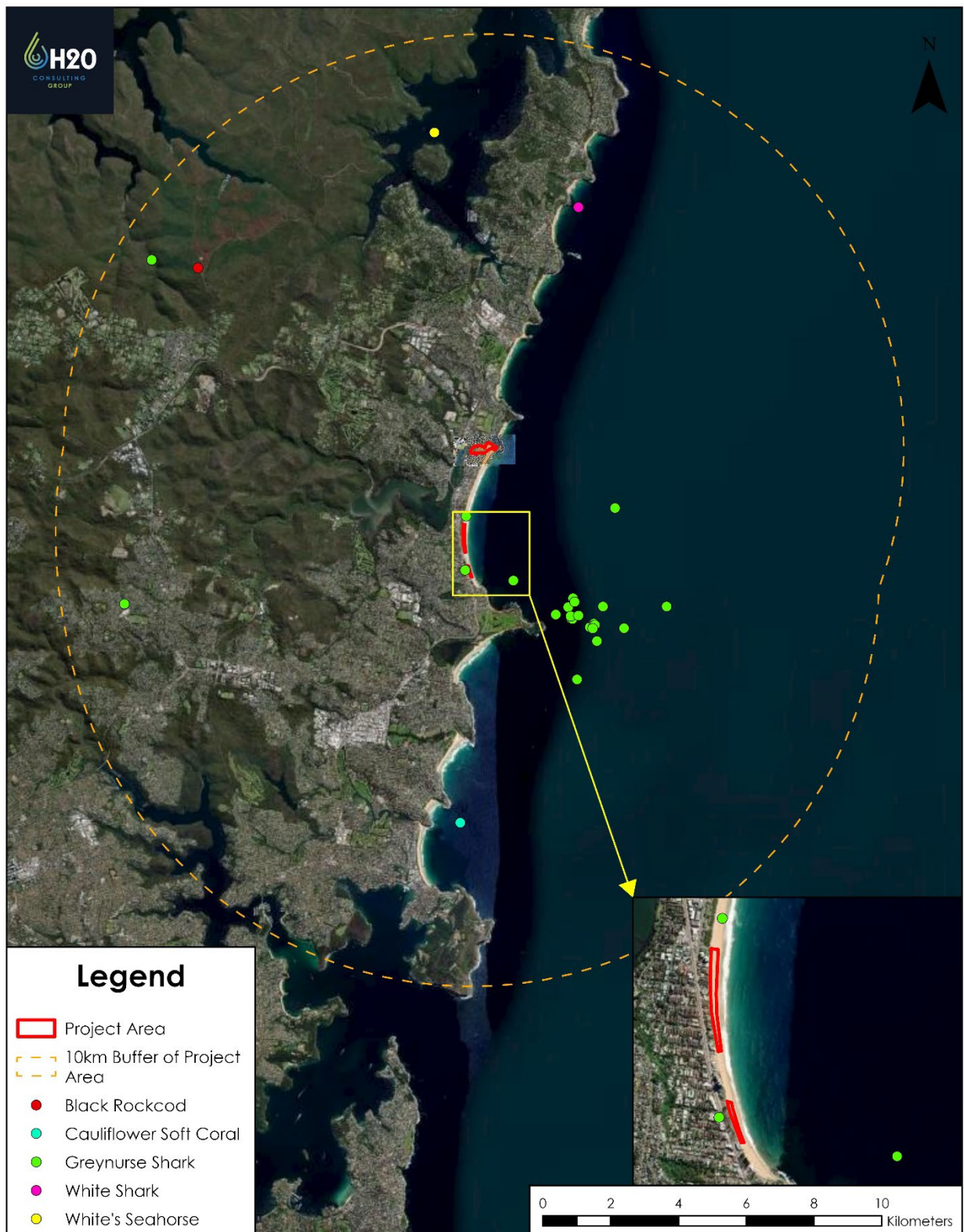


Figure 6-16 ALA sightings of threatened species listed under the FM Act within 10 km of the study area (source: H2O Consulting)

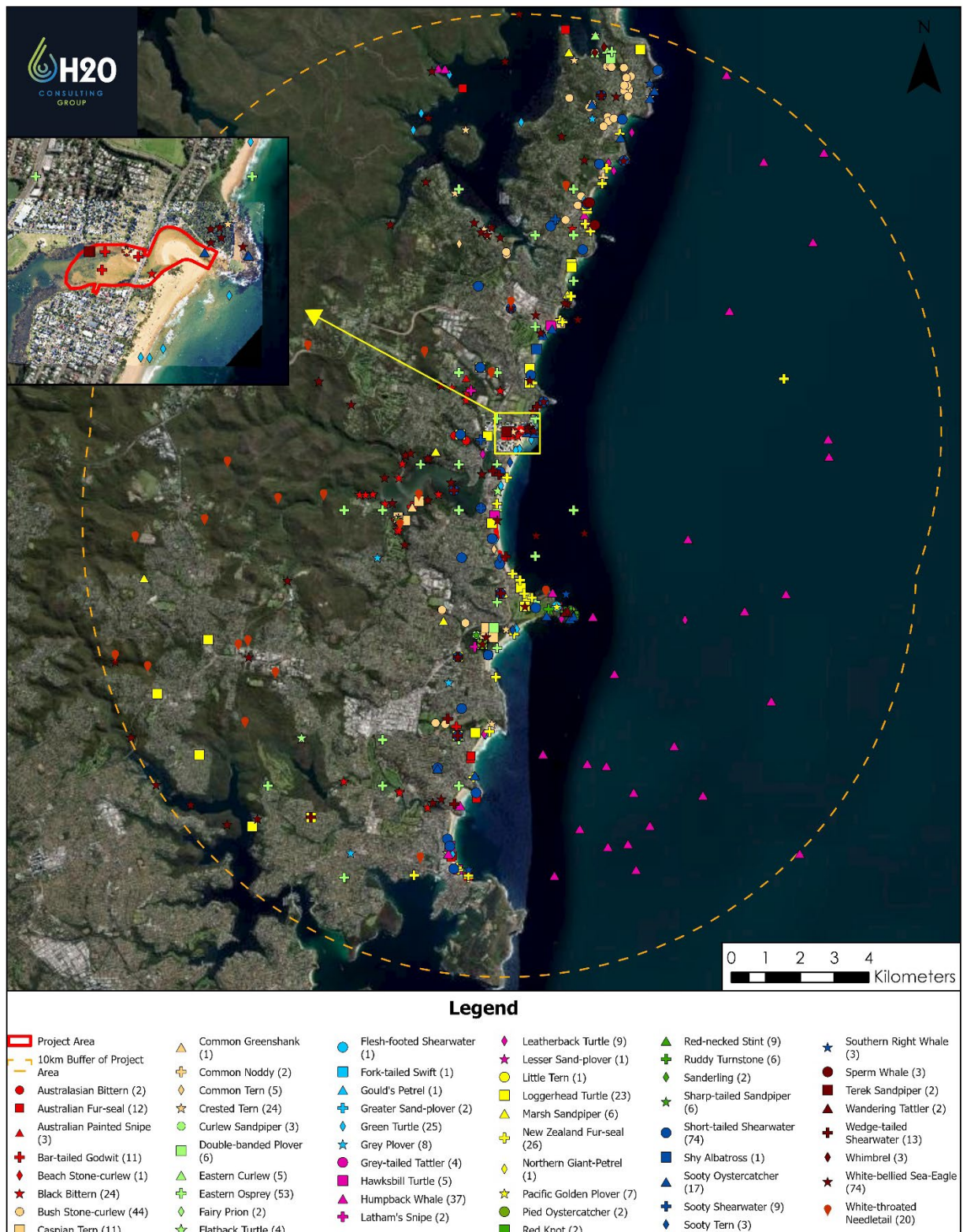


Figure 6-17 Bionet sightings of threatened species listed under the BC Act within 10 km of the study area (source: H2O Consulting)

Existing Ecological Mapping and Aerial Imagery

Existing mapping of estuarine macrophytes by NSW DPI (2025b) conducted in 2010 identified extensive *Zostera* sp. seagrass beds throughout the entire Narrabeen Lagoon, with fringing beds present within the study area and adjacent areas to the west. Fringing beds are mapped along the northern shoreline, to the west of Ocean Street bridge, adjacent to Lakeside Park. Two small fringing beds are also mapped on the southern shoreline, directly west of Ocean Street bridge, with a large, extensive bed mapped along the western boundary of the study area that extends along the shore further upstream and outside of the study area.

The Endangered *Posidonia australis* seagrass Population and Endangered Ecological Community (EEC) do not occur within Narrabeen Lagoon.

NSW DPI mapping (2025b) also indicates isolated stands of saltmarsh and mangroves occur along the shorelines of Narrabeen Lagoon; however, these are mapped outside and upstream of the project footprint.

Estuarine habitat mapping conducted by H2O Consulting Group in 2023 identified a similar distribution of seagrasses within the lagoon. High and medium density beds of *Zostera* sp. were identified along the northern shoreline adjacent to Lakeside Park, all of which was outside of the previous clearance area. The eastern-most extent of these fringing beds extended adjacent to Lakeside Park carpark. On the southern shoreline, directly west of the Ocean Street bridge, habitat supported high, medium and low-density *Z. capricorni* beds reflective of NSW DPI mapping. Seagrass beds along the remaining southern shoreline in the study area were slightly different to those captured in NSW DPI 2010 mapping. High and medium density beds were present along the entire shoreline from the end of Lagoon Street extending west, with some isolated fringing beds further into the centre of the lagoon channel, but outside of the clearance area. Two small mangroves were also identified mid-way along the southern shoreline in the study area.

The nearest Marine Protected Area (MPA) to the proposal is the Narrabeen Head Aquatic Reserve, located off Narrabeen Headland, the MPA stretches north from North Narrabeen Rockpool to south Turrimetta Beach, approximately 150 m from the eastern extent of the clearance area. At times when Narrabeen Lagoon is open, water may flow out of the lagoon entrance into the reserve.

Currently, no aquaculture leases or commercial fisheries exist inside Narrabeen Lagoon (NSW DPI, 2023b).

The entirety of tidal areas within the study area are identified as Key Fish Habitat (KFH). Narrabeen Lagoon is considered to be Type 2 – Moderately Sensitive KFH, based on it being a lagoon that is subject to artificial opening. Seagrass beds in the lagoon that are greater than 5 m² in size are classified as Type 1 – Highly sensitive KFH (Fairfull, 2013).

Description of Habitat and Biota

Lagoon Intertidal Habitats

Intertidal habitat within the proposal area comprises natural sandy shorelines vegetated by macrophytes, the shallow sand flat in the centre of the lagoon and artificial habitats including rock armouring, stone seawalls and the Ocean Street bridge abutments.

Intertidal habitat along the northern shoreline, from the western side of Ocean Street bridge to the eastern end of the Lakeside Park carpark predominantly comprises of soft, sandy sediment with a small area of rock armouring directly adjacent to the western side of the bridge. Adjacent to the Lakeside Park carpark,

intertidal habitat comprises of a sandstone block seawall and small boat ramp, spanning west approximately 75 m, before intertidal habitat transitions back to natural soft sediments and occasional rocky rubble, which extends upstream. In this area west of the seawall, soft sediments along the high intertidal area are densely vegetated by beds of the estuarine macrophyte Common Reed (*Phragmites australis*), whilst a singular juvenile Grey Mangrove (*Avicennia marina*) was also observed approximately 15 m west of the study area (**Figure 6-18a**). Artificial hard substrata and occasional rocky rubble supported Sydney Rock Oysters (*Saccostrea glomerata*) (**Figure 6-18b**), assemblages of which continued into subtidal habitat as patchy oyster reef, whilst soft sediments support a high abundance of Sydney Mud Whelks (*Pyrazus ebeninus*).

Intertidal habitat along the southern shoreline within 100 m to the west of Ocean Street bridge comprises rock armouring and soft sediment vegetated by a dense bed of *P. australis*. Intertidal habitat along the remainder of the southern shoreline within the study area predominantly comprises of soft, sandy sediments with occasional stands of *P. australis*, Sea Rush (*Juncus kraussii*) and rocky rubble, whilst occasional small seawalls associated with individual properties provide hard substrata along the western edge of the study area. Fauna assemblages were reflective of those observed in intertidal habitat on the northern shore, including *S. glomerata* and *P. ebeninus*. Four juvenile *A. marina* trees were observed in the mid intertidal zone approximately 265 m west of Ocean Street bridge. In the middle of the lagoon, the sand flat provides a large area of shallow, soft, sandy sediment with exposed areas of sand during low tide (**Figure 6-18d**). The intertidal flat was observed being used as foraging and refuge habitat by shorebirds during low tide.

On the eastern side of Ocean Street bridge, intertidal habitat comprises a mix of sandy soft sediments along the southern and eastern shores, whilst the seawall, bridge abutment and rock armouring provide artificial hard substrata along the western and northern shore (**Figure 6-18e and f**). Mid to low intertidal areas along the seawall, footings and rock armouring supported common invertebrate species including the sessile *S. glomerata* and the mobile Striped-mouth Conniwink (*Bembicium nanum*).



Figure 6-18 Typical intertidal habitat in the study area (Images: H2O Consulting, 2025)

Lagoon Subtidal Habitats

Subtidal habitat within the study area consists of a shallow seabed, with some deeper, moderately sloping areas in the western portion associated with the natural tidal channel. Bed substrate is dominated by soft sandy sediments, with some areas of silt, gravel and rubble, whilst rock revetment and abutments provide some artificial habitat, largely confined to the eastern side of the bridge. Subtidal habitat within the proposed clearance area footprint was largely unvegetated, consisting of the very shallow sand flat west of the bridge (**Figure 6-19b**). Along the western edge of the sand flat, where the seabed is slightly deeper, a large volume of wrack has accumulated, predominantly comprised of dead Kelp (*Ecklonia radiata*) and

Strap Caulerpa (*Caulerpa filiformis*). Macroalgae and seagrass wrack was also observed sporadically across much of the study area site in low densities.

Shallow subtidal habitat along the northern shoreline within the western extent of the study area supported extensive fringing seagrass beds of *Zostera* sp., with areas of low, medium and high-density growth (**Figure 6-19a**). The main seagrass bed extends approximately 55 m from shore over 100 m along the shoreline, towards the centre of the lagoon commencing directly west of the boat ramp and continuing west of the study area boundary (**Figure 3-1**). In shallow subtidal areas mid-way along the shoreline edge of the bed, rocky rubble supported ~120 m² of patchy oyster reef (*S. glomerata*). Two smaller fringing seagrass beds are also present adjacent to the Lakeside Park seawall, whilst a small, isolated patch of low-density *Halophila* sp. was observed close to shore approximately 30 m east of the seawall (**Figure 6-19b**).

To the west of the bridge along the southern shoreline, fringing *Zostera* sp. seagrass beds are also present, with a large high-density bed in the southeast corner of the lagoon, directly west of the bridge. This bed continues for ~100 m of the southern shoreline and is ~33 m wide at its widest point, with a few small areas of patchy oyster reef in the middle of the bed. Low to moderate density *Zostera* sp. patches and small beds are dotted along the southern shoreline and shallow subtidal channels extending west ~350 m from the bridge, with some occasional macroalgae growth associated with rocky rubble (**Figure 6-18c**). Along the southern shoreline, close to the study areas western boundary, a ~55 m stretch of low-density mixed *Zostera* sp. and *Halophila* sp. is present in shallow subtidal habitat. West of this bed and along the western boundary of the study area where the seabed becomes slightly deeper, moderate-density seagrass beds extend up to 95 m towards the lagoon centre, mixed with occasional macroalgae stands of Dead Man's Fingers (*Codium fragile*).

Benthic habitat to the east of the Ocean Street bridge consists of soft sandy sediment, bioturbated in parts, with large ballast rocks in deeper areas on the northern side of the creek associated with the rocky revetment along Ocean Street. Rocks provide habitat for dense assemblages of *S. glomerata* and Gulfweed (*Sargassum* sp.) (**Figure 6-18d**). Seagrass and macroalgae wrack and debris was observed ~60 m east of the Ocean Street bridge however, no seagrass was found to occur east of the bridge during this survey.

The seagrass beds and armour rocks formed protective habitats supporting a diversity of less cryptic fish that were observed to include Yellowfin Bream (*Acanthopagrus australis*), Dusky Flathead (*Platycephalus fuscus*), Common Toadfish (*Tetractenos hamiltoni*), Sand Whiting (*Sillago ciliata*) and small schooling fish.

Key Fish Habitat

The seagrass beds >5 m² that were mapped to occur within the study area are considered Type 1 – Highly sensitive KFH. These are located outside of the clearance footprint.

Seagrass patches <5 m² in size, macroalgae stands, mangroves and the remaining habitat within the lagoon (as an ICOLL) is considered as Type 2 – Moderately sensitive KFH.

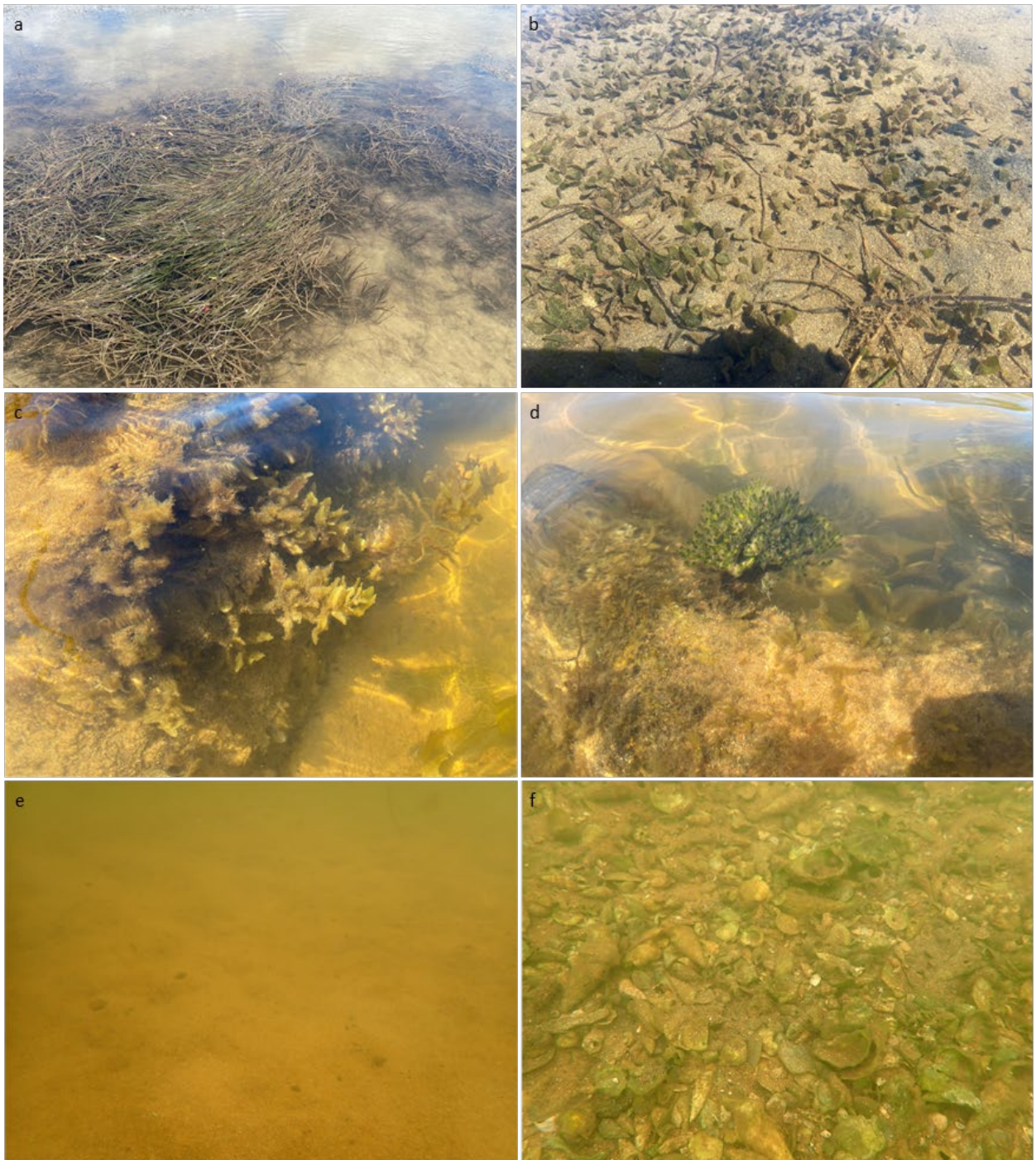


Figure 6-19 Typical subtidal habitat in the study area (Images: H2O Consulting, 2025)

Lagoon Supratidal Areas

The stockpiling and dewatering site at the base of the Birdwood Park sand dune, at the entrance of Narrabeen Lagoon, is a moderately-sized vegetated sand dune. The sand dune was vegetated by common coastal dune vegetation occurred on some foredunes including Hairy Spinifex (*Spinifex hirsutus*), Pennywort (*Hydrocotyle bonariensis*) and Guinea Flower (*Hibbertia scandens*), with some larger shrubs on the inner side of the dune, such as Coastal Wattle (*Acacia sophorae*). The sand flat stretched from the

northern end of the dune around to the beach front, providing some soft sediment intertidal habitat on the shore of the lagoon.

Collaroy-Narrabeen Beach Placement Area

Shoreline habitat along Collaroy-Narrabeen Beach comprises a moderately sloping beach face, with steeply sloping foredunes. Sections of the foredune showed evidence of erosion, with sandstone armour rock and exposed seawalls in sections. The top of the foredune was vegetated by the saltmarsh species Pigface (*Carpobrotus glaucescens*), as well as other common dune species such as Dune Pennywort (*Hydrocotyle bonariensis*) and Gazania (*Gazania linearis*). The lower foredune and beach face comprises soft, clean marine sands with occasional gravel and shell debris.

Lake Reserve

The NSW State Type Vegetation Mapping (C2.0.M2.1 (November 2024)) does not map any Plant Community Types in Lake Reserve.

Habitat within the Lagoon Street Reserve minor nourishment area is predominantly represented by unvegetated, soft, sandy sediment, with a small accumulation of rocky rubble along the shoreline of the reserve. Rocky rubble supports two areas with macroalgal growth, dominated by *C. fragile* with occasional low-density *Sargassum* sp. A small bed (30 m²) of medium-density *Zostera* is present within approximately 2 m of the outer western edge of the minor nourishment area.

Collaroy Beach Reserve

The NSW State Type Vegetation Mapping (C2.0.M2.1 (November 2024)) does not map any Plant Community Types in Collaroy Beach Reserve. As at March 2025, works that ongoing in the reserve have disturbed the site.

6.5.3 Potential Impacts

Sand clearance activities (excavation or dredging) can have significant impacts on benthic marine organisms, particularly phototrophic macrophytes (e.g. seagrasses) and fauna of limited mobility living in seabed sediment (e.g. infauna such as worms and bivalves) (Fraser et al., 2017). Such disturbances may occur through mechanisms such as direct removal for those situated on/in sediments to be dredged, and excessive sedimentation and reduction in light availability as a result of increased mobilisation and suspension of sediments during dredging.

The *Guidelines for Aquatic Ecology in Environmental Impact Assessment* (Lincoln Smith, 2003) identifies that environmental disturbances to aquatic ecology can be categorised in terms of potential physical, chemical and biological effects, which allows for the nature of impacts and their likely magnitude to be assessed. More recently, research on impacts to marine fauna has had increased focus on behavioural impacts as a result of additional sources of disturbance such as underwater noise (Erbe, 2012) and light (Tidau, 2021).

A summary of potential impacts on aquatic habitat and biota is provided in **Table 6-8**. Further discussion on potential impacts to sensitive habitats and species is provided below. The proposal is not expected to trigger any habitat offset requirements for marine species under the BC Act.

There is also potential to damage trees located in Lake Reserve.

Table 6-8 Potential aquatic ecological impacts associated with the proposal

Impact	Likelihood	Description
Physical impacts		
Removal or modification of Key Fish Habitat	Known	Unvegetated shoaling sands that have accumulated in the lagoon entrance channel, and accumulations of macroalgae and seagrass wrack will be removed. Habitat within the clearance area comprises Type 2 – Moderately Sensitive KFH. Sandy habitat and some macroalgae stands in the minor nourishment area will be modified during placement. Habitat within the minor nourishment area comprises Type 2 – Moderately Sensitive KFH, including some marine macroalgae.
Removal or loss of marine vegetation	Known	<p>Live marine vegetation does not occur within the clearance footprint. An estimated 2,800 m³ of macroalgae wrack is present along the western side of the dredge area, which will need to be removed to facilitate works. The dredge area has been offset a minimum of 10 m from all seagrasses.</p> <p>Approximately 90 m² of marine macroalgae will be smothered by sand placement in the minor nourishment area. A 30 m² medium density bed of <i>Zostera</i> is also present within 2 m of the outer western boundary of this area. There is potential for some indirect impacts as a result of edge effects from sedimentation and increased turbidity on all seagrasses within 10 m of sand placement.</p>
Disturbance to a threatened ecological community or population	Unlikely	The proposed dredging activities are unlikely to have the potential to result in removal or loss of any TEC or population. The Endangered EEC and Population of <i>P. australis</i> does not occur within Narrabeen Lagoon.
Disturbance to a threatened or migratory species or their habitat	Likely	Threatened species that are likely to have important habitat within the lagoon or Collaroy-Narrabeen Beach were found to be limited to shorebirds and marine birds. The removal of shallow shoaling sediments that form large sand flats has potential for short term reductions in availability of foraging habitat in the lower reaches of the lagoon for some of these species, until such time that the shoal re-forms.
Physical disturbance to marine fauna and flora	Known	Dredging works will result in physical disturbance to epibenthic organisms (sessile invertebrates) and benthic infauna inhabiting the sediments to be removed and the associated wrack. Invertebrates or macroalgae stands within the minor nourishment area may also be smothered or experience habitat disturbance during and following the placement of sand.
Barriers to fish passage	None	The works are not expected to result in any permanent barriers to fish passage, whilst the lower sections of the lagoon do not maintain permanent connectivity with the ocean. Silt curtains may be temporarily installed to minimise potential disturbances to seagrass beds, however, are expected to still allow for fish passage.
Injury caused by ingestion of, or entanglement in, harmful marine debris	Possible	Materials used during construction work that are not contained or disposed of correctly have potential to find their way into the water and be ingested by marine fauna. Dredging has potential to mobilise any marine debris that has accumulated amongst sediments or wrack.

Impact	Likelihood	Description
Potential for increased risk of vessel strike for marine fauna	Unlikely	The works are not expected to result in any notable or sustained increase in vessel movements as a result of the proposal that pose a risk to marine fauna that occupy waters at or near the surface.
Generation of noise resulting in injury	Unlikely	The level of underwater noise expected to be generated via the excavation or dredging machinery will be well below levels considered potentially harmful to marine fauna. Given this, the potential to produce levels of underwater noise capable of injury to marine fauna is negligible.
Chemical		
Changes in water quality	Likely	The clearance works, including dredging, dewatering and placement works are expected to result in elevated levels of turbidity within the lower lagoon for the duration of works. The works may also result in generation of 'foam' due to physical perturbation, similar to when foam naturally forms due to heavy surf. As the lagoon will remain closed during works, tidal flushing will not occur and any potential water quality issues occurring as a result of the work or from naturally occur processes may result in more prolonged disturbances to water quality compared to an open estuary subject to tidal exchange. Impacts to sensitive marine biota, including seagrasses, are proposed to be mitigated by the installation of silt curtains. Provided the mitigation measures in this REF are implement, water quality impacts associated the works are expected to be minor and are considered unlikely to impact estuarine biota.
Mobilisation of contaminants	Unlikely	The sediments present in the proposed dredge area are primarily comprised of clean, coarse marine sands that have historically been periodically dredged since the 1970s and are considered unlikely to contain contaminants.
Nutrication	Unlikely	The works are not expected to result in any nutrient-enriched inputs or mobilisation of significant amounts of nutrient-enriched sediments as the sediment to be dredged are typically clean marine sands that have accumulated since previous clearance works.
Biological		
Invasion or spread of non-native or invasive species	Possible	There is potential for the introduction of the aquatic weed <i>Caulerpa taxifolia</i> (or other aquatic pests or weeds) via construction machinery brought to the site for the works.
Introduction of disease or pathogens	Possible	No known diseases or pathogens have been identified in the Study Area that pose an environmental issue for marine fauna and flora. Dredging equipment, machinery or vessels that have been used in estuaries effected by White Spot Disease (Evans and Richmond Rivers) have potential to introduce the disease to the project area if proper cleaning has not been undertaken.
Behavioural		
Generation of underwater noise	Unlikely	The level of underwater noise associated with the entrance clearance works may result in some behavioural changes for fish and crustaceans who may move away from works area but are not expected to have any material behavioural impacts (e.g. on migratory marine species).

Potential Impacts to Estuarine Flora and Fauna

Seagrasses

Extensive fringing seagrass beds are present in shallow subtidal areas along the northern and southern shorelines of Narrabeen Lagoon, west of the Ocean Street Bridge. Seagrasses are susceptible to physical damage and removal during dredging activities, while sediment placement can smother and rapidly kill seagrass plants. The clearance area has been designed to avoid seagrass beds, with a minimum 10 m buffer from all seagrasses, thus no direct impacts to seagrass beds in Narrabeen Lagoon are expected from dredging. Additionally, the purpose of the proposed works is to remove shoaling sands rather than maintain a deeper navigational channel. Thus, there is minimal potential for dredging to result in physical disturbance to nearby seagrass via slumping of seabed sediment.

Seagrasses, particularly *Zostera* sp., are susceptible to changes in light availability and sedimentation (Kirkman and Kuo, 2012) that may arise from water quality disturbances during dredging and sand placement activities. Seagrass beds in proximity to dredging activities will likely experience reduced light availability and increased sedimentation and turbidity for the duration of dredging works, particularly those beds in closer proximity to the clearance area along the southern boundary. A bed (30 m²) of *Zostera* sp. is present within 2 m of the outer western boundary of the Lake Reserve minor nourishment area, noting the mapped footprint of these works represents a maximum possible extent and is likely to be smaller and therefore further away from the seagrass. Sand placement in this area has a high risk to disturb and/or damage adjacent seagrass beds as a result of sedimentation and/or settling of sediment outside of the nominated placement area and a localised reduction in water quality as a result of increased turbidity. There is potential at lessening magnitude that these disturbances may be evident up to 10 m from the edge of the placement area.

There is also some potential that seagrass beds may be disturbed during construction works from construction equipment, barge anchors (if used), landing of vessels (if used) and silt curtains. The *Zostera* genus is known to have a high capacity to re-establish from the natural seed bank (Waycott et al., 2004), with such spatial changes in coverage regularly observed in Botany Bay in Sydney's south (Niche, 2021). The distribution and density of seagrass beds may also change substantially between seasons or following high rainfall weather events (Waycott et al., 2014). Given the above, impacts to seagrass beds as a result of dredging and/or placement works and associated activities is likely to be limited to temporary and short-term disturbances. The implementation of suitable mitigation measures, where appropriate, will assist in minimising these impacts.

Marine birds, shorebirds and waders

Marine birds, shorebirds and waders regularly use the aerial, estuarine and terrestrial habitats associated with the Study Area to forage, rest or roost at times, with rare nesting events. Impacts on these birds that may occur due to dredging and sand placement may include short term disturbances to habitat quality relating to reduced water quality, lower prey abundances, construction noise and modification of some existing shoreline/foreshore foraging habitats. Such foraging habitat is well represented for these species in the upper reaches of Narrabeen Lagoon or the intertidal and wash zones of Narrabeen Beach, however, it is likely that these species may continue to use habitat within the area during works.

Threatened or migratory shorebirds and waders that have a moderate to high likelihood of occurrence in the area include:

- *Calidris acuminata* (Sharp-tailed Sandpiper);
- *Calidris ferruginea* (Curlew Sandpiper);
- *Haematopus fuliginosus* (Sooty Oystercatcher);
- *Haematopus longirostris* (Pied Oystercatcher); and
- *Limosa lapponica* (Bar-tailed Godwit).

Whilst Sooty Oystercatchers likely occur in the study area, the species utilises rocky shores and shelves for foraging and roosting and thus are considered unlikely to be impacted by entrance clearance works. The assessments of significance in **Appendix G** have considered potential foraging and roosting impacts on Threatened Wading Shorebirds in more detail.

A wide diversity of marine birds that forage along the NSW coastline are likely to also forage in habitat within the study area at times. These species are typically birds of flight that forage aerially over large areas of water along the coastline and at sea (SEWPAC, 2012). Species such as the Eastern Osprey (*Pandion cristatus*) and White-bellied Sea Eagle (*Haliaeetus leucogaster*) are known to frequent the area (Cardno, 2021; Bionet, 2025).

Threatened or migratory marine birds that have a moderate to high likelihood of occurrence in the study area include:

- *Ardenna pacifica* (Wedge-tailed Shearwater);
- *Ardenna tenuirostris* (Short-tailed Shearwater);
- *Haliaeetus leucogaster* (White-bellied Sea Eagle);
- *Pandion cristatus* (Eastern Osprey).

These shorebirds and raptors typically forage over the water and rely on detecting prey aerially (Billerman et al., 2020, DAW, 2020). In NSW Shearwaters predominately forage in offshore and coastal waters while the Eastern Osprey is expected to actively forage over estuarine habitats, however they will also forage over a range of habitats up to 3 km from their nest (NSW Scientific Committee, 2009). There is potential that reduced prey detection success from waters with elevated levels of turbidity may impact on some of the marine birds that forage as waders or aerially within or over the lagoon (Lunt and Smeeth, 2015), or due to a decrease in available prey as a result of disturbance from works. The potential for detrimental impacts to the water quality from the proposed works is considered to be generally minor in spatial extent considering the vast areas of coastal waters these marine birds may utilise for foraging; thus, it is highly unlikely that any disturbance effecting ability for aerial foraging would be of ecological significance for these species. There is, however, some potential that placement works may disturb shearwaters that have washed or being forced ashore during storm events.

The assessments of significance in **Appendix G** have considered potential impacts on threatened marine birds (shearwaters) in more detail. The assessments concluded that the proposal is not expected to significantly impact threatened shorebird or marine bird species.

Marine mammals

The works are limited to shallow areas within the Narrabeen Lagoon. It is unlikely that marine mammals such as dolphins and fur-seals would enter the shallow entrance channel of the lagoon. It is also expected to be rare for these species to occur in shallow waters between the shore and surf zone of Collaroy-Narrabeen Beach, while with any such occurrences is likely part of transient movements or an opportunistic pursuit of prey during periods of high tide. Given these species forage over very large areas

of the coastline and use of any habitat within the lagoon or placement areas is not expected, the proposal is not expected to have potential to impact on these species.

The potential for ecologically significant impacts on these species as a result of the proposed dredging clearance works, including the sand placement on Collaroy-Narrabeen Beach is considered minimal.

Marine reptiles

Marine turtles are known to travel along the coastline adjacent to Narrabeen Lagoon entrance and Collaroy-Narrabeen Beach at times. Periodic entrance closure and the shallow subtidal channel of Narrabeen Lagoon provides limited opportunity for access by marine turtles, with only rare sightings of marine turtles inside the lagoon. The Green Turtle (*Chelodina mydas*) was considered to have a moderate likelihood of occurrence in the area, predominantly limited to those periods when the lagoon maintains connectivity with the ocean. During these times, soft sediment shorelines and seagrass beds may provide some refuge and/or foraging habitat for the species. However, as the lagoon will be closed during clearance works, the proposed dredging is not considered to have potential to impact on threatened marine reptiles.

Sandy shoreline habitat adjacent to placement areas on Collaroy-Narrabeen Beach may provide refuge habitat and/or marginal nesting habitat for Green or Loggerhead Turtles at times. Turtle nesting events along the Australian east coast are typically confined to Queensland and northern NSW, with nesting events as far south as Sydney rare. One Green Turtle used Manly Beach as a nesting site in 2020 (Thomas, 2020), however, nesting at Collaroy-Narrabeen Beach has not previously occurred. As marine turtles, including Green and Loggerhead Turtles, typically show high nesting site-fidelity (Hamann et al., 2022), no nesting sites have been recorded previously on Collaroy-Narrabeen Beach and Sydney is outside of the typical nesting range for marine turtles, sand placement activities are not considered to have potential to impact on nesting sites and/or activities of threatened marine reptiles, thus further assessment is not required.

Fish, sharks and rays

Large sharks and rays including the Threatened Great White Shark (*Carcharodon carcharias*) and Grey Nurse Shark (*Carcharias taurus*) are known to travel along the adjacent coastline but are highly unlikely to occur close to shore or in the lagoon, thus further assessment for these species is not required.

Given the relatively slow forward progress of the dredge or machinery during the clearance works, any fish, sharks and rays would have sufficient time and mobility to move away from the works to suitable alternative areas nearby. Direct impacts on these species are considered unlikely. It is possible, however, that the disturbed seabed and uncovering of benthic infaunal prey species in the works area may attract species such as Yellowfin Bream (*Acanthopagrus australis*) and Dusky Flathead (*Platycephalus fuscus*) due to the expected elutriation of substantial amounts of benthic infauna prey items into the water column.

Cryptic species such as protected Syngnathid fishes are likely restricted to habitat associated with the seagrasses, which are not expected to be directly impacted. The Endangered White's Seahorse (*Hippocampus whitei*) is not known to occur in the lagoon, which lacks its preferred habitat among *P. australis*.

It is highly unlikely that benthic habitat within and in Lagoon entrance channel would provide suitable habitat for the Vulnerable Black Rockcod (*Epinephelus daemeli*), particularly given its episodic connectivity with coastal waters. Further, the small amounts of rocky subtidal habitat located in the project area would

provide only marginal potential habitat for juvenile Black Rockcod. Hence, it is considered unlikely the works would impact Black Rockcod.

The works are also not expected to result in any significant levels of underwater noise disturbance, with potential to physiologically impact on fish, sharks or rays. Some fauna may be deterred from the noise source and avoid the area during works.

Marine invertebrates

The works will likely result in the loss of some invertebrate and infauna community assemblages inhabiting the 22,500-30,000 m³ of soft sediment to be removed. These assemblages are likely to consist of various polychaetes, gastropods and bivalves. However, recolonisation of the sediment in the newly dredged channel section will likely begin soon after dredging and recover to pre-dredging diversity and abundance quickly once they stabilise (Dernie et al., 2003).

Macroalgae and seagrass wrack can provide habitat foraging and refuge for various macroinvertebrate species, with higher species richness and density of macroinvertebrate seen on beaches with wrack compared to those without (Ince et al., 2007). Taxa typically associated with wrack are dominated by detritivores, including amphipods and isopods, bacterivores and macrofauna such as crustaceans or polychaete worms. Macroinvertebrate communities that are associated with the wrack to be removed will likely be disturbed or removed; however, larger, mobile invertebrates may disperse from the disturbance. High volumes of macroalgae and seagrass wrack are present along the lagoon edges and in areas further upstream outside of the clearance works footprint that will continue to provide this habitat for macroinvertebrates. Whilst the local abundance may temporarily decrease associated with the immediate wrack habitat to be removed, the proposed works are not likely to impact on the wider macroinvertebrate populations in the lagoon at any ecologically significant scale.

In addition, infauna occupying surface sediments may also be smothered during the sand placement and as a result some animals may perish where they cannot escape or migrate away from the sediment that is placed. Given the highly degraded nature of placement Areas on Collaroy-Narrabeen Beach due to coastal erosion, infauna biomass is expected to be minimal. Infauna monitoring at Stockton Beach, which experiences similarly constant and extensive coastal erosive processes as Collaroy-Narrabeen Beach, observed low infaunal abundance and taxonomic richness in the intertidal zone, likely attributed to ongoing disturbances and changes to sediment characteristics (such as particle size distribution and total organic carbon) (H2O Consulting Group, 2024). Monitoring data indicated no significant changes occurred to intertidal infaunal abundance or richness following sand nourishment to nearshore areas at Stockton Beach (H2O Consulting Group, 2024). Thus, the extent and magnitude of any disturbance to or loss of infauna as a result of this proposal is not expected to occur at any ecologically relevant scale.

Macroalgae

Occasional rocky rubble along the southern shoreline of Narrabeen Lagoon at Lake Reserve supported stands of common macroalgae species. The minor nourishment area at this location will result in the smothering of up to around 90 m² of marine macroalgae associated with rocky rubble, predominantly comprising *C. fragile* with occasional stands of *Sargassum* sp. The extent of direct impact to macroalgae associated with the minor nourishment works at Lake Reserve will likely be lesser as the mapped footprint of these works is conservative. Dredging will also be required in close proximity to macroalgae associated with rocks along the lower entrance channel. These stands are not expected to be directly impacted, with

all other impacts to macroalgae confined to reduced water quality for the duration of works. Macroalgae is typically less sensitive to change in reduced light availability that may occur as a result of increased turbidity and more resilient to environmental disturbances, while it can recolonise relatively quickly (Sze, 1998). Given this, any impacts on macroalgae from temporary disturbances to water quality associated with the dredging works is considered very minimal.

The works will require the removal of a large amount (estimated 2,800 m³) of macroalgae wrack from the western edge of the dredge area. Wrack can be an important ecosystem component by providing a food source, refuge habitat and nutrient cycling (Hyndes et al., 2022). Various macroinvertebrate and small fish species may at times utilise wrack habitat as niche foraging or sheltering grounds, including that proposed to be removed. Macroalgal and seagrass wrack is prevalent along the edges and upstream areas of the lagoon outside of the clearance works footprint that will not be impacted and will continue to provide this habitat for fauna until new wrack is distributed from existing seagrass beds or from macroalgae at times when the lagoon is open. Thus, the removal of wrack within the Dredge Area is not expected to significantly impact on the availability of habitat or food sources for invertebrate or small fish species within the lagoon.

Water Quality

Clearance activities and sand placement activities within Narrabeen Lagoon are likely to result in short-term reductions in water quality for the duration of works. As soft sediment is dredged, sediment will be mobilised creating elevated turbidity and increasing potential for sedimentation of adjacent habitats. Increased suspended sediments in the lagoon may also alter the physical chemistry of the water and reduce available light. These sediments will likely settle over a period of hours to days, however, may impact on fringing habitats (Clark, 2001) such as seagrass beds or if the lagoon is open or opened during works, reef assemblages in the receiving environment around its entrance.

Other potential impacts on water quality may include unplanned spills of hydrocarbons during construction activities. Hydrocarbon will spread over the surface of water forming a thin surface film that is toxic and considered a harmful substance to marine flora and fauna (Clark, 2001).

Narrabeen Head Aquatic Reserve

The most eastern end of the Dredge Area lies approximately 150 m west of the Narrabeen Head Aquatic Reserve. The works will not encroach into the reserve, including any associated intertidal areas on Narrabeen Head. The northern extent of the closest placement area on Collaroy-Narrabeen Beach is approximately 2 km south from the Aquatic Reserve.

As per the Marine Estate Management (Aquatic Reserve) Notification 2020 (NSW Government, 2020), activities that are prohibited in the Narrabeen Head reserve unless the consent of the relevant Ministers or a permit issued by the relevant Ministers has been obtained include:

- The taking of the tunicate 'cunjevoi' – *Pyura* spp., and all invertebrates (including anemones, barnacles, chitons, cockles, crabs, mussels, octopus, oysters, pipis, sea urchins, sea stars, snails and worms) (whether dead or alive) with the exception of eastern rock lobster (*Sagmariasus verreauxi*), southern rock lobster (*Jasus edwardsii*) and blacklip abalone (*Haliotis rubra rubra*);
- Collecting, destroying or interfering with any marine vegetation (whether dead or alive), with the exception of sea lettuce (*Ulva lactuca*) and bait weed (*Enteromorpha intestinalis*).

The proposal is not expected to result in a prohibited activity within the reserve. As the lagoon will be closed during clearance works, disturbances to habitats within the Aquatic Reserve are considered highly unlikely.

Key Threatening Processes

The following Key Threatening Processes (KTPs) are potentially relevant to the proposal:

- *Entanglement in, or ingestion of, anthropogenic debris in marine and estuarine environments* (KTP under the FM Act and EPBC Act) – the planned or unplanned disposal of any wastes, petroleum-based products and other debris has potential to have direct and indirect impacts on marine fauna in the study area. Additionally, any marine debris that has accumulated within sediments to be removed has potential to be transported to placement areas, where it may enter the marine environment. The implementation of management measures to manage waters and minimise the likelihood of unplanned spills, as well as minimise the transport of debris (such as sediment screening or raking) will be required to minimise this risk; and
- *Introduction of non-indigenous fish and marine vegetation* (KTP under the FM Act) – introduced fish and marine vegetation, or noxious (invasive or toxic) species, that may occur and be transferred between locations on dredging equipment and associated vessels can pose a risk in terms of infestation by non-native or invasive species. *Caulerpa taxifolia* is present in nearby Pittwater and Sydney Harbour, however it has not yet been recorded inside Narrabeen Lagoon (NSW DPI, 2022). Measures to minimise risk of the introduction and spread of non-native and invasive species will be required.

Biodiversity Offsets

The proposal is not expected to trigger any habitat offset requirements for marine estuarine species under the BC Act.

NSW DPI enforces a 'no net loss' habitat policy as a permit condition or condition of consent. This may require proponents to conduct habitat rehabilitation and/or provide environmental compensation. Approximately 90 m² of live macroalgae is expected to be directly impacted by the works, which may require offsetting at a rate of 2:1 under the current NSW DPI Policy (Fairfull, 2013), equivalent to 180 m². Potential offsetting requirements should be confirmed with DPIRD and pending confirmation of the proposed minor nourishment works extent.

6.5.4 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise the potential impacts of the proposal on biodiversity:

- BD1 - The location of sensitive seagrass and mangrove habitat is marked on the for construction drawings. Direct disturbance of seagrasses and mangroves will be avoided, including by operation of vessels or machinery, dredge pipes or silt curtains, and dewatering discharge.
- BD2 - The position of the dredge pipe/excavator bucket shall be inspected regularly to ensure no impacts to seagrasses.
- BD3 - Stockpiling and de-watering areas should not be placed on vegetated land or habitat for roosting or nesting habitat for endemic or migratory shorebirds.
- BD4 – For the minor nourishment works at Lake Reserve, the following mitigation measures will be adopted:

- The proposed nourishment area should be reviewed with a view to minimising impacts on estuarine macrophytes in so far as is reasonable and feasible;
- Sand placement within 5 m of the seagrass bed should not exceed a 1:10 slope;
- Sediment fencing should be installed at the base of the minor nourishment area to minimise sedimentation impacts on the adjacent seagrass bed (within 2 m). Sand in this area must be placed in a manner that minimises sedimentation, pluming and disturbance.
- BD5 - Silt curtains shall be placed around seagrass beds to prevent sedimentation from clearance works, including dewatering activities. The silt curtains should be placed so as to avoid direct contact with the seagrass beds and inspected weekly to ensure their ongoing effectiveness.
- BD6 – Dewatering outlets should not be placed within 10 m of any seagrasses. These structures, their position and their effectiveness should be subject to ongoing monitoring and inspected weekly.
- BD7 - The measures identified in **Sections 6.2.3 and 6.3.3** will be implemented to minimise the impact of erosion and sedimentation, and water quality impacts, on biodiversity.
- BD8 - All equipment and machinery will be clean and free of *C. taxifolia* and other pests and weeds prior to being mobilised to the site. All equipment and machinery that has previously been used within the White Spot Disease control zone (in vicinity of Evans and Richmond Rivers) will be cleaned prior to being mobilised to site.
- BD9 - Sand placement areas on Collaroy-Narrabeen Beach are to be inspected for fauna prior to the commencement of works, and after storm events or high seas, to avoid trampling of birds (such as Shearwaters) that may have washed ashore.
- BD10 - The works on Collaroy-Narrabeen Beach shall avoid vegetated land.
- BD11 – The heritage listed trees located in Lake Reserve will be protected in accordance with *AS4970-2009 Protection of trees on development sites*.

