Port Macquarie southern breakwall upgrade

Review of Environmental Factors

Transport for NSW | June 2022

NSW GOVERNMENT

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Transport for NSW | June 2022

Prepared by Blue Sky Planning and Environment on behalf of Transport for NSW

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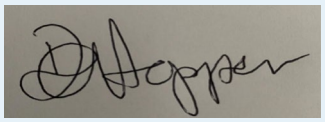
Signed:	
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Appendix B	Tree Summary Report
Appendix C	Aquatic Ecology Assessment
Appendix D	Procedure for Aboriginal cultural heritage consultation and investigation (PACHCI)
Appendix E	Archaeological Assessment

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1. Introduction

The purpose of the Minor Works review of environmental factors (REF) is to describe the proposal, to document the likely impacts of the proposal on the environment, to detail mitigation measures to be implemented and to determine whether or not the project can proceed. For the purposes of this work, Transport for NSW is the proponent and determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The description of the proposed works and assessment of associated environmental impacts has been undertaken in the context of section 171 of the *Environmental Planning and Assessment Regulation 2021*, the factors in *Is an EIS Required? Best Practice Guidelines for Part 5 of the Environmental Planning and Assessment Act 1979* (DUAP, 1995/1996), *Roads and Related Facilities EIS Guideline* (DUAP, 1996) the *Biodiversity Conservation Act 2016 (BC Act)*, the *Fisheries Management Act 1994* (FM Act) and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the REF helps to fulfil the requirements of section 5.5 of the EP&A Act including that Transport 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 assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore the necessity 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
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore, the requirement for a species impact statement or a Biodiversity Development Assessment report
- The potential for the proposal to significantly impact a matter of national environmental significance, including nationally listed threatened biodiversity matters, or the environment of Commonwealth land. Where a significant impact is considered likely on nationally listed biodiversity matters, either the proposal must be reconsidered or a project REF must be prepared.

2. The proposal

2.1 Description

2.1.1 Proposal location

Location details	
Title	Port Macquarie southern breakwall upgrade
Road name and number	N/A
Local government area:	Port Macquarie-Hastings
TfNSW Services region:	Northern

2.1.2 Description of proposed work

Transport for NSW propose to upgrade the existing southern Port Macquarie Breakwall, including ancillary works such as upgrades to the existing footpath located adjacent the breakwall. The proposal is shown in plans provided as Appendix A.

Key features of the proposal include:

Breakwall Upgrade Works

The proposal would include upgrade works to the existing Port Macquarie southern breakwall. The upgrade works are necessary to provide an ongoing safe, navigable boat entrance to the Hastings River and assist in the breakwall infrastructure meeting current safety standards. More specifically, the breakwall requires remediation and potential upgrading to address issues of toe scour, movement/displacement of rock armour and consideration of climate change impacts (including a rise in sea level).

The total length of the breakwall to be upgraded is about 700 metres in length. The proposal footprint is depicted in Figure 1 below.

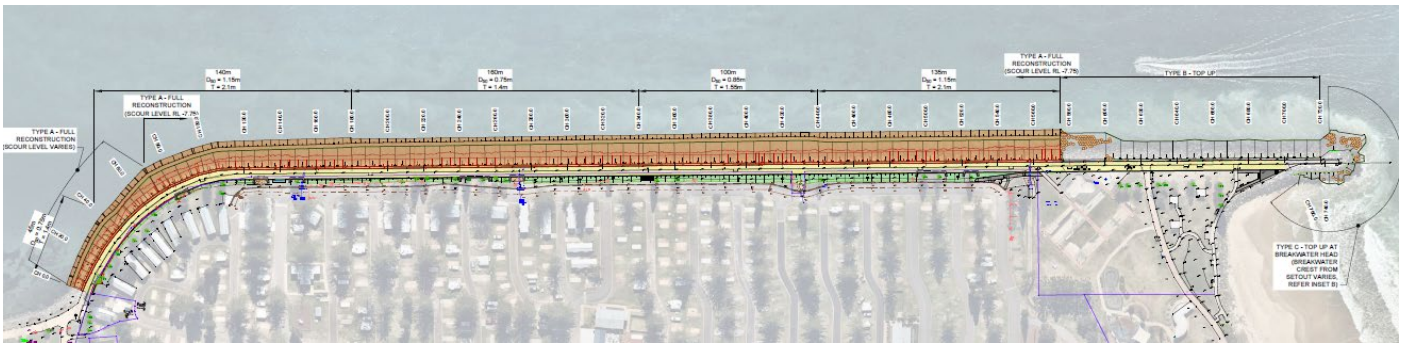


Figure 1: Proposed Footprint (Source: Royal Haskoning DHV)

The following methodology is proposed:

Step 1 – Demolition and Excavation

1. Relocate access to temporary location and demolish existing footpath;
2. Remove existing rock for reuse where possible;
3. Excavation to new design level and to create temporary construction batter.

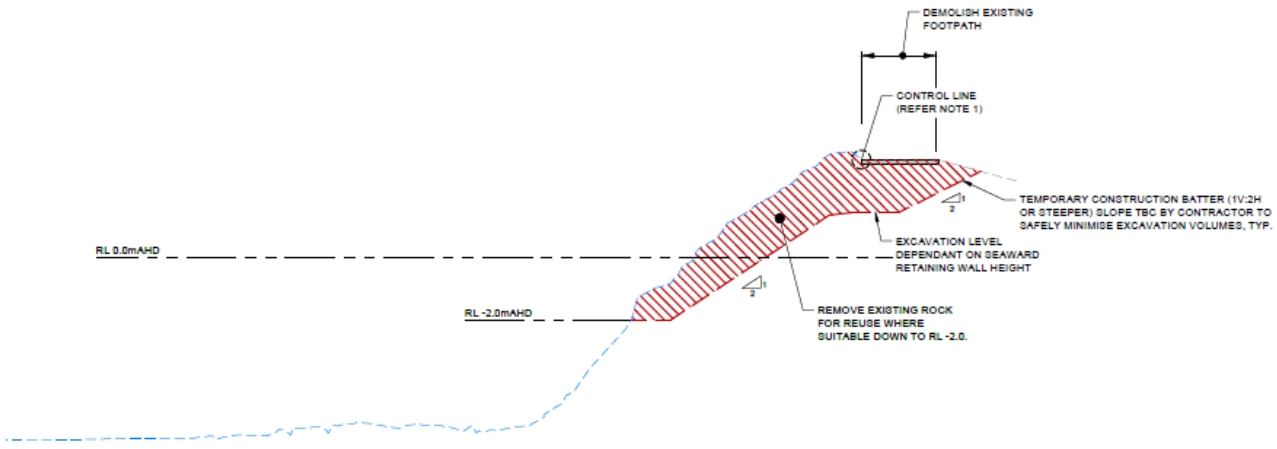


Figure 2: Step 1 – Demolition and Excavation (Source: Royal Haskoning DHV)

Step 2 – Place Lower Breakwall

1. Create underlayer (layer thickness variable)
2. Place re-used rock to create toe (5m width)
3. Create armour layer (layer thickness variable);
4. Place reused rock below RL -2.0 (Slope 1V:1.5H).