6.6 Noise and Vibration

6.6.1 Existing Environment

The proposed works are located in a residential area, with some small businesses, a SLSC and the NRMA Sydney Lakeside Holiday Park also located nearby. The nearest receivers to the Narrabeen Lagoon entrance channel works area include:

- Residences on the southern shoreline of the lagoon, west of the bridge, which are around 40 to 45 m from the clearance works. The nearest residence is located about 55 m from the Birdwood Park works compound. These residences are also in proximity to the Lake Reserve nourishment works, with the façade of the closest dwelling about 20 m from the works; and
- Camp/caravan sites in southern part of Sydney Lakeside Holiday Park that are located adjacent to the lagoon about 30 to 40 m distant from the shoreline.

Sensitive receivers near the works area in Narrabeen Lagoon include:

- North Narrabeen SLSC is located about 55 m from the Birdwood Park works compound;
- Lake Park sports fields, about 140 m west of the works footprint;
- The lagoon foreshores and waterways and adjacent beach, which are passive recreation areas; and
- The Coastal Environment Centre, which is about 75 m from the works area.

The proposed northern placement area on Collaroy-Narrabeen Beach is located between the ocean and residential development. The distance of the residences from the placement area varies depending on the

location of the dwelling in relation to the property boundary; however, the minimum distance between a residential façade and the works area is around 10 m. Sensitive receivers nearby include:

- Narrabeen Lakes Primary School, which is located on the opposite side of Pittwater Road north of Goodwin Street, about 150 m distant from the placement area; and
- St Faith’s Anglican Church on Clarke Street, about 160 m from the placement area.

The beach and ocean also comprise both passive and active recreation areas.

It is anticipated that the local noise environment would generally be representative of a coastal residential environment and anthropogenic noise would be dominated by traffic on Ocean Street and Pittwater Road.

6.6.2 Potential Impacts

The EPA’s *Draft Construction Noise Guideline* (2020) provides noise management levels (NMLs) for residences as summarised in **Table 6-9**.

Table 6-9 Noise management levels for residential receivers (source: EPA, 2020)

Time of day	Noise management level ($L_{Aeq, 15 \text{ min}}$)
Recommended standard hours:	Noise affected
• Monday to Friday 7am to 6pm	RBL + 10dB
• Saturday 8am to 1pm	Highly noise affected
• No work Sundays or public holidays	75 dB(A)
Outside of recommended standard hours	Noise affected
	RBL + 5dB
	Highly noise affected
	65 dB(A)

For purposes of this assessment, the local noise environments at each of the two works locations has been characterised using the TfNSW Noise Calculator as R2, for which the representative noise environment has background noise levels of:

- 45 dB(A) during the day (7am to 6pm);
- 40 dB(A) in the evening (6pm to 10pm); and
- 35 dB(A) during the night (10pm to 7am).

These values are used as the Rating Background Levels (RBLs) for residential receivers in the study area.

The noise criteria for the relevant types of sensitive receivers are provided in **Table 6-10**. It is noted that the NMLs for residential receivers are applied at the façade of the residence, whereas the noise criteria for sensitive receivers may be applied at either externally or internally, depending on the receiver type. Insertion losses, which are the reduction in noise levels as measured external to a building versus internally, are generally around 10 dB(A).

Table 6-10 Noise criteria for sensitive receivers (source: EPA, 2020)

Receiver type	Noise management level ($L_{Aeq, 15 \text{ min}}$)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)

Receiver type	Noise management level ($L_{Aeq, 15 \text{ min}}$)
Active recreation areas	External noise level 65 dB(A)
Passive recreation areas	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre

During construction there would be noise associated with the operation of trucks, plant and machinery. The sound power levels (SPLs) associated with the expected plant and machinery are provided in **Table 6-11**.

Table 6-11 Potential Plant for the works and associated sound power levels

Plant	SWL ($L_{Aeq, dB(A)}$)
Barge / workboat	108
23T excavators or Excavator (tracked) 35T	110
Road truck / delivery truck	108
Tipper truck / bogie tippers	110
Tipper truck / bogie tipper pass-by	106
D65 bulldozer	116
Front-end loader	91
Light construction vehicles	88

A distance-based assessment was undertaken for the noisiest plant (i.e. the D65 bulldozer) using the TfNSW Construction Noise Estimation Tool assuming a direct line of sight to the receiver and adopting standard construction hours for the works. During the day time the works would be audible for a distance of around 240 m from the source and exceed the NML of 65 dB(A) and be considered ‘moderately intrusive’ during the day for residences within 105 m of the works. The works would be ‘highly intrusive’ (i.e. be ≥ 75 dB(A)) for residences located within 35 m of the works. Based on this assessment, and noting the bulldozer would likely only be used in the beach placement area, the key affected residences would be those located near the beach placement sites.

For the sensitive receivers near the beach placement site, the works would not have a direct line of sight. Updating the distance-based assessment for the noisiest plant (i.e. the D65 bulldozer), the works would not be expected to be audible at Narrabeen Lakes Primary School or St Faith’s Anglican Church. The works at the beach placement areas would however be audible to recreational users of the beach and adjacent ocean.

To evaluate noise emissions from the clearance works area in the lagoon entrance channel, a distance-based assessment was undertaken for the noisiest plant expected to be used at this location (i.e. the D65 bulldozer) using the TfNSW Construction Noise Estimation Tool assuming a direct line of sight to the receiver and adopting standard construction hours for the works. The works would be audible during the daytime for a distance of 145 m from the source, and would exceed the NML of 65 dB(A) and be considered ‘moderately intrusive’ for a distance of 55 m. No residences are expected to experience ‘highly intrusive’ levels of noise.

For sensitive receivers near the clearance works site, the works would exceed the NML for passive recreation and be ‘moderately intrusive’ for a radius of 50 m, and ‘highly intrusive’ for both active and passive recreational users for a distance of about 25 m from the source.

An assessment of potential noise impacts associated with the estimated daily bogie truck movements reported in **Section 6.4.2** were entered into the TfNSW Road Traffic Noise calculator adopting the AADT volumes from the nearest TfNSW Traffic Volume Counter. The increase in traffic noise arising from the additional heavy vehicle movements along Pittwater Road are expected to change by 0.1 dB(A), which is not expected to impact adjacent receivers. Even with the additional 35 - 40 truck movements per day associated with the additional clearance area (i.e. the ‘worst case scenario’), the increase in traffic noise remains around 0.1 dB(A).

During the 2023 entrance clearance works there were some community complaints about truck noise, in particular at roundabouts and key intersections along the haulage route (Rhelm, 2024). This may have been due to the higher rate of progress of the works in 2021 and the resultant implications for the volume of truck movements.

With respect to vibration, none of the plant proposed to be used during the works is particularly vibratory. However, some vibration may be perceived by nearby receivers from truck pass-bys.

6.6.3 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise the potential impacts of the proposal on noise and vibration:

- NV1 - Works are to be carried out during standard construction hours, as per **Section 3.4**.
- NV2 - Noise impacts are to be minimised in accordance with the *Draft Construction Noise Guideline* (EPA, 2020). The CEMP shall include reasonable and feasible measures to reduce noise impacts to receivers, including:
 - Where practicable, adopting quieter work methods and using quieter plant and equipment;
 - Operating plant and equipment in a quiet and efficient manner (e.g. minimising reversing alarms, turning equipment off when not in use);
 - Regularly inspecting and maintaining equipment to ensure it is in good working order;
 - Limiting the idling of trucks as much as possible;
 - Considering proximity to residences and sensitive receivers when selecting overnight parking locations for trucks and other vehicles used in the works;
 - Taking care when unloading trucks at the beach access points to minimise noise.
- NV3 - Local residents would be notified of the commencement of works via direct mail-out, on Council’s webpage and via the local media in advance of the works. A contact should be provided to impacted residents to enable them to make further enquiries or complaints.
- NV4 - Signage will be erected at the works sites with the relevant contact details of the person(s) to whom community members can direct complaints or enquiries to.
- NV5 - A complaints register will be established for the duration of the works to record any noise or other complaints related to the works. Any complaints received shall be responded to promptly and appropriately.
- NV6 - Should any noise or vibration complaints be received, the need for additional mitigation measures would be investigated and implemented where reasonable and feasible.

6.7 Heritage

6.7.1 Existing Environment

Aboriginal cultural heritage

Listed Aboriginal cultural heritage sites and places were identified via a search of the Aboriginal Heritage Information Management System (AHIMS) and the State Heritage Inventory (refer **Table 6-12**). Three AHIMS sites were identified in proximity to the works. None of these sites are located in the proposed project footprint.

Table 6-12 AHIMS search results

Site ID	Site Name	Site Type
45-6-0738	Narrabeen Head	Midden and open camp site
45-6-2747	Octavia Street Burial	Burial
45-6-4140	Octavia Street Potential Archaeological Deposit	Potential Archaeological Deposit (PAD)

Non-Aboriginal Heritage

Listed non-Aboriginal cultural heritage sites and places were identified via a search of the relevant State and federal statutory and non-statutory registers, including:

- World Heritage List;
- Commonwealth Heritage List;
- National Heritage List;
- State Heritage Register;
- Warringah and Pittwater LEPs;
- Transport for NSW and Sydney Water Section 170 Heritage and Conservation Registers; and
- Register of the National Estate (non-statutory archive).

The items of local significant located near the study area are listed in **Table 6-13**. Those items that are closest to the proposal footprint are mapped in **Figure 6-20**.

There is one heritage site, Site I91 – Group of Washington Palms (*Washingtonia robusta*), that is located in Lake Reserve and adjacent to the proposed beach nourishment area.

There were no items listed on the World Heritage, Commonwealth Heritage, National Heritage, State Heritage or Section 170 Registers.

Table 6-13 Non-Aboriginal heritage search results

Item	Location	Listing	Proximity to study area
Ocean rock pool – Narrabeen Beach	Narrabeen Headland	PLEP Item 2270137	~ 70 m to east of project footprint
Group of Washington Palms (<i>Washingtonia robusta</i>)	Southern foreshore west of the Ocean Street bridge	WLEP 2011 Item I91	In and adjacent to Lake Reserve nourishment area

Item	Location	Listing	Proximity to study area
Stone Wall	Located along Ocean Street between the bridge and Malcolm Street	WLEP 2011 Item I93	Adjacent to Birdwood Park construction access, along haulage route
Narrabeen Lake Bridge (RTA Bridge No. 56)	Pittwater Road bridge over Narrabeen Lagoon	WLEP 2011 Item I145	Along haulage route
Bus Shelter (former tram shelter)	1417 Pittwater Road, Narrabeen	WLEP 2011 I97	Along haulage route
Narrabeen Fire Station	9 Ocean Street, Narrabeen	Register of the National Estate, WLEP 2011 Item I94	Along haulage route
Vegetation group	58–62 Ocean Street (corner of King Street), Narrabeen	WLEP 2011 Item I95	Within 500 m of placement area
House known as ‘Lemville’	14 Goodwin Street, Narrabeen	WLEP 2011 Item I90	Within 500 m of placement area
House known as ‘Chez Nous’	19 Frazer Street, Collaroy	WLEP 2011 Item I135	Within 500 m of placement area
Narrabeen Primary School: <ul style="list-style-type: none"> • Memorial known as “SS Collaroy Memorial” • Sandstone memorial • School administration building • Main school building 			
	1299 Pittwater Road, Narrabeen	WLEP 2011 Items I98, I99, I100, I101	Within 500 m of placement area
Narrabeen Lagoon Catchment	Wakehurst Parkway, Narrabeen	Register of the National Estate (not a statutory register)	Encompasses clearance area



Figure 6-20 Non-Aboriginal Heritage Search Results

6.7.2 Potential Impacts

Direct impacts to heritage listed sites, including AHIMS sites, are anticipated as a result of the proposal, except in relation to the locally listed heritage site, Site I91 – Group of Washington Palms (*Washingtonia robusta*), that is located in Lake Reserve and adjacent to the proposed beach nourishment area. While the project footprint intersects the curtilage of this heritage site, none of the subject palms are located within

the proposed beach nourishment area (refer **Figure 3-1**). Provided the safeguards and mitigation measures detailed in this REF are implemented, adverse impacts to the subject trees are not anticipated.

There is potential for indirect impacts to built heritage items located along the haulage route or in proximity to the works due to the vibration associated with truck movements, which can indirectly impact structures. However, no such issues have arisen during past entrance clearance works and no impacts are anticipated.

The proposed clearance areas are located within the curtilage of the 'Narrabeen Lagoon Catchment' site (a non-statutory archive listing on the Register of the National Estate (RNE)). The Statement of Significance for this item identifies the importance of the recreational and ecological values of the lagoon. As discussed, in **Sections 6.5 and 6.8**, impacts to these values are expected to be short-term and limited to the works phase. Provided the mitigation measures and safeguards in this REF are implemented, no significant impacts are anticipated. Given the non-statutory nature of the RNE the works do not require any further assessment, permits or approvals.

There remains potential to encounter unexpected finds during the works. The risk is generally considered low given the clearance area in the lagoon entrance channel is expected to comprise clean marine sand. No excavation is proposed in the replenishment area, although the placement of the sand on the beach has potential to result in some disturbance of surficial sediments. However, similar to the lagoon entrance, this area is a highly dynamic environment and is subject to regular cycles of erosion and accretion (refer **Section 6.1**). Hence, it is considered there is a low likelihood of unexpected finds.

No operational phase impacts to items of Aboriginal or non-Aboriginal cultural heritage significance are anticipated during the operational phase.

6.7.3 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise the potential impacts of the proposal on heritage:

- BD9 – The heritage listed trees located in Lake Reserve will be protected in accordance with *AS4970-2009 Protection of trees on development sites* (See discussion in the **Biodiversity Section 6.5**).
- HE1 - No works shall be undertaken outside the project footprint (refer **Figure 3-1**).
- HE2 - The CEMP will include a procedure for managing unexpected finds during construction. The procedure will be implemented if unanticipated heritage items, relics or archaeological material are located during the works.
- HE3 - All works personnel will be inducted on their responsibilities in relation to heritage items and sites, informing them of the location and significance of known heritage items in proximity to the works and the unexpected finds procedure in the CEMP.
- HE4 - If unexpected 'relics' are encountered during excavation, a Section 146 relics notification will be forwarded to Heritage NSW. 'Relics' cannot be impacted without appropriate approvals under the *Heritage Act 1977*.
- HE5 – If suspected Aboriginal heritage items or archaeological material are uncovered during the works, all works in the vicinity of the find will cease and Council's Site Superintendent and Heritage NSW contacted immediately. Following evaluation of the material, a suitable course of action will be determined by Heritage NSW in consultation with Council.

6.8 Socio-economic Impacts

6.8.1 Existing Environment

The Australian Bureau of Statistics 2021 Census Community Profile for the Northern Beaches LGA (ABS, 2023) records a population of 263,554 people, of which 0.6% identify as Aboriginal and/or Torres Strait Islanders. Portuguese, Italian and Spanish are the three languages other than English most commonly spoken in the home.

The main land use types adjacent to the works areas include residential and public open space / recreational land. There are also some community facilities (e.g. the Coastal Environment Centre and SLSC) and tourist accommodation (Sydney Lakeside Holiday Park) near the clearance works area.

The public open space areas are comprised of the Lagoon waterway and adjacent shorelines, Lake Reserve Birdwood Park and Dune, and Collaroy-Narrabeen Beach. Narrabeen Lagoon, and in particular the entrance channel either side of the Ocean Street bridge, is a popular recreational area for both land-based and aquatic recreational activities such as swimming and paddling, snorkelling, boating, use of personal watercraft, fishing, walking, picnics and BBQs, cycling, and general enjoyment of the natural environment (RHDHV, 2022). Fluctuations in lagoon water levels and periodic water quality issues (refer **Sections 6.1.1 and 6.3.1**, respectively) may on occasion affect aquatic recreational activities, although the opening of the lagoon affords benefits to aquatic recreation due to improved water quality associated with tidal flushing of the entrance channel.

The section of Collaroy-Narrabeen Beach in the placement area footprint is also popular for walking, sunbathing and swimming. As discussed in **Section 6.1.1**, beach amenity and access can be negatively impacted at times when there is less sand on the beach.

The North Narrabeen SLSC was founded in 1912-1913 and is located near Birdwood Park. It is an important community hub that hosts events and provides volunteer surf life-saving patrols and training. Nippers training is typically on a Sunday from October to March. The SLSC also hosts competitions over summer. The North Narrabeen Boardriders Club also has a dedicated space located in the SLSC.

The North Narrabeen National Surfing Reserve, which is located adjacent to the Lagoon entrance, was dedicated in October 2009 in recognition of its important role in the history of surfing culture in Australia and the number of surfing champions associated with the local area (RHDHV, 2022). North Narrabeen Beach is a world-famous surf break, known to have one of the most consistent, quality surf breaks on the east coast of Australia. The presence of sand bars, rips, rocky reefs, tidal conditions and swell characteristics of the site all contribute to the creation of a quality surf break. The quality of one of the key breaks in the Surfing Reserve, the Alley left break, is on any given day generally a result of recent large swells as well as the decadal rotation of the whole of Collaroy-Narrabeen Beach (resulting in more or less sand at North Narrabeen depending on the rotation state).

North Narrabeen Beach hosts local, state, national and international surfing competitions, including the World Surf League Championship tour event (the Narrabeen Classic) and Sydney Surf Pro Challenger Series, which is held annually at North Narrabeen Beach (RHDHV, 2022). The Surfing Reserve and various surfing competitions held on Narrabeen Beach attract large number of visitors and contribute to the regional economy.

The impact of flooding on low-lying land around Narrabeen Lagoon is discussed in **Section 6.1**. Catchment flood events can have a range of socio-economic impacts, including damage due to flooding of public and

private land, disruption to daily activities such as travelling around the local area and general stress, as well as displacement of residents when evacuations are required. The *Narrabeen Lagoon Floodplain Risk Management Study* (Cardno, 2019) calculated (pre-mitigation or existing) average annual damage costs of flooding at \$11.54 million.

6.8.2 Potential Impacts

During the works there would be short-term, minor impacts on the recreational use of the Lagoon entrance channel and foreshores, and of the replenishment areas. Fencing would prohibit public access to the works area. The potential impacts on traffic, transport and public access are discussed in **Section 6.4.2**. There may also be some disruption to the community associated with noise during the works, as detailed in **Section 6.6.2**. Visual impacts are discussed in **Section 6.9.2**. Impacts to local businesses are not anticipated as a result of the works.

In the operational phase, the key benefit of the proposal is related to flood mitigation. As well as alleviating the social impacts of flooding, the entrance clearance works were shown to reduce the average annual damages associated with flooding by \$2.4 million (Cardno, 2019). In addition, the entrance clearance works, also make the mechanical entrance opening more efficient. Other benefits associated with the proposal include:

- Improved water quality for recreational users of the lower reaches of Narrabeen Lagoon associated with reinstatement of tidal flushing;
- Recreational fishing opportunities associated with recruitment of fish and prawns during entrance open conditions (where coincident with a recruitment event); and
- Improved public access and beach amenity due to increased beach volume associated with the replenishment works on Collaroy-Narrabeen Beach.

These benefits are associated with the entrance opening and would be of a medium-term duration.

The potential impacts of the proposal on North Narrabeen surf break is not known, although many local experts agree that the quality of the surf break is more directly associated with other conditions and does not appear to be influenced by the Lagoon entrance condition (RHDHV, 2022).

6.8.3 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise any adverse socio-economic impacts of the proposal:

- The CEMP would include the mitigation measures in **Sections 6.1.3, 6.3.3, 6.4.3 and 6.6.3**.
- SE1 - Northern Beaches Council will prepare a community engagement plan prior to the commencement of works, to be implemented during construction to provide timely and up to date information to the community during construction. It would include, as a minimum:
 - Mechanisms to provide details and timing of proposed activities to affected residents and local businesses, including changes to traffic and access; and
 - A contact name and telephone number for queries and complaints. Contact details will be clearly displayed at the entrance to the entrance clearance works sites and all affected beach accessways at the placement area.
- SE2 - A webpage and telephone number will be established for enquiries regarding the proposal and will remain active for the duration of the works.

- SE3 - All enquiries and complaints will be tracked through a tracking system and be acknowledged within 24 hours of being received.

6.9 Visual Amenity and Landscape Character

6.9.1 Existing Environment

The landscape character of project locality is characterised by the residential land use, recreational open space and natural environments associated with Narrabeen Lagoon, Birdwood Dune, Narrabeen Head and Collaroy-Narrabeen Beach.

The proposed placement area on Collaroy-Narrabeen Beach is characterised by residential development with landscaped gardens and the beach, with dune vegetation located between these two land uses in places.

Lake Reserve is characterised by residential development and the Narrabeen Lagoon foreshore, with heritage listed Washington Palms adjacent to the placement area (see **Section 6.7**)

The project locality is generally a coastal suburban environment, with views to and along the coast and across Narrabeen Lagoon. The headlands, remnant bushland, coastal views and seascape are key components of the high visual amenity of the locality.

6.9.2 Potential Impacts

The proposal would result in short-term, temporary visual impacts to the locality during the works phase due to the presence of stockpiles, machinery and vehicles and the use of fencing to preclude access to the site compound(s) and works areas.

Following the completion of the works, there would be minor, short to medium-term visual impacts associated with the removal of the sand shoals in the Lagoon entrance and increase in beach volume arising from the placement of sand in the placement area. However, these changes would be within the range of natural variation due to coastal and catchment flood processes.

6.9.3 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise the impacts of the proposal on the visual amenity of the locality:

- VA1 - The site compound would be fenced and screened where possible.
- VA2 - Works would be undertaken during standard construction hours. Outside these times, all plant, machinery and equipment would be kept in the construction compound.
- VA3 - The works site will be kept clean and tidy for the duration of the works.
- VA4 - No vegetation removal is permitted.
- VA5 - All works compounds / staging areas are to be reinstated to their original, pre-works condition following the completion of the works.

6.10 Air Quality and Climate

6.10.1 Existing Environment

The existing air quality near the location of the proposal is primarily influenced by emissions from motor vehicles and residential activities. Air quality is also influenced by the prevailing weather and climatic conditions, bushfires and other natural factors such as pollen. The *NSW Annual Air Quality Statement 2024*

(NSW DCCEEW, 2025c) reports that pollutant levels were within National Environmental Protection Measures 97% of the time for the East Sydney Region, which encompasses the Northern Beaches LGA.

The nearest BoM automatic weather station is at Terrey Hills (066059), about 4 km away from the project location. Mean monthly rainfall when the works are expected to be undertaken ranges from 57.5 mm to 126 mm in Winter and 63.1 mm to 97.3 mm in Spring, with an average number of days with at least 1 mm of rainfall ranging from 5.2 to 9.2 days (BoM, 2025).

6.10.2 Potential Impacts

Rainfall events have the potential to create runoff from stockpiles of excavated material, increasing turbidity in the Lagoon or nearshore zone along Collaroy-Narrabeen Beach. However, provided the mitigation measures in **Section 6.2.3** are implemented, this risk is considered low.

The potential impacts of the proposal on air quality are related to exhaust emissions from works vehicles, plant and machinery, and aeolian transport of excavated material. Emissions from vehicles, plant and machinery would be short-term and temporary and would be unlikely to noticeably change the air quality of the locality.

The risk of aeolian transport of excavated material is considered low given it will be wet when excavated, although there is a chance of mobilisation of material from stockpiles under windy conditions or during transport. This risk would be managed through implementation of the mitigation measures in **Section 6.2.3**.

There would be no operational phase impacts on air quality or climate.

6.10.3 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise the impacts of the proposal on air quality:

- The CEMP would include the mitigation measures in **Sections 6.2.3**.
- AQ1 - All plant, equipment and vehicles will be maintained to ensure good operating conditions and exhaust emissions in compliance with the relevant legislation, including the PoEO Act.
- AQ2 - Machinery and vehicles will be turned off rather than left to idle when not in use.

6.11 Waste Management

6.11.1 Requirements

Section 143 of the PoEO Act requires waste to be transported to a place that can lawfully accept it and that the owner of the waste and the transporter are responsible for ensuring that waste is transported to a suitable waste facility. Principles of waste management and the Resource Management Hierarchy (e.g. avoid, reduce, reuse, dispose) are also embodied in the *Waste Avoidance and Resource Recovery Act 2001*.

6.11.2 Potential Impacts

There are no waste generating activities associated with the entrance clearance area or sand placement area, apart from wrack removal. The wrack removed from the clearance area would be disposed of at Kimbriki Resource Recovery Centre. Rubbish bins are provided for visitors to Birdwood Park.

Based on historic entrance clearance works and noting the proposed works methodology, it is expected that the amount of waste material or materials of a hazardous nature generated as result of the works would be negligible. General waste from construction personnel and maintenance activities would be generated during the works at the Birdwood Park construction compound. There is potential for accidental

spills of hydrocarbons, hydraulic fluids and other chemicals, although this risk is considered manageable provided the mitigation measures detailed in **Section 6.3.3** are implemented during the works.

The design of the sand replenishment works on Collaroy-Narrabeen Beach assumes all material excavated from the Lagoon would be placed on the beach, although there is a low potential for excavation of a small amount of material unsuitable for this purpose which would require an alternative disposal method.

Waste generation is not expected during the operational phase.

6.11.3 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise the impacts of the proposal on air quality:

- The CEMP would include the mitigation measures in **Section 6.3.3**.
- WM1 - The CEMP would identify potential waste streams associated with the works. The CEMP would include measures to minimise waste, outline methods of disposal, re-use and recycling and monitoring, as appropriate.
- WM2 - Any excavated material that requires off-site disposal will be classified in accordance with the *Waste Classification Guidelines* (EPA, 2014) and disposed of at a suitably licenced waste management facility where an appropriate beneficial re-use cannot be identified.

6.12 Infrastructure, Utilities and Services

6.12.1 Existing Environment

A Dial Before You Dig search was undertaken on 26 February 2025 to identify utilities and services in the proposal footprint. The following infrastructure was identified:

- Ausgrid infrastructure end of Lagoon Street;
- Council stormwater assets located at the end of Mactier Street and running from Ocean Street across Birdwood Park and discharging to the Lagoon; and
- A 750 mm Sydney Water potable water main located on the western side of the Ocean Street bridge.

There is a range of other relevant infrastructure that is located within the project footprint that requires consideration, including:

- The vertical seawalls on Collaroy-Narrabeen Beach located at 1150 Pittwater Road to 1168 Pittwater Road and from 1172 Pittwater Road to 1182 Pittwater Road, where sand placement would be undertaken up to the edge of the structure;
- The Birdwood Dune car park;
- Lake Reserve and associated assets.

There is potential for unknown services to exist in the proposal footprint.

6.12.2 Potential Impacts

There is potential for the works to impact utilities and services located in the proposal footprint, including previously unidentified services. It is considered that impacts to the utilities could be reasonably avoided during the works and the risk to these utilities is considered low.

There is potential for damage to occur to infrastructure located within or interfacing with the works area, in particular aspects of the vertical seawalls, car parks and accesses to Collaroy-Narrabeen Beach

placement areas. For example, hand rails on the staircase integrated in the vertical seawall were damaged in the 2023 works and required repair.

No operational phase impacts are anticipated.

6.12.3 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise the impacts of the proposal on infrastructure, utilities and services:

- US1 - The location of utilities and services within the proposal footprint, or with potential to be impacted by the works, will be confirmed by the Contractor prior to the commencement of works to enable further assessment and mitigation of any potential impacts to utilities.
- US2 – Pre- and post-works dilapidation survey would be undertaken of all infrastructure with potential to be adversely impacted by the works. Where it is identified that damage to infrastructure has occurred as a result of the works, rectification works would be undertaken as required.

6.13 Cumulative Impacts

6.13.1 Potential Cumulative Impacts

Cumulative Impacts of Entrance Management Strategy

Whilst there are benefits to the clearance, there is potential for cumulative impacts associated with implementation of the entrance clearance works, related to the frequency of entrance clearance works as recommended under the Entrance Management Strategy (RHDHV, 2022); chiefly the potential for increased marination of the estuary.

A key indicator of marination is a net long-term change in salinity over time. A review of the available salinity data collected under the NSW Government Monitoring Evaluation and Reporting (MER) Program was undertaken as a preliminary evaluation of potential changes in average salinity over time. The MER water quality monitoring method involves undertaking continuous water quality monitoring via probe over the course of undertaking set transects. There are seven transects located in Narrabeen Lagoon at the locations indicated in **Figure 6-21** which are usually sampled 12 times in each survey year.

Table 6-14 Salinity Statistics for Narrabeen Lagoon MER Program

Survey Period	Minimum Salinity (ppt)	Maximum Salinity (ppt)	Average Salinity (ppt)
2011/2012	3.53	31.29	18.13
2018/2019	0	35.39	22.61
2019/2020	0.02	29.47	21.73
2020/2021	0	31.15	16.92
2021/2022	0	33.19	17.89
2022/2023	0.13	33.19	19.79
2023/2024	8.16	34.29	23.75

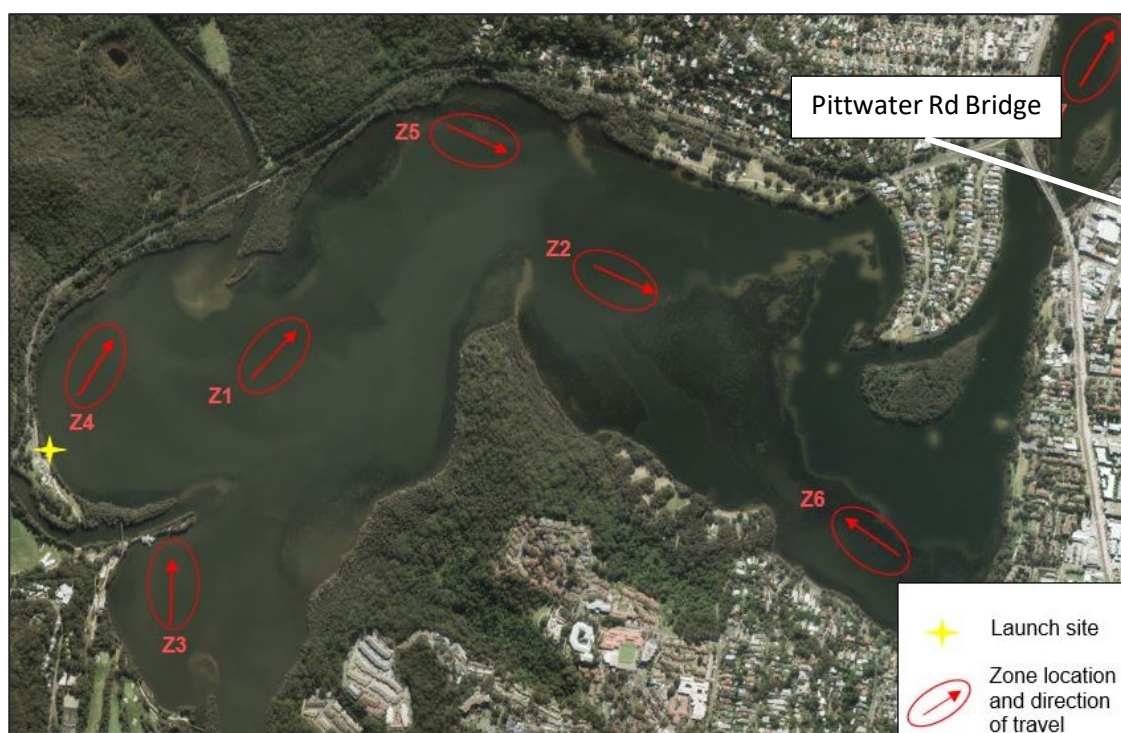


Figure 6-21 NSW Government MER Monitoring transects in Narrabeen Lagoon (source: NBC)

A simple analysis of the available salinity data including derivation of the minimum, maximum and average salinity values recorded in the collated data set for each year's sampling campaigns. The data does not indicate any clear upward trend in salinity, likely due to the limited temporal scope of the data set and large number of environmental variables that influence salinity at any given location at the time of sampling, ranging from catchment inflows and tidal flushing, to circulation and mixing within the basin or water column. It would be beneficial to analyse a long-term, continuous water quality data set to gain a better appreciation of potential medium- to long-term changes in salinity over time.

Irrespective, it is reasonable to assume that more regular opening of the lagoon and a net cumulative increase in entrance open conditions would lead to marinisation of the lagoon, including changes in water quality (particularly near the entrance) and recruitment of marine species such as mangroves, crustaceans and fish. Adverse impacts may include increased risk of tidal inundation for some low-lying areas around the lagoon.

In addition to marinisation of the estuary, another potential cumulative impact associated with the entrance clearance works is the localised change in hydraulic processes in the general vicinity of the works. The changes in bathymetry have potential to change flow velocities and preferential flow paths in the entrance channel, which may have implications for estuary morphology.

Review of historical Nearmap imagery for the study area over the period 20 October 2009 to 4 February 2025 indicates progressive loss of trees and riparian vegetation along a portion of the southern foreshore with more significant erosion observed after high flow events or floods in the lagoon (e.g. refer **Figure 6-4**). Nonetheless, it is possible the entrance clearance works are to some extent contributory to the ongoing bank erosion observed along the Lake Reserve shoreline.

Cumulative Impacts with Other Projects

It is possible that there would be other projects in the construction phase that would occur at the same time as the entrance clearance works.

A review of Council's Development Applications (DA) register on the 20 March 2025 did not identify any DAs of significance that may result in concurrent construction with the proposed entrance clearance works.

All DAs identified for Collaroy, Narrabeen and North Narrabeen for properties located in the vicinity of the proposal footprint are for minor developments such as demolition, alterations and additions to a residential development. However, it is understood that Council has obtained a DA for alterations and additions to North Narrabeen SLSC (DA2024/0013), and it is possible the Stage 1 works would be undertaken concurrently with the clearance works.

A search of the NSW Planning Portal undertaken on the 20 March 2025 did not identify any other Division 5.1 (Part 5) Activities or State Significant Infrastructure applications for the general locality.

Should any construction activities undertaken by other proponents be undertaken concurrently with the entrance clearance works, cumulative impacts may occur. Depending on the nature of any concurrent construction works, these may include:

- Short-term, temporary impacts to traffic, on-street parking and access on the affected roads and footpaths accessways associated with respective projects;
- Temporary loss of pedestrian access to the beach via beach accessways;
- Cumulative noise and vibration impacts to local residents, businesses and users of recreational areas associated with the respective projects; and
- Increased visual impacts to the locality.

6.13.2 Safeguards and Mitigation Measures

The following measures and safeguards will be adopted to minimise the cumulative impacts of the proposal on the locality:

- CI1 - Where possible, scheduling of the works will avoid the respective projects being in construction at the same time.
- CI2 - Prior to the commencement of works, Council will coordinate with any other local developments (including the works at the North Narrabeen SLSC under DA2024/0013) in an effort to minimise cumulative impacts to the community associated with traffic, noise, etc.
- CI3 – Ongoing monitoring of water quality using a continuous water quality logger is recommended to facilitate further consideration of potential medium- to long-term changes in estuary processes in Narrabeen Lagoon. In the event the monitoring indicates marinization of the lagoon, Council is to consider the implications for ongoing entrance management.
- CI4 – It is recommended Council consider undertaking localised hydrodynamic modelling to evaluate the extent to which the entrance clearance works are contributing to bank erosion in the entrance channel, in particular along the Lake Reserve shoreline. In the event it is confirmed that the works are a contributing factor to the observed erosion, Council is to investigate and implement a longer-term solution to address the shoreline erosion at the affected location(s).

7 Environmental Management

7.1 Environmental Management Plans

A number of safeguards and mitigation measures have been identified in this REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal. Should the proposal proceed, these safeguards and mitigation measures would be incorporated applied during the works and during operation of the proposal.

A CEMP will be prepared to describe the safeguards and mitigation measures identified. The CEMP would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to the commencement of works and must be reviewed and approved by Northern Beaches Council prior to the commencement of any on-site work. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

7.2 Summary of Safeguards and Mitigation Measures

The safeguards and mitigation measures detailed in this REF are summarised in **Table 7-1**.

Table 7-1 Summary of safeguards and mitigation measures

Environmental safeguards and mitigation measures	Responsibility	Timing
General		
<p>GEN1 - A CEMP will be prepared prior to the commencement of works and must be reviewed and approved by Council prior to the commencement of works. As a minimum, the CEMP will address the following:</p> <ul style="list-style-type: none"> Any requirements associated with statutory approvals. Details of how the project will implement the identified safeguards outlined in the REF. Issue-specific environmental management plans (if required). Roles and responsibilities. Communication requirements. Induction and training requirements. Procedures for monitoring and evaluating environmental performance, and for corrective action. Reporting requirements and record-keeping. Procedures for emergency and incident management. Procedures for audit and review. <p>The approved CEMP will be implemented during the undertaking of the activity.</p>	Contractor	Pre-construction
GEN2 - All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular 'toolbox' style briefings.	Contractor	Pre-construction / Construction
GEN3 - The Contractor's CEMP will detail when and how the entrance should be opened and closed.	Contractor	Pre-construction
Coastal processes		
CP1 - A temporary berm would be established across the lagoon entrance, with a crest height set at approximately 2 mAHD (unless otherwise instructed by Council's Site Superintendent), to maintain the lagoon water level of not less	Contractor	Pre-construction

Environmental safeguards and mitigation measures	Responsibility	Timing
than 0.4 mAHD for the duration of the works and prevent waves and tides impacting the works.		
CP2 - Local weather and marine forecasts provided by the Bureau of Meteorology (BoM) would be monitored daily for the duration of the works, as would lagoon water levels as measured at the Ocean Street bridge gauge (station ID 213408D) maintained by MHL.	Contractor	Construction
CP3 - An Incident Response Plan shall be prepared as part of the CEMP, to include consideration of catchment floods and coastal storms. All construction personnel will be inducted in the Plan.	Contractor	Pre-construction
CP4 - In the event of a forecast high rainfall/flood event or big ocean swells, plant and equipment is to be relocated to higher ground.	Contractor	Construction
CP5 - In the event of a catchment flood during the works: <ul style="list-style-type: none"> Works are to cease immediately and all plant and equipment secured or moved to higher ground, A mechanical breakout is to be implemented under the direction of Council in accordance with EM-OMS 455, and A temporary berm is to be re-established at the lagoon entrance as soon as possible following the breakout event to facilitate the completion of the works. 	Contractor	Construction
CP6 – The Contractor is to review the available entrance survey and inferred depth to rockhead and take caution not to damage.	Contractor	Construction
Soils and sediments		
SS1 - The depth of excavation shall be progressively monitored during the works to ensure it conforms to the design. Monitoring shall be undertaken via hydrosurvey of the clearance area undertaken immediately prior to the commencement of works, at least once during the works and once immediately following the completion of works. The survey should be undertaken by the Contractor, but independently verified by Council.	Contractor	Pre-, during & post-construction
SS2 - The CEMP shall identify the steps to be taken in the event of over-excavation.	Contractor	Pre-construction
SS3 – The excavated material shall be de-watered and sieved to ensure the material meets Council’s specifications and does not incorporate any rock, shell or other material that may represent a hazard to beach users once placed on Collaroy-Narrabeen Beach.	Contractor	Construction
SS4 - In the event material other than clean marine sands are encountered during the clearance works, a field pH test should be undertaken to test for ASS. If the field testing confirms the presence of Actual or Potential ASS, the material will be managed in accordance with the <i>Acid Sulfate Soil Manual</i> (ASSMAC, 1998).	Contractor	Construction
SS5 - In the event suspected contaminated material is encountered during the works, works shall cease immediately, the material contained and Council’s Project Manager contacted to determine a suitable course of action, to include as a minimum, laboratory testing of the material.	Contractor	Construction
SS6 – An ESCP is to be prepared and implemented in accordance with Landcom (2004) Managing Urban Stormwater – Soils and Construction – Volume 1 (the ‘Blue Book’). Erosion and sediment controls will be checked and maintained on a regular basis and records of such inspections kept and provided upon request.	Contractor	Construction

Environmental safeguards and mitigation measures	Responsibility	Timing
SS7 - Movement of excavated material is not to be undertaken during periods of high rainfall or high wind.	Contractor	Construction
SS8 - Visual monitoring of local water quality (e.g. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls.	Contractor	Construction
SS9 - Stockpiles for de-watering of excavated material would be suitably bunded and water discharged back into the lagoon monitored visually for high suspended sediments loads.	Contractor	Construction
Water quality		
WQ1 - Silt curtains are to be installed around any sensitive marine habitats (i.e. seagrasses) prior to the commencement of work. The silt curtains will be monitored and maintained for the duration of the works as required to contain any suspended sediments.	Contractor	Pre-construction
WQ2 - Re-fuelling of plant and equipment, or any other activity with potential to result in an accidental spill, is to be undertaken in an impervious bunded area away from drainage lines.	Contractor	Construction
WQ3 - Any re-fuelling of plant or machinery or storage of hazardous materials on barges (or vessels) is to occur in a double-bunded area.	Contractor	Construction
WQ4 - An emergency spill kit is to be kept on site at all times and maintained throughout the works. The spill kit must be of an appropriate type for the volume and type of substances to be used during the works. Spill kits for barges (if required) must be specific for working in the marine environment.	Contractor	Construction
WQ5 - The Incident Response Plan prepared as part of the CEMP shall include measures to respond to and manage 'pollution incidents' as defined in the PoEO Act (e.g. accidental spills) and address the requirements of Part 5.1 of the PoEO Act with respect to the duty to notify pollution incidents to the NSW EPA. All construction personnel will be inducted in the Plan.	Contractor	Pre-construction
WQ6 - In the event of a pollution incident, Council's Superintendent is to be notified as soon as practicable.	Contractor	Construction
WQ7 - Emergency contacts will be recorded in the CEMP and kept in readily accessible places in vehicles, vessels and at the site office. All workers will be advised of these contact details and procedures.	Contractor	Construction
WQ8 - All works personnel will be trained in the use of the spill kits kept on site.	Contractor	Construction
WQ9 - Vehicles, vessels and plant will be properly maintained and regularly checked for leaks of fuel or other fluids.	Contractor	Construction
WQ10- No vehicle or vessel wash down will occur on the site.	Contractor	Construction
Traffic, Navigation and Access		
TA1 – The Contractor would prepare a TMP based on their proposed construction methodology and program and in accordance with the TMP and accompanying Traffic Guidance Schemes (TTPP, 2025) included as Appendix B to this REF. The Contractors TMP would be subject to review and approval to Council prior to commencement of works and would be implemented as part of the CEMP. Monitoring in the form of weekly inspections of construction vehicle activities would be undertaken to monitor conformance with the TMP, focussing on:	Contractor	Construction
<ul style="list-style-type: none"> • Safe movement of traffic and pedestrians, 		

Environmental safeguards and mitigation measures	Responsibility	Timing
<ul style="list-style-type: none"> Signage and barriers are clearly visible, Construction roads support safe working and driving, Safety of persons and property in and around the work sites. <p>Traffic will be monitoring on the road network, including construction vehicle movements entering and departing the work site.</p>		
TA2 – All construction personnel and subcontractors working on-site will undergo a site inspection, which will include the routes to/from the site, on-street parking, and other requirements of the TMP.	Contractor	Construction
TA3 - Council will seek a relaxation of the three tonne load limit on Walsh Street from the Traffic Management Committee to enable trucks to use this route during construction.	Council	Pre-construction
TA4 - The community engagement plan would be prepared and implemented as specified in Section 6.8.3 . In the event the additional clearance area is to be excavated and the volume of truck movements and/or duration of construction is increased, prior notification would also be provided to the community.	Contractor	Pre-construction / construction
<p>TA5 - All construction vehicles will enter and exit the site in a forward direction, and all loading/unloading shall be undertaken on-site during the approved work hours. Construction vehicles shall radio/call the site office on approach to the site to ensure that space is available within the site loading area. The queuing or marshalling of construction vehicles shall not be permitted on public roads other than at the approved layover area. Other protocols would be in place to ensure:</p> <ul style="list-style-type: none"> site inductions are implemented for construction workers, heavy vehicle drivers shall adhere to the nominated transport routes, heavy vehicle drivers and construction workers are aware of pedestrians and cyclists in the vicinity of the site, drivers shall be aware of the existing sign posted speed limits. 	Contractor	Construction
TA6 - All loaded trucks arriving at and departing from the work areas are required to have an effective cover over their load for the duration of the journey. The load cover may be removed only upon arrival at the destination. Care must be taken to ensure that all loose debris from vehicles and wheels are removed prior to exiting the work areas. Street sweepers will be used where required. Any sand tracked onto the road shall be removed as soon as is practicable.	Contractor	Construction
TA7 - Signage will be erected notifying the public of parking changes in the affected locations.	Council	Construction
TA8 - Trucks are not permitted to park in side streets where they will block access for local residents.	Contractor	Construction
TA9 - Where possible, truck operators should not use engine brakes near residences areas. All trucks must be fitted with audible reversing alarms. However, to minimise disturbance to neighbouring residents, reversing should be minimised on site where possible.	Contractor	Construction
TA10 - The works areas will be fenced to prohibit public access during construction.	Contractor	Construction
TA11 - Where access for pedestrians or cyclists is impacted, suitable alternative, safe access will be provided.	Contractor	Construction
TA12 - Where possible, public access to the waterway and for navigation is to be maintained during the works.	Contractor / Council	Construction

Environmental safeguards and mitigation measures	Responsibility	Timing
TA13 - Appropriate signage will be provided to notify waterway users of the exclusion area during construction.	Contractor	Construction
TA14 - Liaison would be maintained with police and emergency services agencies throughout the construction period and a 24-hour contact would be made available for 'out-of-hours' emergencies and access.	Contractor / Council	Construction
Biodiversity		
BD1 - The location of sensitive seagrass and mangrove habitat will be marked on the design drawings. Direct disturbance of seagrasses and mangroves will be avoided, including by operation of vessels or machinery, dredge pipes or silt curtains, and dewatering discharge.	Council / Contractor	Design / construction
BD2 - The position of the dredge pipe/excavator bucket shall be inspected regularly to ensure no impacts to seagrasses.	Contractor	Construction
BD3 - Stockpiling and de-watering areas should not be placed on vegetated land or habitat for roosting or nesting habitat for shorebirds.	Contractor	Construction
BD4 – For the minor nourishment works at Lake Reserve, the following mitigation measures will be adopted: <ul style="list-style-type: none"> The proposed nourishment area should be reviewed with a view to minimising impacts on estuarine macrophytes in so far as is reasonable and feasible; Sand placement within 5 m of the seagrass bed should not exceed a 1:10 slope; Sediment fencing should be installed at the base of the minor nourishment area to minimise sedimentation impacts on the adjacent seagrass bed (within 2 m). Sand in this area must be placed in a manner that minimises sedimentation, pluming and disturbance. 	Contractor	Construction
BD5 - Silt curtains shall be placed around seagrass beds to prevent sedimentation from clearance works, including dewatering activities. The silt curtains should be placed so as to avoid direct contact with the seagrass beds and inspected weekly to ensure their ongoing effectiveness.	Contractor	Construction
BD6 – Dewatering outlets should not be placed within 10 m of any seagrasses. These structures, their position and their effectiveness should be subject to ongoing monitoring and inspected weekly.	Contractor	Construction
BD7 - The measures identified in Sections 6.2.3 and 6.3.3 will be implemented to minimise the impact of erosion and sedimentation, and water quality impacts, on biodiversity.	Contractor	Construction
BD8 - All equipment and machinery will be clean and free of <i>C. taxifolia</i> and other pests and weeds prior to being mobilised to the site.	Contractor	Construction
BD9 - Sand placement areas on Collaroy-Narrabeen Beach are to be inspected for fauna prior to the commencement of works, and after storm events or high seas, to avoid trampling of birds (such as Shearwaters) that may have washed ashore.	Contractor	Pre-construction
BD10 - The works on Collaroy-Narrabeen Beach shall avoid vegetated land.	Contractor	Construction
BD11 – The heritage listed trees located in Lake Reserve will be protected in accordance with <i>AS4970-2009 Protection of trees on development sites</i> .	Contractor	Construction
Noise and vibration		
NV1 - Works are to be carried out during standard construction hours, as per Section 3.4 .	Contractor	Construction

Environmental safeguards and mitigation measures	Responsibility	Timing
<p>NV2 - Noise impacts are to be minimised in accordance with the <i>Draft Construction Noise Guideline</i> (EPA, 2020). The CEMP shall include reasonable and feasible measures to reduce noise impacts to receivers, including:</p> <ul style="list-style-type: none"> • Where practicable, adopting quieter work methods and using quieter plant and equipment; • Operating plant and equipment in a quiet and efficient manner (e.g. minimising reversing alarms, turning equipment off when not in use); • Regularly inspecting and maintaining equipment to ensure it is in good working order; • Limiting the idling of trucks as much as possible; • Considering proximity to residences and sensitive receivers when selecting overnight parking locations for trucks and other vehicles used in the works; • Taking care when unloading trucks at the beach access points to minimise noise. 	Contractor	Construction
<p>NV3 - Local residents would be notified of the commencement of works via direct mail-out, on Council's webpage and via the local media in advance of the works. A contact should be provided to impacted residents to enable them to make further enquiries or complaints.</p>	Contractor	Pre-construction
<p>NV4 - Signage will be erected at the works sites with the relevant contact details of the person(s) to whom community members can make complaints or enquiries.</p>	Contractor	Pre-construction
<p>NV5 - A complaints register will be established for the duration of the works to record any noise or other complaints related to the works. Any complaints received shall be responded to promptly and appropriately.</p>	Contractor	Construction
<p>NV6 - Should any noise or vibration complaints be received, the need for additional mitigation measures would be investigated and implemented where reasonable and feasible.</p>	Council	Construction
Heritage		
<p>HE1 - No works shall be undertaken outside the project footprint (refer Figure 3-1).</p>	Contractor	Construction
<p>HE2 - The CEMP will include a procedure for managing unexpected finds during construction. The procedure will be implemented if unanticipated heritage items, relics or archaeological material are located during the works.</p>	Contractor	Pre-construction
<p>HE3 - All works personnel will be inducted on their responsibilities in relation to heritage items and sites, informing them of the location and significance of known heritage items in proximity to the works and the unexpected finds procedure in the CEMP.</p>	Contractor	Pre-construction
<p>HE4 - If unexpected 'relics' are encountered during excavation, a Section 146 relics notification will be forwarded to Heritage NSW. 'Relics' cannot be impacted without appropriate approvals under the <i>Heritage Act 1977</i>.</p>	Contractor	Construction
<p>HE5 - If suspected Aboriginal heritage items or archaeological material are uncovered during the works, all works in the vicinity of the find will cease and Council's Site Superintendent and Heritage NSW contacted immediately. Following evaluation of the material, a suitable course of action will be determined by Heritage NSW in consultation with Council.</p>	Contractor	Construction
Socio-economic		
<p>SE1 - Northern Beaches Council will prepare a community engagement plan prior to the commencement of works, to be implemented during construction</p>	Contractor	Construction

Environmental safeguards and mitigation measures	Responsibility	Timing
to provide timely and up to date information to the community during construction. It would include, as a minimum: <ul style="list-style-type: none"> • Mechanisms to provide details and timing of proposed activities to affected residents and local businesses, including changes to traffic and access; and • A contact name and telephone number for complaints. Contact details will be clearly displayed at the entrance to the entrance clearance works sites and all affected beach accessways at the replenishment area. 		
SE2 - A webpage and telephone number will be established for enquiries regarding the proposal and will remain active for the duration of the works.	Contractor	Construction
SE3 - All enquiries and complaints will be tracked through a tracking system and be acknowledged within 24 hours of being received.	Contractor	Construction
Visual amenity & landscape character		
VA1 - The site compound would be fenced and screened where possible.	Contractor	Construction
VA2 - Works would be undertaken during standard construction hours. Outside these times, all plant, machinery and equipment would be kept in the construction compound.	Contractor	Construction
VA3 - The works site will be kept clean and tidy for the duration of the works.	Council	Construction
VA4 - No vegetation removal is permitted.	Council	Construction
VA5 - All works compounds / staging areas are to be reinstated to their original, pre-works condition following the completion of the works.	Contractor	Post-construction
Air quality		
AQ1 - All plant, equipment and vehicles will be maintained to ensure good operating conditions and exhaust emissions in compliance with the relevant legislation, including the PoEO Act.	Council	Construction
AQ2 - Machinery and vehicles will be turned off rather than left to idle when not in use.	Council	Construction
Waste Management		
WM1 - The CEMP would identify potential waste streams associated with the works. The CEMP would include measures to minimise waste, outline methods of disposal, re-use and recycling and monitoring, as appropriate.	Contractor	Post-construction
WM2 - Any excavated material that requires off-site disposal will be classified in accordance with the <i>Waste Classification Guidelines</i> (EPA, 2014) and disposed of at a suitably licenced waste management facility where an appropriate beneficial re-use cannot be identified.	Contractor	Construction
Infrastructure, services & utilities		
US1 - The location of utilities and services within the proposal footprint, or with potential to be impacted by the works, will be confirmed by the Contractor prior to the commencement of works to enable further assessment and mitigation of any potential impacts to utilities.	Contractor	Pre-construction
US2 – Pre- and post-works dilapidation survey would be undertaken of all infrastructure with potential to be adversely impacted by the works. Where it is identified that damage to infrastructure has occurred as a result of the works, rectification works would be undertaken as required.	Contractor	Pre-, during & post-construction
Cumulative impacts		

Environmental safeguards and mitigation measures	Responsibility	Timing
CI1 - Where possible, scheduling of the works will avoid the respective projects being in construction at the same time.	Council	Construction
CI2 - Prior to the commencement of works, Council will coordinate with any other local developments (including the works at the North Narrabeen SLSC under DA2024/0013) in an effort to minimise cumulative impacts to the community associated with traffic, noise, etc.	Council	Pre-construction
CI3 – Ongoing monitoring of water quality using a continuous water quality logger is recommended to facilitate further consideration of potential medium- to long-term changes in estuary processes in Narrabeen Lagoon. In the event the monitoring indicates marinization of the lagoon, Council is to consider the implications for ongoing entrance management.	Council	Operational phase
CI4 – It is recommended Council consider undertaking localised hydrodynamic modelling to evaluate the extent to which the entrance clearance works are contributing to bank erosion in the entrance channel, in particular along the Lake Reserve shoreline. In the event it is confirmed that the works are a contributing factor to the observed erosion, Council is to investigate and implement a longer-term solution to address the shoreline erosion at the affected location(s).	Council	Operational phase

7.3 Licensing and Approvals

A summary of licences and approvals required for the proposal is provided below:

- Fisheries Permits from DPIRD:
 - The proposal will result in the destruction of marine vegetation (marine macroalgae) and potential harm or damage to seagrasses. As such, a Section 205 - permit to harm (cut, remove, damage, destroy, shade etc.) marine vegetation (saltmarshes, mangroves, seagrass and seaweeds) under the FM Act will be required. Additionally, the proposal will likely require the removal of >20 kg/day of wrack, including seagrass wrack, which will require a Section 205 permit; and
 - The proposal will require dredging works by a local government authority and as such a Section 200 consultation for a dredging and reclamation permit under the FM Act will likely be required for these works.

8 Justification and Conclusion

8.1 Project Justification

Narrabeen Lagoon is an ICOLL. When the entrance of the lagoon is closed for longer periods of time there is a significant risk of socio-economic and environmental impacts to the community and the lagoon ecosystem, including:

- Increased flood levels throughout the lagoon (Cardno, 2019; RHDHV, 2022);
- Reductions in water quality for estuary ecosystem and human health and recreational amenity due to lack of tidal flushing;
- Reduced biodiversity, due to lack of recruitment through the entrance.

The *Narrabeen Lagoon Floodplain Risk Management Study and Plan* (Cardno, 2019) recommended the entrance clearance works be undertaken as the highest priority flood risk mitigation option under the Plan. The proposal reduces flood risk and the associated socio-economic impacts of flooding to the community.

While the primary objective of the proposed works is for flood mitigation, additional benefits include improved beach amenity at the proposed sand placement site and improved water quality while the lagoon entrance is open.

The objectives of the proposal are:

- To mitigate flood risk to low-lying properties surrounding Narrabeen Lagoon; and
- To maintain or enhance beach amenity.

8.2 Objects of the EP&A Act

The objects of the EP&A Act are considered in **Table 8-1**.

Table 8-1 Objects of the EP&A Act

Object	Comment
<i>1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.</i>	The proposal facilitates improved social and economic welfare for the community, primarily through the mitigation of flood risks, as detailed in Section 6.8.2 . The proposal would not result in significant impact on any natural or other resources.
<i>1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.</i>	The design of the entrance clearance works has considered potential impacts to biodiversity (in particular seagrasses) and built infrastructure (the rock revetment). Similarly the beach replenishment design considers the desired beach amenity outcomes. The proposal itself has been justified from an economic and social perspective in the <i>Floodplain Risk Management Study and Plan</i> (Cardno, 2019).
<i>1.3(c) To promote the orderly and economic use and development of land.</i>	The proposal facilitates the development of the land by mitigating flood risk to low-lying land around Narrabeen Lagoon.
<i>1.3(d) To promote the delivery and maintenance of affordable housing.</i>	Not relevant to the proposal.

Object	Comment
<i>1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.</i>	The design of the entrance clearance works has adopted a 10 m buffer from seagrass beds. An ecological impact assessment was undertaken for the proposal by H2O Consulting and is summarised in Section 6.5 . The assessment concluded that no significant impact to biodiversity would result from the proposal.
<i>1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).</i>	The proposal is not expected to adversely impact any Aboriginal or non-Aboriginal heritage sites or items. The mitigation measures in Section 6.7 would manage the risk of impact to previously unidentified heritage.
<i>1.3(g) To promote good design and amenity of the built environment.</i>	Not relevant to the proposal.
<i>1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.</i>	Not relevant to the proposal.
<i>1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.</i>	Not relevant to the proposal.
<i>1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.</i>	Community engagement with the community and key stakeholders would continue through the works phase.

8.3 Conclusion

The proposed entrance clearance works at Narrabeen is subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

This has included consideration (where relevant) of conservation agreements and plans of management under the NP&W Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the EPBC Act.

A number of potential environmental impacts from the proposal have been avoided or reduced during the concept design development and options assessment. The proposal as described in the REF best meets the project objectives but would still result in some impacts on traffic, navigation, public access, noise, and visual amenity. Safeguards and management measures as detailed in this REF would ameliorate or minimise these expected impacts. The proposal would also mitigate the flood risk to the community. On balance the proposal is considered justified and the following conclusions are made.

Significance of impact under NSW legislation

The proposal would be unlikely to cause a significant impact on the environment. Therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A BDAR or SIS is not required. The proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

Significance of impact under Commonwealth legislation

The proposal is not likely to have a significant impact on MNES or the environment of Commonwealth land within the meaning of the EPBC Act. A referral to the Commonwealth DCCEEW is not required.

9 Certification, Review and Determination

I certify that I have reviewed and endorsed the contents of this REF document and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under clause 170 of the EP&A Regulation, and the information it contains is neither false nor misleading.

A handwritten signature in blue ink that reads "Tanja Mackenzie".

Tanja Mackenzie

Principal Environmental Scientist (CEnvP no.: 0447)

Rhelm Pty Ltd

Date: 4 August 2025

I have examined this REF and accept it on behalf of Northern Beaches Council.

Patrick Stuart

Team Leader, Floodplain Planning and Response

Northern Beaches Council

Date:

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Appendix A

Entrance Clearance Works Designs

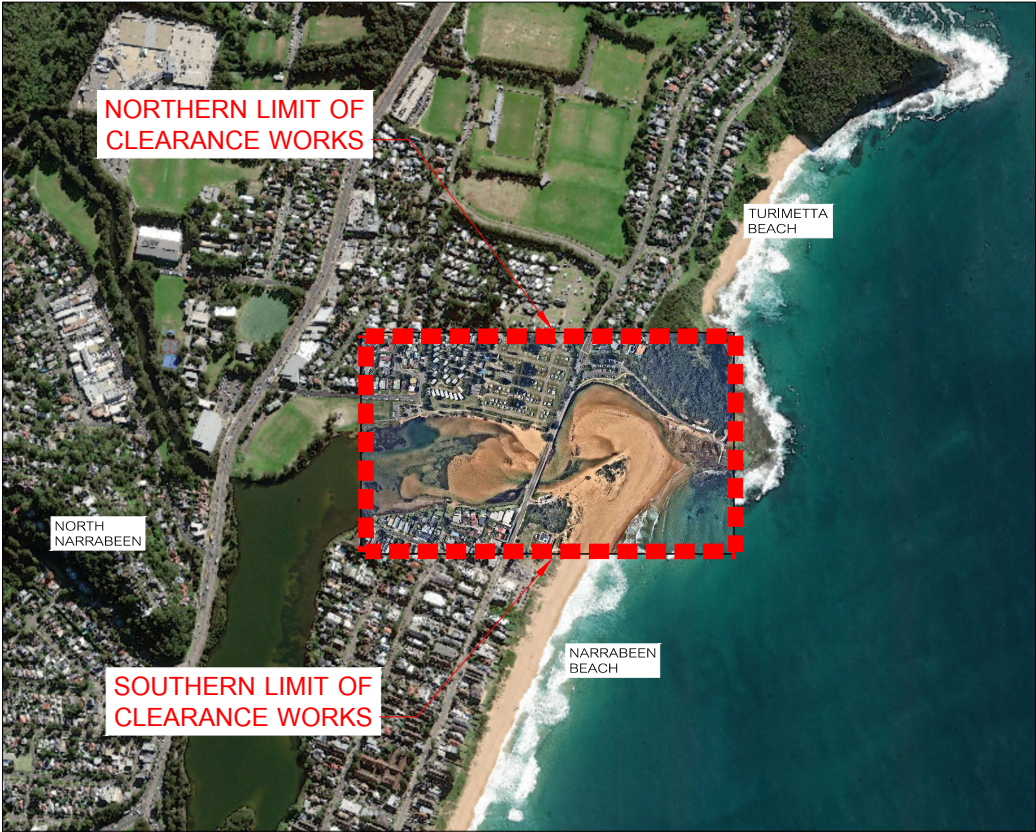
NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

ISSUED FOR TENDER

OVERALL PROJECT LOCATION PLAN



PROJECT LOCATION:



DATE: 2025/04/28

PREPARED FOR:

Northern Beaches Council



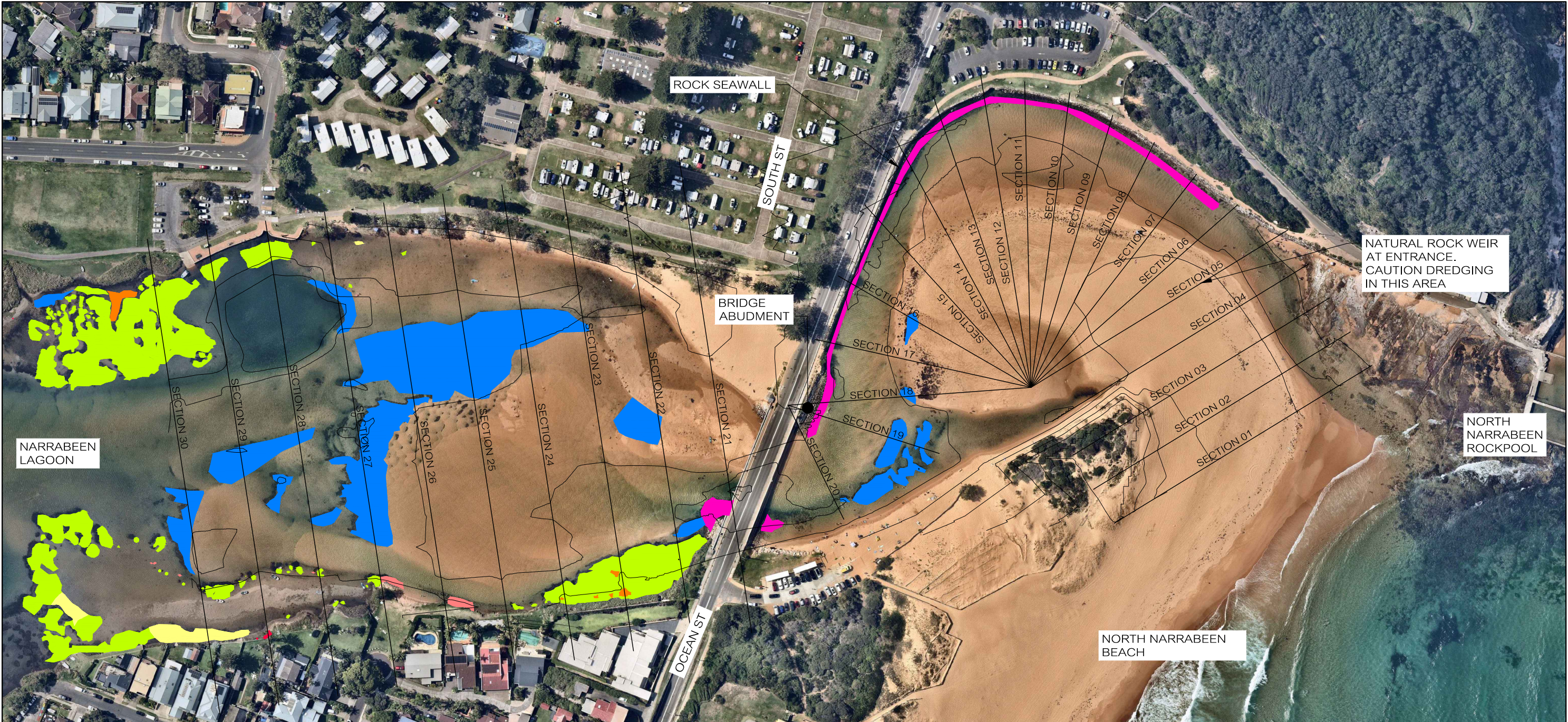
PREPARED BY:

Baird.

Baird Australia

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Sydney, NSW 2000
+61-2-8278-7266

DRAWING NUMBER	DRAWING TITLE	REVISION	DRAWING NUMBER	DRAWING TITLE	REVISION
13142-504-000	TITLE PAGE AND DRAWING INDEX	REV. 0	13142-504-130	OPTION 01 - SECTIONS 29-30	REV. 0
13142-504-010	EXISTING CONDITIONS	REV. 0	13142-504-140	OPTION 02 - STAGING PLAN AND NOTES	REV. 0
13142-504-020	OPTION 01 - STAGING PLAN AND NOTES	REV. 0	13142-504-150	OPTION 02 - DREDGE VOLUME TARGET 30,000M3	REV. 0
13142-504-030	OPTION 01 - DREDGE VOLUME TARGET 22,500 M3	REV. 0	13142-504-160	OPTION 02 - SECTIONS 1-4	REV. 0
13142-504-040	OPTION 01 - SECTIONS 1-4	REV. 0	13142-504-170	OPTION 02 - SECTIONS 5-8	REV. 0
13142-504-050	OPTION 01 - SECTIONS 5-8	REV. 0	13142-504-180	OPTION 02 - SECTIONS 9-12	REV. 0
13142-504-060	OPTION 01 - SECTIONS 9-12	REV. 0	13142-504-190	OPTION 02 - SECTIONS 13-16	REV. 0
13142-504-070	OPTION 01 - SECTIONS 13-16	REV. 0	13142-504-200	OPTION 02 - SECTIONS 17-20	REV. 0
13142-504-080	OPTION 01 - SECTIONS 17-20	REV. 0	13142-504-210	OPTION 02 - SECTIONS 21-22	REV. 0
13142-504-090	OPTION 01 - SECTIONS 21-22	REV. 0	13142-504-220	OPTION 02 - SECTIONS 23-24	REV. 0
13142-504-100	OPTION 01 - SECTIONS 23-24	REV. 0	13142-504-230	OPTION 02 - SECTIONS 25-26	REV. 0
13142-504-110	OPTION 01 - SECTIONS 25-26	REV. 0	13142-504-240	OPTION 02 - SECTIONS 27-28	REV. 0
13142-504-120	OPTION 01 - SECTIONS 27-28	REV. 0	13142-504-250	OPTION 02 - SECTIONS 29-30	REV. 0

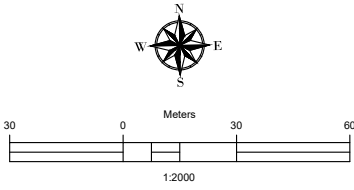


LEGEND

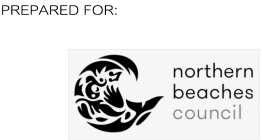
- SEAGRASS WRACK
- ZOSTERA - HALOPHILA
- ZOSTERA
- MANGROVE
- OYSTER RUBBLE
- MACROALGAE
- ROCKY REEF WITH SARGASSUM

NOTES:

- VERTICAL DATUM AUSTRALIAN HEIGHT DATUM (m AHD).
- HORIZONTAL DATUM: MGA GDA2020.
- EXISTING BED: SURVEY DATE FEBRUARY 04, 2025
- B.M ADOPTED PM7786, R.L. 2.290 (CLASS LB)
- DESIGN BATTER SLOPES AT 1V:6H
- MINIMUM 10M DREDGE AREA DISTANCE FROM SEAGRASS AREAS AND 15M FROM ROCKWALL AND BRIDGE ABUTMENTS.
- AERIAL IMAGERY (DATED 4 FEBRUARY 2025) SOURCED FROM NEARMAP.



REV		DESCRIPTION		DATE	
B	0	ISSUED FOR TENDER	MDST	JC	JC
B	A	ISSUED FOR REVIEW	MDST	JC	JC
PH	REV	DESCRIPTION	DRN	DSN	APR QCM
REVISIONS					
(PH) PHASE OF ISSUE	(A) PRELIMINARY (B) DESIGN	(C) PERMIT (D) TENDER DOCUMENT	(E) CONSTRUCTION DOCUMENT	(F) RECORD	



NARRABEEN LAGOON ENTRANCE CLEARANCE WORK	
EXISTING CONDITIONS	
DRAWING NUMBER: 13142-504-010	REV. 0 DATE: 2025/04/28

NOTES:

1.

WORKS ARE TO BE UNDERTAKEN IN ACCORDANCE WITH THE NARRABEEN LAGOON ENTRANCE CLEARANCE WORKS REVIEW OF ENVIRONMENTAL FACTORS (REF, RHELM, 2025). THESE DRAWINGS SHOULD BE READ IN CONJUNCTION WITH THAT DOCUMENT.
2.

WORKS ARE NOT TO COMMENCE UNTIL ALL RELEVANT APPROVALS, PERMITS AND LICENSES ARE OBTAINED AS REQUIRED AND THE CONTRACTOR COMMISSIONED AND THE CEMP PREPARED BY THE CONTRACTOR IS ACCEPTED BY COUNCIL.
3.

PRIOR TO WORKS COMMENCING ALL TEMPORARY TRAFFIC SIGNAGE AND EROSION AND SEDIMENT CONTROLS MUST BE IMPLEMENTED. WORKS SHOULD BE FENCED OFF TO PREVENT PUBLIC ACCESS.
4.

IF THE ENTRANCE IS NOT CLOSED AT THE COMMENCEMENT OF THE WORKS, IT SHALL BE ARTIFICIALLY CLOSED WITH SAND PRIOR TO CLEARANCE WORKS COMMENCING. THE ENTRANCE SHALL BE CLOSED TO ENSURE THAT THE WATER LEVEL OF THE LAGOON IS APPROXIMATELY 0.4m AHD TO ENSURE SEAGRASS BEDS HAVE SUFFICIENT WATER COVERAGE.
5.

AS A CONTINGENCY MEASURE, IN THE EVENT OF A FLOOD OR RAINFALL INCREASING THE WATER LEVEL OF THE LAGOON BEYOND THAT WHICH ALLOWS THE PRACTICAL CONTINUATION OF CLEARANCE WORKS, WORKS WOULD CEASE AND A MECHANICAL BREAKOUT AND SUBSEQUENT CLOSURE WOULD TAKE PLACE TO RESTORE THE WATER LEVEL OF THE LAGOON TO APPROX 0.4m AHD.
6.

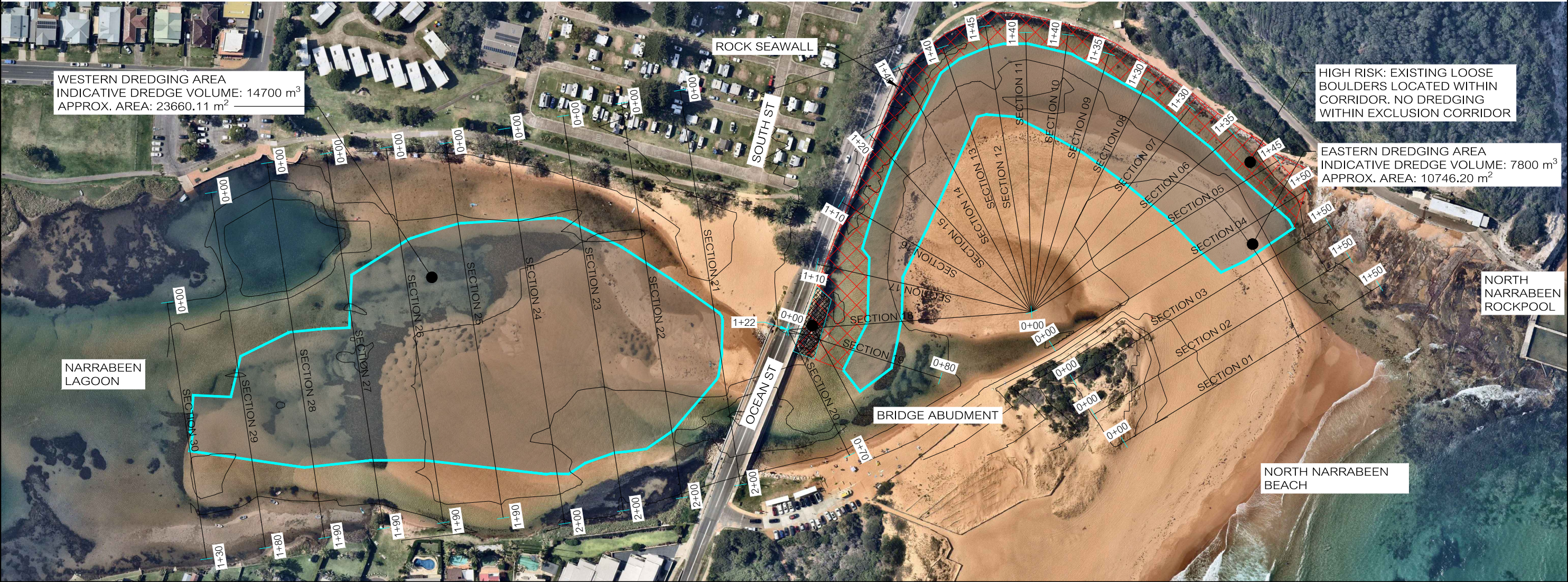
THE GENERAL ORDER OF WORKS ASSUMES THE DREDGING WILL COMMENCE IN THE AREA ON THE WESTERN SIDE OF OCEAN ST BRIDGE AND PROGRESS EASTWARDS UNTIL COMPLETION OF THE WORKS AT THE ENTRANCE. EXCAVATED SAND IS TO BE STOCKPILED TEMPORARILY AT LOCATIONS AS DESCRIBED IN THE REF (RHELM, 2025). THE EXCAVATED SAND IS TO BE PLACED ALONG COLLAROY - NARRABEEN BEACH BETWEEN DEVITT STREET STUART STREET AS A PRIORITY, AND BETWEEN FRAZER STREET AND 1156 PITTWATER ROAD, WITH THE HAULAGE ROUTE OUTLINED IN THE TRAFFIC MANAGEMENT PLAN (RHELM 2025).
7.

AT THE COMPLETION OF THE CLEARANCE WORKS, THE ENTRANCE SHALL BE MECHANICALLY OPENED IN ACCORDANCE WITH WARRINGAH COUNCIL'S NARRABEEN LAGOON ENTRANCE MANAGEMENT OPERATIONAL MANAGEMENT STANDARD (EM-OMS 455).
8.

THE BED PROFILE AT THE ENTRANCE BETWEEN SECTION 04 AND SECTION 06 (INCLUSIVE) REQUIRES A CHECK OF THE PRE-WORKS SURVEY TO DETERMINE THE DESIGN LEVEL TO ENSURE THE NATURAL ROCK SHELF IS NOT DAMAGED DURING DREDGING OPERATIONS.
9.

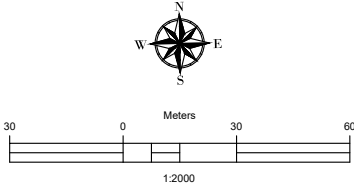
DREDGING AREAS HAVE BEEN OBSERVED TO CONTAIN LOOSE ROCK AND ORGANIC MATERIAL (SHELLS). SCREENING OF MATERIAL SHALL BE REQUIRED TO SEPARATE ROCK AND ORGANIC MATERIAL PRIOR TO PLACEMENT OF SAND.
10.

WRACK (DEAD MACROALGAE, KELP AND SEAGRASS) TO BE REMOVED PRIOR TO DREDGING WORKS COMMENCING. REMOVAL TO BE IN ACCORDANCE WITH RELEVANT PERMIT CONDITIONS.



NOTES:

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- HORIZONTAL DATUM: MGA GDA2020.
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- DESIGN BATTER SLOPES AT 1V:6H
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- AERIAL IMAGERY (DATED 4 FEBRUARY 2025) SOURCED FROM NEARMAP.



B	0	ISSUED FOR TENDER		MDST	JC	JC	JC	2025/04/28
B	A	ISSUED FOR REVIEW		MDST	JC	JC	JC	2025/03/25
PH	REV	DESCRIPTION			DRN	DSN	APR	QCM
REVISIONS								
(PH) PHASE OF ISSUE		(A) PRELIMINARY (B) DESIGN		(C) PERMIT (D) TENDER DOCUMENT		(E) CONSTRUCTION DOCUMENT (F) RECORD		

PREPARED FOR:



PREPARED BY:

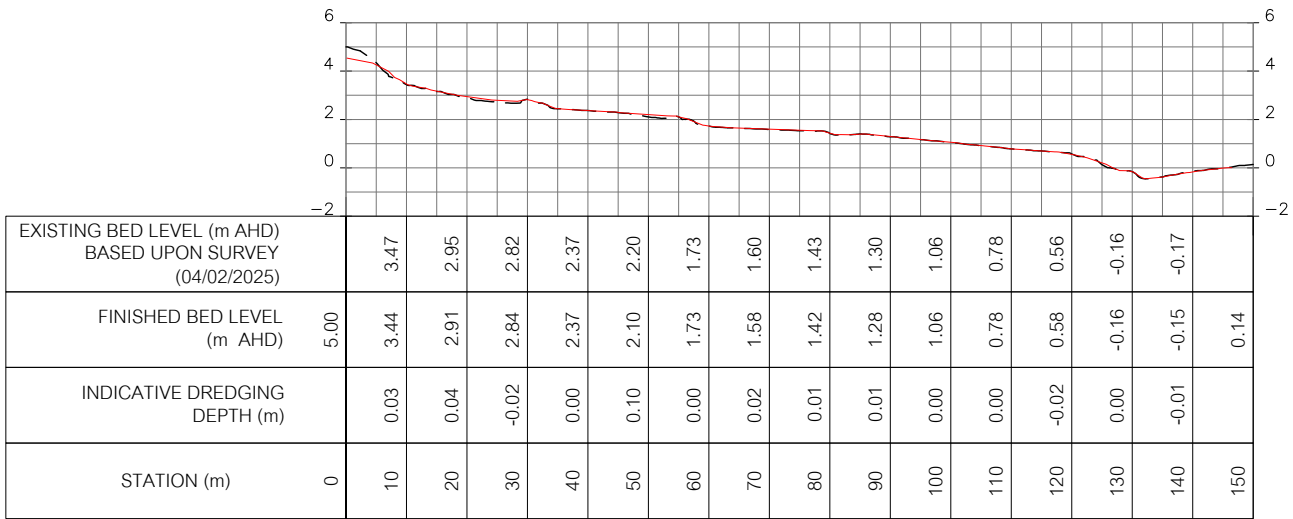


NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

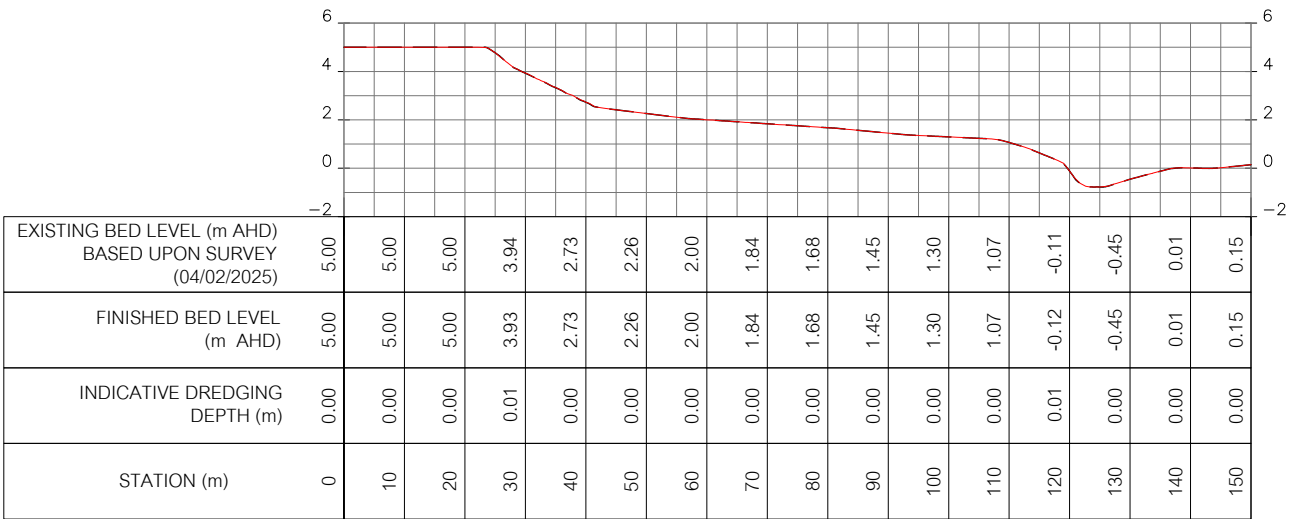
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DREDGE VOLUME 22500 m3

DRAWING NUMBER: 13142-504-020 REV. 0 DATE: 2025/04/28

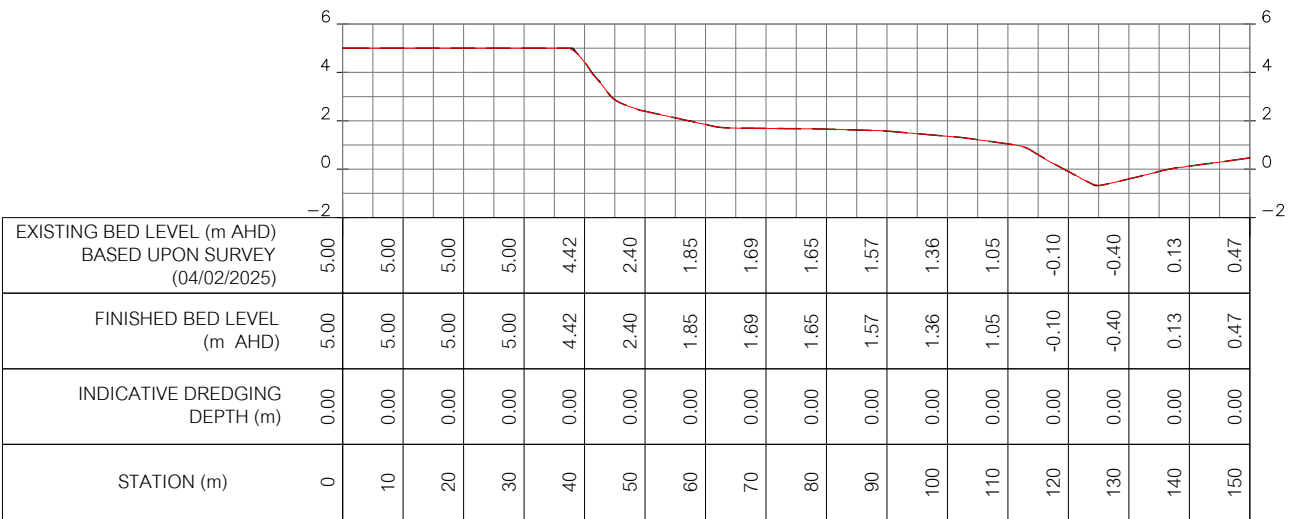
SECTION 01



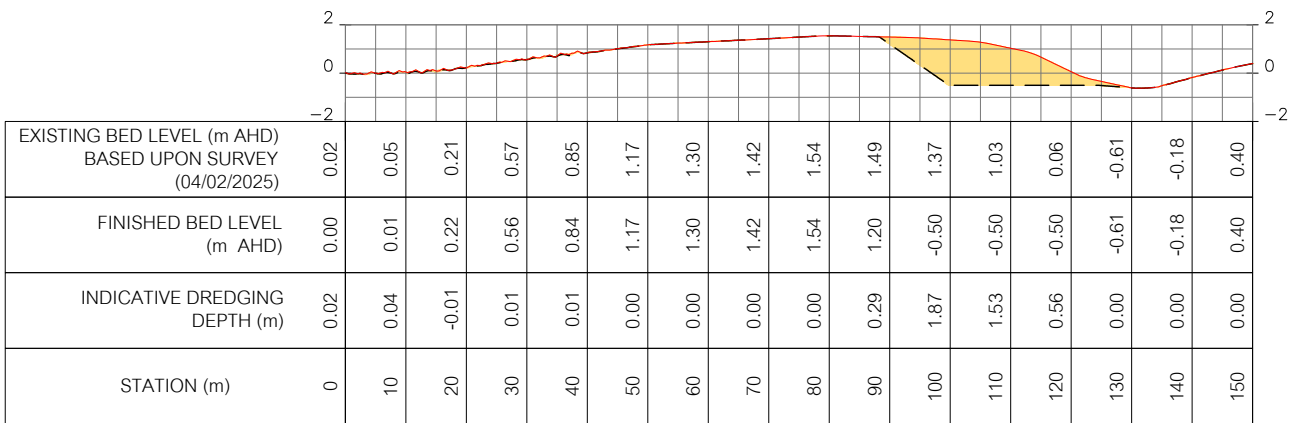
SECTION 02



SECTION 03



SECTION 04



LEGEND

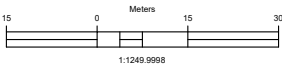
EXISTING BED

DESIGN PROFILE

DREDGING AREA

NOTES:

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- HORIZONTAL DATUM: MGA GDA2020.
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B	A	ISSUED FOR REVIEW	MDST	JC	JC	JC	2025/03/25		
PH	REV	DESCRIPTION	DRN	DSN	APR	QCM	YYYY-MM-DD		
REVISIONS									
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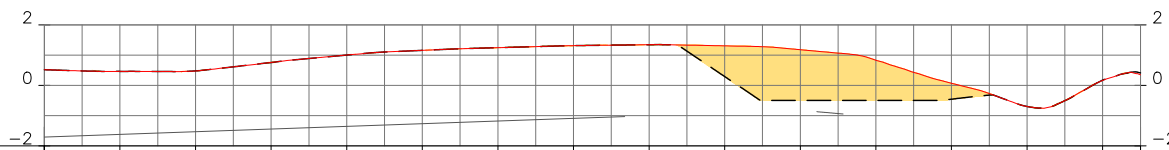
PREPARED BY:

NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

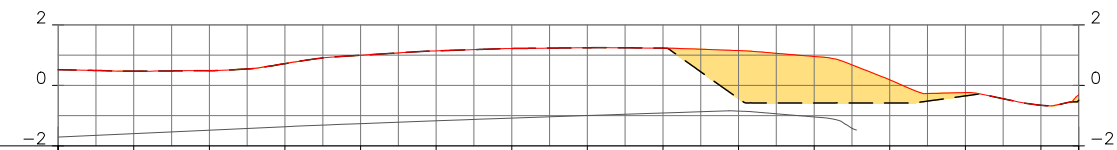
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DRAWING NUMBER: 13142-504-040 REV. 0 DATE: 2025/04/28

SECTION 05

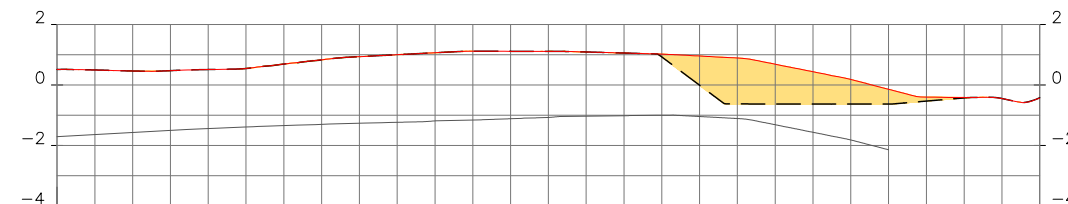
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SECTION 06



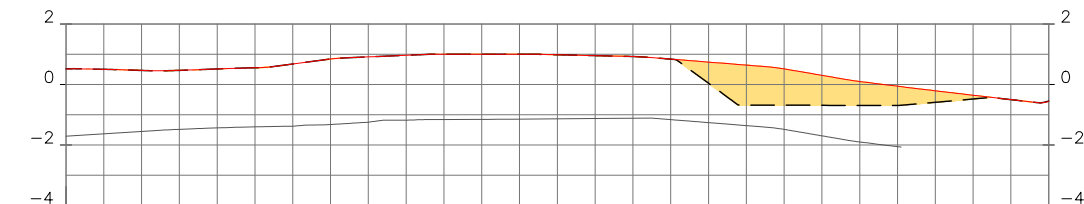
EXISTING BED LEVEL (m AHD) BASED UPON SURVEY (04/02/2025)	0.52	0.47	0.49	0.72	1.00	1.14	1.22	1.24	1.23	1.15	0.96	0.18	-0.24	-0.66	-0.31
FINISHED BED LEVEL (m AHD)	0.52	0.47	0.49	0.72	1.00	1.14	1.22	1.24	1.23	-0.43	-0.58	-0.58	-0.35	-0.66	-0.49
INDICATIVE DREDGING DEPTH (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.58	1.54	0.76	0.11	0.00	0.18
STATION (m)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	135

SECTION 07



EXISTING BED LEVEL (m AHD) BASED UPON SURVEY (04/02/2025)	0.52	0.46	0.51	0.69	0.94	1.07	1.12	1.09	1.02	0.89	0.44	-0.14	-0.41	-0.43
FINISHED BED LEVEL (m AHD)	0.52	0.46	0.51	0.69	0.94	1.07	1.12	1.09	0.93	-0.62	-0.63	-0.63	-0.43	-0.41
INDICATIVE DREDGING DEPTH (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	1.51	1.07	0.49	0.01	-0.01
STATION (m)	0	10	20	30	40	50	60	70	80	90	100	110	120	130

SECTION 08



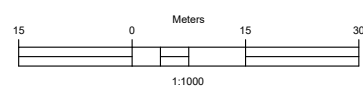
EXISTING BED LEVEL (m AHD) BASED UPON SURVEY (04/02/2025)	0.52	0.47	0.52	0.68	0.91	1.00	1.00	0.96	0.84	0.64	0.30	-0.06	-0.35	-0.55
FINISHED BED LEVEL (m AHD)	0.52	0.47	0.52	0.68	0.91	1.00	1.00	0.96	0.84	-0.68	-0.68	-0.69	-0.48	-0.54
INDICATIVE DREDGING DEPTH (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.32	0.99	0.63	0.12	-0.01
STATION (m)	0	10	20	30	40	50	60	70	80	90	100	110	120	130

LEGEND

-  EXISTING BED
 DESIGN PROFILE
 DREDGING AREA
 ROCK LAYER BASED ON SURVEY 2025

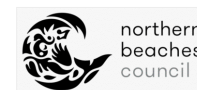
NOTES:

- VERTICAL DATUM AUSTRALIAN HEIGHT DATUM (m AHD).
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- EXISTING BED: SURVEY DATE FEBRUARY 04, 2025
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B	A	ISSUED FOR REVIEW	MDST	JC	JC	JC	2025/03/25	
PH	REV	DESCRIPTION	DRN	DSN	APR	QCM	YYYY-MM-DD	
REVISIONS								
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PHASE OF ISSUANCE	(B) DESIGN	(D) TENDER DOCUMENT	(F) RECORD					

PREPARED FOR:



PREPARED BY:	
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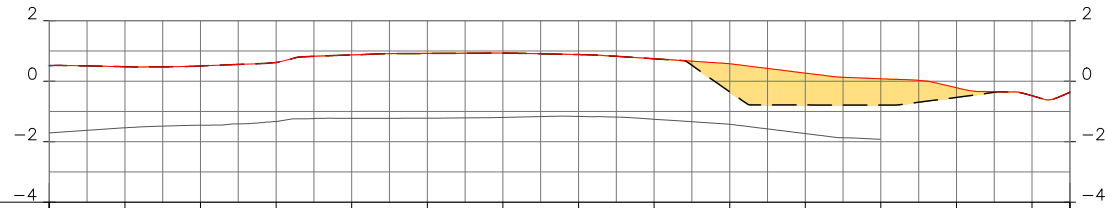
Baird.
Baird Australia

NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

OPTION 01 - SECTIONS 5-8

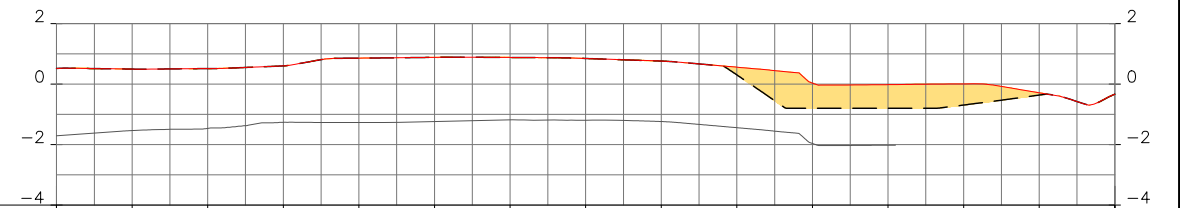
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SECTION 09



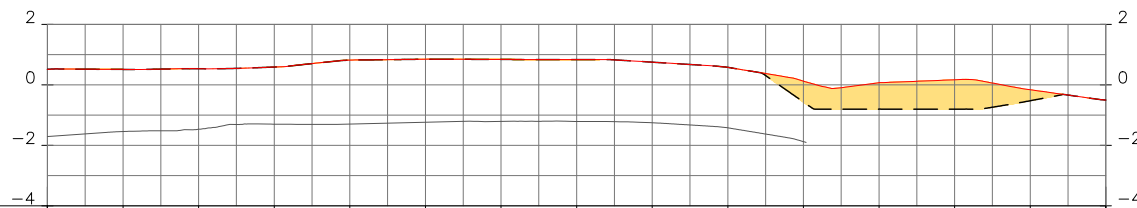
EXISTING BED LEVEL (m AHD) BASED UPON SURVEY (04/02/2025)	0.52	0.48	0.50	0.62	0.87	0.92	0.93	0.88	0.74	0.58	0.27	0.08	-0.22	-0.48	-0.37
FINISHED BED LEVEL (m AHD)	0.52	0.48	0.50	0.62	0.87	0.92	0.93	0.88	0.74	-0.35	-0.78	-0.79	-0.54	-0.48	-0.37
INDICATIVE DREDGING DEPTH (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.93	1.05	0.87	0.32	0.00	0.00
STATION (m)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	135

SECTION 10



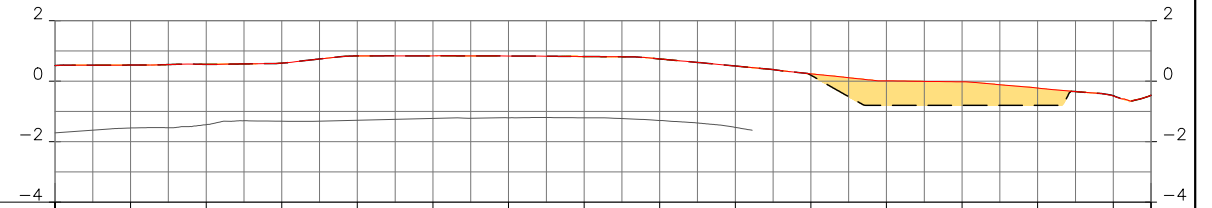
EXISTING BED LEVEL (m AHD) BASED UPON SURVEY (04/02/2025)	-4	0.52	0.49	0.51	0.60	0.86	0.88	0.88	0.85	0.76	0.56	0.03	-0.02	0.01	-0.29	-0.33
FINISHED BED LEVEL (m AHD)	0.52	0.49	0.51	0.60	0.86	0.88	0.88	0.85	0.76	0.30	-0.80	-0.80	-0.69	-0.36	-0.33	
INDICATIVE DREDGING DEPTH (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.83	0.78	0.70	0.08	0.00	
STATION (m)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	

SECTION 11



EXISTING BED LEVEL (m AHD) BASED UPON SURVEY (04/02/2025)	0.52		0.51		0.53		0.59		0.82		0.85		0.84		0.84		0.75		0.58		0.12		0.07		0.17		-0.16		-0.50
FINISHED BED LEVEL (m AHD)	0.52		0.51		0.54		0.59		0.82		0.85		0.84		0.84		0.75		0.58		-0.56		-0.80		-0.80		-0.52		-0.50
INDICATIVE DREDGING DEPTH (m)	0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.00		0.69		0.87		0.97		0.36		0.00
STATION (m)	0		10		20		30		40		50		60		70		80		90		100		110		120		130		140

SECTION 12



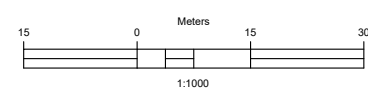
EXISTING BED LEVEL (m AHD) BASED UPON SURVEY (04/02/2025)	0.52	0.53	0.55	0.60	0.83	0.84	0.83	0.82	0.74	0.50	0.24	0.01	-0.02	-0.23	-0.49	-0.46
FINISHED BED LEVEL (m AHD)	0.52	0.53	0.55	0.60	0.83	0.84	0.83	0.82	0.73	0.50	0.20	-0.80	-0.80	-0.80	-0.48	-0.46
INDICATIVE DREDGING DEPTH (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.81	0.78	0.57	-0.01	0.00
STATION (m)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	145

LEGEND

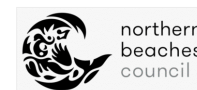
-  EXISTING BED
 DESIGN PROFILE
 DREDGING AREA
 ROCK LAYER BASED ON SURVEY 2025

NOTES:

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- AERIAL IMAGERY (DATED 4 FEBRUARY 2025) SOURCED FROM NEARMAP.

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PREPARED FOR:



PREPARED BY:	
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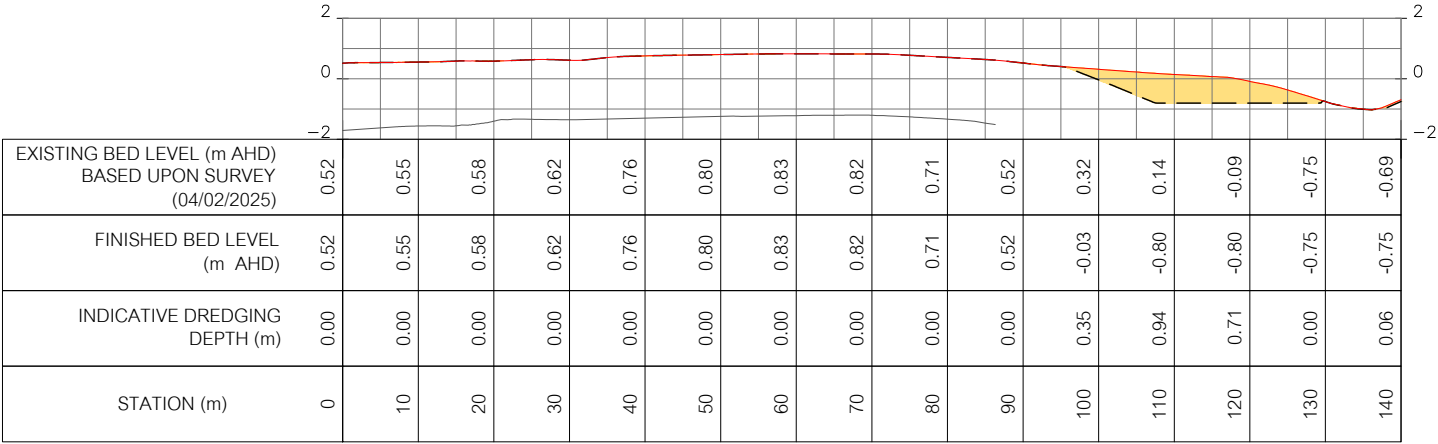
Baird.
Baird Australia

NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

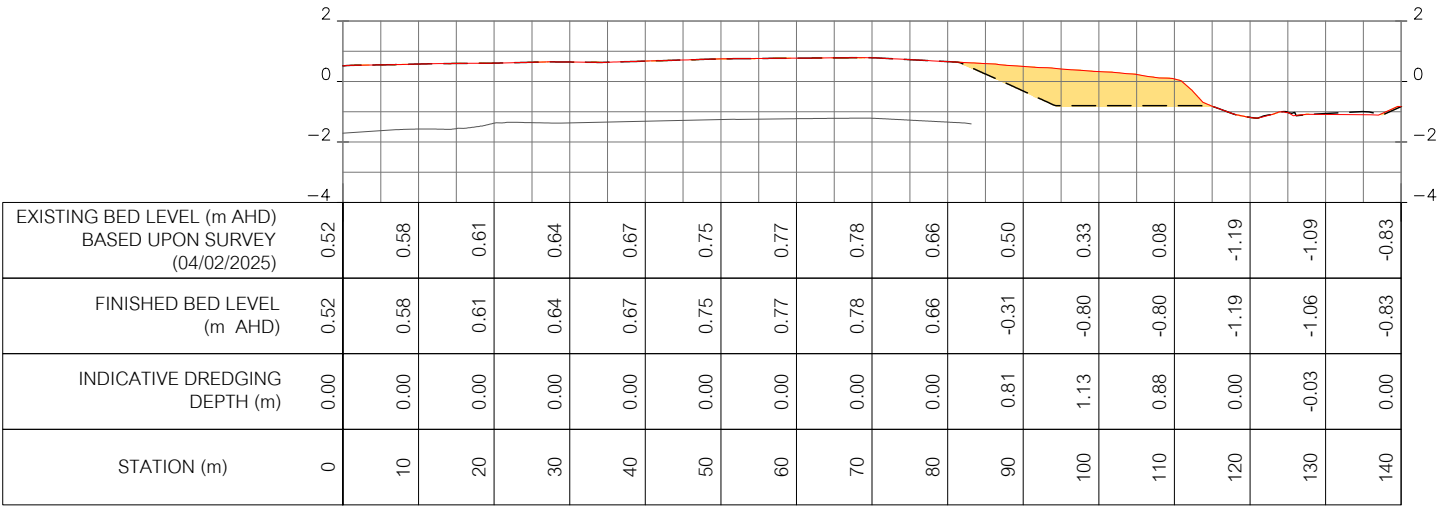
OPTION 01 - SECTIONS 9-12

DRAWING NUMBER: 13142 504 060	REV. 0	DATE: 2025/04/04
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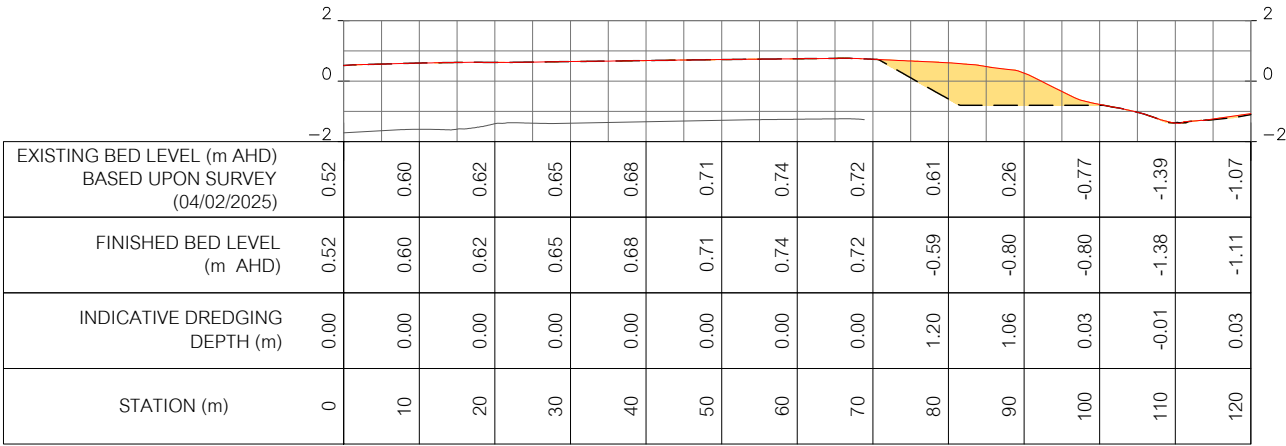
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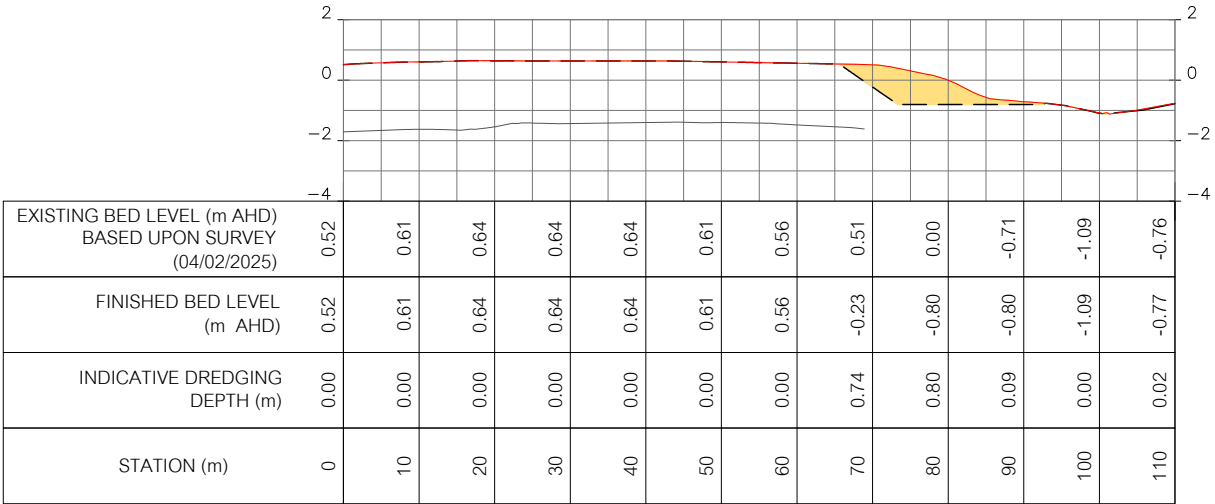
SECTION 14



SECTION 15



SECTION 16



LEGEND

EXISTING BED

DESIGN PROFILE

DREDGING AREA

ROCK LAYER BASED
ON SURVEY 2025

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B	0	ISSUED FOR TENDER	MDST	JC	JC	JC	2025/04/28		
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PREPARED BY:

NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

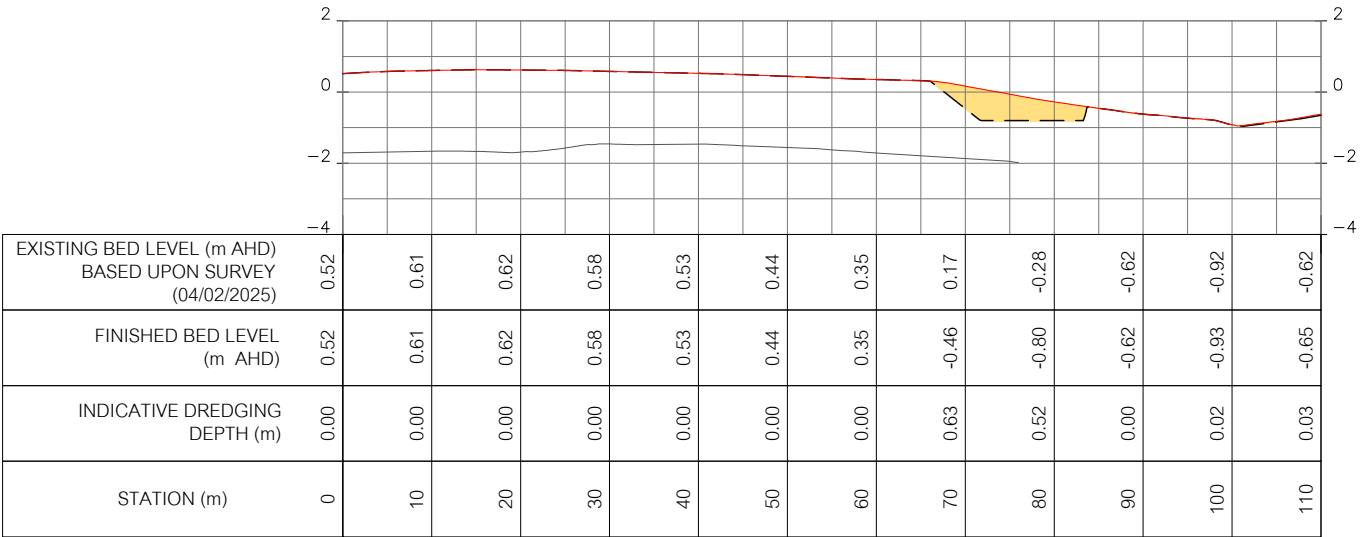
OPTION 01 - SECTIONS 13-16

DRAWING NUMBER: 13142-504-070

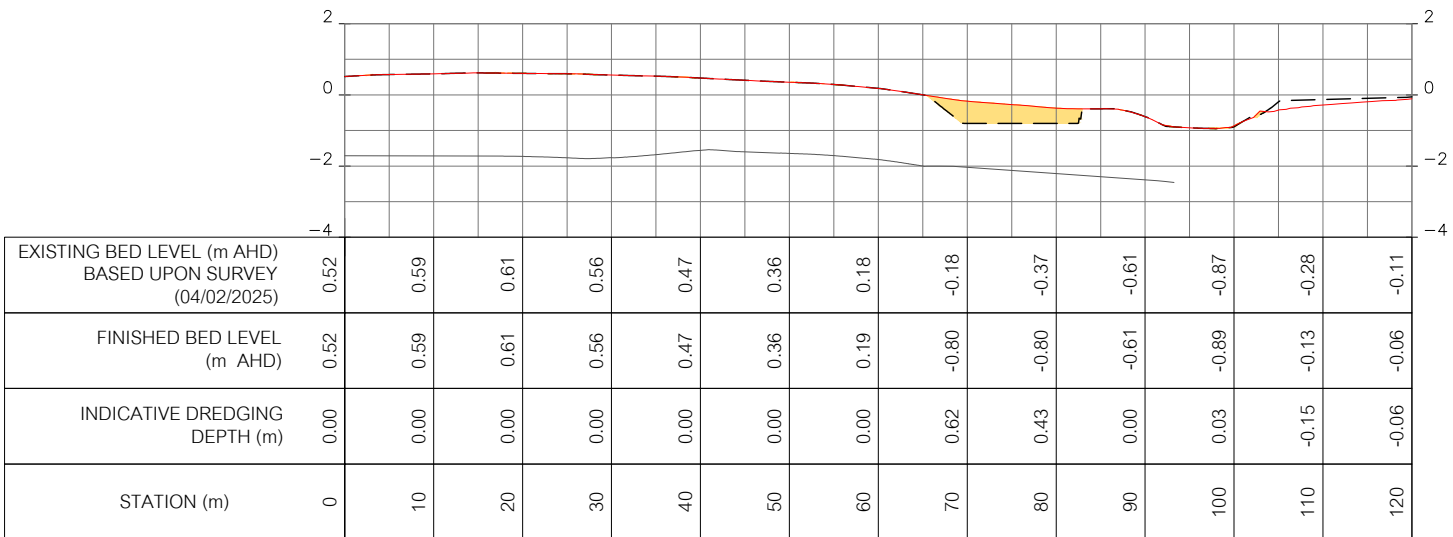
REV. 0

DATE: 2025/04/28

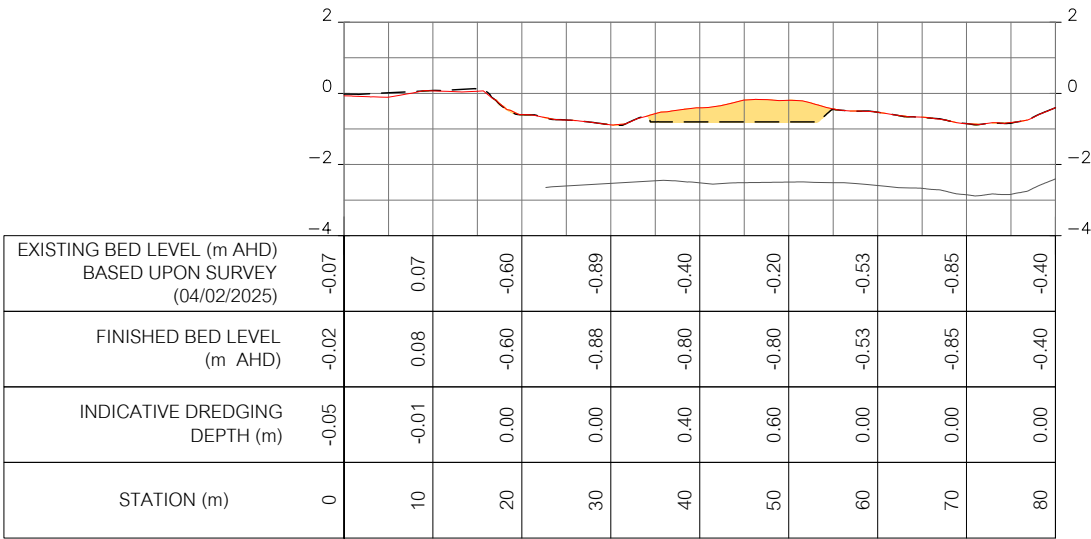
SECTION 17



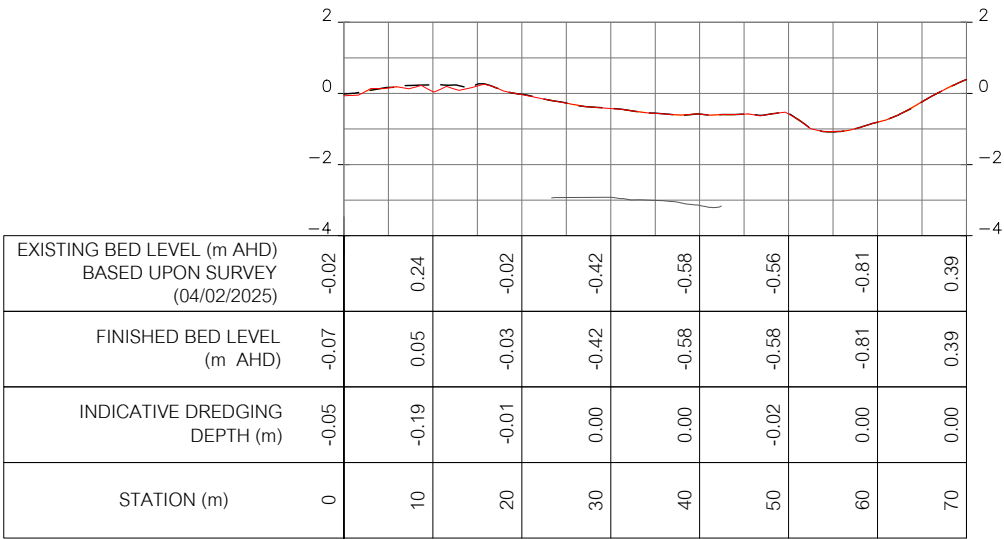
SECTION 18



SECTION 19



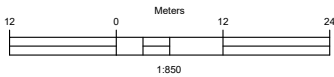
SECTION 20



LEGEND

- EXISTING BED
- DESIGN PROFILE
- DREDGING AREA
- ROCK LAYER BASED ON SURVEY 2025

- NOTES:
- VERTICAL DATUM AUSTRALIAN HEIGHT DATUM (m AHD).
 - HORIZONTAL DATUM: MGA GDA2020.
 - EXISTING BED: SURVEY DATE FEBRUARY 04, 2025
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REVISIONS							
(PH) PHASE OF ISSUE	(A) PRELIMINARY (B) DESIGN	(C) PERMIT (D) TENDER DOCUMENT	(E) CONSTRUCTION DOCUMENT	(F) RECORD			

PREPARED FOR:



PREPARED BY:

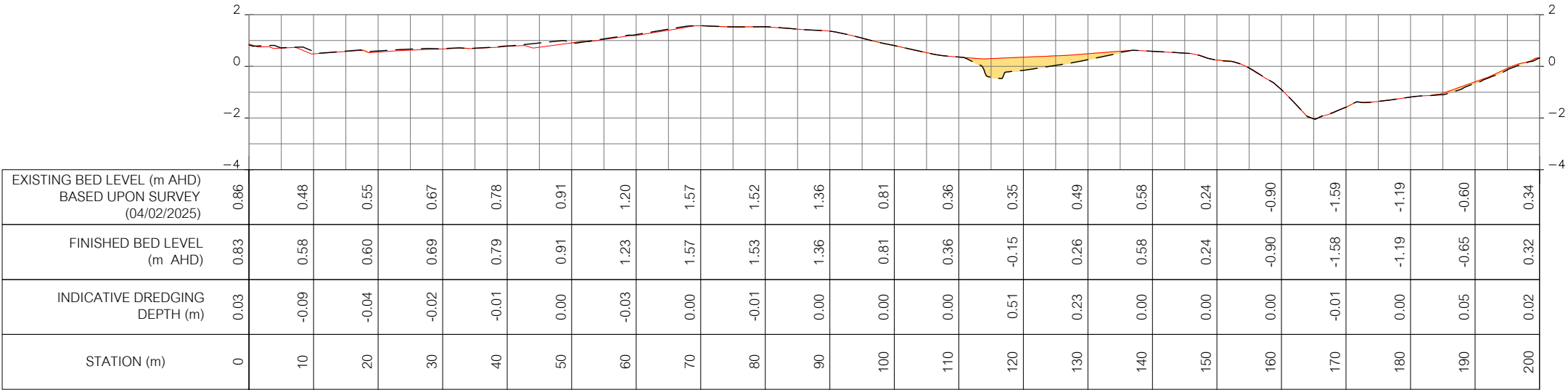


NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

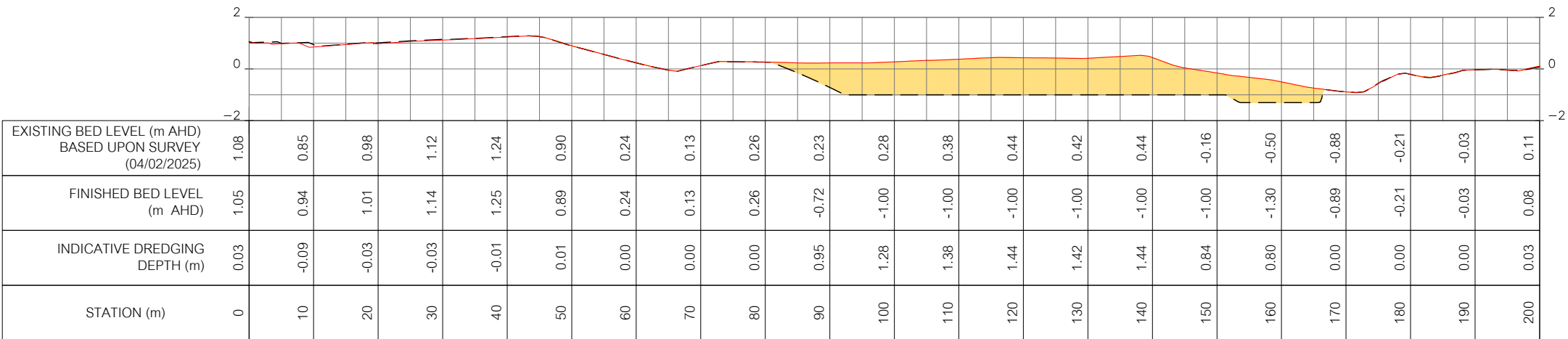
OPTION 01 - SECTIONS 17-20

DRAWING NUMBER: 13142-504-080 REV. 0 DATE: 2025/04/28

SECTION 21



SECTION 22



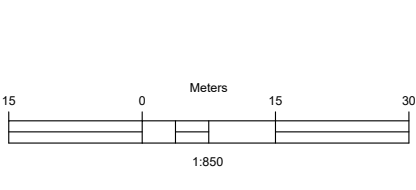
LEGEND

EXISTING BED

DESIGN PROFILE

DREDGING AREA

- NOTES:
- VERTICAL DATUM AUSTRALIAN HEIGHT DATUM (m AHD).
 - HORIZONTAL DATUM: MGA GDA2020.
 - EXISTING BED: SURVEY DATE FEBRUARY 04, 2025
 - B.M ADOPTED PM7786, R.L. 2.290 (CLASS LB)
 - DESIGN BATTER SLOPES AT 1V:6H
 - MINIMUM 10M DREDGE AREA DISTANCE FROM SEAGRASS AREAS AND 15M FROM ROCKWALL AND BRIDGE ABUTMENTS.
 - AERIAL IMAGERY (DATED 4 FEBRUARY 2025) SOURCED FROM NEARMAP.



B	0	ISSUED FOR TENDER				MDST	JC	JC	JC	2025/04/28
B	A	ISSUED FOR REVIEW				MDST	JC	JC	JC	2025/03/25
PH	REV	DESCRIPTION				DRN	DSN	APR	QCM	YYYY-MM-DD
REVISIONS										
(PH) PHASE OF ISSUE		(A) PRELIMINARY (B) DESIGN		(C) PERMIT (D) TENDER DOCUMENT		(E) CONSTRUCTION DOCUMENT (F) RECORD				

PREPARED FOR:

northern beaches council

PREPARED BY:

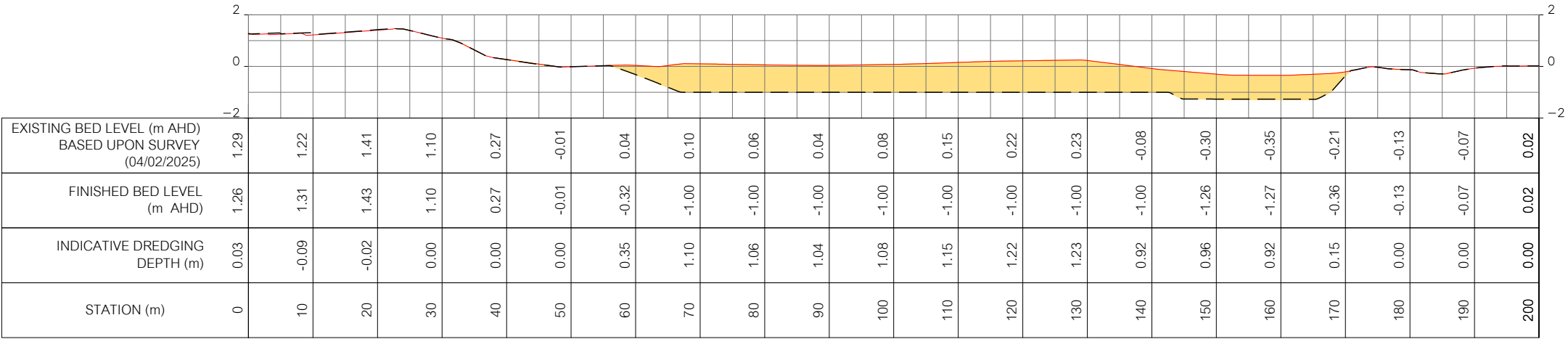
Baird Australia

NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

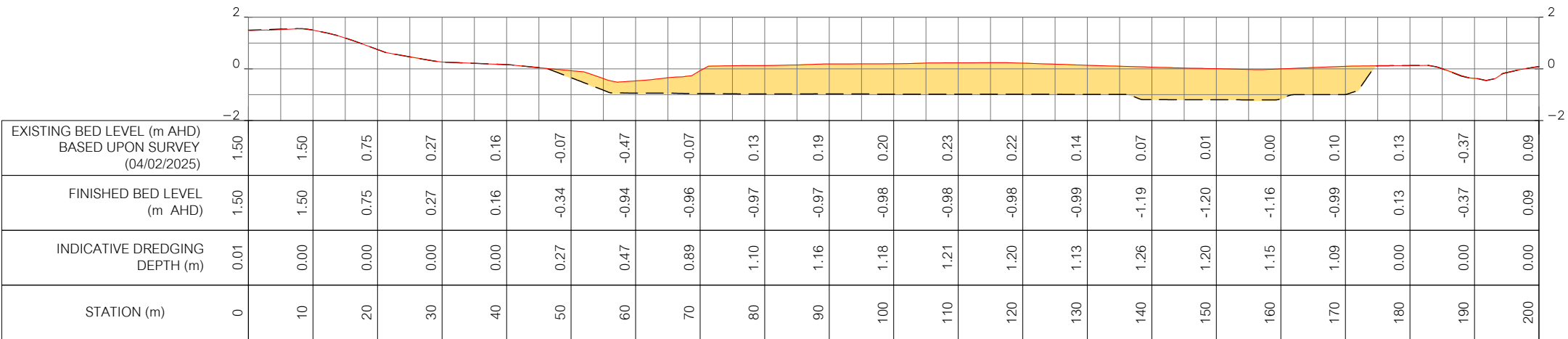
OPTION 01 - SECTIONS 21-22

DRAWING NUMBER: 13142-504-090REV. 0DATE: 2025/04/28

SECTION 23



SECTION 24



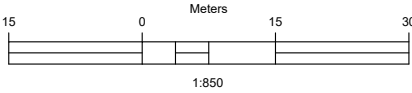
LEGEND

EXISTING BED

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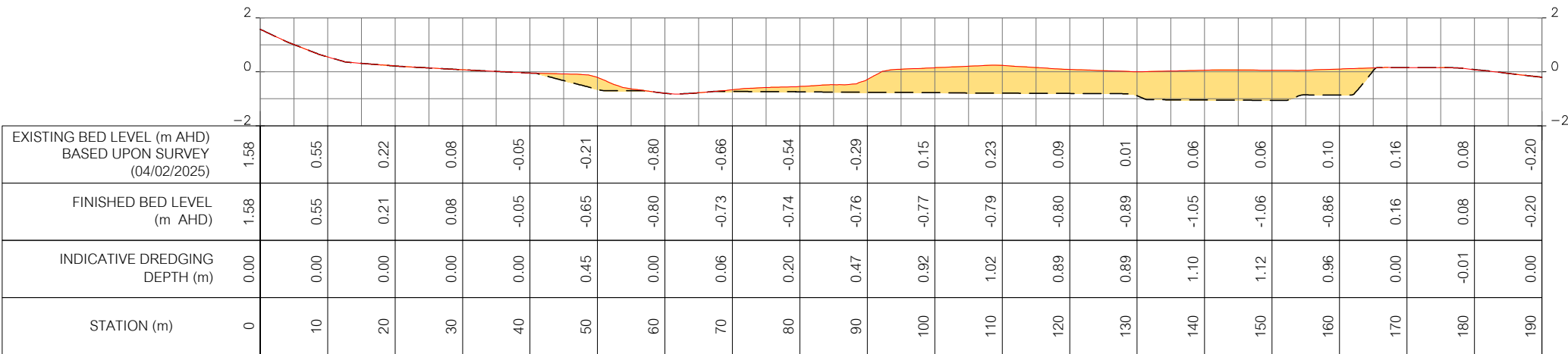


NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

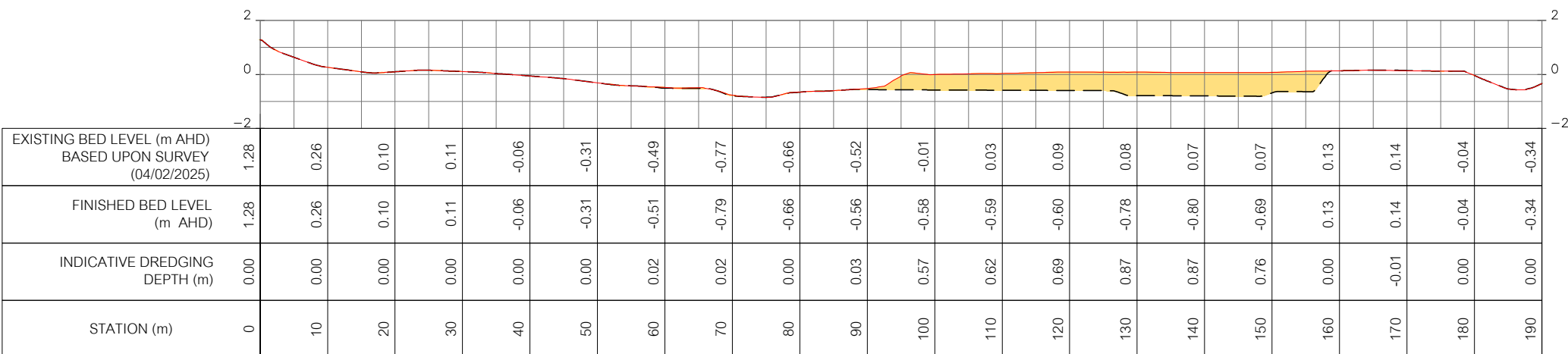
OPTION 01 - SECTIONS 23-24

DRAWING NUMBER: 13142-504-100 REV. 0 DATE: 2025/04/28

SECTION 25



SECTION 26



LEGEND

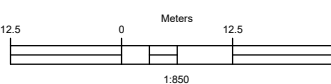
EXISTING BED

DESIGN PROFILE

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		MDST	JC	JC	JC	JC	2025/03/-
		DRN	DSN	APR	QCM		YYYY-MM-JJ
REVISIONS							
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PREPARED FOR



PREPARED BY:

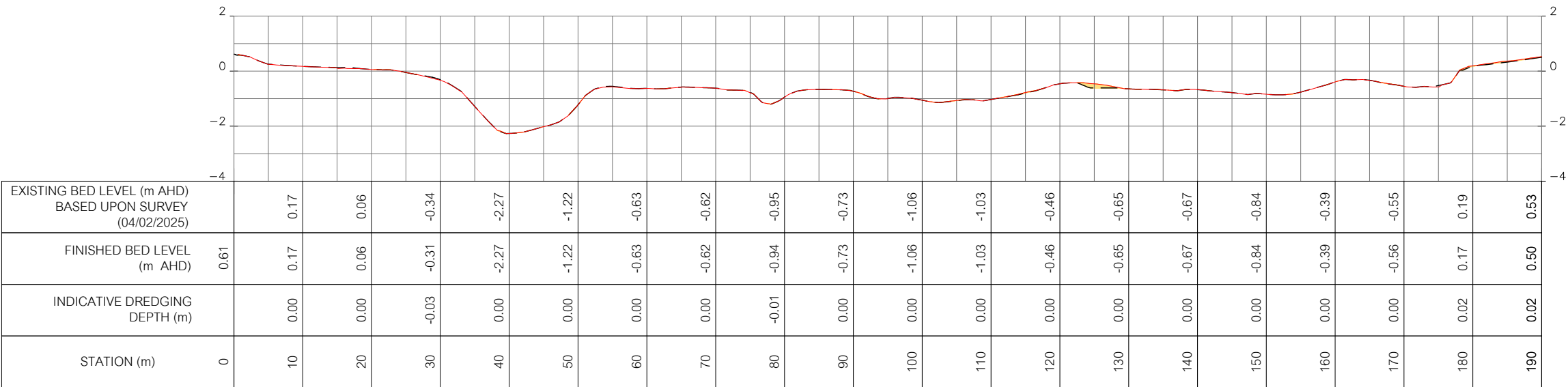
Baird.
Baird Australia

NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

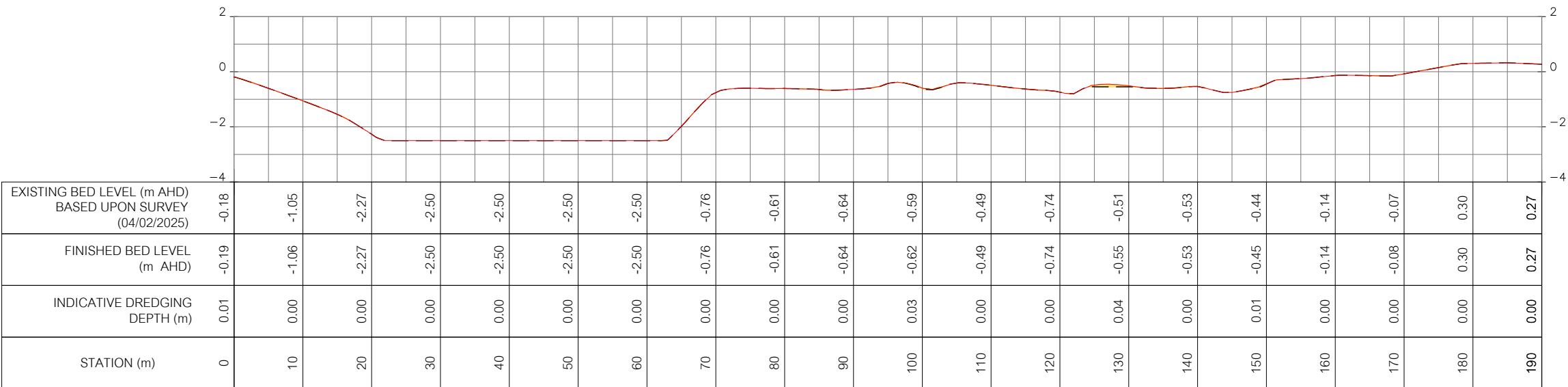
OPTION 01 - SECTIONS 25-26

DRAWING NUMBER: 13142-504-110 REV. 0 DATE: 2025/04/28

SECTION 27



SECTION 28



LEGEND

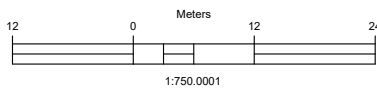
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DESIGN PROFILE

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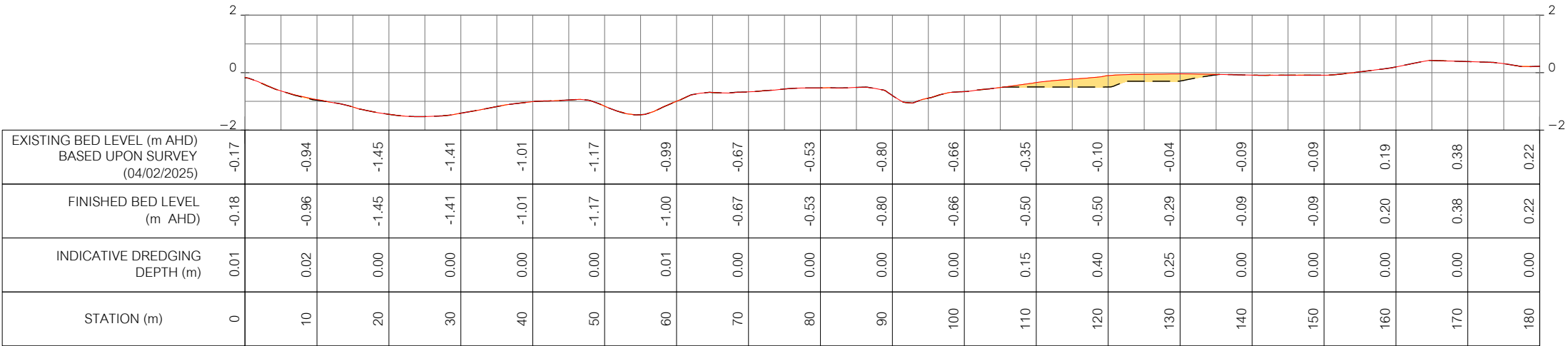
Baird.
Baird Australia

NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

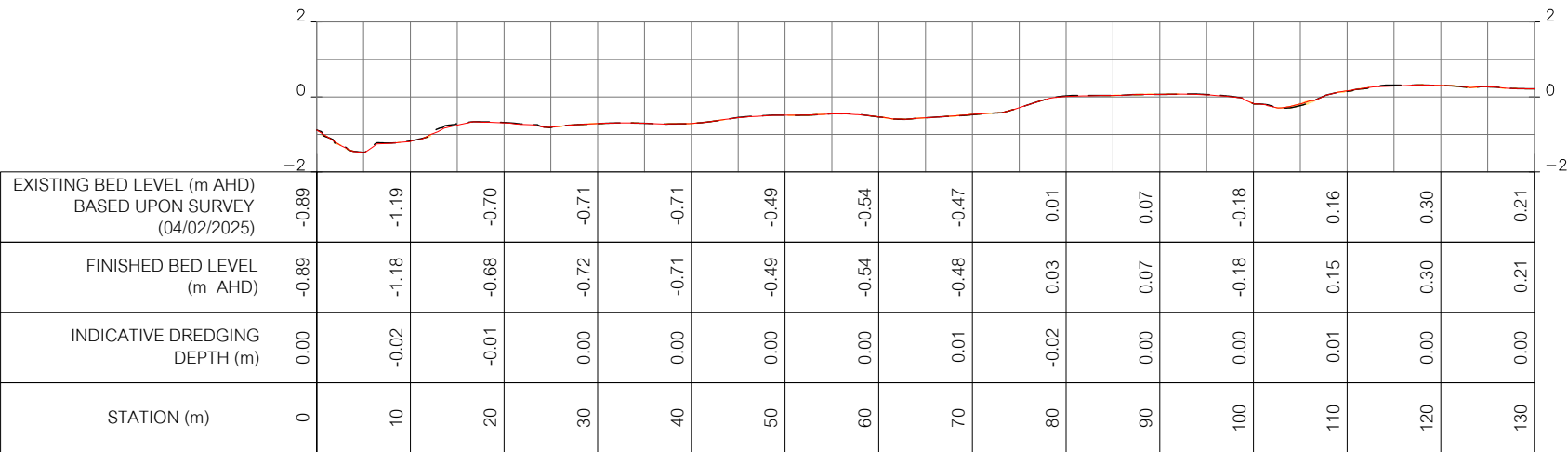
OPTION 01 - SECTIONS 27-28

DRAWING NUMBER: 13142-504-120 | REV. 0 | DATE: 2025/04/28

SECTION 29



SECTION 30



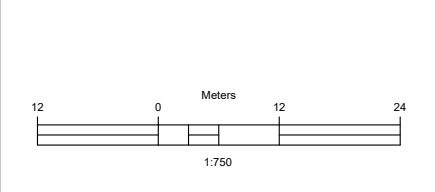
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EXISTING BED

DESIGN PROFILE

DREDGING AREA

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PREPARED FOR:

northern beaches council

PREPARED BY:

Baird Australia

NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

OPTION 01 - SECTIONS 29-30

DRAWING NUMBER: 13142

504

130

REV. 0

DATE: 2025/04/28

NOTES:

1.

WORKS ARE TO BE UNDERTAKEN IN ACCORDANCE WITH THE NARRABEEN LAGOON ENTRANCE CLEARANCE WORKS REVIEW OF ENVIRONMENTAL FACTORS (REF, RHELM, 2025). THESE DRAWINGS SHOULD BE READ IN CONJUNCTION WITH THAT DOCUMENT.
2.

WORKS ARE NOT TO COMMENCE UNTIL ALL RELEVANT APPROVALS, PERMITS AND LICENSES ARE OBTAINED AS REQUIRED AND THE CONTRACTOR COMMISSIONED AND THE CEMP PREPARED BY THE CONTRACTOR IS ACCEPTED BY COUNCIL.
3.

PRIOR TO WORKS COMMENCING ALL TEMPORARY TRAFFIC SIGNAGE AND EROSION AND SEDIMENT CONTROLS MUST BE IMPLEMENTED. WORKS SHOULD BE FENCED OFF TO PREVENT PUBLIC ACCESS.
4.

IF THE ENTRANCE IS NOT CLOSED AT THE COMMENCEMENT OF THE WORKS, IT SHALL BE ARTIFICIALLY CLOSED WITH SAND PRIOR TO CLEARANCE WORKS COMMENCING. THE ENTRANCE SHALL BE CLOSED TO ENSURE THAT THE WATER LEVEL OF THE LAGOON IS APPROXIMATELY 0.4m AHD TO ENSURE SEAGRASS BEDS HAVE SUFFICIENT WATER COVERAGE.
5.

AS A CONTINGENCY MEASURE, IN THE EVENT OF A FLOOD OR RAINFALL INCREASING THE WATER LEVEL OF THE LAGOON BEYOND THAT WHICH ALLOWS THE PRACTICAL CONTINUATION OF CLEARANCE WORKS, WORKS WOULD CEASE AND A MECHANICAL BREAKOUT AND SUBSEQUENT CLOSURE WOULD TAKE PLACE TO RESTORE THE WATER LEVEL OF THE LAGOON TO APPROX 0.4m AHD.
6.

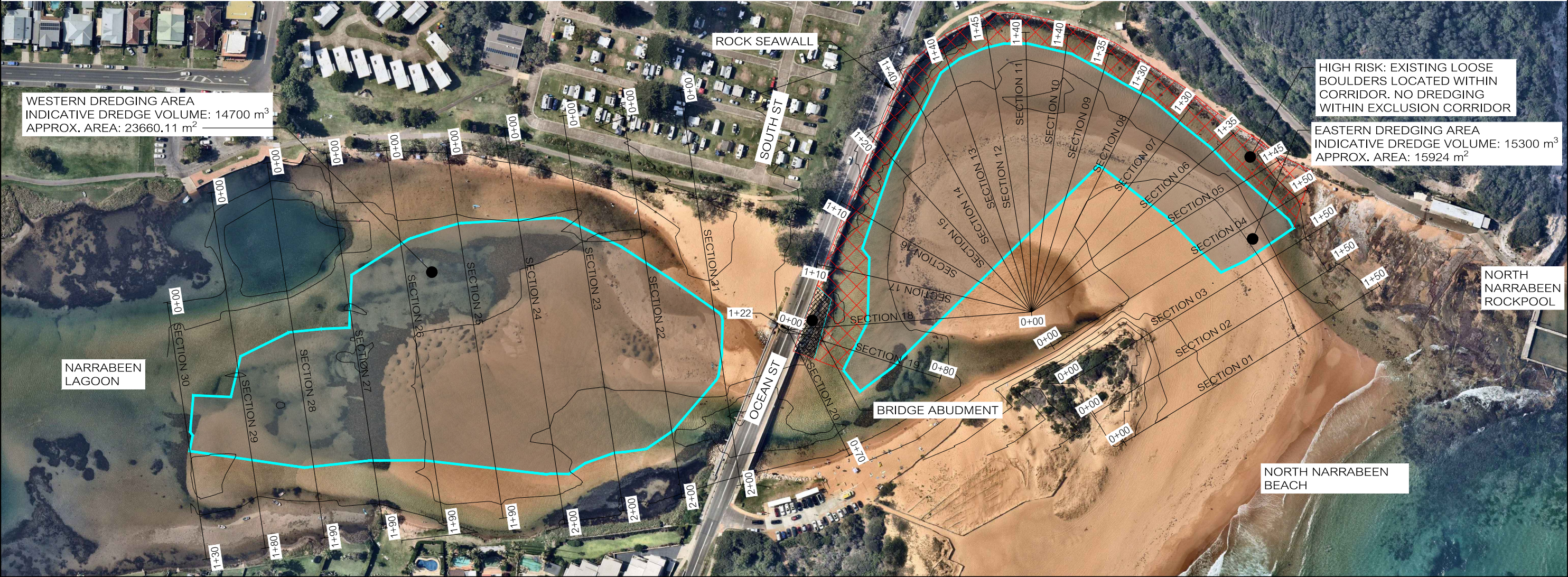
THE GENERAL ORDER OF WORKS ASSUMES THE DREDGING WILL COMMENCE IN THE AREA ON THE WESTERN SIDE OF OCEAN ST BRIDGE AND PROGRESS EASTWARDS UNTIL COMPLETION OF THE WORKS AT THE ENTRANCE. EXCAVATED SAND IS TO BE STOCKPILED TEMPORARILY AT LOCATIONS AS DESCRIBED IN THE REF (RHELM, 2025). THE EXCAVATED SAND IS TO BE PLACED ALONG COLLAROY - NARRABEEN BEACH BETWEEN DEVITT STREET STUART STREET AS A PRIORITY, AND BETWEEN FRAZER STREET AND 1156 PITTWATER ROAD, WITH THE HAULAGE ROUTE OUTLINED IN THE TRAFFIC MANAGEMENT PLAN (RHELM 2025).
7.

AT THE COMPLETION OF THE CLEARANCE WORKS, THE ENTRANCE SHALL BE MECHANICALLY OPENED IN ACCORDANCE WITH WARRINGAH COUNCIL'S NARRABEEN LAGOON ENTRANCE MANAGEMENT OPERATIONAL MANAGEMENT STANDARD (EM-OMS 455).
8.

THE BED PROFILE AT THE ENTRANCE BETWEEN SECTION 04 AND SECTION 06 (INCLUSIVE) REQUIRES A CHECK OF THE PRE-WORKS SURVEY TO DETERMINE THE DESIGN LEVEL TO ENSURE THE NATURAL ROCK SHELF IS NOT DAMAGED DURING DREDGING OPERATIONS.
9.

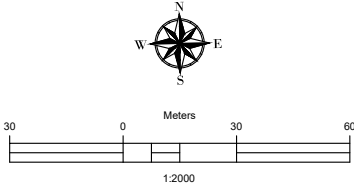
DREDGING AREAS HAVE BEEN OBSERVED TO CONTAIN LOOSE ROCK AND ORGANIC MATERIAL (SHELLS). SCREENING OF MATERIAL SHALL BE REQUIRED TO SEPARATE ROCK AND ORGANIC MATERIAL PRIOR TO PLACEMENT OF SAND.
10.

WRACK (DEAD MACROALGAE, KELP AND SEAGRASS) TO BE REMOVED PRIOR TO DREDGING WORKS COMMENCING. REMOVAL TO BE IN ACCORDANCE WITH RELEVANT PERMIT CONDITIONS.



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PREPARED FOR:



PREPARED BY:

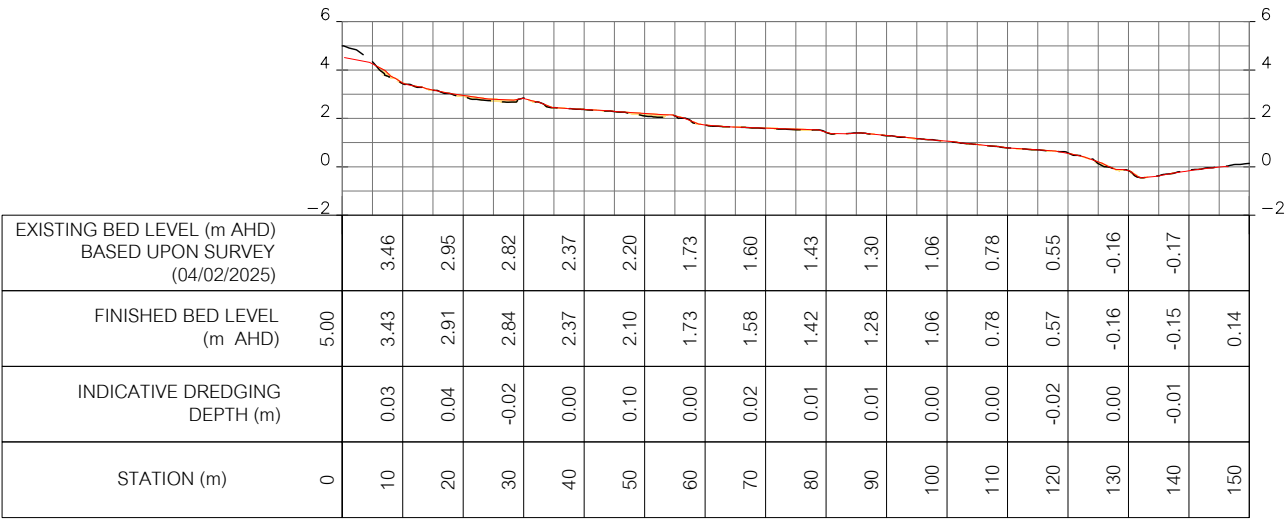


NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

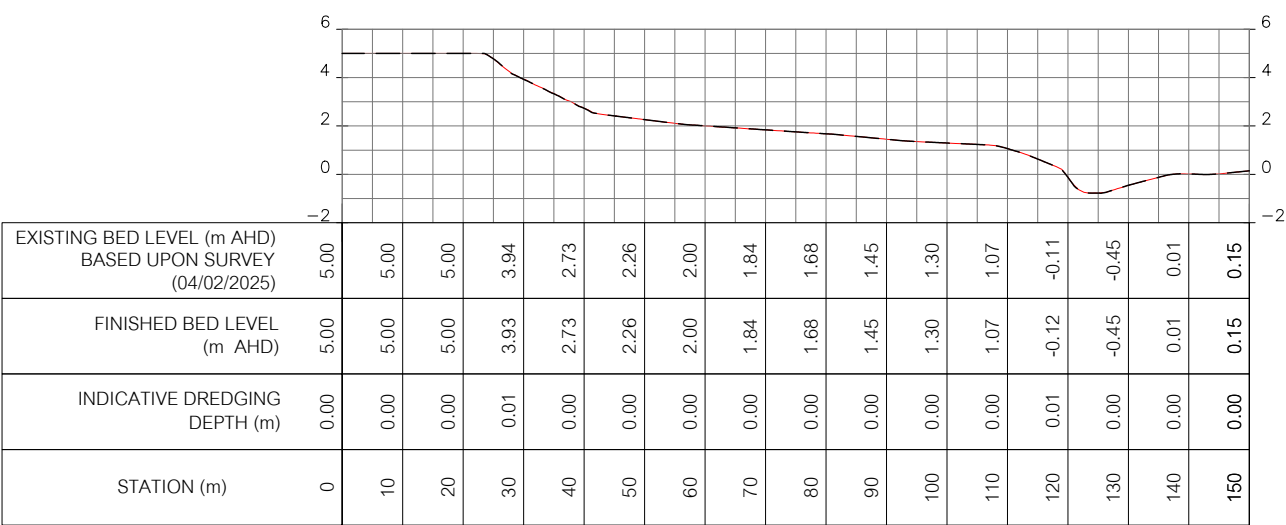
OPTION 02 - STAGING PLAN AND NOTES
DREDGE VOLUME 30000 m3

DRAWING NUMBER: 13142-504-140 REV. 0 DATE: 2025/04/28

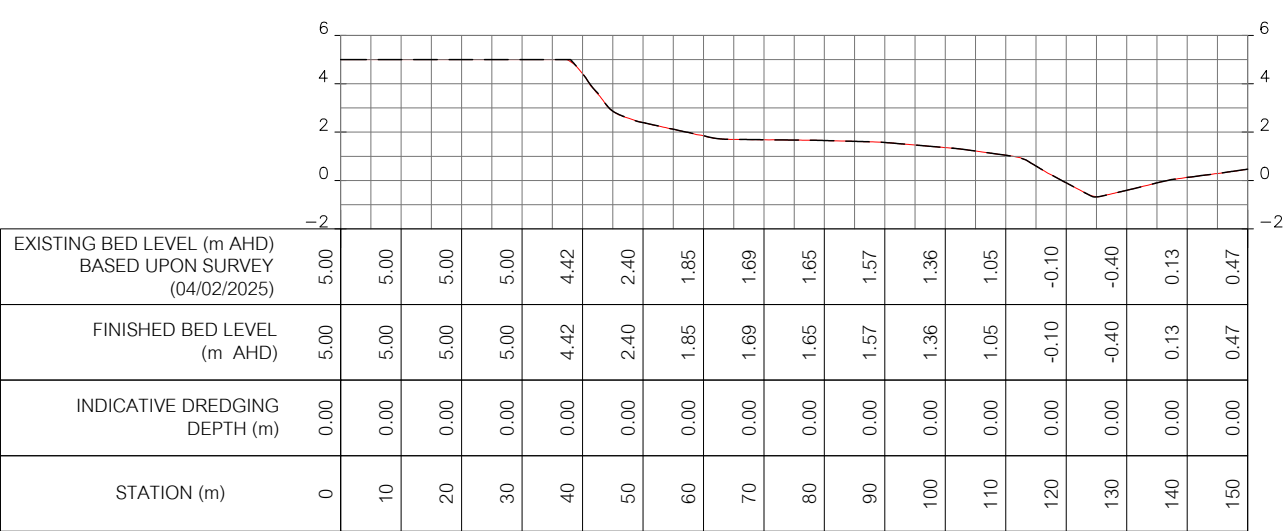
SECTION 01



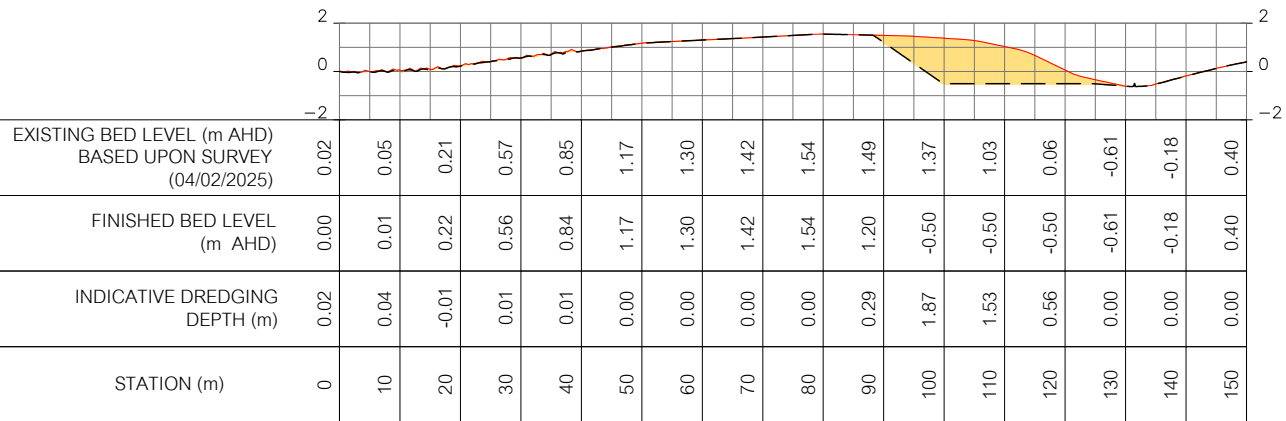
SECTION 02



SECTION 03



SECTION 04

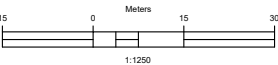


LEGEND

- EXISTING BED
- DESIGN PROFILE
- DREDGING AREA

NOTES:

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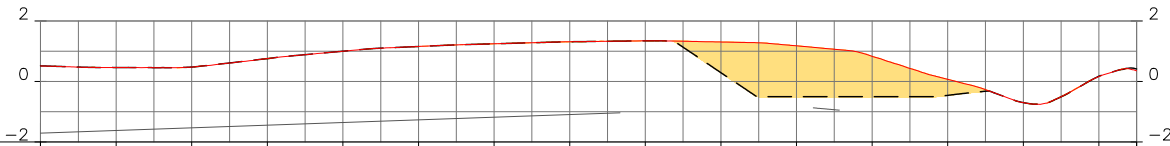


NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

OPTION 02 - SECTIONS 1-4

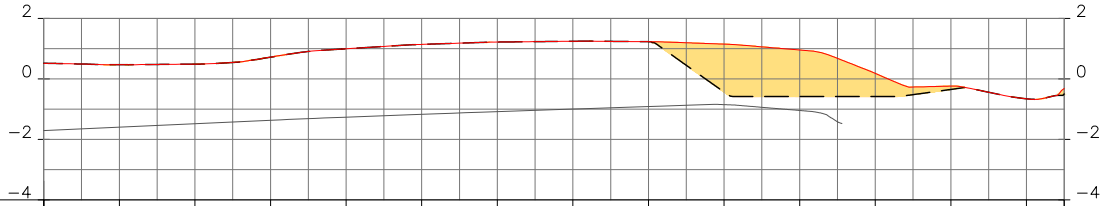
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SECTION 05



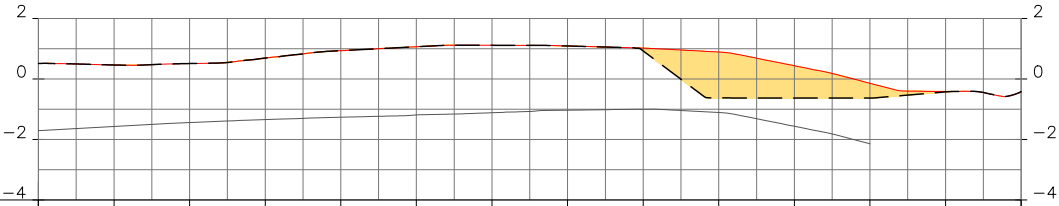
EXISTING BED LEVEL (m AHD) BASED UPON SURVEY (04/02/2025)	0.52	0.46	0.48	0.76	1.00	1.16	1.25	1.31	1.34	1.31	1.18	0.83	0.07	-0.70	0.16	0.35
FINISHED BED LEVEL (m AHD)	0.52	0.46	0.48	0.75	1.00	1.16	1.25	1.31	1.34	0.29	-0.50	-0.50	-0.46	-0.70	0.17	0.41
INDICATIVE DREDGING DEPTH (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.01	1.68	1.33	0.53	0.00	-0.01	-0.06
STATION (m)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	145

SECTION 06



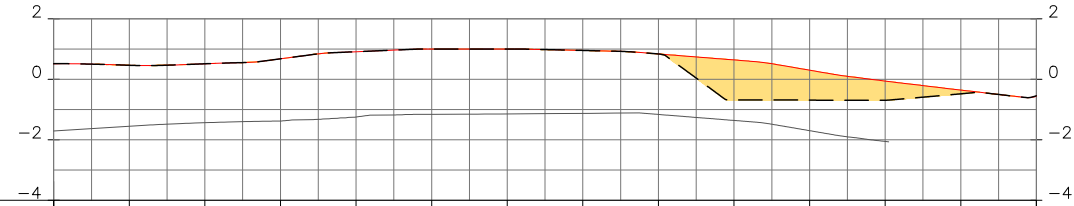
EXISTING BED LEVEL (m AHD) BASED UPON SURVEY (04/02/2025)	0.52	0.47	0.49	0.72	1.00	1.14	1.22	1.24	1.23	1.15	0.96	0.18	-0.24	-0.66	-0.32
FINISHED BED LEVEL (m AHD)	0.52	0.47	0.49	0.72	1.00	1.14	1.22	1.24	1.23	-0.43	-0.58	-0.58	-0.35	-0.66	-0.50
INDICATIVE DREDGING DEPTH (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.58	1.54	0.76	0.11	0.00	0.18
STATION (m)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	135

SECTION 07



EXISTING BED LEVEL (m AHD) BASED UPON SURVEY (04/02/2025)	0.52	0.46	0.51	0.69	0.94	1.07	1.12	1.09	1.02	0.89	0.44	-0.14	-0.41	-0.43
FINISHED BED LEVEL (m AHD)	0.52	0.46	0.51	0.69	0.94	1.07	1.12	1.09	0.93	-0.62	-0.63	-0.63	-0.43	-0.42
INDICATIVE DREDGING DEPTH (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	1.51	1.07	0.49	0.01	-0.02
STATION (m)	0	10	20	30	40	50	60	70	80	90	100	110	120	130

SECTION 08

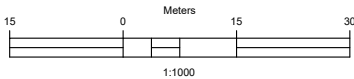


EXISTING BED LEVEL (m AHD) BASED UPON SURVEY (04/02/2025)	0.52	0.47	0.52	0.68	0.91	1.00	1.00	0.96	0.84	0.64	0.30	-0.06	-0.35	-0.55
FINISHED BED LEVEL (m AHD)	0.52	0.47	0.52	0.68	0.91	1.00	1.00	0.96	0.84	-0.68	-0.68	-0.69	-0.48	-0.54
INDICATIVE DREDGING DEPTH (m)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.32	0.99	0.63	0.12	-0.01
STATION (m)	0	10	20	30	40	50	60	70	80	90	100	110	120	130

LEGEND

- EXISTING BED
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- DREDGING AREA
- ROCK LAYER BASED ON SURVEY 2025

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PREPARED FOR:



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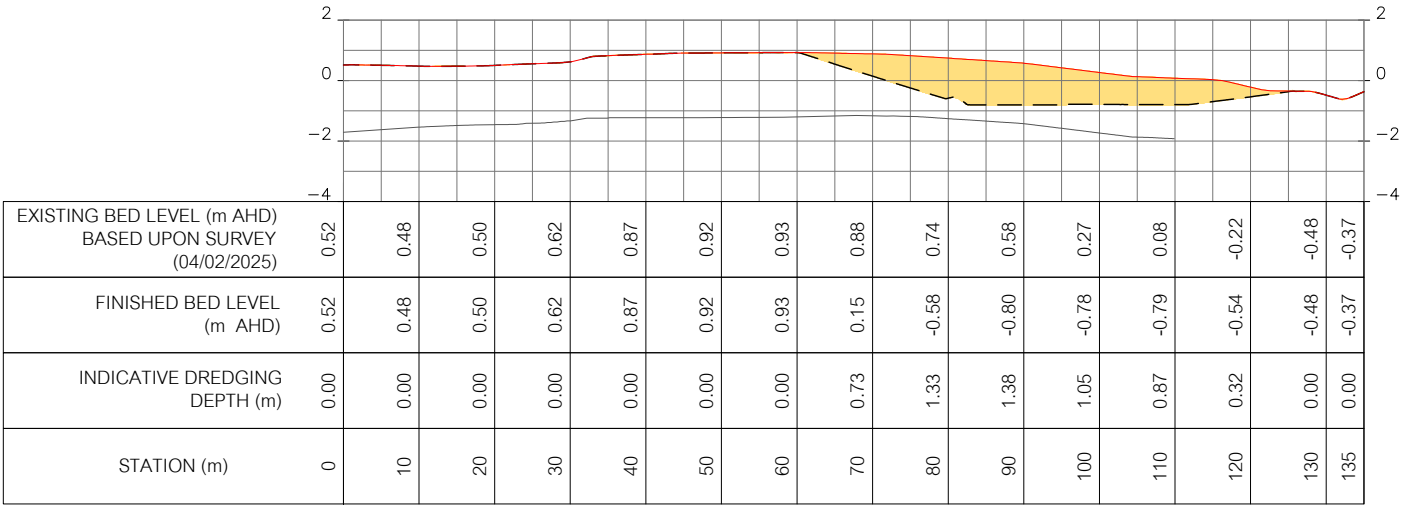


NARRABEEN LAGOON ENTRANCE CLEARANCE WORK

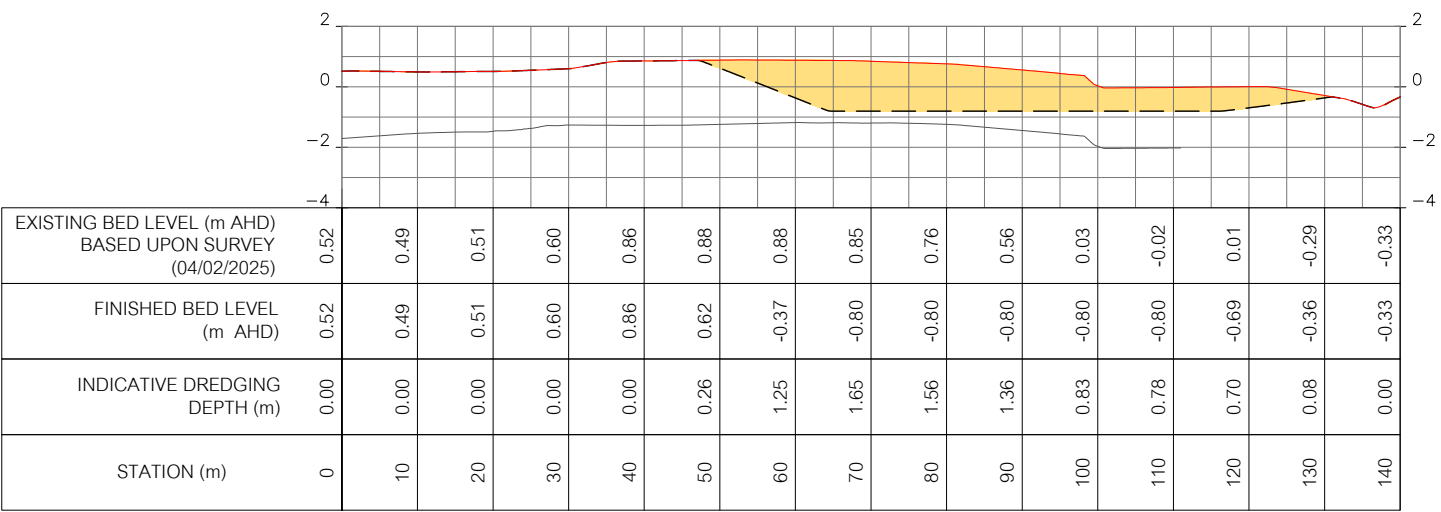
OPTION 02 - SECTIONS 5-8

DRAWING NUMBER: 13142-504-170 REV. 0 DATE: 2025/04/28

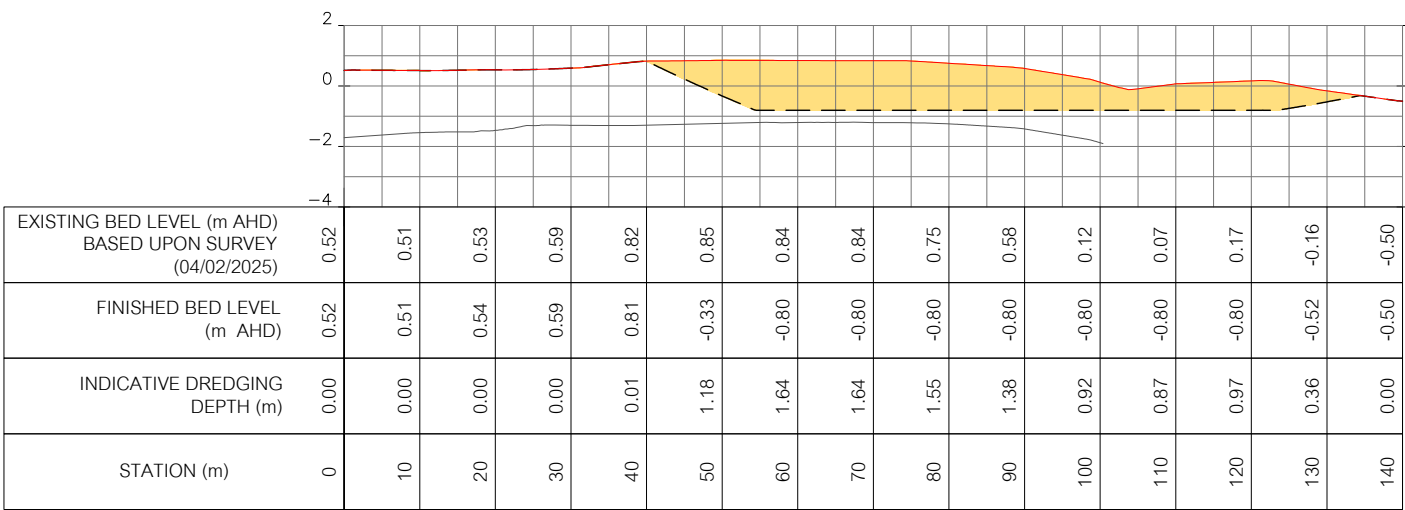
SECTION 09



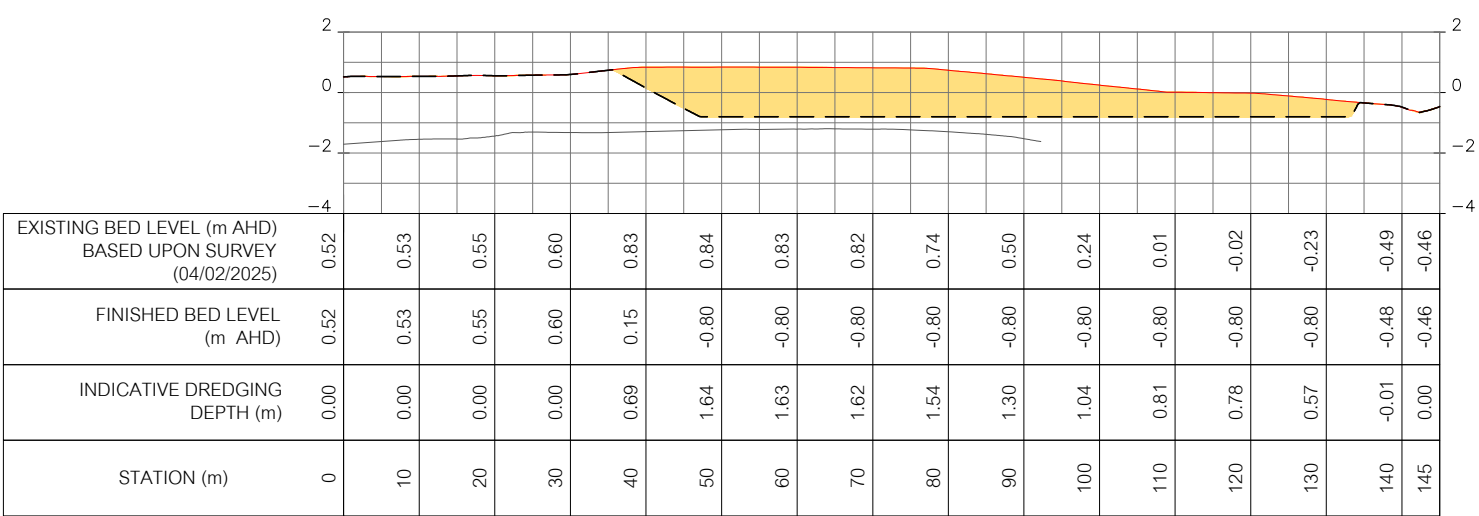
SECTION 10



SECTION 11



SECTION 12

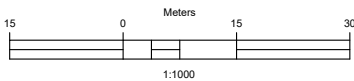


LEGEND

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- ROCK LAYER BASED ON SURVEY 2025

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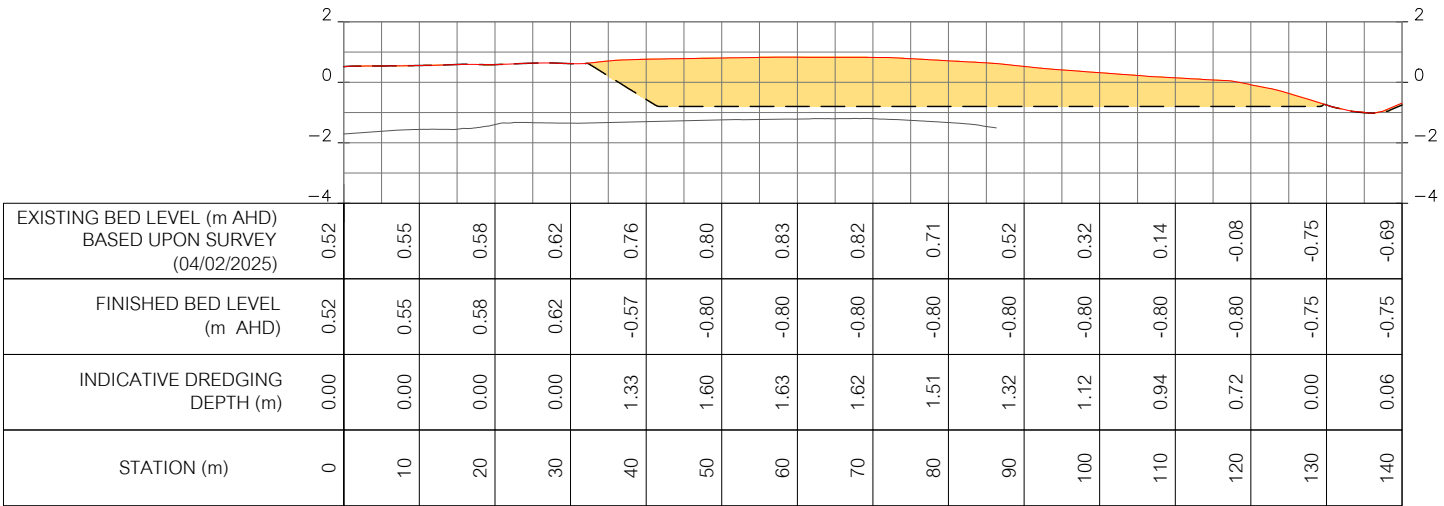


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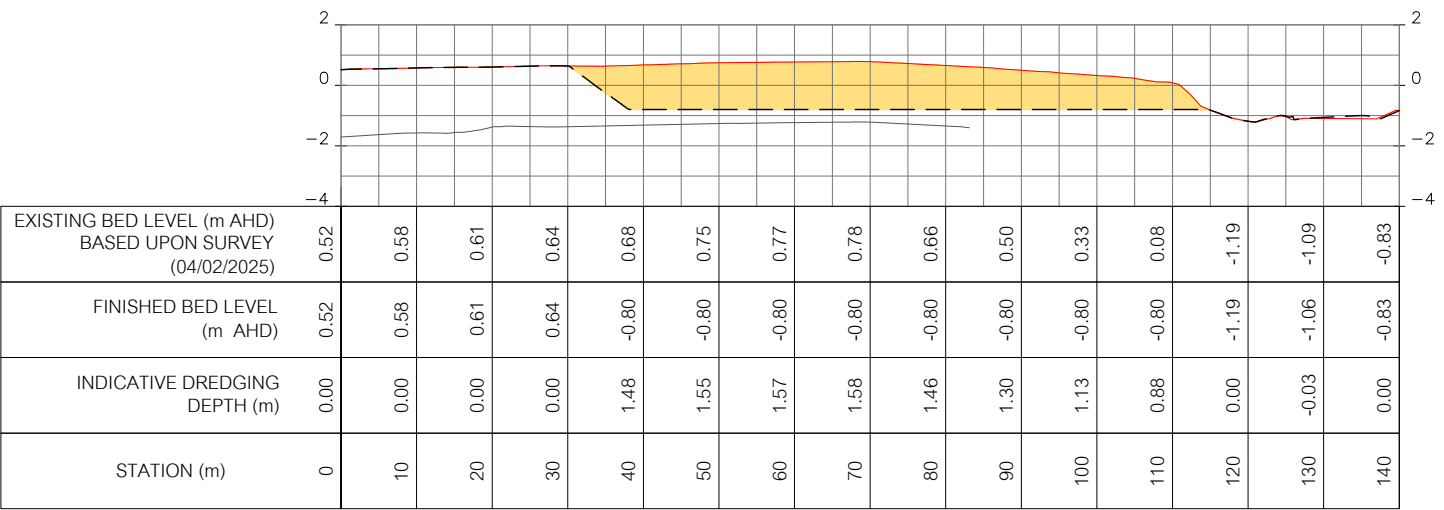
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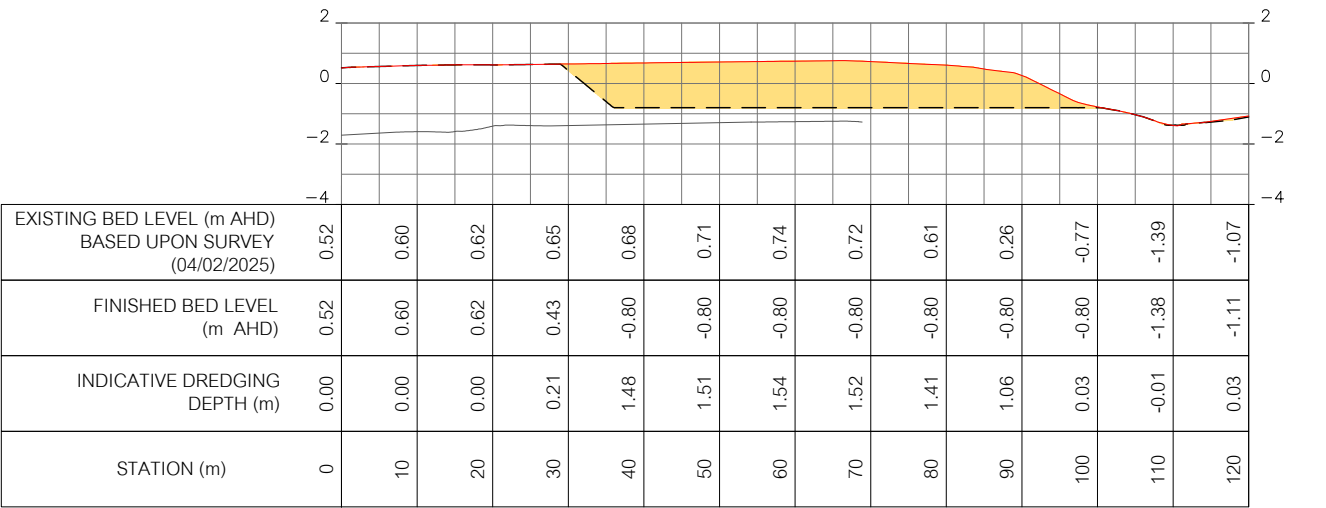
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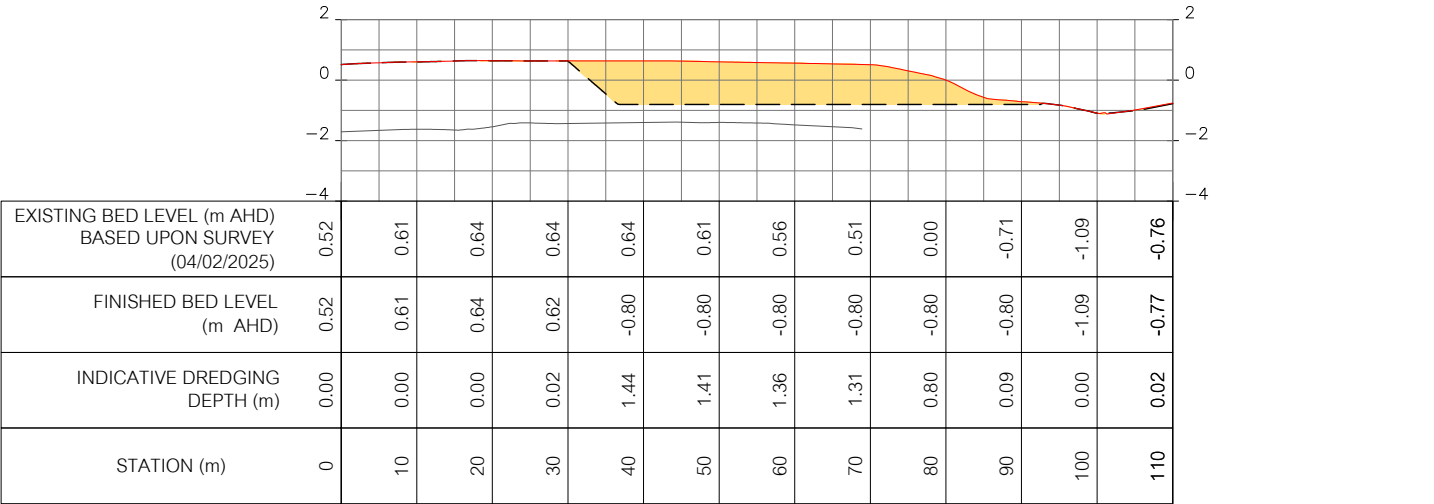
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SECTION 15



SECTION 16



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DREDGING AREA

ROCK LAYER BASED
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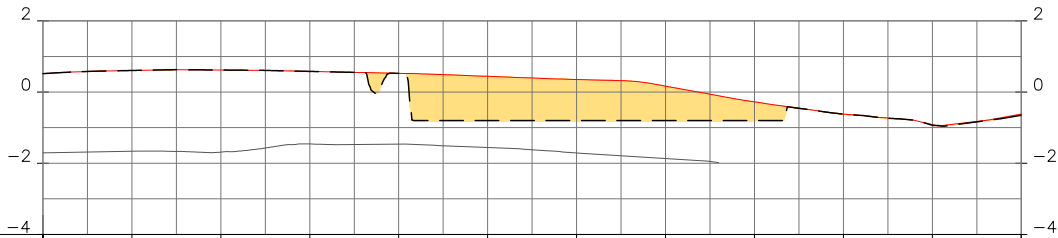
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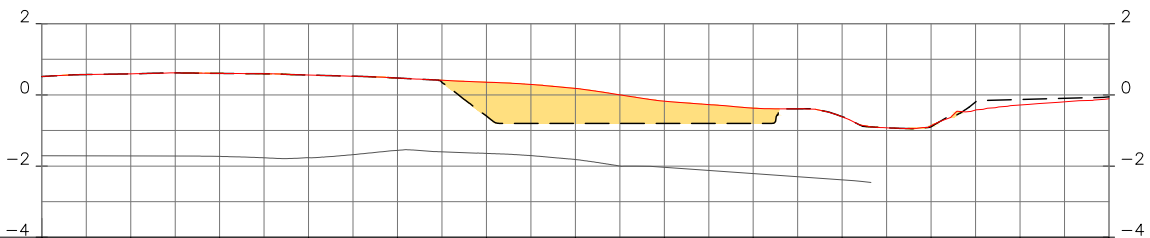
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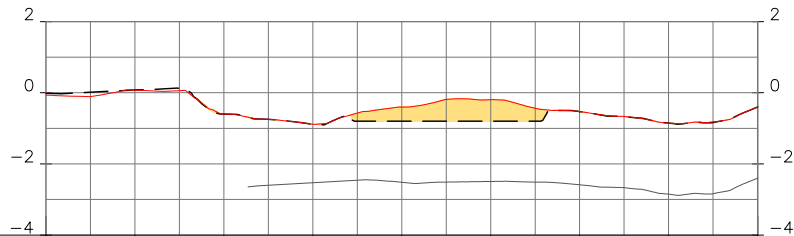
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SECTION 18



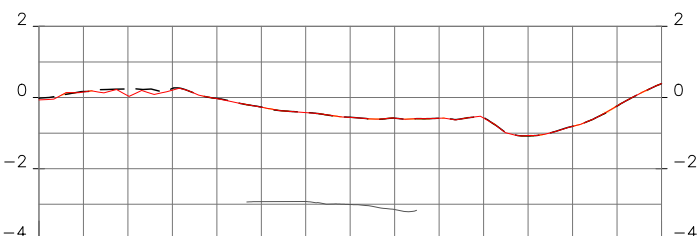
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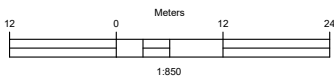
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LEGEND

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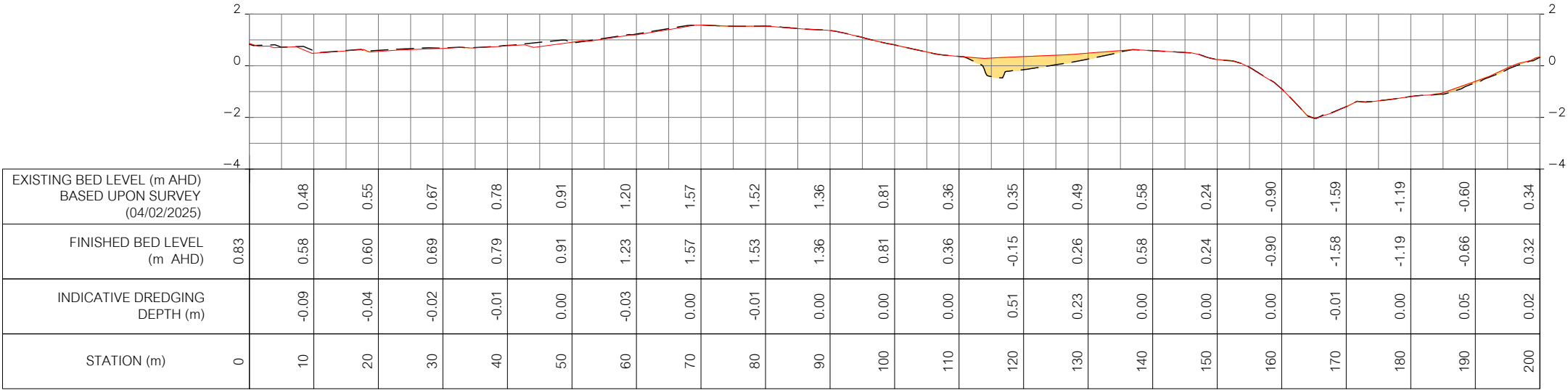


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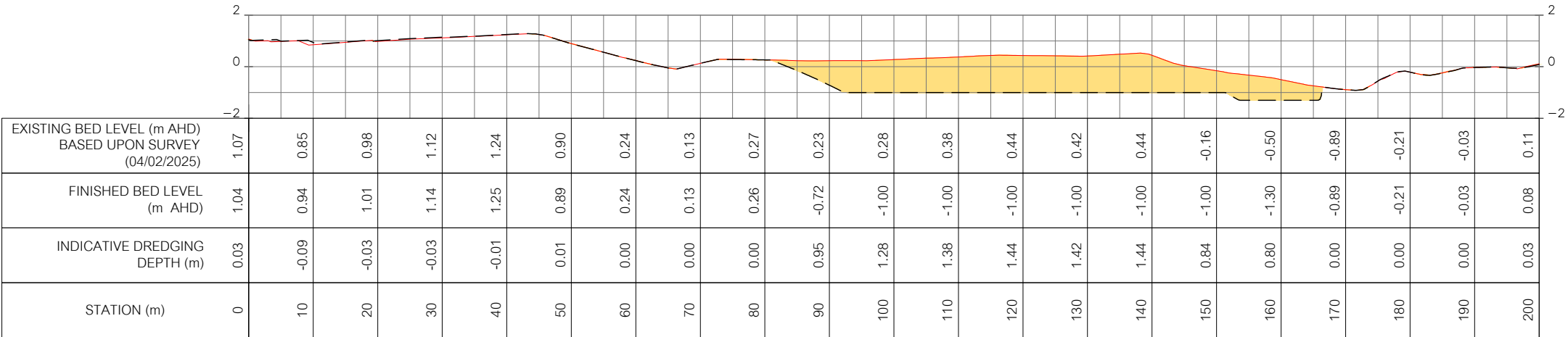
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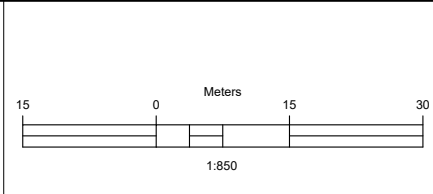
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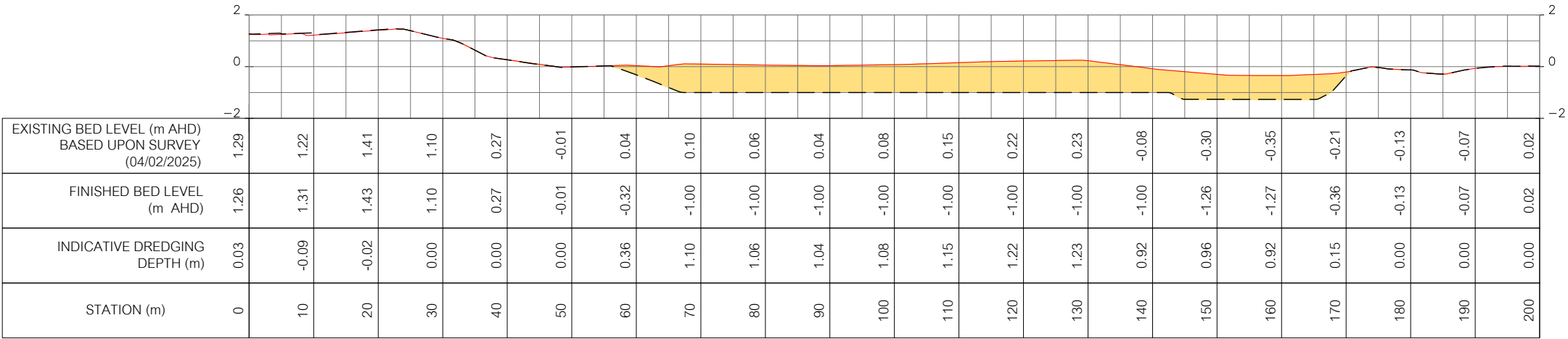
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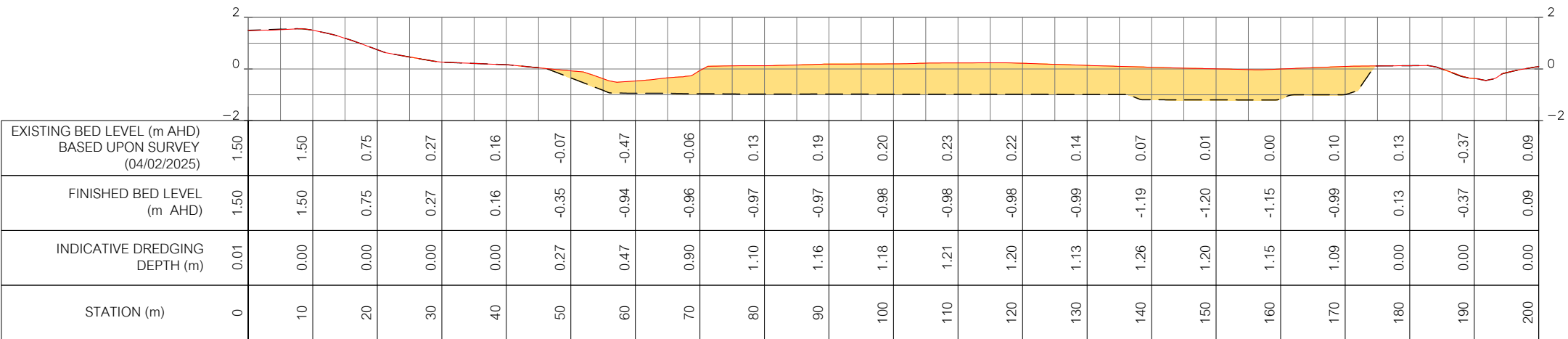
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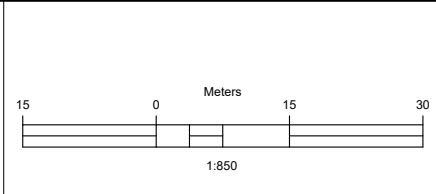
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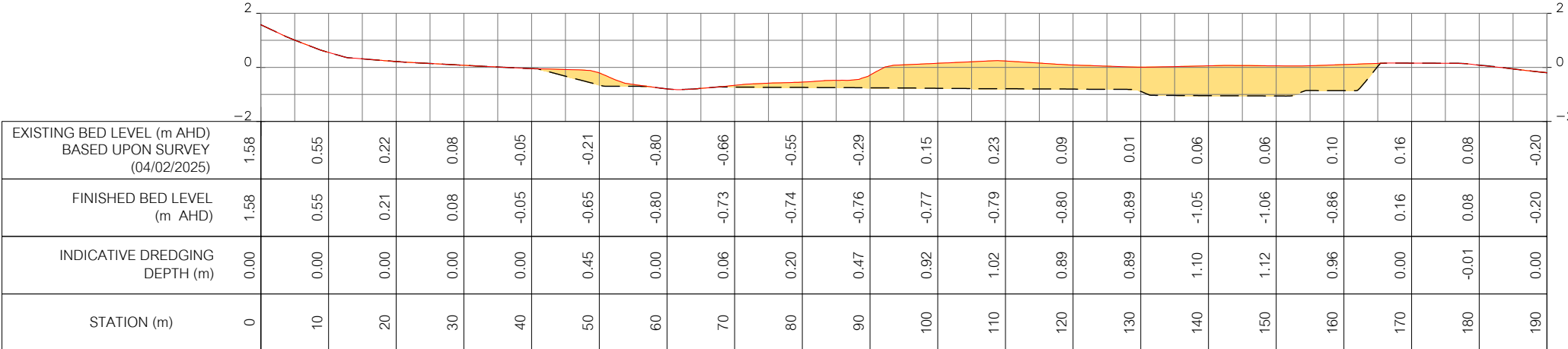
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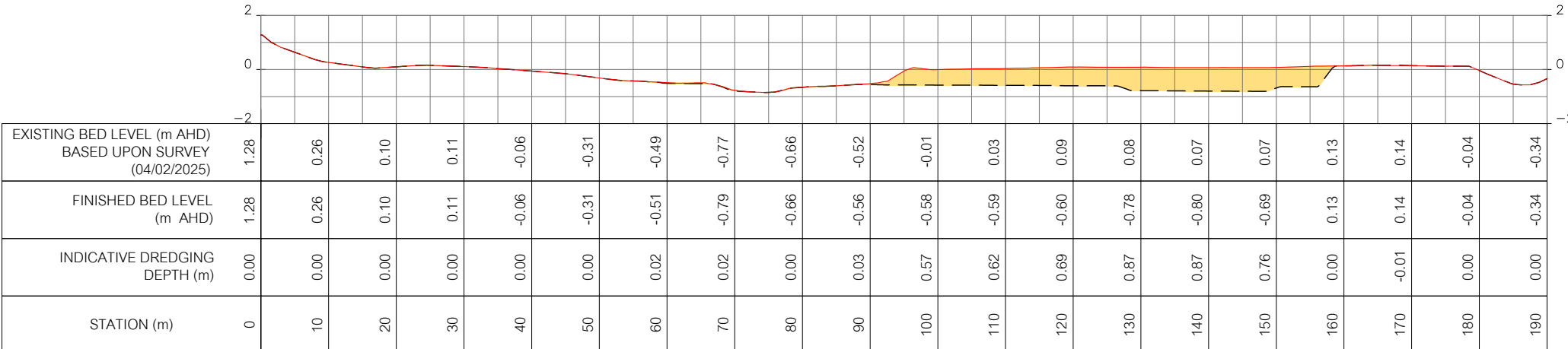
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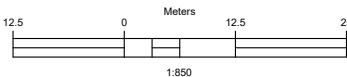


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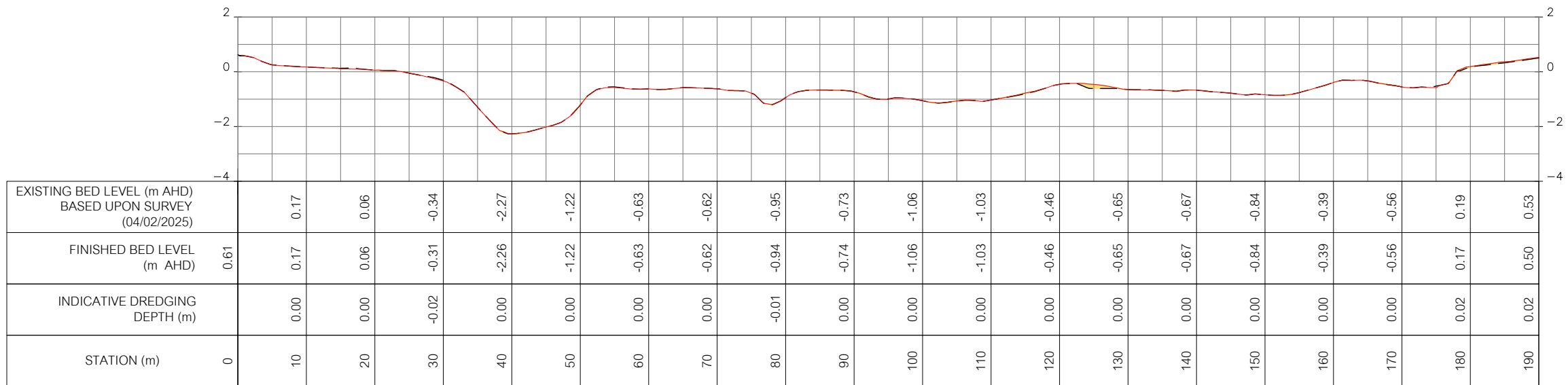
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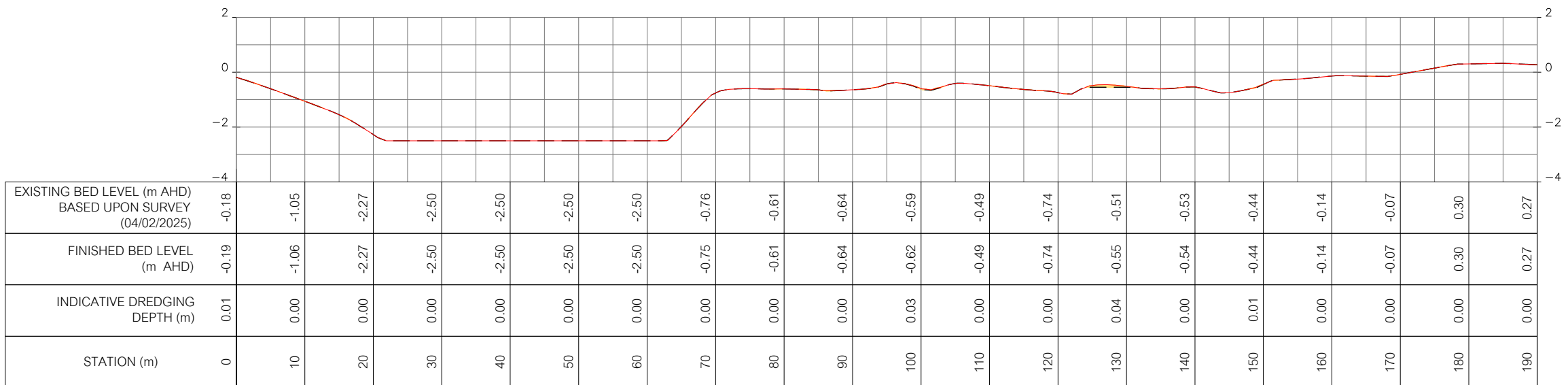
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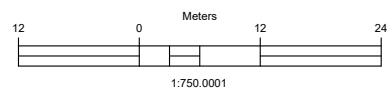


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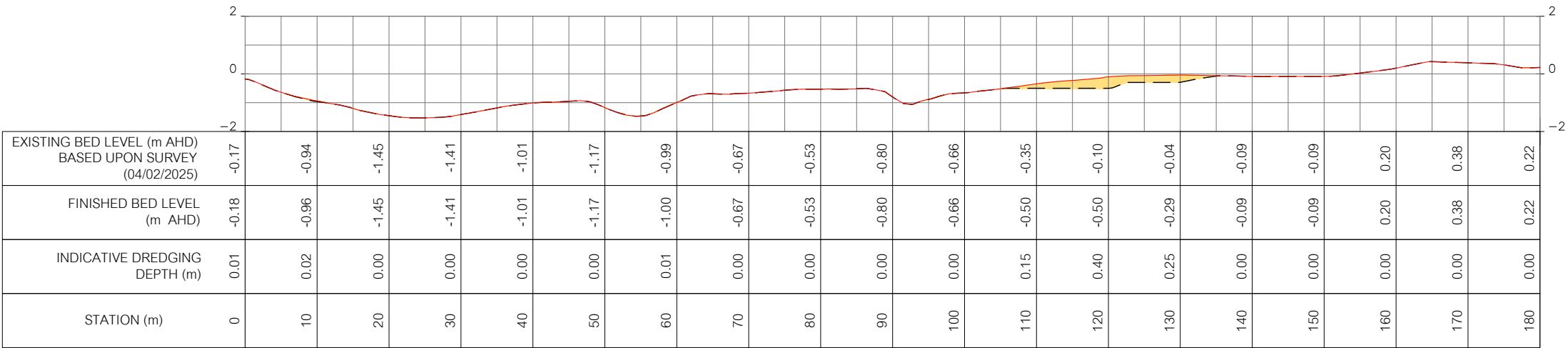
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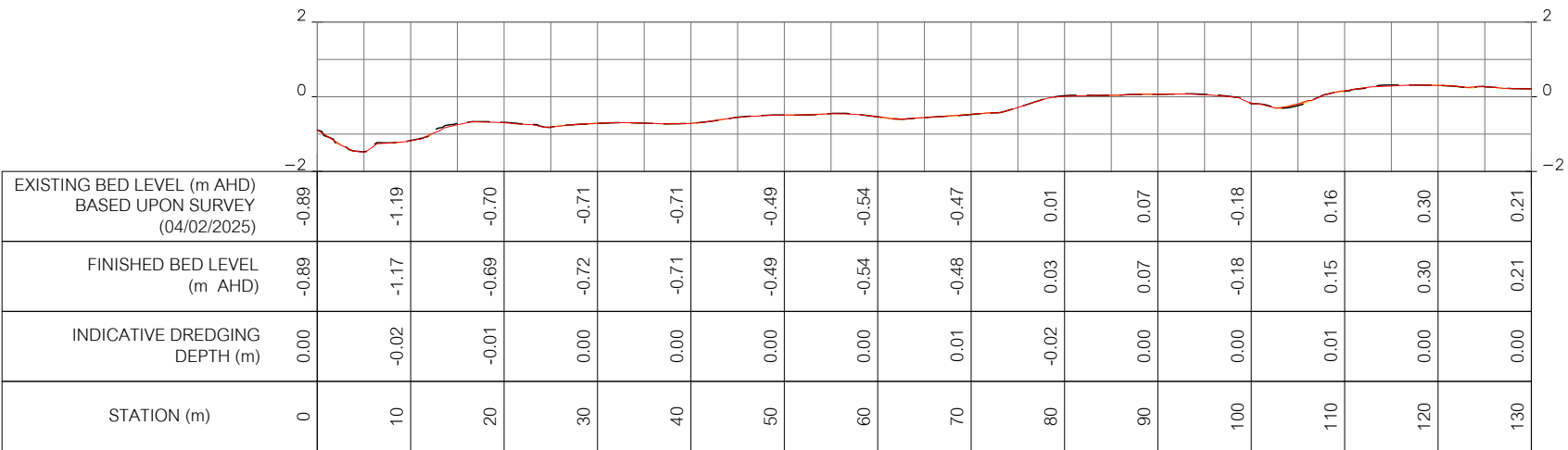
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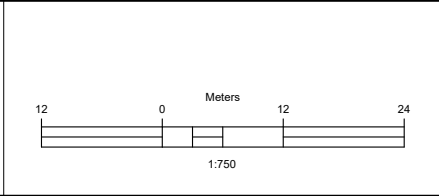
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OPTION 02 - SECTIONS 29-30

DRAWING NUMBER: 13142

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DATE: 2025/04/28



Appendix B

Traffic Management Plan



Traffic Management Plan

Narrabeen Lagoon Entrance Clearance 2025

Prepared for:

Rhelm

29 April 2025

The Transport Planning Partnership

Traffic Management Plan

Narrabeen Lagoon Entrance Clearance 2025

Client: Rhelm

Version: V02

Date: 29 April 2025

TPPP Reference: 23066

Quality Record

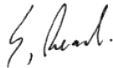
Version	Date	Prepared by	Reviewed by	Approved by	Signature
V01	28/03/2025	Tim Zhang	Paul Cai	Stephen Read	-
V02	29/04/2025	Tim Zhang	Paul Cai	Stephen Read	

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- A. TRAFFIC GUIDANCE SCHEME
- B. SWEPT PATH ANALYSIS

1 Introduction

1.1 Overview

The Transport Planning Partnership (TPPP) has been commissioned by Rhelm to prepare a Traffic Management Plan (TMP) for the 2025 Narrabeen Lagoon Entrance Clearance Works.

Narrabeen Lagoon Entrance is located on Sydney's northern beaches. Northern Beaches Council proposes to undertake clearance of the sand that has been accumulated in the entrance channel of Narrabeen Lagoon for flood mitigation purposes, with the excavated material to be placed on Collaroy-Narrabeen Beach. Public parking in the Birdwood Park car park would be temporarily unavailable due to the use of this car park as a construction compound.

The proposed sand replenishment areas on Collaroy-Narrabeen Beach are located between Devitt Street and 1150-1152 Pittwater Road (northern replenishment area) and between Frazer Street and 1056-1058 Pittwater Road (southern replenishment area). The primary access for unloading of sand is from Mactier Street, with an alternative access at Collaroy Beach Reserve via 1102 Pittwater Road when required.

The Narrabeen Lagoon Clearance works have been conducted multiple times in the past by Northern Beaches Council (formerly Warringah Council and Pittwater Council), most recently in 2018, 2021 and 2023.

In preparation of this report, reference has been made to the following documents:

- TPPP 2023, Traffic Management Plan – Narrabeen Lagoon Entrance Clearance
- Rhelm 2024, Narrabeen Lagoon Entrance Clearance Works 2023 – Post Completion Report
- Transport for NSW 2022, Traffic Control at Work Sites Technical Manual, Issue No. 6.1.

This report has been prepared and checked by engineers who hold the TfNSW Prepare Work Zone Traffic Management Plans (PWZTMP) certification.

1.2 Objective of Works

The objectives of the proposed Narrabeen Lagoon Entrance Clearance Works are:

- To mitigate flood risk to the low-lying properties surrounding Narrabeen Lagoon; and
- To maintain or enhance beach amenity.

1.3 Purpose of this Plan

The overall principles of this traffic management plan during the construction works include:

- manage access to/from adjacent properties
- manage and control construction vehicle activity in the vicinity of the site
- provide an appropriate and convenient environment for pedestrians and cyclists
- minimise impact on pedestrian movements
- provide alternative detour routes
- carry out construction activity in accordance with the approved work hours
- maintain appropriate public transport access; and
- estimate indicative traffic generation associated with the construction works.

1.4 Report Structure

This TMP is structured as follow:

- Section 2 describes the existing conditions
- Section 3 describes the proposed construction methodology
- Section 4 assesses the construction impacts of the proposed works
- Section 5 details the construction traffic management measures
- Section 6 provides a summary of the key findings and draws conclusions.

2 Existing Conditions

2.1 Site Description

Narrabeen Lagoon is located within Northern Beaches Local Government Area (LGA). Ocean Street Bridge passes over the entrance channel of the lagoon between Narrabeen Headland and Birdwood Park. The entrance channel is approximately 2km long and 150m wide and links the main body of the lagoon to the ocean. The location of the Narrabeen Lagoon and sand placement areas are shown in Figure 2.1.

Figure 2.1: Site Location and Project footprint

Proposed Clearance Area



Proposed Placement Areas



2.2 Surrounding Road Network

The site is surrounded by a network of state road and local roads. A description of the key roads that would be utilised during construction activities is detailed below. The road network surrounding the site is shown in Figure 2.2.

2.2.1 Pittwater Road

Pittwater Road is a two-way divided State Road (MR164) with three traffic lanes in each direction. Pittwater Road is a dual carriageway, with the width of each carriageway measuring approximately 10m. A bus lane is provided in the southbound direction in the AM between 6am – 10am, and in the northbound direction in the PM between 3pm – 7pm. Parking is generally permitted outside of these hours. The posted speed limit is 60 – 70km/h. It has several signalised intersections and a 40km/h school zone between Mactier Street and Robertson Street.

2.2.2 Ocean Street

Ocean Street is a two-way local collector road with one traffic lane in each direction and on-street parking on both sides of the road. The width of the carriageway is approximately 12.6m, providing enough space for on-street parking and cycle lanes on both sides of the

road. It has a posted speed limit of 50km/h. St Joseph's Catholic Primary School is also located on this street with a school zone 40km/h limit between Wellington Street and Waterloo Street.

2.2.3 Walsh Street

Walsh Street is a two-way local road with one traffic lane in each direction. Walsh Street is a residential area between Collins Street and Pittwater Road. The width of the carriageway is approximately 10.9m, providing enough space for on-street parking on both sides of the road. It has a posted speed limit of 50km/h and is a shared on-road cycle route. Walsh Street is left turn entry only from Pittwater Road and left turn exit only into Pittwater Road. The street is signposted with "No Truck 3t and Over" signage between Collins Street and Narrabeen Park Parade in the eastbound direction only.

2.2.4 Mactier Street

Mactier Street is a two-way no-through local access street to the east of Pittwater Road. Traffic signals are provided at this intersection of Mactier Street / Pittwater Road, which will assist the turning movements at the intersection. It has a posted speed limit of 50km/h. The width of the carriageway is approximately 12.8m. The road provides unrestricted on-street parking spaces for approximately 10 cars.

2.2.5 Ocean Grove

Ocean Grove is a two-way road with a carriageway width of approximately 11m between Pittwater Road and Seaview Parade. Kerb-side parking is permitted on both sides of Ocean Grove. Traffic signals are provided at the intersection of Ocean Grove / Pittwater Road, which will assist the turning movements at this intersection. The speed limit on Ocean Grove is 50km/h.

2.2.6 Seaview Parade

Seaview Parade is a two-way road connecting Ocean Grove with Anzac Avenue. It has a carriageway width of approximately 12m with kerb-side parking on both sides of the road. The intersection of Seaview Parade / Anzac Avenue is a priority-controlled intersection with Anzac Avenue being the major road.

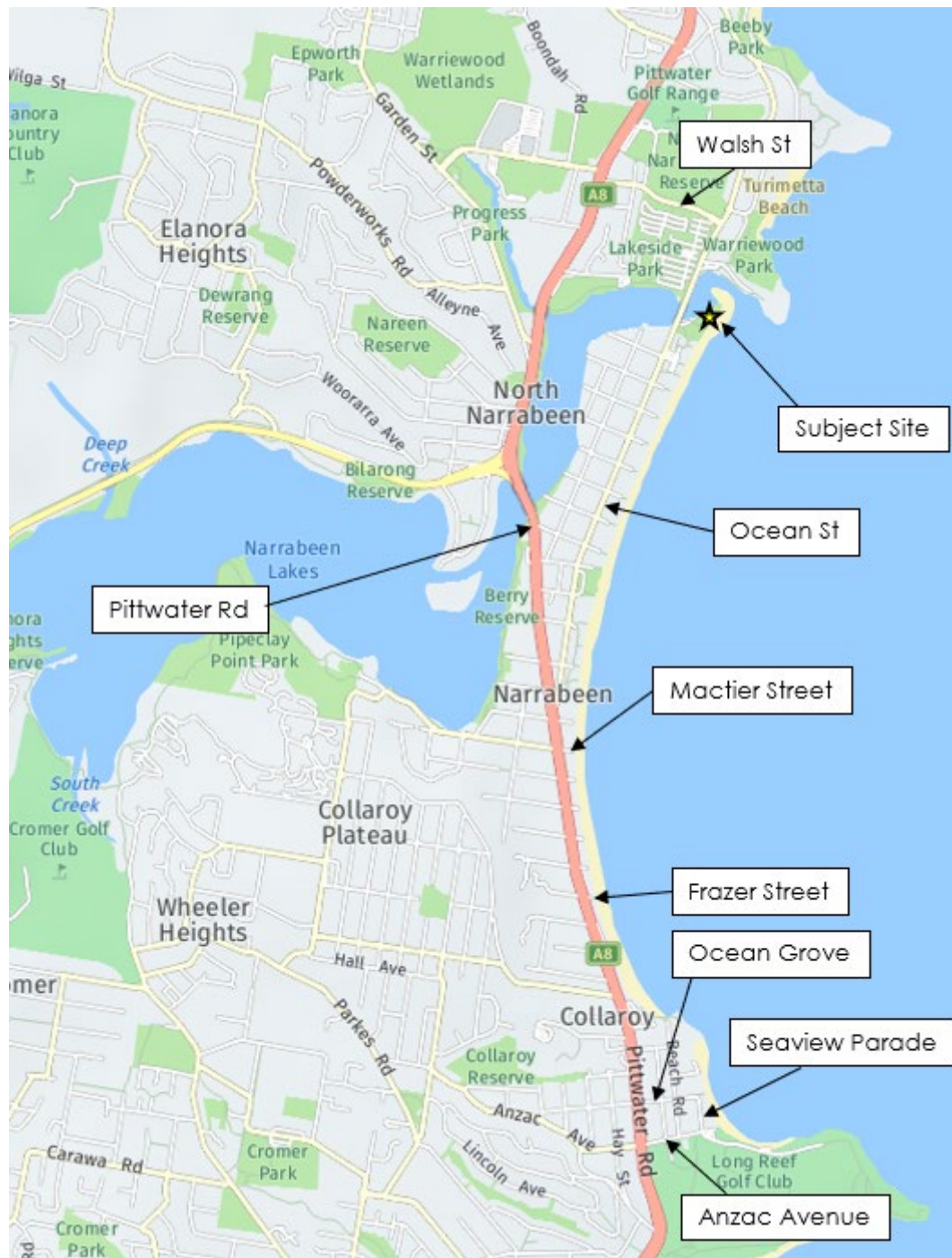
2.2.7 Anzac Avenue

Anzac Avenue is a two-way no through road to the east of Pittwater Road. Traffic signals are provided at the intersection of Anzac Avenue / Pittwater Road, which will assist the turning movements at the intersection. The width of the carriageway is about 12m with kerb-side parking on both sides of the road. It has a posted speed limit of 50km/h.

2.2.8 Frazer Street

Frazer Street is a two-way no through road to the east of Pittwater Road. The intersection between Pittwater Road and Frazer Street permits all turning movements except U-turns. The road provides unrestricted parking for approximately 3 cars.

Figure 2.2: Road Network



2.3 Public Transport Facilities

Bus route 155 between Frenchs Forest and Bayview is the only bus service which operates along Ocean Street and Narrabeen Park Parade, Narrabeen. Bus stops are located every 200-300m along Ocean Street at Albemarle Street, Octavia Street, Emerald Street and

Malcolm Street. The frequency of Route 155 on weekdays is once every 25-35 minutes during morning and evening peak hours, and once every hour outside of the peak. The service runs once every hour on weekends and public holidays.

Several bus routes also run north-south on Pittwater Road, including Bus Routes 182, 185, 181X, 190X and 199, as well as B-Line Bus Routes B1 and BN1. Route 181X also travels partly along the southern end of Ocean Street between Waterloo Street and Pittwater Road.

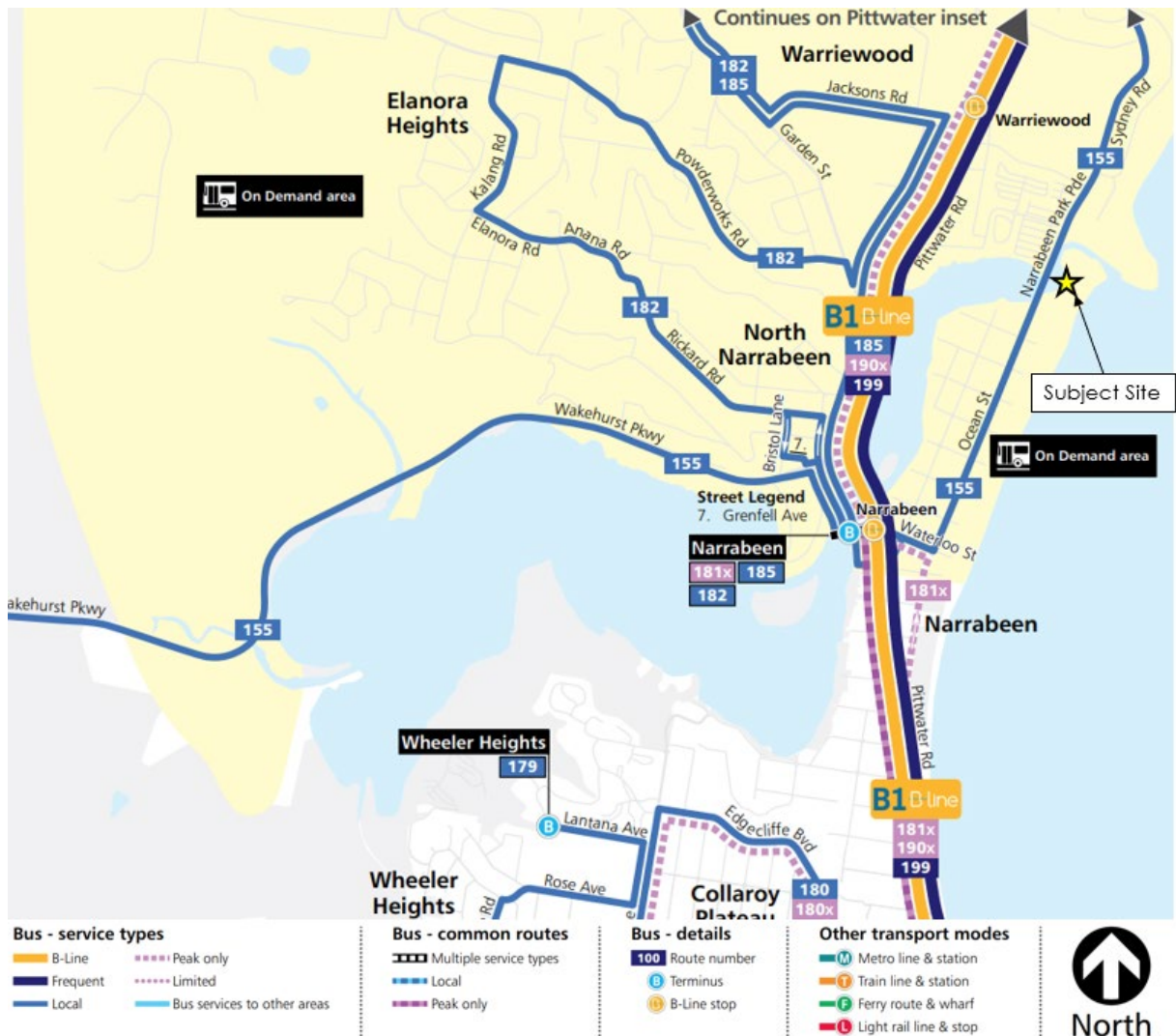
A summary of the existing bus services is provided in Table 2.1.

Table 2.1: Existing Bus Services

Bus Route	Route Description	Frequency
155	Bayview Garden Village to Narrabeen and Frenchs Forest	25-35 minutes during morning/evening peak periods Hourly during off-peaks
181X	Narrabeen to City Wynyard (Express)	10 minutes during morning peak period 20-30 minutes during evening peak period Does not run off-peak
182	Mona Vale to Narrabeen	20-30 minutes during morning/evening peak periods Hourly during off-peaks
185	Mona Vale to Narrabeen via Warriewood Valley	10 minutes during the evening peak period; 30 minutes during off-peaks
190X	North Avalon to City Wynyard (Express)	10-15 minutes during morning/evening peak periods Does not run off-peak
199	Palm Beach to Manly via Mona Vale & Dee Why	10-15 min

Information Source: Transport for NSW

Figure 2.3: Site Nearby Bus Routes



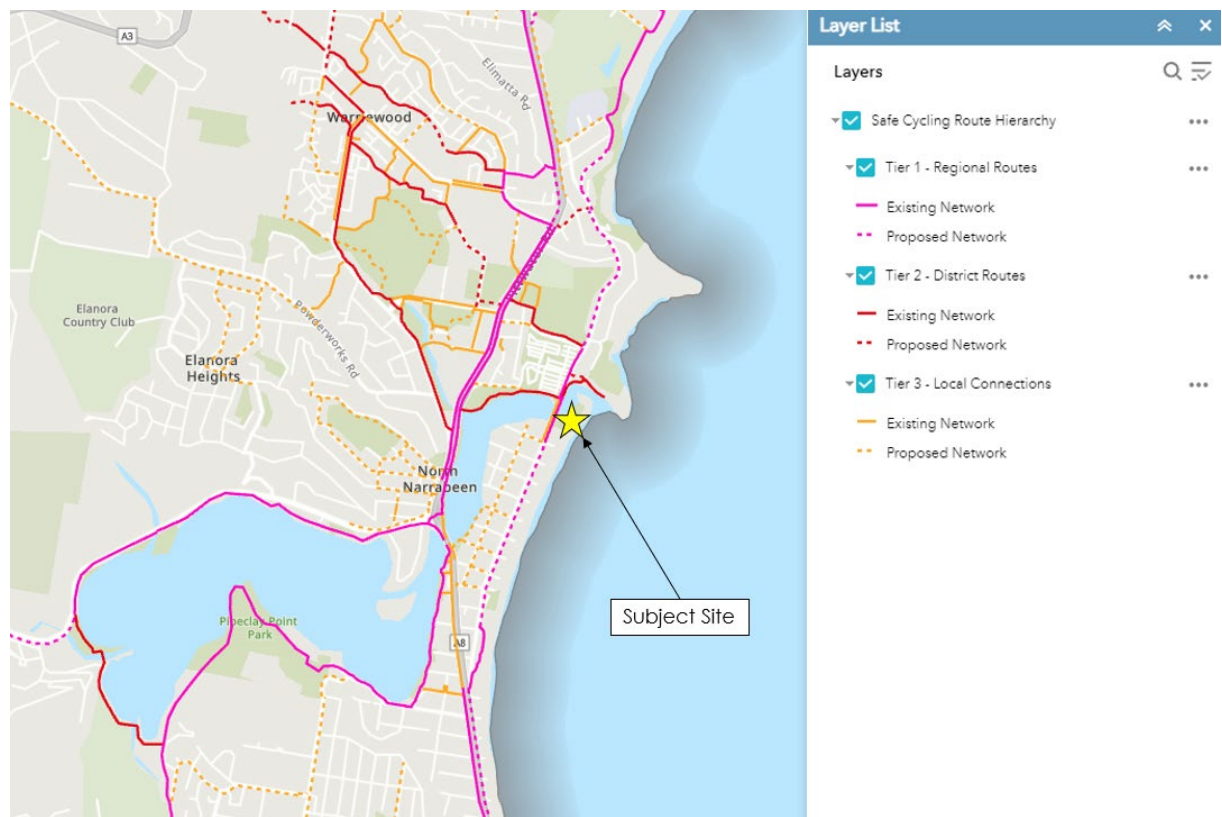
Source: TfNSW Northern Beaches and Lower North Shore Public Transport Network Map

2.4 Pedestrian and Cyclist Infrastructure

Well-established pedestrian infrastructure is provided surrounding the site. The area surrounding Narrabeen Lagoon Entrance is a popular destination for pedestrians. The pedestrian infrastructure provides good connectivity to the surrounds.

A number of off-road cycle paths and dedicated on-road cycle lanes are provided within the vicinity. The existing and proposed cycleway network is shown in Figure 2.4.

Figure 2.4: Cycleway Network



Source: Northern Beaches Council Bike Plan 2020 Safe Cycling Network

3 Proposed Construction Methodology

3.1 Description of Works

The Narrabeen Lagoon Entrance Clearance Works involves sand being transported from Narrabeen Lagoon Entrance to Collaroy-Narrabeen Beach. Sand will be loaded into rigid 12-tonne bogie tipper trucks (~8m long) from Birdwood Park Carpark or from a stockpile area on the north-western side of Narrabeen Lagoon Bridge and driven to Mactier Street (primary access) or 1102 Pittwater Road (alternative access) via the nominated haulage routes as shown in Figure 3.2 and Figure 3.3.

It is proposed that the 2025 works will involve the excavation of approximately 14,700m³ of sand west and up to 15,300m³ of sand east of Narrabeen Lagoon Bridge, summing to a total of up to 30,000m³ of marine sand from the lagoon entrance as shown in Figure 3.1. As per previous operations, a sand stockpile area will be located east of the Birdwood Park carpark and also on the north-western side of Narrabeen Lagoon Bridge. The sand will then be transported from these two locations to Mactier Street (primary unloading point) or to Collaroy Beach Reserve at 1100-1102 Pittwater Road (alternative unloading point), then unloaded onto the beach. Sand will be placed on Collaroy-Narrabeen Beach between Devitt Street and 1056-1058 Pittwater Road. The nominated truck routes are provided in Section 3.6 of this report.

Figure 3.1: Narrabeen Lagoon Entrance Clearance Zones



3.2 Work Hours and Duration

The works would be restricted to standard construction hours as follows:

- 7:00am-6:00pm Monday to Friday
- 8:00am-1:00pm on Saturday

The works would be largely undertaken Monday to Friday, although some Saturday works may be necessary to keep to the proposed program. No work would be undertaken on Sundays or public holidays.

It is anticipated that the works would be completed in around 12 to 16 weeks. The works would be undertaken outside of the peak holiday periods (i.e. the peak winter east coast low season and December/January summer school holidays).

3.3 Construction Workforce

The number of employees on any given day is expected to be between 5-10 for the Clearance works. It is assumed that the majority will arrive at the work site before 7.00 am and leave the work site after 6.00 pm. This will generate a minimal increase in trips, consisting of inbound light vehicle traffic between 6.30 am – 7.00 am and outbound light vehicle traffic between 6.00 pm – 6.30 pm. Therefore, the peak vehicle movements generated by construction workforce will be earlier than the typical network morning peak hour (8 am to 9 am) and later than the network afternoon peak hour (5 pm to 6 pm) on a weekday.

3.4 Construction Worker Parking

Construction staff will utilise the Birdwood Park carpark as the primary site compound. It is expected that there will be around 6 workers for the dredging works. This number of workers can be accommodated within the existing car park. However, construction staff would be encouraged to carpool to reduce traffic movements generated by the construction staff.

3.5 Construction Vehicle Type and Volumes

As per the 2018, 2021 and 2023 works, it is anticipated that the plant and equipment to be used may include any or all of the following:

- Cutter pump dredge with generator
- 23t excavators
- Bulldozer
- Front end loader

- 12t Bogie tipper trucks
- Light construction vehicles travelling to the site, or between work areas

3.6 Construction Vehicle Movement Routes

Construction vehicles would be loaded with sand at the site compound at Birdwood Park carpark or the stockpile area on the north-western side of the Narrabeen Lagoon Bridge. The primary route used the majority of the time for transport of excavated sand from the lagoon to the beach would be via Ocean Street, Narrabeen Park Parade, Walsh Street, Pittwater Road and Mactier Street. The proposed primary truck route is shown in Figure 3.2.

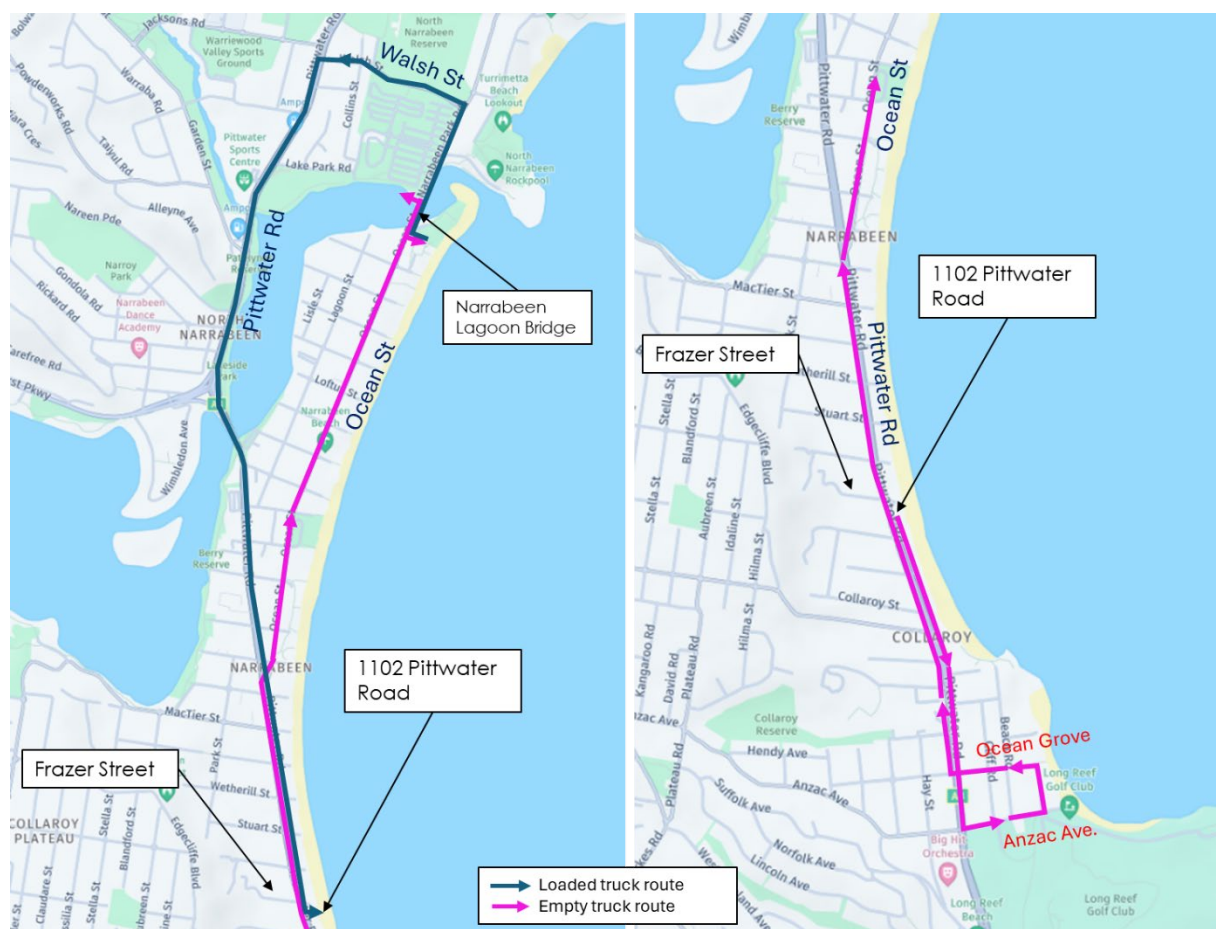
Figure 3.2: Primary Construction Vehicle Routes (Mactier Street Access)



A secondary unloading area at 1102 Pittwater Road may also be used. This alternative unloading area would assist in transporting excavated material to the southern replenishment area if required. It is estimated that the secondary unloading area could be used between 0% to 20% of the total material. Vehicle access to 1102 Pittwater Road is restricted to a left-in and left-out arrangement. It is proposed that empty trucks exiting from 1102 Pittwater Road onto Pittwater Road southbound would perform a loop movement via Anzac Avenue, Seaview Parade, Ocean Grove and Pittwater Road to travel north back to the Birdwood Park Carpark or the stockpile area on the north-western side of Narrabeen Lagoon Bridge. The alternative construction vehicle route is shown in Figure 3.3.

Swept path analysis has been conducted demonstrating a rigid tipper truck (8m long) looping around via Anzac Avenue, Seaview Parade, Ocean Grove and Pittwater Road, as shown in Appendix B.

Figure 3.3: Alternative Construction Vehicle Routes (1102 Pittwater Road Access)



3.7 Truck Layover Area

Based on previous Clearance Work experience, it was found that a truck layover area was required due to the ability to only unload one truck at a time. Therefore, trucks are to use a truck layover area while waiting to access the beach front at Mactier Street (or 1102 Pittwater Road).

An appropriate truck layover area has been identified on the southern side of Walsh Street between Narrabeen Park Parade and Collins Street as shown in Figure 3.2. At this location, Walsh Street is approximately 11m wide with plenty of on-street parking available and no adjacent residential houses. It is recommended that additional signage be provided to inform truck and other road users to use caution in this area. If a temporary truck zone is required on Walsh Street, an application for the truck zone will be submitted to Council for approval. This will be a separate application to this Traffic Management Plan.

No trucks are permitted to wait on Pittwater Road in the bus lane just prior to Mactier Street, as Pittwater Road is a state road with high traffic volumes and regular bus services.

3.8 Mactier Street Work Area

Signage will be provided for the designated unloading area on Mactier Street to advise the public not to park within the work area during the clearance period. Neighbouring properties will be notified by letter to inform residents of the works in Mactier Street and the temporary change of parking controls. The site manager to liaise with Council Ranger to enforce temporary work zones.

4 Construction Impacts Assessment

4.1 Traffic Generation

It is anticipated that up to 30,000m³ of sand would be excavated and transported from Narrabeen Lagoon to Collaroy-Narrabeen Beach. A similar sized transportation truck (12 tonne bogie tipper truck) would again be used during the 2025 clearance works. The anticipated truck movements are shown in Table 4.1.

It is estimated that a total of 4,859 laden truck movements would be required to transport 30,000m³ of sand during the 2025 clearance works. Assuming the scheduled duration of 14 weeks (77 full working days), this equates to approximately 63 laden truck movements per weekday or an average of 6 laden truck movements per hour.

However, it is noted that efficiency and productivity can be improved through additional truck movements per day and thus enable completion of works within a shorter timeframe.

Table 4.1: Traffic Generation

Traffic Generation Estimate	
Volume of Sand to be Transported	30,000 m ³
Approximate Capacity of Truck	6.17 m ³ / truck (based on 2018 operation)
Total Number of Estimated Truck Movements	4,859 laden truck movements
Scheduled Duration for Sand Transportation	14 weeks x 5.5 days / week = 77 days
Number of Truck Movements per Day	63 laden truck movements / weekday
Average Number of Truck Movements per Hour (average 11 hours per full work day)	6 laden truck movements / hour

4.2 Pedestrian Management and Cycle Access

Temporary fencing would be used around the site perimeter providing separation between the construction site and the footpath.

Pedestrian movements on the footpath along the site frontages would be maintained at all stages. Site personnel would assist construction vehicles as they arrive or depart the site to manage safe vehicle interactions with pedestrians. Pedestrians would have right of way at all times. Access to the site would require authorisation from the construction site manager and be prohibited for the general public.

Nearby cycling activity would not be impacted by the proposed construction works.

As per previous post-completion reports and audits, the following pedestrian management measures are recommended:

- Installation of barricades on both footpaths (opposite sides of the road) at the intersection of Mactier Street / beach front;
- The area of the beach where sand replenishment works is being carried out be cordoned off from pedestrian movements by installing Para webbing around the perimeter of the works area on the beach;
- Maintain access to beach access ways without being blocked with stockpiles, where feasible. Where it may not be feasible, appropriate signage would be provided to direct pedestrians to use another footpath; and
- Maintain safe access and provide level areas in front of surf clubs for the launching of rescue boats and undertaking surf club activities.

4.3 Public Transport Impacts

Construction traffic generation is expected to be low, and unlikely to result in any impacts to public transport routes on the broader road and transport network.

4.4 Emergency Services

Access to the subject site and neighbouring sites by emergency vehicles would not be affected by the works as the roads and footpath would be unaffected. Emergency protocols on the site would include a requirement for site personnel to assist with emergency access from the street.

Liaison would be maintained with police and emergency services agencies throughout the construction period and a 24-hour contact would be made available for 'out-of-hours' emergencies and access.

There would be no impact on access for emergency vehicles to neighbouring properties as a result of the proposed construction activities.

5 Construction Traffic Management Measures

5.1 Traffic Guidance Scheme

Traffic Guidance Schemes (TGSs) have been prepared and designed in accordance with TfNSW Traffic Control at Works Sites manual. The TGSs are provided in Appendix A.

Advisory road signages would be installed along surrounding streets to warn drivers approaching the site of construction vehicles entering and exiting the site and work areas and the presence of portable boom barriers. Traffic controllers would wait for a suitable gap in traffic to allow them to assist trucks to exit the site.

All advisory signs would be installed in accordance with AS 1742.3 *Manual of Uniform Traffic Control Devices - Traffic Control Devices for Works on Roads* and the TfNSW *Traffic Control at Worksites Manual*. Signs would be installed and maintained throughout the construction period where it applies.

5.2 Inspection of Traffic Control Measures

It is the project managers responsibility to implement the traffic control measures as identified in the TMP and monitor the effectiveness of the traffic control measures.

Temporary traffic controls will be regularly inspected by the Construction Contractor to identify potential safety hazards to enable implementation of corrective solutions. Daily inspections and maintenance of controls will be undertaken by the contractor, and any maintenance/amendments will be recorded. The site supervisor will check all relevant traffic control management measures on-site prior to commencement of works each day.

5.3 Monitoring

Monitoring under this TMP will be undertaken by the contractor during weekly inspections of construction vehicle activities to monitor conformance with the requirements of the Council and this plan. Weekly inspections will focus on the following key issues:

- Safe movement of traffic and pedestrians
- Signage and barriers are clearly visible
- Construction roads support safe working and driving
- Safety of persons and property in and around the work site

Traffic will be monitored on the road network including construction vehicle movements entering and departing the work site.

5.4 Worker Induction and Parking

All workers and subcontractors on-site would be required to undergo a site induction. The induction will include the routes to/ from the site, on-site parking, environmental, OH&S, driver protocols and emergency procedure. This would be the responsibility of the Construction Contractor.

Sufficient off-street parking will be provided for construction staff. Nevertheless, it is encouraged to promote the use of public transport and/or carpooling.

5.5 Vehicle Access and Transport Routes

All construction vehicles will enter and exit the site in a forward direction, and all loading/unloading shall be undertaken on-site during the approved work hours.

Construction vehicles shall radio/call the site office on approach to the site to ensure that space is available within the site loading area. The queuing or marshalling of construction vehicles shall not be permitted on public roads other than at the approved layover area.

Other protocols would be in place to ensure:

- site inductions are implemented for construction workers.
- heavy vehicle drivers shall adhere to the nominated transport routes.
- heavy vehicle drivers and construction workers are aware of pedestrians and cyclists in the vicinity of the site.
- drivers shall be aware of the existing sign posted speed limits.

5.6 Load Covering and Spoil Management

All loaded trucks arriving at and departing from the work areas are required to have an effective cover over their load for the duration of the journey. The load cover may be removed only upon arrival at the destination. Care must be taken to ensure that all loose debris from vehicles and wheels are removed prior to exiting the work areas. Street sweepers will be used where required.

5.7 Vehicles Parked in Work Zones

The 2023 completion report noted issue with private vehicles parked in the work zone and blocking access. It is recommended that site managers liaise with Council rangers to ensure that temporary parking restrictions are enforced.

5.8 Noise Control

The primary proposed truck routes have been designed to minimise use of local streets and residential areas where possible to minimise the noise impact on residents.

Truck operators should not use compression brakes near residential areas. All trucks must be fitted with audible reversing alarms. However, to minimise disturbance to neighbouring residents, reversing should be minimised on site where possible. Trucks should only be operated on the haulage route during the construction hours during the day.

6 Conclusion

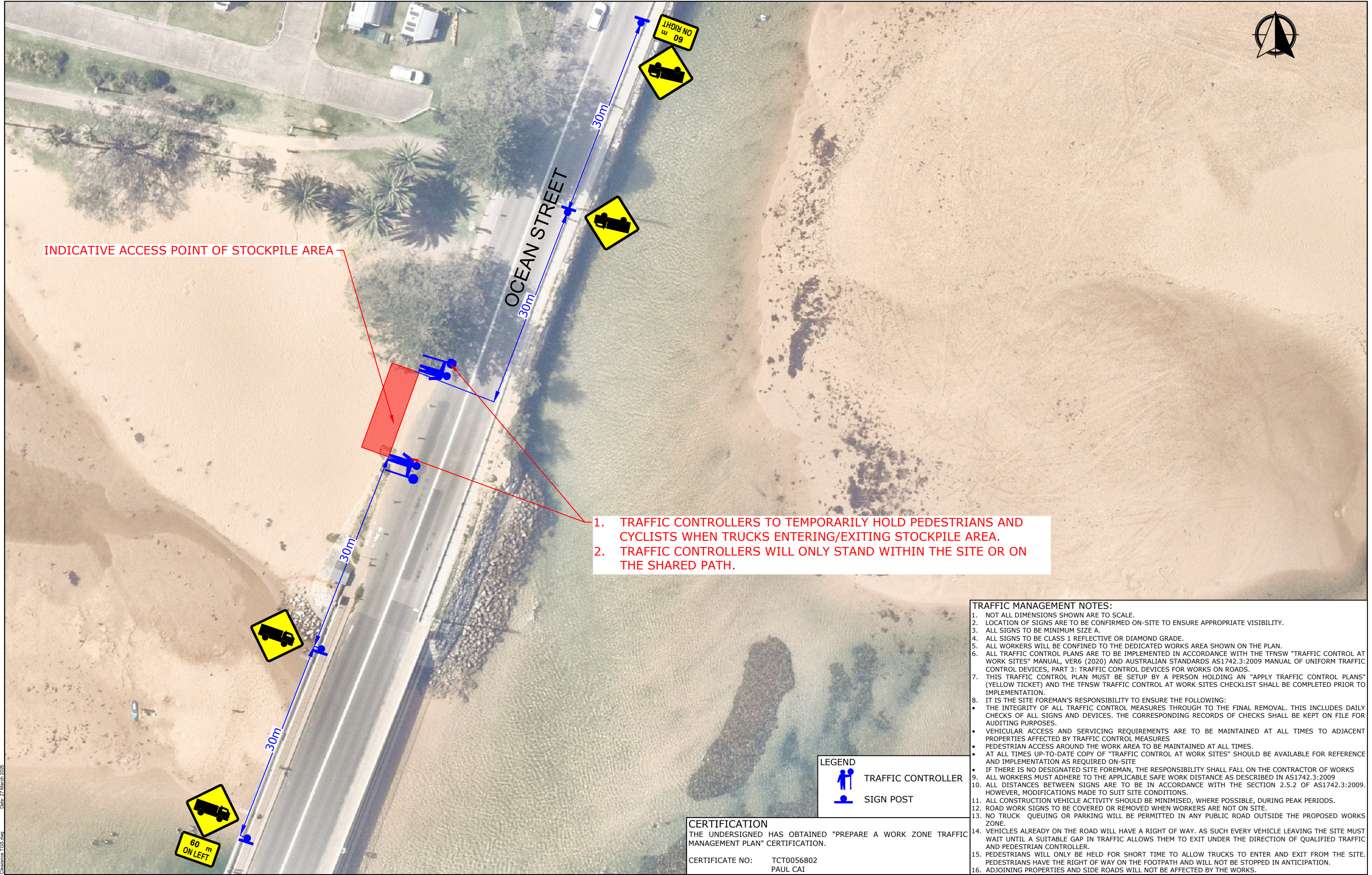
The proposed 2025 Narrabeen Lagoon Entrance Clearance Works Project has been assessed with regard to the traffic, parking and active transport impacts. The main findings from this Traffic Management Plan were:

- The 2025 Narrabeen Lagoon Entrance Clearance Works will follow a similar procedure to previous clearance works, most recently in 2023. Learnings from past operations have been taken into consideration to optimise the construction methodology, and to minimise impacts to the community and road network.
- The 2025 Clearance Works is proposed to excavate about 30,000m² of sand. Sand will be loaded into trucks from Birdwood Park Carpark or from a secondary stockpile area on the north-western side of Narrabeen Lagoon Bridge.
- Based on similar truck capacity used in the 2023 Traffic Management Plan, there will be up to 63 truck movements per day (or average 6 truck movements per hour) to transport a total of 30,000m³ of sand over a timeframe of 14 weeks (77 days). This forecasted traffic generation of the 2025 clearance works can be accommodated by the existing road network.
- The primary sand transportation route will be the same as previous 2023 Clearance works, with trucks travelling in an anti-clockwise direction along Narrabeen Park Parade, Walsh Street, Pittwater Road, Mactier Street and Ocean Street. The truck layover area will be on the southern side of Walsh Street between Narrabeen Park Parade and Collins Street.
- An alternative unloading area at 1102 Pittwater Road is being proposed for the 2025 clearance works. Loaded trucks will travel along Narrabeen Park Parade, Walsh Street, and Pittwater Road to unload the sand. Empty trucks exiting from 1102 Pittwater Road will travel on Pittwater Road southbound, perform a loop movement via Anzac Avenue, Seaview Parade and Ocean Grove onto Pittwater Road northbound to travel back to Birdwood Park Carpark.
- Mitigation measures for pedestrians, cyclists and beach users have been addressed to ensure their safety and that impacts during construction are minimised.
- The community should be notified about the project through different mediums such as online, on-site and through newspapers so they are aware about the project and know how they will be temporarily impacted.

The overall traffic, transport and parking impacts during construction work are supported.

Appendix A

Traffic Guidance Scheme



- 1. TRAFFIC CONTROLLERS TO TEMPORARILY HOLD PEDESTRIANS AND CYCLISTS WHEN TRUCKS ENTERING/EXITING STOCKPILE AREA.
- 2. TRAFFIC CONTROLLERS WILL ONLY STAND WITHIN THE SITE OR ON THE SHARED PATH.

TRAFFIC MANAGEMENT NOTES:

1. NOT ALL DIMENSIONS SHOWN ARE TO SCALE.
2. LOCATION OF SIGNS ARE TO BE CONFIRMED ON-SITE TO ENSURE APPROPRIATE VISIBILITY.
3. ALL SIGNS TO BE MINIMUM SIZE A.
4. ALL SIGNS TO BE CLASS 1 REFLECTIVE OR DIAMOND GRADE.
5. ALL WORKERS WILL BE CONFINED TO THE DEDICATED WORKS AREA SHOWN ON THE PLAN.
6. ALL TRAFFIC CONTROL PLANS ARE TO BE IMPLEMENTED IN ACCORDANCE WITH THE TfNSW "TRAFFIC CONTROL AT WORK SITES" MANUAL, VER6 (2020) AND AUSTRALIAN STANDARDS AS1742.3:2009 MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, PART 3: TRAFFIC CONTROL DEVICES FOR WORKS ON ROADS.
7. THIS TRAFFIC CONTROL PLAN MUST BE SETUP BY A PERSON HOLDING AN "APPLY TRAFFIC CONTROL PLANS" (YELLOW TICKET) AND THE TfNSW TRAFFIC CONTROL AT WORK SITES CHECKLIST SHALL BE COMPLETED PRIOR TO IMPLEMENTATION.
8. IT IS THE SITE FOREMAN'S RESPONSIBILITY TO ENSURE THE FOLLOWING:
 - THE INTEGRITY OF ALL TRAFFIC CONTROL MEASURES THROUGH TO THE FINAL REMOVAL. THIS INCLUDES DAILY CHECKS OF ALL SIGNS AND DEVICES. THE CORRESPONDING RECORDS OF CHECKS SHALL BE KEPT ON FILE FOR AUDITING PURPOSES.
 - VEHICULAR ACCESS AND SERVICING REQUIREMENTS ARE TO BE MAINTAINED AT ALL TIMES TO ADJACENT PROPERTIES AFFECTED BY TRAFFIC CONTROL MEASURES
 - PEDESTRIAN ACCESS AROUND THE WORK AREA TO BE MAINTAINED AT ALL TIMES.
 - AT ALL TIMES UP-TO-DATE COPY OF "TRAFFIC CONTROL AT WORK SITES" SHOULD BE AVAILABLE FOR REFERENCE AND IMPLEMENTATION AS REQUIRED ON-SITE
 - IF THERE IS NO DESIGNATED SITE FOREMAN, THE RESPONSIBILITY SHALL FALL ON THE CONTRACTOR OF WORKS
9. ALL WORKERS MUST ADHERE TO THE APPLICABLE SAFE WORK DISTANCE AS DESCRIBED IN AS1742.3:2009
10. ALL DISTANCES BETWEEN SIGNS ARE TO BE IN ACCORDANCE WITH THE SECTION 2.5.2 OF AS1742.3:2009. HOWEVER, MODIFICATIONS MADE TO SUIT SITE CONDITIONS.
11. ALL CONSTRUCTION VEHICLE ACTIVITY SHOULD BE MINIMISED, WHERE POSSIBLE, DURING PEAK PERIODS.
12. ROAD WORK SIGNS TO BE COVERED OR REMOVED WHEN WORKERS ARE NOT ON SITE.
13. NO TRUCK QUEUING OR PARKING WILL BE PERMITTED IN ANY PUBLIC ROAD OUTSIDE THE PROPOSED WORKS ZONE.
14. VEHICLES ALREADY ON THE ROAD WILL HAVE A RIGHT OF WAY. AS SUCH EVERY VEHICLE LEAVING THE SITE MUST WAIT UNTIL A SUITABLE GAP IN TRAFFIC ALLOWS THEM TO EXIT UNDER THE DIRECTION OF QUALIFIED TRAFFIC AND PEDESTRIAN CONTROLLER.
15. PEDESTRIANS WILL ONLY BE HELD FOR SHORT TIME TO ALLOW TRUCKS TO ENTER AND EXIT FROM THE SITE. PEDESTRIANS HAVE THE RIGHT OF WAY ON THE FOOTPATH AND WILL NOT BE STOPPED IN ANTICIPATION.
16. ADJOINING PROPERTIES AND SIDE ROADS WILL NOT BE AFFECTED BY THE WORKS.

LEGEND

 TRAFFIC CONTROLLER

 SIGN POST

CERTIFICATION
THE UNDERSIGNED HAS OBTAINED "PREPARE A WORK ZONE TRAFFIC MANAGEMENT PLAN" CERTIFICATION.
CERTIFICATE NO: TCT0056802
PAUL CAI

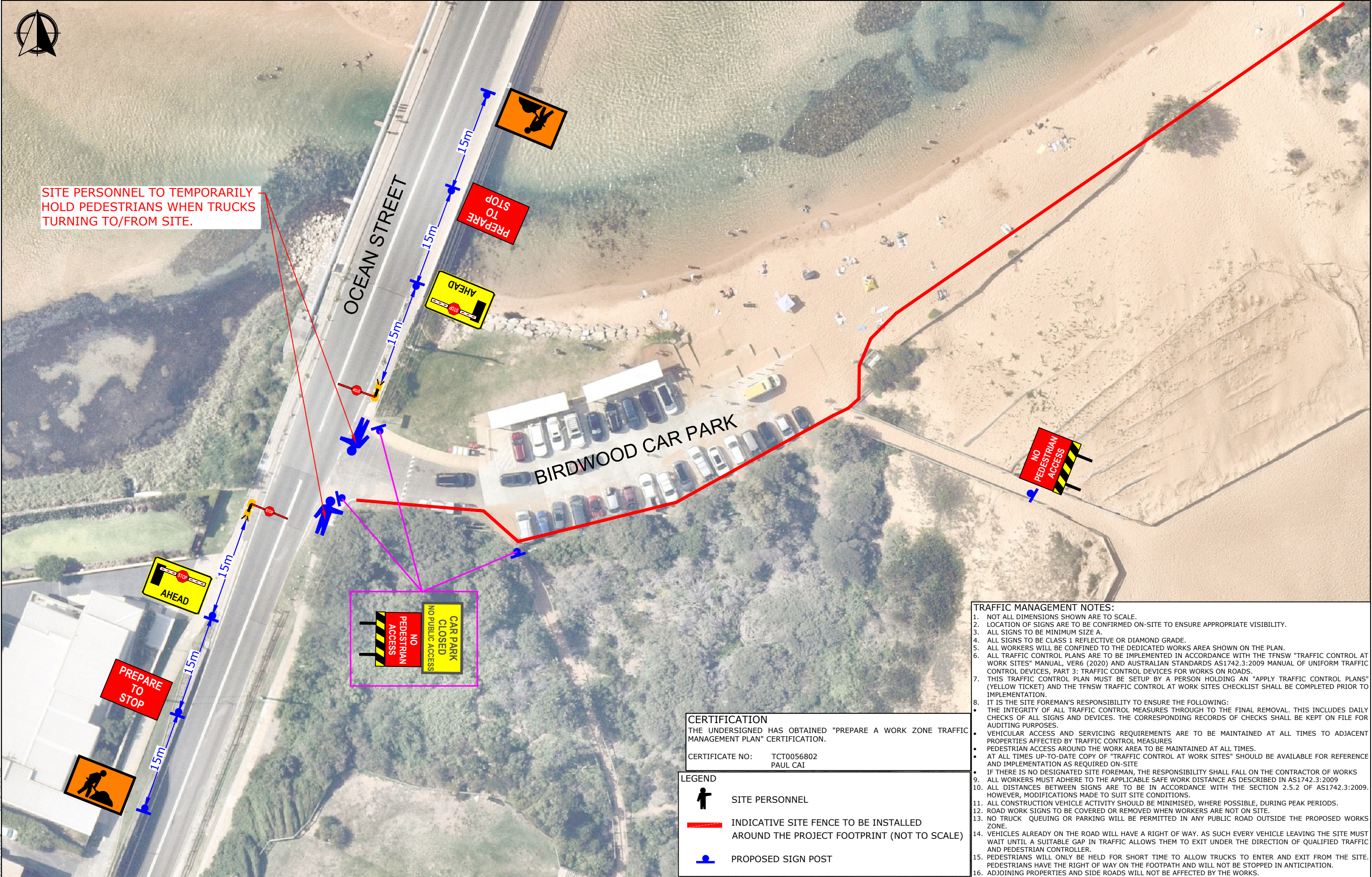
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A	ISSUE FOR DISCUSSION	TZ	PC	SR	27/03/25



PROJECT
2025 NARRABEEN LAGOON ENTRANCE CLEARANCE

TITLE
**TRAFFIC GUIDANCE SCHEME
STOCKPILE AREA NORTHWEST OF NARRABEEN LAGOON BRIDGE**

DWG No. 23066CAD006 FIGURE 1		
DATE STAMP 27 MARCH 2025		
PROJECT No. 23066	SCALE 1:500 @A3	REV. A



SITE PERSONNEL TO TEMPORARILY HOLD PEDESTRIANS WHEN TRUCKS TURNING TO/FROM SITE.

NO PEDESTRIAN ACCESS
CAR PARK CLOSED
NO PUBLIC ACCESS

CERTIFICATION
THE UNDERSIGNED HAS OBTAINED "PREPARE A WORK ZONE TRAFFIC MANAGEMENT PLAN" CERTIFICATION.
CERTIFICATE NO: TCT0056802
PAUL CAI

LEGEND
 SITE PERSONNEL
 INDICATIVE SITE FENCE TO BE INSTALLED AROUND THE PROJECT FOOTPRINT (NOT TO SCALE)
 PROPOSED SIGN POST

- TRAFFIC MANAGEMENT NOTES:**
1. NOT ALL DIMENSIONS SHOWN ARE TO SCALE.
 2. LOCATION OF SIGNS ARE TO BE CONFIRMED ON-SITE TO ENSURE APPROPRIATE VISIBILITY.
 3. ALL SIGNS TO BE MINIMUM SIZE A.
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 14. VEHICLES ALREADY ON THE ROAD WILL HAVE A RIGHT OF WAY. AS SUCH EVERY VEHICLE LEAVING THE SITE MUST WAIT UNTIL A SUITABLE GAP IN TRAFFIC ALLOWS THEM TO EXIT UNDER THE DIRECTION OF QUALIFIED TRAFFIC AND PEDESTRIAN CONTROLLER.
 15. PEDESTRIANS WILL ONLY BE HELD FOR SHORT TIME TO ALLOW TRUCKS TO ENTER AND EXIT FROM THE SITE. PEDESTRIANS HAVE THE RIGHT OF WAY ON THE FOOTPATH AND WILL NOT BE STOPPED IN ANTICIPATION.
 16. ADJOINING PROPERTIES AND SIDE ROADS WILL NOT BE AFFECTED BY THE WORKS.

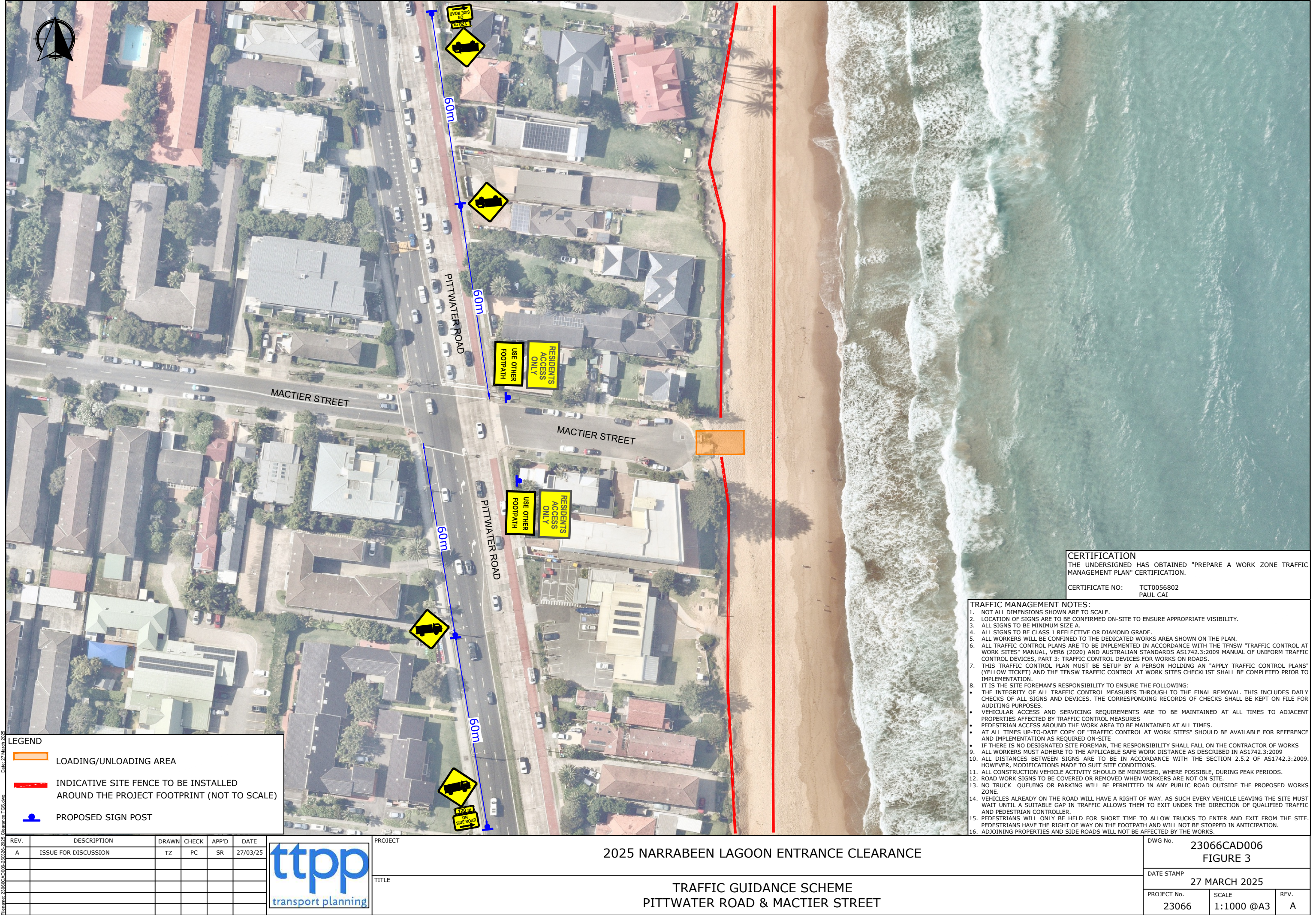
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A	ISSUE FOR DISCUSSION	TZ	PC	SR	27/03/25



PROJECT
2025 NARRABEEN LAGOON ENTRANCE CLEARANCE

TITLE
**TRAFFIC GUIDANCE SCHEME
OCEAN STREET & BIRDWOOD CAR PARK**

DWG No. 23066CAD006 FIGURE 2		
DATE STAMP 27 MARCH 2025		
PROJECT No. 23066	SCALE 1:500 @A3	REV. A



CERTIFICATION
THE UNDERSIGNED HAS OBTAINED "PREPARE A WORK ZONE TRAFFIC MANAGEMENT PLAN" CERTIFICATION.

CERTIFICATE NO: TCT0056802
PAUL CAI

- TRAFFIC MANAGEMENT NOTES:**
1. NOT ALL DIMENSIONS SHOWN ARE TO SCALE.
 2. LOCATION OF SIGNS ARE TO BE CONFIRMED ON-SITE TO ENSURE APPROPRIATE VISIBILITY.
 3. ALL SIGNS TO BE MINIMUM SIZE A.
 4. ALL SIGNS TO BE CLASS 1 REFLECTIVE OR DIAMOND GRADE.
 5. ALL WORKERS WILL BE CONFINED TO THE DEDICATED WORKS AREA SHOWN ON THE PLAN.
 6. ALL TRAFFIC CONTROL PLANS ARE TO BE IMPLEMENTED IN ACCORDANCE WITH THE TfNSW "TRAFFIC CONTROL AT WORK SITES" MANUAL, VER6 (2020) AND AUSTRALIAN STANDARDS AS1742.3:2009 MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, PART 3: TRAFFIC CONTROL DEVICES FOR WORKS ON ROADS.
 7. THIS TRAFFIC CONTROL PLAN MUST BE SETUP BY A PERSON HOLDING AN "APPLY TRAFFIC CONTROL PLANS" (YELLOW TICKET) AND THE TfNSW TRAFFIC CONTROL AT WORK SITES CHECKLIST SHALL BE COMPLETED PRIOR TO IMPLEMENTATION.
 8. IT IS THE SITE FOREMAN'S RESPONSIBILITY TO ENSURE THE FOLLOWING:
 - THE INTEGRITY OF ALL TRAFFIC CONTROL MEASURES THROUGH TO THE FINAL REMOVAL. THIS INCLUDES DAILY CHECKS OF ALL SIGNS AND DEVICES. THE CORRESPONDING RECORDS OF CHECKS SHALL BE KEPT ON FILE FOR AUDITING PURPOSES.
 - VEHICULAR ACCESS AND SERVICING REQUIREMENTS ARE TO BE MAINTAINED AT ALL TIMES TO ADJACENT PROPERTIES AFFECTED BY TRAFFIC CONTROL MEASURES
 - PEDESTRIAN ACCESS AROUND THE WORK AREA TO BE MAINTAINED AT ALL TIMES.
 - AT ALL TIMES UP-TO-DATE COPY OF "TRAFFIC CONTROL AT WORK SITES" SHOULD BE AVAILABLE FOR REFERENCE AND IMPLEMENTATION AS REQUIRED ON-SITE
 - IF THERE IS NO DESIGNATED SITE FOREMAN, THE RESPONSIBILITY SHALL FALL ON THE CONTRACTOR OF WORKS
 9. ALL WORKERS MUST ADHERE TO THE APPLICABLE SAFE WORK DISTANCE AS DESCRIBED IN AS1742.3:2009
 10. ALL DISTANCES BETWEEN SIGNS ARE TO BE IN ACCORDANCE WITH THE SECTION 2.5.2 OF AS1742.3:2009. HOWEVER, MODIFICATIONS MADE TO SUIT SITE CONDITIONS.
 11. ALL CONSTRUCTION VEHICLE ACTIVITY SHOULD BE MINIMISED, WHERE POSSIBLE, DURING PEAK PERIODS.
 12. ROAD WORK SIGNS TO BE COVERED OR REMOVED WHEN WORKERS ARE NOT ON SITE
 13. NO TRUCK QUEUING OR PARKING WILL BE PERMITTED IN ANY PUBLIC ROAD OUTSIDE THE PROPOSED WORKS ZONE.
 14. VEHICLES ALREADY ON THE ROAD WILL HAVE A RIGHT OF WAY. AS SUCH EVERY VEHICLE LEAVING THE SITE MUST WAIT UNTIL A SUITABLE GAP IN TRAFFIC ALLOWS THEM TO EXIT UNDER THE DIRECTION OF QUALIFIED TRAFFIC AND PEDESTRIAN CONTROLLER.
 15. PEDESTRIANS WILL ONLY BE HELD FOR SHORT TIME TO ALLOW TRUCKS TO ENTER AND EXIT FROM THE SITE. PEDESTRIANS HAVE THE RIGHT OF WAY ON THE FOOTPATH AND WILL NOT BE STOPPED IN ANTICIPATION.
 16. ADJOINING PROPERTIES AND SIDE ROADS WILL NOT BE AFFECTED BY THE WORKS.

LEGEND

- LOADING/UNLOADING AREA
- INDICATIVE SITE FENCE TO BE INSTALLED AROUND THE PROJECT FOOTPRINT (NOT TO SCALE)
- PROPOSED SIGN POST

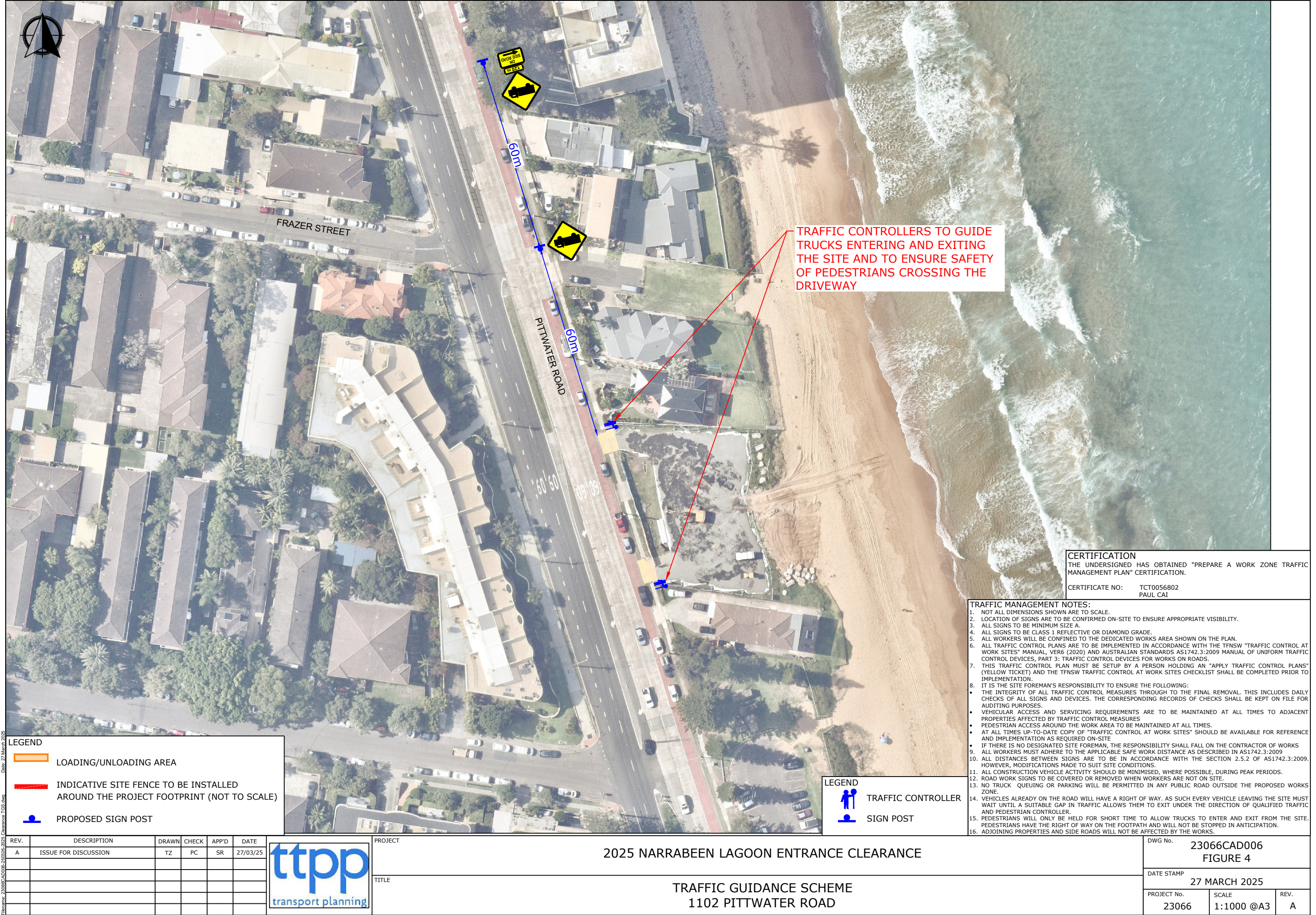
REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	TZ	PC	SR	27/03/25



PROJECT
2025 NARRABEEN LAGOON ENTRANCE CLEARANCE

TITLE
**TRAFFIC GUIDANCE SCHEME
PITTWATER ROAD & MACTIER STREET**

DWG No.	23066CAD006 FIGURE 3		
DATE STAMP	27 MARCH 2025		
PROJECT No.	SCALE	REV.	
23066	1:1000 @A3	A	



Filename: 23066CAD006-240325-2025 Clearance TGS.dwg Date: 27 March 2025

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	TZ	PC	SR	27/03/25



PROJECT	2025 NARRABEEN LAGOON ENTRANCE CLEARANCE		
TITLE	TRAFFIC GUIDANCE SCHEME 1102 PITTWATER ROAD		

DWG No.		23066CAD006 FIGURE 4	
DATE STAMP		27 MARCH 2025	
PROJECT No.	SCALE	REV.	
23066	1:1000 @A3	A	

Appendix B

Swept Path Analysis



Mercedes Actros Rigid Tipper 6x4 2632K
Overall Length 8.040m
Overall Width 2.490m
Overall Body Height 3.191m
Min Body Ground Clearance 0.257m
Track Width 2.490m
Lock-to-lock time 5.00s
Wall to Wall Turning Radius 8.750m

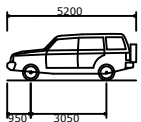
KEY:		
Wheel path	Forward	Reverse
Body envelope		
500mm clearance		

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	TZ	PC	SR	26/03/25

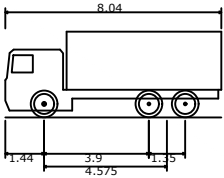


PROJECT	NARRABEEN LAKE PROJECT		
TITLE	SWEPT PATH ANALYSIS 8m TIPPER TRUCK		

DWG No. 23066CAD007 FIGURE 1	
DATE STAMP 26 MARCH 2025	
PROJECT No. 23066	REV. A
SCALE 1:400 @A3	



B99 Vehicle (Realistic min radius) (2004)	
Overall Length	5200mm
Overall Width	1940mm
Overall Body Height	1878mm
Min Body Ground Clearance	272mm
Track Width	1840mm
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	6250mm



Mercedes Actros Rigid Tipper 6x4 2632K	
Overall Length	8.040m
Overall Width	2.490m
Overall Body Height	3.191m
Min Body Ground Clearance	0.257m
Track Width	2.490m
Lock-to-lock time	5.00s
Wall to Wall Turning Radius	8.750m

KEY:

	Forward	Reverse
Wheel path		
Body envelope		
500mm clearance		

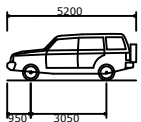
REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	TZ	PC	SR	26/03/25



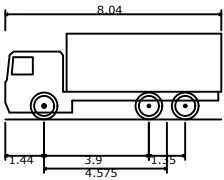
PROJECT	NARRABEEN LAKE PROJECT	
TITLE	SWEPT PATH ANALYSIS 8m TIPPER TRUCK & 5.2m B99 VEHICLE	

DWG No. 23066CAD007 FIGURE 2	
DATE STAMP 26 MARCH 2025	
PROJECT No. 23066	SCALE 1:400 @A3
REV. A	

Filename: 23066CAD007-260325-SWEPT PATH.dwg Date: 26 March 2025



B99 Vehicle (Realistic min radius) (2004)
Overall Length 5200mm
Overall Width 1940mm
Overall Body Height 1878mm
Min Body Ground Clearance 272mm
Track Width 1840mm
Lock-to-lock time 4.00s
Curb to Curb Turning Radius 6250mm



Mercedes Actros Rigid Tipper 6x4 2632K
Overall Length 8.040m
Overall Width 2.490m
Overall Body Height 3.191m
Min Body Ground Clearance 0.257m
Track Width 2.490m
Lock-to-lock time 5.00s
Wall to Wall Turning Radius 8.750m

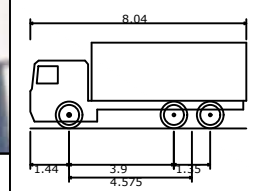
KEY:		
Wheel path	Forward	Reverse
Body envelope		
500mm clearance		

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	TZ	PC	SR	26/03/25



PROJECT	NARRABEEN LAKE PROJECT				
TITLE	SWEPT PATH ANALYSIS 8m TIPPER TRUCK & 5.2m B99 VEHICLE				

DWG No.		23066CAD007	
		FIGURE 3	
DATE STAMP			
26 MARCH 2025			
PROJECT No.	SCALE	REV.	
23066	1:400 @A3	A	



KEY:	
Wheel path	Forward Reverse
Body envelope	
500mm clearance	

Mercedes Actros Rigid Tipper 6x4 2632K	
Overall Length	8.040m
Overall Width	2.490m
Overall Body Height	3.191m
Min Body Ground Clearance	0.257m
Track Width	2.490m
Lock-to-lock time	5.00s
Wall to Wall Turning Radius	8.750m

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	TZ	PC	SR	26/03/25



PROJECT	NARRABEEN LAKE PROJECT	
TITLE	SWEPT PATH ANALYSIS 8m TIPPER TRUCK	

DWG No. 23066CAD007 FIGURE 4	
DATE STAMP 26 MARCH 2025	
PROJECT No. 23066	SCALE 1:400 @A3
REV. A	

Filename: 23066CAD007-260325-SWEPT PATH.dwg Date: 26 March 2025

The Transport Planning Partnership
Suite 402 Level 4, 22 Atchison Street
St Leonards NSW 2065

P.O. Box 237
St Leonards NSW 1590

02 8437 7800

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Appendix C

Consideration of Clause 171(2)
Factors and MNES and
Commonwealth Land

Clause 171(2) Checklist

In addition to the requirements of the *Is an EIS required? guideline* (DUAP 1996) as detailed in the REF, the following factors, listed in clause 171(2) of the EP&A Regulation, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Environmental factor	Impact
<p>(a) <i>The environmental impact on the community,</i></p> <p>During the works there would be works-related noise and visual impacts to surrounding receivers and impacts to traffic, navigation and access associated with the fencing of the works areas. Impacts would be minimised through implementation of the mitigation measures in Section 7 of this REF.</p> <p>In the operational phase there would be a benefit to the community through a reduction in the socio-economic impact of flooding over the medium-term.</p>	<p>Moderate, short-term negative</p> <p>Medium-term positive</p>
<p>(b) <i>The transformation of the locality,</i></p> <p>The impact of the proposal on visual amenity and landscape character is considered minor and would be associated with the presence of the works sites and associated fencing, which would disrupt views across the lagoon and to/along the beach.</p> <p>In the operational phase, the impacts are considered negligible, being within the range of natural fluctuation for the locality.</p>	<p>Minor, short-term negative</p> <p>Negligible medium-term</p>
<p>(c) <i>The environmental impact on the ecosystems of the locality,</i></p> <p>As discussed in the assessment of the potential impacts to biodiversity, the design has avoided direct impacts to seagrasses. However, the works would result in the loss over the medium-term of intertidal sand flats that are roosting and foraging habitat for shorebirds and waders, including migratory species. Nonetheless, it is considered that these impacts are minor in the context of the available habitat in the locality.</p> <p>Impacts to biodiversity would be minimised through implementation of the mitigation measures in Section 7 of this REF.</p>	<p>Minor, medium-term negative</p> <p>Negligible long-term</p>
<p>(d) <i>Reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality,</i></p> <p>There would be temporary aesthetic impacts during the works, including elevated noise levels and restricted recreational access.</p> <p>Landscape character and visual impacts have been assessed as negligible to minor.</p> <p>No long-term impacts to environmental quality and value are anticipated.</p>	<p>Moderate, short-term negative</p> <p>Negligible to minor, short-term</p> <p>Negligible long-term</p>
<p>(e) <i>The effects on any locality, place or building that has –</i></p> <p>(i) <i>Aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance, or</i></p> <p>(ii) <i>Other special value for present or future generations,</i></p> <p>Direct impacts to listed heritage sites and items as a result of the works are not anticipated, provided the mitigation measures in Section 6.7.3 are implemented.</p>	<p>Negligible short to long term</p>
<p>(f) <i>The impact on the habitat of protected animals, within the meaning of the Biodiversity Conservation Act 2016,</i></p> <p>The assessment of impacts to biodiversity concluded that there would be a minor impact to biodiversity during the works due to the loss over the medium-term of intertidal sand flats that are roosting and foraging habitat for shorebirds and waders,</p>	

Environmental factor	Impact
<p>including migratory species. Nonetheless, it is considered that these impacts are minor in the context of the available habitat in the locality.</p> <p>No significant impacts to threatened species are anticipated.</p> <p>Impacts to biodiversity would be minimised through implementation of the mitigation measures in Section 7 of this REF.</p>	<p>Minor, short-term negative</p> <p>Negligible, long-term</p>
<p><i>(g) The endangering of a species of animal, plant or other form of life, whether living on land, in water or in the air,</i></p> <p>The proposal is unlikely to endanger any species of animal, plant or other form of life, whether living on land, in water or in the air provided safeguards and management measures identified in Section 7 of the REF are implemented.</p>	<p>No impact</p>
<p><i>(h) Long-term effects on the environment,</i></p> <p>No long-term impacts to the environment are anticipated. The proposal would result in medium-term impacts through the excavation of material from the lagoon entrance and placement of sand on the beach. These changes in geomorphology are within the range of natural variation within the system and would be less apparent in the short to medium-term due to the re-distribution of sand due to coastal processes.</p>	<p>Minor, medium-term</p>
<p><i>(i) Degradation of the quality of the environment,</i></p> <p>The proposal would result in localised sediment disturbance during the works, which would result in temporary impacts to water quality. There is also potential for accidental spills/leaks of fuel, oil or other chemicals to impact water quality during construction.</p> <p>Impacts would be minor with implementation of the safeguards and mitigation measures identified in Section 7 of the REF.</p>	<p>Minor, short-term negative</p>
<p><i>(j) Risk to the safety of the environment,</i></p> <p>Construction related activities pose potential risks to the safety of the environment through spills/leaks of fuel, oil or other chemicals.</p> <p>The risk is considered low provided the safeguards and management measures identified in Section 7 of the REF are implemented.</p>	<p>No impact</p>
<p><i>(k) Reduction in the range of beneficial uses of the environment,</i></p> <p>Following the proposal, there would be no reduction in the range of beneficial uses of the environment.</p>	<p>No impact</p>
<p><i>(l) Pollution of the environment,</i></p> <p>Construction related activities may result in pollution of the environment through spills/leaks of fuel, oil or other chemicals, air and noise emissions, and temporary increase in suspended sediments. Impacts would be minor with implementation of the safeguards and management measures identified in Section 7 of the REF.</p>	<p>Minor, short-term negative</p>
<p><i>(m) Environmental problems associated with the disposal of waste,</i></p> <p>All wastes generated by the proposal would (if required) be disposed of at an off-site facility which is licenced to receive such waste.</p> <p>There would be no significant environmental problems associated with waste disposal.</p>	<p>Negligible, short-term</p>

Environmental factor	Impact
<p>(n) <i>Increased demand on natural or other resources that are, or are likely to become, in short supply,</i></p> <p>The proposal involves the transport of sand excavated from the lagoon entrance onto Collaroy-Narrabeen Beach. This is within the same sediment compartment and in keeping with the general northerly littoral drift of sand along the beach.</p> <p>All resources required by the proposal are readily available and are not likely to become in short supply.</p>	No impact
<p>(o) <i>The cumulative environmental effect with other existing or likely future activities,</i></p> <p>Assessment of cumulative impacts for the proposal is provided in Section 6.13. Other projects with the same timing of this proposal include coastal protection works proposed for Collaroy-Narrabeen Beach to the north of the beach placement area.</p>	
<p>(p) <i>The impact on coastal processes and coastal hazards, including those under projected climate change conditions,</i></p> <p>Consideration of coastal processes and coastal hazards is detailed in Sections 6.1 and 6.2.</p> <p>No significant impacts to coastal processes are anticipated for the proposal, which effectively adopts a ‘working with nature’ approach that uses the natural coastal processes.</p>	No impact
<p>(q) <i>Applicable local strategic planning statements, regional plans or district strategic plans made under the Act, Division 3.1,</i></p> <p>Towards 2040, the Northern Beaches Local Strategic Planning Statement, has as Priority 8 that the LGA will be ‘Adapted to the impacts of natural and urban hazards and climate change’. The proposed entrance clearance works are identified as an existing project to build coastal resilience.</p> <p>Similarly, the North District Plan prepared by the Greater Sydney Commission has as Planning Priority N22 ‘Adapting to the impacts of natural and urban hazards and climate change’. Under this umbrella, Objective 37 is ‘Exposure to natural and urban hazards is reduced’. The proposal directly supports this objective by reducing risk to the community from flooding.</p> <p>The other plans and strategies of relevance to the proposal are discussed in Section 2.</p>	The proposal aligns with applicable strategies and plans
<p>(r) <i>Other relevant environmental factors.</i></p>	In considering the potential impacts of this proposal all relevant environmental factors have been considered, refer to Section 6 of this assessment.

Matters of National Environmental Significance and Commonwealth land

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

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

Environmental factor	Impact
(a) <i>Any impact on a World Heritage property?</i>	No impact
(b) <i>Any impact on a National Heritage place?</i>	No impact
(c) <i>Any impact on a wetland of international importance?</i>	No impact
<p>(d) <i>Any impact on a listed threatened species or community?</i></p> <p>No threatened species were observed during the field survey. One critically endangered species, the Curlew Sandpiper, is considered to have a moderate likelihood of occurrence in the study area. This is due to the presence of potential habitat for this species in the project area in the form of supratidal and intertidal sand flats. These habitats are used for resting and foraging. There would be short to medium-term impacts to these sand flats due to the excavations, however, they would recover over time as the entrance channel gradually infills. In addition, it is considered that there is suitable alternative habitat in the locality that could be used in the interim.</p> <p>An Assessment of Significance for this species concluded that the proposal is unlikely to significantly impact on any threatened species or communities.</p> <p>There were no TECs present in the project area at the time of the assessment.</p>	Minor, short-term
<p>(e) <i>Any impacts on listed migratory species?</i></p> <p>Six migratory birds were considered to have a moderate to high likelihood of occurrence in the proposal area due to the presence of potential habitat in the form of supratidal and intertidal sand flats. These habitats are used for resting and foraging. There would be short to medium-term impacts to these sand flats due to the excavations, however, they would recover over time as the entrance channel gradually infills. In addition, it is considered that there is suitable alternative habitat in the locality that could be used in the interim.</p> <p>An Assessment of Significance for these species of migratory birds concluded that the proposal is unlikely to significantly impact on any threatened species or communities.</p>	Minor, short-term
(f) <i>Any impact on a Commonwealth marine area?</i>	No impact
(g) <i>Does the proposal involve a nuclear action (including uranium mining)?</i>	No
(h) <i>Additionally, any impact (direct or indirect) on the environment of Commonwealth land?</i>	No impact



Appendix D

Stakeholder Engagement
Responses

Our Ref: ID 3011

Your Ref:

16 April 2025

Tanja Mackenzie
Rhelm
Suite 8/ 111 William Street
Port Macquarie NSW 2444

Via email

email: tanja.mackenzie@rhelm.com.au

CC: helen.slater@ses.nsw.gov.au

Dear Tanja,

Notification under section 2.13 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 in relation to the proposed Narrabeen Lagoon Entrance Upgrade

Thank you for the notification under section 2.13 of the *State Environmental Planning Policy (Transport and Infrastructure) 2021* in relation to the proposed upgrade of Narrabeen Lagoon Entrance. It is understood that the proposed works include:

The NSW State Emergency Service (NSW SES) is the agency responsible for dealing with floods, storms and tsunamis in NSW. This role includes, planning for, responding to and coordinating the initial recovery from floods. As such, the NSW SES has an interest in the public safety aspects of the development of flood prone land, particularly the potential for changes to land use to either exacerbate existing flood risk or create new flood risk for communities in NSW.

The NSW SES has reviewed the proposed upgrade and the flood risk information available (e.g. Northern Beaches Local Flood Plan 2021, Narrabeen Lagoon Flood Study 2013 and Narrabeen Lagoon Floodplain Risk Management Study and Plan 2019 etc.). We note that the Narrabeen Lagoon Floodplain Risk Management Study has identified that the most effective structural option for the Narrabeen Lagoon floodplain is the continuation of the sand clearance from above and below Ocean Street Bridge as a flood mitigation measure. Based on this review, the NSW SES provides the following advice:

Based on this review, we provide the following advice:

- **Ensure** workers and people using the road during and after the upgrades are aware of the flood risk, for example through site inductions, by using signage and other flood information tools.
- **Consider** closing the worksite and securing all materials and equipment prior to the start of the working day if there is a risk of riverine flooding, on receipt of advice from the Bureau of Meteorology (BoM), or when other evidence leads to an expectation of flooding.

During site works, check the BoM website prior to start of the workday for any Severe Thunderstorm or Severe Weather Warnings that may result in flash flooding of the area.

In addition, if the construction phase of the upgrades causes disruption to the operation of local roads, this may impact the ability for emergency vehicles to use these routes. The NSW SES requests that notification be provided where there are likely to be significant delays in the operation of the roads affected by the upgrades.

Please feel free to contact me via email at rra@ses.nsw.gov.au should you wish to discuss any of the matters raised in this correspondence. The NSW SES would also be interested in receiving future correspondence regarding the outcome of this referral via this email address.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Elspeth O'Shannessy', written over a horizontal line.

Elspeth O'Shannessy
Manager, Emergency Risk Assessment
NSW State Emergency Service

From: [Phil Hunt](#) on behalf of [AHO](#)
To: [Tanja Mackenzie](#); [AHO](#)
Cc: [Valerie Tulk](#); [Patrick Stuart](#); [Online](#)
Subject: [External] RE: Narrabeen Lagoon Entrance Clearance Works by Northern Beaches Council
Date: Monday, 31 March 2025 5:22:04 PM
Attachments: [image005.png](#)
[image007.png](#)

Hi Tanja,

Thanks for your email.

The Aboriginal Heritage Office has reviewed previous projects in this area for this kind of activity.

As it involves removing sand from areas where there is no known Aboriginal heritage potential, and depositing it in similar contexts, the Aboriginal Heritage Office does not foresee any Aboriginal heritage issues.

The sites you note are not in the proposed areas. Unfortunately AHIMS data is old. The AHO has much more recent monitoring information and can confirm the sites would not be affected.

Please let us know if you have further queries.

Kind regards

Phil

Phil Hunt
Senior Archaeologist



Aboriginal Heritage Office

Ku-ring-gai, Lane Cove, North Sydney,
Northern Beaches, Strathfield & Willoughby Councils
29 Lawrence St, Freshwater NSW 2096
aho@northernbeaches.nsw.gov.au
PH# 8495 5616
www.aboriginalheritage.org

We acknowledge the traditional owners of the lands we work across – the Gamaragal, Garigal, Gayamaygal, Darramurragal and Wangal clans.

From: Tanja Mackenzie <tanja.mackenzie@rhelm.com.au>
Sent: Wednesday, 26 March 2025 3:03 PM
To: AHO <aho@northernbeaches.nsw.gov.au>
Cc: Valerie Tulk <Valerie.Tulk@northernbeaches.nsw.gov.au>; Patrick Stuart <Patrick.Stuart@northernbeaches.nsw.gov.au>
Subject: Narrabeen Lagoon Entrance Clearance Works by Northern Beaches Council

Dear Sir or Madam,

I am writing regarding the proposed Narrabeen Lagoon Entrance Clearance Works, for which Northern Beaches Council is both the proponent and the determining authority. Rhelm has been engaged by Council to prepare an REF for the works, having previously prepared the impact assessment for the 2023 works.

We have undertaken searches for the proposed works footprint, as indicated in the attached Locality Plans. Plotting these sites they appear outside our works area and we assume we are not directly impacting any listed sites. I was a little concerned about site 45-6-0738, but the attached site card indicates its up on the headland. However, we would appreciate any advice you have about the potential to encounter Aboriginal heritage sites or archaeology in this area, or if there are any other considerations we should be aware of.

We appreciate your kind assistance in this matter.

Kind regards,

Tanja Mackenzie

Principal Environmental Scientist



Suite 8/ 111 William Street | Port Macquarie, NSW 2444

Front Desk 02 9098 6998 | Mobile +61 499 169 084

tanja.mackenzie@rhelm.com.au



Rheln acknowledges the Traditional Owners of Country throughout Australia. We pay our respects to Elders past and present.

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Northern Beaches Council

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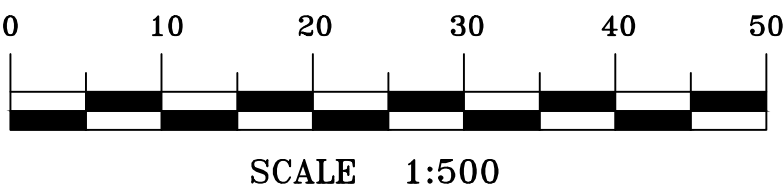
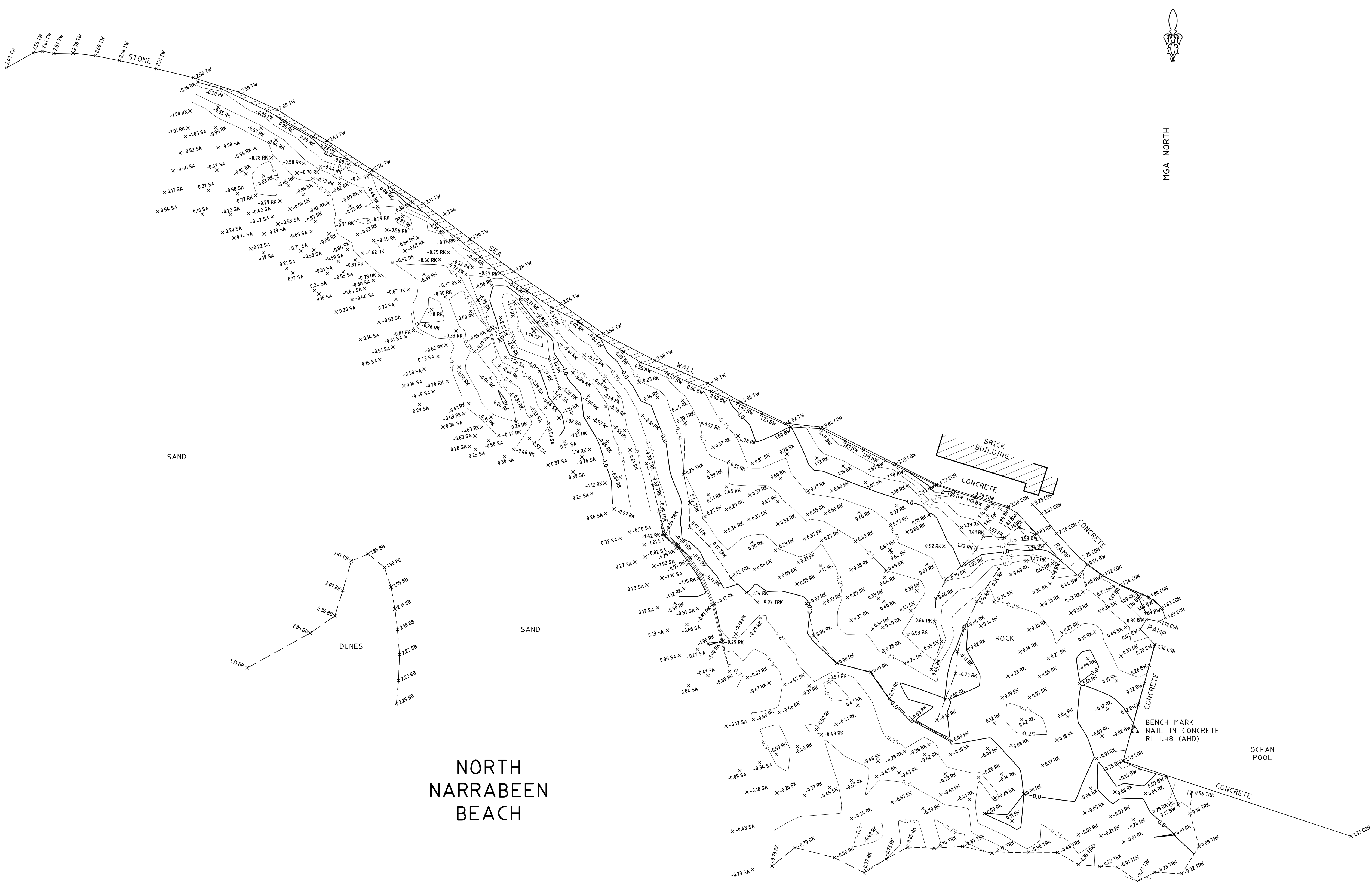
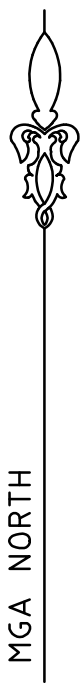


Appendix E

2015 Entrance Survey

STREET

OCEAN



NOTES

- THIS PLAN HAS BEEN PREPARED FOR THE EXCLUSIVE USE OF WARRINGAH COUNCIL.
- SERVICES HAVE NOT BEEN LOCATED. DIAL BEFORE YOU DIG SERVICES (dn 1000) SHOULD BE USED AND A FULL UTILITY INVESTIGATION, INCLUDING A UTILITY LOCATION SURVEY, SHOULD BE UNDERTAKEN BEFORE CARRYING OUT ANY CONSTRUCTION ACTIVITY IN OR NEAR THE SURVEYED AREA.
- CRITICAL SPOT LEVELS SHOULD BE CONFIRMED WITH SURVEYOR.
- THIS PLAN IS ONLY TO BE USED FOR THE PURPOSE OF DESIGNING NEW CONSTRUCTIONS.
- CONTOURS SHOWN DEPICT THE TOPOGRAPHY OF THE ROCK SURFACE ONLY. THEY DO NOT REPRESENT THE EXACT LEVEL AT ANY PARTICULAR POINT. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION.
- CONTOUR INTERVAL - 0.25 metre. - SPOT LEVELS SHOULD BE ADOPTED.
- THE INFORMATION IS ONLY TO BE USED AT A SCALE ACCURACY OF 1:500.
- DO NOT SCALE OFF THIS PLAN / FIGURED DIMENSIONS TO BE TAKEN IN PREFERENCE TO SCALED READINGS.
- COPYRIGHT © CMS SURVEYORS 2015.
- NO PART OF THIS SURVEY MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM OR TRANSMITTED IN ANY FORM, WITHOUT THE WRITTEN PERMISSION OF THE COPYRIGHT OWNER EXCEPT AS PERMITTED BY THE COPYRIGHT ACT 1968.
- ANY PERMITTED DOWNLOADING, ELECTRONIC STORAGE, DISPLAY, PRINT, COPY OR REPRODUCTION OF THIS SURVEY SHOULD CONTAIN NO ALTERATION OR ADDITION TO THE ORIGINAL SURVEY.
- THIS NOTICE MUST NOT BE ERASED.

LEGEND:

- BB = BOTTOM OF BANK
- BW = BOTTOM WALL
- CON = CONCRETE
- RET = RETAINING
- RK = ROCK
- SA = SAND
- TRK = TOP OF ROCK
- TW = TOP WALL

HORIZONTAL DATUM:
CO-ORDINATE SYSTEM: MGA
MARKS ADOPTED: PM.7786 & PM.7785

VERTICAL DATUM:
DATUM: AUSTRALIAN HEIGHT DATUM (AHD)
B.M. ADOPTED: PM.7786
R.L. 2.290 (ORDER L2)
SOURCE: S.C.I.M.S. (20/09/10)

I	FIRST ISSUE	05/05/15
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CLIENT:
WARRINGAH COUNCIL
CIVIC CENTRE
725 PITTWATER ROAD
DEE WHY NSW 2099

SURVEY PLAN
SHOWING DETAIL & LEVELS OVER
NARRABEEN LAGOON ENTRANCE
NARRABEEN NSW 2101

C.M.S. Surveyors
Pty Limited
ACN: 096 240 201
PO Box 463 Dee Why
NSW 2099
1/32 Campbell Avenue,
Dee Why NSW 2099
Telephone: (02) 9971 4802
Facsimile: (02) 9971 4822
E-mail: info@cmsurveyors.com.au

LGA: WARRINGAH			SHEET 1 OF 1	
SURVEYED DR	DRAWN CJR	CHECKED DR	APPROVED SE	
SURVEY INSTRUCTION 13047		SCALE 1:500 @ A1	DATE OF SURVEY 29/04/15	
DRAWING NAME 13047detail			ISSUE 1	
CAD FILE 13047detail 1.dwg				



Appendix F

Biodiversity Database Search
Results



Australian Government

Department of Climate Change, Energy,
the Environment and Water

EPBC Act Protected Matters Report

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

Report created: 26-Feb-2025

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	98
Listed Migratory Species:	58

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	4
Commonwealth Heritage Places:	None
Listed Marine Species:	83
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	6
Key Ecological Features (Marine):	None
Biologically Important Areas:	3
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities

[Resource Information]

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

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area	In feature area
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	Community may occur within area	In feature area
Coastal Upland Swamps in the Sydney Basin Bioregion	Endangered	Community may occur within area	In feature area
Eastern Suburbs Banksia Scrub of the Sydney Region	Critically Endangered	Community may occur within area	In feature area
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species

[Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Ardeenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Callocephalon fimbriatum Gang-gang Cockatoo [768]	Endangered	Species or species habitat known to occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Climacteris picumnus victoriae Brown Treecreeper (south-eastern) [67062]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Dasyornis brachypterus Eastern Bristlebird [533]	Endangered	Species or species habitat may occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Erythroriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Endangered	Species or species habitat known to occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat may occur within area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat may occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area	In feature area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area	In feature area
Pycnoptilus floccosus Pilotbird [525]	Vulnerable	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding likely to occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In feature area
FISH			
Epinephelus daemeli Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In feature area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In feature area
Prototroctes maraena Australian Grayling [26179]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Seriolella brama Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area	In feature area
FROG			
Heleioporus australiacus Giant Burrowing Frog [1973]	Vulnerable	Species or species habitat known to occur within area	In feature area
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area	In feature area
MAMMAL			
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dasyurus maculatus maculatus (SE mainland population)			
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat known to occur within area	In feature area
Eubalaena australis			
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In feature area
Isoodon obesulus obesulus			
Southern Brown Bandicoot (eastern), Southern Brown Bandicoot (south-eastern) [68050]	Endangered	Species or species habitat known to occur within area	In feature area
Notamacropus parma			
Parma Wallaby [89289]	Vulnerable	Species or species habitat may occur within area	In feature area
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat likely to occur within area	In feature area
Petaurus australis australis			
Yellow-bellied Glider (south-eastern) [87600]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Pseudomys novaehollandiae			
New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area	In feature area
PLANT			
Acacia bynoeana			
Bynoe's Wattle, Tiny Wattle [8575]	Vulnerable	Species or species habitat may occur within area	In feature area
Acacia terminalis subsp. Eastern Sydney (G.P.Phillips 126) listed as Acacia terminalis subsp. terminalis MS			
Sunshine Wattle (Sydney region) [91564]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Asterolasia elegans [56780]	Endangered	Species or species habitat may occur within area	In feature area
Caladenia tessellata Thick-lipped Spider-orchid, Daddy Long-legs [2119]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Eucalyptus camfieldii Camfield's Stringybark [15460]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Genoplesium baueri Yellow Gnat-orchid, Bauer's Midge Orchid, Brittle Midge Orchid [7528]	Endangered	Species or species habitat likely to occur within area	In feature area
Lasiopetalum joyceae [20311]	Vulnerable	Species or species habitat may occur within area	In feature area
Leucopogon exolasius Woronora Beard-heath [14251]	Vulnerable	Species or species habitat may occur within area	In feature area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat may occur within area	In feature area
Melaleuca deanei Deane's Melaleuca [5818]	Vulnerable	Species or species habitat may occur within area	In feature area
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area	In feature area
Persoonia hirsuta Hairy Geebung, Hairy Persoonia [19006]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pimelea curviflora var. curviflora [4182]	Vulnerable	Species or species habitat may occur within area	In feature area
Prostanthera densa Villous Mintbush [12233]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rhizanthella slateri Eastern Underground Orchid [11768]	Endangered	Species or species habitat may occur within area	In buffer area only
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat may occur within area	In feature area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area	In feature area
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hoplocephalus bungaroides Broad-headed Snake [1182]	Endangered	Species or species habitat may occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
SHARK			
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Galeorhinus galeus School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In feature area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Sphyrna lewini Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In feature area
SNAIL			
Meridolum maryae Maroubra Woodland Snail, Maroubra Land Snail [89884]	Endangered	Species or species habitat likely to occur within area	In feature area
Listed Migratory Species			
[Resource Information]			
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Ardenna grisea Sooty Shearwater [82651]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat known to occur within area	In feature area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In feature area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area	In feature area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area	In feature area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Migratory Marine Species			
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In feature area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area	In feature area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In feature area
Carcharias taurus Grey Nurse Shark [64469]		Species or species habitat known to occur within area	In feature area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Dugong dugon Dugong [28]		Species or species habitat may occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In feature area
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat likely to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands

[[Resource Information](#)]

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

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Australian Postal Corporation		
Commonwealth Land - Australian Postal Commission [13228]	NSW	In buffer area only
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [13226]	NSW	In buffer area only
Commonwealth Land - Australian Telecommunications Commission [13225]	NSW	In buffer area only

Unknown		
Commonwealth Land - [13227]	NSW	In buffer area only

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

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

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

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

Scientific Name	Threatened Category	Presence Text	Buffer Status
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area	In feature area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In feature area
Phoebastria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area	In feature area
Pterodroma cervicalis White-necked Petrel [59642]		Species or species habitat may occur within area	In feature area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Stercorarius antarcticus as Catharacta skua Brown Skua [85039]		Species or species habitat may occur within area	In buffer area only
Sterna striata White-fronted Tern [799]		Foraging, feeding or related behaviour likely to occur within area	In feature area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat may occur within area overfly marine area	In feature area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Foraging, feeding or related behaviour may occur within area	In feature area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In feature area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In feature area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Fish			
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area	In feature area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area	In feature area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area	In feature area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In feature area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In feature area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area	In feature area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area	In feature area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area	In feature area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In feature area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In feature area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In feature area
Solegnathus spinosissimus Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area	In feature area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In feature area
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area	In feature area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In feature area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In feature area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In feature area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In feature area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In feature area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In feature area
Arctocephalus pusillus Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area	In feature area
Dugong dugon Dugong [28]		Species or species habitat may occur within area	In feature area
Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area	In feature area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In feature area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area	In feature area
Hydrophis platura as Pelamis platurus Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Whales and Other Cetaceans			
[Resource Information]			
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status
Balaenoptera edeni Bryde's Whale [35]	Endangered	Species or species habitat may occur within area	In feature area
Balaenoptera musculus Blue Whale [36]		Species or species habitat may occur within area	In feature area
Caperea marginata Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area	In feature area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]	Endangered	Species or species habitat may occur within area	In feature area
Eubalaena australis Southern Right Whale [40]		Species or species habitat likely to occur within area	In feature area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In feature area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In feature area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In feature area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In feature area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In feature area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In feature area

Current Scientific Name	Status	Type of Presence	Buffer Status	
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In feature area	
Extra Information				
State and Territory Reserves			[Resource Information]	
Protected Area Name	Reserve Type	State	Buffer Status	
Narrabeen	Aquatic Reserve	NSW	In feature area	
EPBC Act Referrals			[Resource Information]	
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Construction of a high-capacity fibre optic submarine cable	2006/2914	Not Controlled Action	Completed	In feature area
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Japan-Guam-Australia Sunshine Coast Branch Marine Cable Route Survey (JGA) QLD	2018/8373	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Japan-Guam-Australia (JGA) Fibre Optic Cable project	2016/7795	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Tasman Global Access submarine cable marine route survey, Narrabeen, NSW	2015/7442	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
Breeding program for Grey Nurse Sharks	2007/3245	Referral Decision	Completed	In feature area
Biologically Important Areas			[Resource Information]	
Scientific Name		Behaviour	Presence	Buffer Status
Dolphins				
Tursiops aduncus Indo-Pacific/Spotted Bottlenose Dolphin [68418]		Breeding	Likely to occur	In feature area

Scientific Name	Behaviour	Presence	Buffer Status
Sharks			
Carcharias taurus			
Grey Nurse Shark [64469]	Foraging	Known to occur	In feature area

Whales			
Megaptera novaeangliae			
Humpback Whale [38]	Foraging	Known to occur	In feature area

Bioregional Assessments			[Resource Information]
SubRegion	BioRegion	Website	Buffer Status
Sydney	Sydney Basin	BA website	In feature area

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

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

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

Please feel free to provide feedback via the [Contact us](#) page.

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Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria : Public Report of all Valid Records of Threatened (listed on BC Act 2016) ,Commonwealth listed ,Protected ,CAMBA listed ,JAMBA listed ,ROKAMBA listed or Native listed Entities in selected area [North: -33.61 West: 151.20 East: 151.39 South: -33.80] recorded since 01 Mar 2005 until 12 Mar 2025 returned a total of 169,563 records of 1,859 species.

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Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records	Info
Animalia	Reptilia	Cheloniidae	2004	<i>Caretta caretta</i>		Loggerhead Turtle	E1,P	E	24	
Animalia	Reptilia	Cheloniidae	2007	<i>Chelonia mydas</i>		Green Turtle	V,P	V	25	
Animalia	Reptilia	Cheloniidae	2008	<i>Eretmochelys imbricata</i>		Hawksbill Turtle	P	V	5	
Animalia	Reptilia	Cheloniidae	2006	<i>Natator depressus</i>		Flatback Turtle	P		4	
Animalia	Reptilia	Dermochelyidae	2013	<i>Dermochelys coriacea</i>		Leatherback Turtle	E1,P	E	9	
Animalia	Aves	Apodidae	0335	<i>Apus pacificus</i>		Fork-tailed Swift	P	C,J,K	1	
Animalia	Aves	Apodidae	0334	<i>Hirundapus caudacutus</i>		White-throated Needletail	V,P	V,C,J,K	20	
Animalia	Aves	Diomedidae	0091	<i>Thalassarche cauta</i>		Shy Albatross	E1,P	E	1	
Animalia	Aves	Procellariidae	0072	<i>Ardenna carneipes</i>		Flesh-footed Shearwater	V,P	J,K	1	
Animalia	Aves	Procellariidae	0070	<i>Ardenna grisea</i>		Sooty Shearwater	P	J	9	
Animalia	Aves	Procellariidae	0069	<i>Ardenna pacifica</i>		Wedge-tailed Shearwater	P	J	13	
Animalia	Aves	Procellariidae	0071	<i>Ardenna tenuirostris</i>		Short-tailed Shearwater	P	C,J,K	75	
Animalia	Aves	Procellariidae	0937	<i>Macronectes halli</i>		Northern Giant-Petrel	V,P	V	1	
Animalia	Aves	Procellariidae	0083	<i>Pachyptila turtur</i>		Fairy Prion	P		2	
Animalia	Aves	Procellariidae	0774	<i>Pterodroma cervicalis</i>		White-necked Petrel	P		1	
Animalia	Aves	Procellariidae	8684	<i>Pterodroma leucoptera leucoptera</i>		Gould's Petrel	V,P	E	1	
Animalia	Aves	Ardeidae	0197	<i>Botaurus poiciloptilus</i>		Australasian Bittern	E1,P	E	2	
Animalia	Aves	Ardeidae	0196	<i>Ixobrychus flavicollis</i>		Black Bittern	V,P		24	

Animalia	Aves	Accipitridae	0226	<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	V,P		80	
Animalia	Aves	Accipitridae	0225	<i>Hieraaetus morphnoides</i>	Little Eagle	V,P		9	
Animalia	Aves	Accipitridae	8739	<i>^^Pandion cristatus</i>	Eastern Osprey	V,P,3		58	
Animalia	Aves	Burhinidae	0174	<i>Burhinus grallarius</i>	Bush Stone-curlew	E1,P		44	
Animalia	Aves	Burhinidae	0175	<i>Esacus magnirostris</i>	Beach Stone-curlew	E4A,P		1	
Animalia	Aves	Haematopodidae	0131	<i>Haematopus fuliginosus</i>	Sooty Oystercatcher	V,P		17	
Animalia	Aves	Haematopodidae	0130	<i>Haematopus longirostris</i>	Pied Oystercatcher	E1,P		2	
Animalia	Aves	Charadriidae	0140	<i>Charadrius bicinctus</i>	Double-banded Plover	P		6	
Animalia	Aves	Charadriidae	0141	<i>Charadrius leschenaultii</i>	Greater Sand-plover	V,P	V,C,J,K	2	
Animalia	Aves	Charadriidae	0139	<i>Charadrius mongolus</i>	Lesser Sand-plover	V,P	E,C,J,K	1	
Animalia	Aves	Charadriidae	0143	<i>Charadrius ruficapillus</i>	Red-capped Plover	P		1	
Animalia	Aves	Charadriidae	8006	<i>Pluvialis fulva</i>	Pacific Golden Plover	P	C,J,K	7	
Animalia	Aves	Charadriidae	0136	<i>Pluvialis squatarola</i>	Grey Plover	P	C,J,K	8	
Animalia	Aves	Rostratulidae	0170	<i>Rostratula australis</i>	Australian Painted Snipe	E1,P	E	3	
Animalia	Aves	Scolopacidae	0129	<i>Arenaria interpres</i>	Ruddy Turnstone	P	C,J,K	6	
Animalia	Aves	Scolopacidae	0163	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	P	C,J,K	6	
Animalia	Aves	Scolopacidae	0166	<i>Calidris alba</i>	Sanderling	V,P	C,J,K	2	
Animalia	Aves	Scolopacidae	0164	<i>Calidris canutus</i>	Red Knot	P	E,C,J,K	2	
Animalia	Aves	Scolopacidae	0161	<i>Calidris ferruginea</i>	Curlew Sandpiper	E4A,P	CE,C,J,K	3	
Animalia	Aves	Scolopacidae	0162	<i>Calidris ruficollis</i>	Red-necked Stint	P	C,J,K	9	
Animalia	Aves	Scolopacidae	0168	<i>Gallinago hardwickii</i>	Latham's Snipe	V,P	V,J,K	2	

Animalia	Aves	Scolopacidae	0153	<i>Limosa lapponica</i>	Bar-tailed Godwit	P	C,J,K	11	
Animalia	Aves	Scolopacidae	0149	<i>Numenius madagascariensis</i>	Eastern Curlew	E4A,P	CE,C,J,K	5	
Animalia	Aves	Scolopacidae	0150	<i>Numenius phaeopus</i>	Whimbrel	P	C,J,K	3	
Animalia	Aves	Scolopacidae	0155	<i>Tringa brevipes</i>	Grey-tailed Tattler	P	C,J,K	4	
Animalia	Aves	Scolopacidae	0156	<i>Tringa incana</i>	Wandering Tattler	P	J	2	
Animalia	Aves	Scolopacidae	0158	<i>Tringa nebularia</i>	Common Greenshank	E1,P	E,C,J,K	1	
Animalia	Aves	Scolopacidae	0159	<i>Tringa stagnatilis</i>	Marsh Sandpiper	P	C,J,K	6	
Animalia	Aves	Scolopacidae	0160	<i>Xenus cinereus</i>	Terek Sandpiper	V,P	V,C,J,K	2	
Animalia	Aves	Laridae	0122	<i>Anous stolidus</i>	Common Noddy	P	C,J	2	
Animalia	Aves	Laridae	0112	<i>Hydroprogne caspia</i>	Caspian Tern	P	J	11	
Animalia	Aves	Laridae	0120	<i>Onychoprion fuscatus</i>	Sooty Tern	V,P		3	
Animalia	Aves	Laridae	0953	<i>Sterna hirundo</i>	Common Tern	P	C,J,K	5	
Animalia	Aves	Laridae	0117	<i>Sternula albifrons</i>	Little Tern	E1,P	C,J,K	1	
Animalia	Aves	Laridae	0115	<i>Thalasseus bergii</i>	Crested Tern	P	J	24	
Animalia	Mammalia	Otariidae	1543	<i>Arctocephalus forsteri</i>	New Zealand Fur-seal	V,P		26	
Animalia	Mammalia	Otariidae	1882	<i>Arctocephalus pusillus doriferus</i>	Australian Fur-seal	V,P		12	
Animalia	Mammalia	Balaenidae	1561	<i>Eubalaena australis</i>	Southern Right Whale	E1,P	E	3	
Animalia	Mammalia	Balaenopteridae	1575	<i>Megaptera novaeangliae</i>	Humpback Whale	P		44	
Animalia	Mammalia	Physeteridae	1578	<i>Physeter macrocephalus</i>	Sperm Whale	V,P		3	



Appendix G

Assessments of Significance

Threatened Shore Birds

Review of Species

Name /Species		Status BC Act	Status EPBC Act
Pied Oystercatcher (<i>Haematopus longirostris</i>)		Endangered	-
Sharp-tailed Sandpiper (<i>Calidris acuminata</i>)		P	Marine, Migratory Species
Curlew Sandpiper (<i>Calidris ferruginea</i>)		Endangered	Critically Endangered, Marine, Migratory Species
Bar-tailed Godwit (<i>Limosa lapponica</i>)		P	Marine, Migratory Species
Species	Distribution	Habitat and Prey	Breeding
<i>H. longirostris</i>	Distributed around the entire Australian coastline, although it is most common in coastal Tasmania and parts of Victoria. In NSW the species is thinly scattered along the entire coast.	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide for molluscs, worms, crabs and small fish.	Nests between August and January, mostly on coastal or estuarine beaches, although occasionally they use saltmarsh or grassy areas.
<i>C. acuminata</i>	Migrates from breeding grounds in the northern hemisphere to the southern hemisphere to winter.	Common in the southeast of Australia in coastal and inland freshwater locations. Feeds on seeds, crustaceans, molluscs and insects on wet sand at the edge of the water or in shallow waters.	Non-breeding migratory species that breeds in the northern hemisphere, particularly northern Siberia.
<i>C. ferruginea</i>	Migrates from breeding grounds in the northern hemisphere to the southern hemisphere to winter.	The species is found across a majority of Australian coastline. Birds will inhabit coastal littoral and estuarine environmental such as mudflats, sandflats and lagoons. Foraging occurs at the water's edge and around exposed macroalgae and seagrass for crustaceans, molluscs, worms and seeds.	Non-breeding migrant to Australia. It breeds in the northern hemisphere in Siberia, traveling to Africa, Asia and Australia in the non-breeding period, generally from September to April.
<i>L. lapponica</i>	Migrates from breeding grounds in the northern hemisphere to the southern hemisphere to winter.	The species occurs across coastal Australia and is often observed at major coastal river estuaries in NSW. Feeds on crustaceans, molluscs, worms and some plants at the water's edge and in shallow water.	Non-breeding migratory species that travels from their Arctic breeding grounds on a non-stop flight to Australia. The birds generally arrive around September and return in March.

Sources: DE (2023), NSW DPE (2021a; 2021b; 2021c; 2020)

5-Part Test – BC Act

Threatened Shore Birds – BC Act

Pied Oystercatcher (*Haematopus longirostris*) – Endangered

Curlew Sandpiper (*Calidris ferruginea*) - Endangered

(a) 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.
<p>Pied Oystercatchers typically use sandy habitats, which may include those areas associated with the sand banks of Narrabeen Lagoon and to a lesser extent the open sandy habitat of Collaroy-Narrabeen Beach. The species is known to forage on exposed sand and mud, and occasionally rocks at low tide. Dredging works will likely result in disturbance to a small amount of habitat this species uses in the locality. These disturbances will likely include removal of habitat via dredging and modification of habitat via sand placement and the presence of dredging machinery and equipment which may reduce available habitat. Increased noise during works may also reduce the quality and availability of foraging habitat at low tide. These disturbances are unlikely to have any adverse effects on the lifecycle of any individuals that may use this location at times, given the habitat to be removed is not considered nesting habitat, while there is availability of similar foraging habitat in the vicinity of the Project Area. It is likely that individuals will continue to forage at low tide when works are not being undertaken and use similar habitat in nearby areas when works are being conducted.</p> <p>The Curlew Sandpiper may utilise the sandy, sheltered habitat within the Study Area around the banks of Narrabeen Lagoon and to a lesser extent the foreshore of Narrabeen Beach. The species is known to forage at the edge or in shallow water in vicinity to seagrass beds and seagrass wrack and roost on sandy beaches. Dredging works will likely result in disturbance to a small amount of habitat that this species may use in the locality. These disturbances will likely include reduction of foraging habitat as a result of dredging, while the presence of dredging infrastructure and any sand stock piling may temporarily reduce a small amount of potential roosting habitat. These disturbances are unlikely to have any adverse effects on the lifecycle of individuals that may use this location at times, given the extensive availability of similar habitat in proximity to the Project Area.</p> <p>Given the above, it is unlikely that the proposed activity has potential to adversely affect the life cycle of shorebird species such that a viable local population is placed at risk of extinction.</p>
<p>(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:</p> <ul style="list-style-type: none"> (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
Not applicable
<p>c) in relation to the habitat of a threatened species or ecological community:</p> <ul style="list-style-type: none"> (i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, 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 development or activity, and (iii) 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
<ul style="list-style-type: none"> i) The sandy habitat that will be removed is limited to clean and unstable marine sands that have accumulated in the lower lagoon, dewatering site, any areas on the shoreline where dredging equipment may be stored and sand placement areas. Habitat within the lagoon will gradually return over the medium term and as sediments accumulate in the lower reaches of the lagoon again, whilst sandy habitat removed to facilitate works areas will be available immediately following completion of works. Any modifications to areas on Collaroy-Narrabeen Beach where sand is deposited will be short-term as coastal processes return the sand to the natural system. These modifications are not expected to result in any net habitat loss over ecological significant time scales. ii) No habitat is expected to become fragmented or isolated as a result of the proposal. iii) The habitat to be removed and modified provides sheltered habitat for wading birds to forage in shallow areas of Narrabeen Lagoon. These shallow sand flats are comprised of clean, yet unstable marine sands that have undergone regular removal for decades as part of maintenance dredging activities. Given the species that use this habitat are nomadic and migratory species that have large foraging territories, the habitat to be removed and modified is not considered to be of ecological significance to the long-term survival of the species in the locality. While other habitats nearby that include the upper sections of Narrabeen Lagoon and Dee Why Lagoon provide similar habitat for shorebirds to utilise if disturbed during the proposed works.
(d) whether the proposed <u>development</u> or activity is likely to have an adverse effect on any <u>declared area of outstanding biodiversity value</u> (either directly or indirectly).
No declared areas of outstanding biodiversity value are located in the Project Area.
(e) 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
NSW KTPs with potential to be exacerbated by the proposed development do not have potential to impact on the Pied Oystercatcher or Curlew Sandpiper.

Conclusion	Shorebirds that utilise habitat in the vicinity of the Study Area are unlikely to be significantly affected by the proposed activity. The proposal will result in some disturbances to habitat associated with foraging amongst intertidal sand shoals to be dredged or shorelines where sand may be placed. These modifications are not expected to be long-term or result in ecologically significant disturbances to these species.
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Significant Impact Criteria: Threatened and Migratory Shorebirds

Significant Impact Criteria: Threatened and Migratory Shorebirds (EPBC Act)		Likelihood of Impact
Sharp-tailed Sandpiper (<i>Calidris acuminata</i>) - Migratory		
Curlew Sandpiper (<i>Calidris ferruginea</i>) - Critically Endangered and Migratory		
Bar-tailed Godwit (<i>Limosa lapponica</i>) – Migratory		
An action is likely to have a significant impact on a threatened or migratory species if there is a real chance or possibility that it will:		
1. Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species		
Entrance clearance works will temporarily modify habitat that migratory species may periodically use for foraging and on occasions roosting. Sandy habitat to be modified is limited to clean and mobile marine sand shoals that have accumulated in the lower lagoon, sand placement areas and areas associated with construction equipment or laydown areas. Physical disturbance from construction works also include increased noise and a reduction in water quality, which may temporarily modify a small amount of foraging habitat. These modifications will be short-term and limited to a confined area of the lagoon and Collaroy-Narrabeen Beach, with similar foraging habitat available in adjacent areas. Habitat will gradually return over the medium-term and as sediments accumulate in the lagoon entrance channel, whilst modifications to areas on Collaroy-Narrabeen Beach where sand is deposited will be short term as coastal processes return the sand to the natural system.		Unlikely
2. Result in an invasive species that is harmful to the migratory species becoming established in area of important habitat for the migratory species		
The proposed dredging is not likely to result in an invasive species harmful to the Sharp-tailed Sandpiper, Curlew Sandpiper or Bar-tailed Godwit becoming established in the area.		Unlikely
3. Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species		
The proposed dredging is not likely to seriously disrupt the lifecycle of an ecologically significant proportion of the population of the Sharp-tailed Sandpiper, Curlew Sandpiper or Bar-tailed Godwit. These species are migratory species that breed in the northern hemisphere; thus, no breeding or nesting sites will be impacted by the proposed works. Their occurrence in NSW is sporadic and distributed across large stretches of the coastline around Australia, while the Project Area is not considered an ecologically significant site at a population level for these species.		Unlikely
4. Lead to a long-term decrease in the size of a population		
The entrance clearance works are not likely to lead to a long-term decrease in the size of these migratory shorebird populations, which breed in the northern hemisphere. Thus, no breeding or nesting sites will be impacted by the proposed works. These species travel extensive distances and frequent coastlines around Australia, with an abundance of alternative habitat to utilise for foraging and roosting if individuals are disturbed by the works.		Unlikely
5. Reduce the area of occupancy of the species		
The proposal will be limited to some short-term disturbances that may reduce habitat quality in the Study Area and potentially some adjacent areas at times, due to physical presence, noise and a reduction in water quality. Disturbances with potential to impact occupancy at the Study Area are likely to be temporary and only last for the duration of works and are not expected to impact the area of occupancy of these shorebirds at any ecologically significant scales.		Unlikely
6. Fragment an existing population into two or more populations		
The proposal is not expected to result in any habitat that these shorebirds may use to become fragmented or isolated from other areas of habitat. It is expected that opportunistic habitat use across the locality will continue by these species, while the proposed action does not have potential to fragment movement between habitats within the locality for these species.		Unlikely
7. Adversely affect habitat critical to the survival of a species		

The habitat is not considered to be critical to the survival of the listed migratory shorebirds. Areas of similar habitat are also available in areas adjacent to the Study Area.	Unlikely
8. Disrupt the breeding cycle of a population	
The habitat is not considered to be critical to the life cycles (including breeding and nesting) of the listed migratory shorebirds, as all species are non-breeding migrants that nest in the northern hemisphere.	Unlikely
9. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	
The proposal will result in some temporary reduction in habitat availability and quality for foraging and roosting; however, this is likely to be short term and the removed sands are likely to accumulate again following completion of the works. Given the small scale of the works and that the habitat is not considered critical to these species it is very unlikely the proposed action has potential to result in any decline in these species.	Unlikely
10. Result in invasive species that are harmful to a critically endangered, endangered or vulnerable species becoming established in the endangered, critically endangered or vulnerable species' habitat	
No known invasive species harmful to the endangered, vulnerable and/or migratory shorebirds are likely to be released or have their populations enhanced as a result of this proposal.	Unlikely
11. Introduce disease that may cause the species to decline	
The proposal is not expected to introduce diseases that may cause migratory shorebird species to decline.	Unlikely
12. Interfere with the recovery of the species	
The proposal is not expected to interfere with the recovery of migratory shorebird species.	Unlikely
Conclusion	
The proposal is unlikely to result in a significant impact on threatened migratory shorebirds. Impacts will be confined to short-term disturbances that may reduce habitat quality and availability. These impacts are likely to be limited to temporary habitat modifications such as a reduction in available foraging habitat due to dredging and some construction noise and disturbances. The habitat at Narrabeen Lagoon represents a small area that may be used by these migratory shorebirds for foraging and roosting in the wider locality and is not considered critical to their lifecycle. Thus, the proposed action does not constitute a significant impact on these species.	

Marine Birds

Review of Species

Name /Species		Status BC Act	Status EPBC Act
Wedge-tailed Shearwater (<i>Ardenna pacifica</i>)		P	Marine, Migratory Species
Short-tailed Shearwater (<i>Ardenna tenuirostris</i>)		P	Marine, Migratory Species
Species	Distribution	Habitat and Prey	Breeding
<i>A. pacifica</i>	Widespread across the Indian and Pacific Ocean, spending non-breeding season in the tropics.	Found in association with tropical and subtropical waters, and offshore waters over the continental slope of eastern Victoria and southern NSW, mostly associated with sea surface temperatures of 13.9-24.4 °C.	Breeds and nests on east and west coasts of Australia and offshore islands.
<i>A. tenuirostris</i>	Migrates from wintering grounds in the northern hemisphere to the southern hemisphere to breed during summer.	Very common in NSW coastal waters during migration periods. Feeds on krill, small fish and other small marine creatures. Food is caught mostly at the surface of the water but sometimes birds are seen diving for food.	Breeds and nests in coastal areas and offshore islands in south and southeast Australia, typically from November to March.

Sources: BirdLife (2023), DPE (2018)

Significant Impact Criteria: Threatened and Migratory Marine Birds

Significant Impact Criteria: Migratory Marine Birds (EPBC Act) Wedge-tailed Shearwater (<i>Ardenna pacifica</i>) - Migratory Short-tailed Shearwater (<i>Ardenna tenuirostris</i>) – Migratory		Likelihood of Impact
An action is likely to have a significant impact on a threatened or migratory species if there is a real chance or possibility that it will:		
1. Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species		
The entrance clearance works will temporarily modify habitat that migratory marine birds may periodically use to forage and roost. Increased noise and a reduction in water quality may temporarily modify foraging habitat. Shearwaters are typically pelagic species and will generally hunt and forage over the ocean, while foraging in a lagoon would likely only occur very occasionally and so is not considered an important foraging habitat for these species. Potential roosting and resting habitat that Shearwaters may use occasionally along Narrabeen Beach may be disturbed during nourishment with dredged sand, however these changes are not expected to result in any modification or loss of habitat		Unlikely
2. Result in an invasive species that is harmful to the migratory species becoming established in area of important habitat for the migratory species		
The proposed dredging is not likely to result in an invasive species harmful to the Wedge-tailed or Short-tailed Shearwater becoming established in the area.		Unlikely
3. Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species		

<p>Shearwaters, including the Wedge-tailed and Short-tailed Shearwater are known to forage over large areas of coastal and offshore and may transiently utilise waters within or near the Study Area. Breeding habitat does not occur within the Study Area and is predominately restricted to offshore islands off the east, south and west coasts of Australia for Wedge-tailed and Short-tailed Shearwaters. Shearwaters are also typically pelagic feeders and would likely only use lagoon habitat for foraging very occasionally.</p> <p>During migrations, these species are known to become injured or die in large numbers due to fatigue from extensive migration distance, starvation and weather events such as high wind, storms and large waves. Shearwaters have previously been observed to wash up on beaches along the NSW coastline. The presence of dredging infrastructure, particularly machinery and trucks on the foreshore of Narrabeen Beach involved in sand placement and sand distribution may pose a threat to injured birds that have been washed ashore. The birds' injuries and fatigue may reduce their capacity to move away from machinery and trucks, which have potential to trample or crush birds resulting in fatalities. However, given the rarity that washing ashore events will coincide with dredging activities and considering events that would naturally follow fatigued birds washing ashore such as predation or drowning, it is not likely that the proposal will have an adverse effect on the life cycle of the species such that local populations are likely to be placed at risk of extinction. It is still recommended that fauna checks be undertaken following weather events to avoid or reduce the possibility of harm.</p> <p>With consideration that breeding and foraging habitat does not typically include habitat within the Project Area, it is very unlikely that an ecologically significant proportion of a population would be seriously disturbed by the proposed works.</p>	<p>Unlikely</p>
<p>Conclusion</p> <p>The proposal is unlikely to result in a significant impact on these migratory marine birds. Impacts will be confined to short-term disturbances that may reduce the quality and availability of a small area of non-core and very marginal habitat. While these impacts are likely to be limited to temporary habitat disturbances. The habitat within Narrabeen Lagoon and along the adjacent beach also only represents a very small area used by these species and is not considered critical to their lifecycle. Thus, the proposed action does not constitute a significant impact on these species.</p>	



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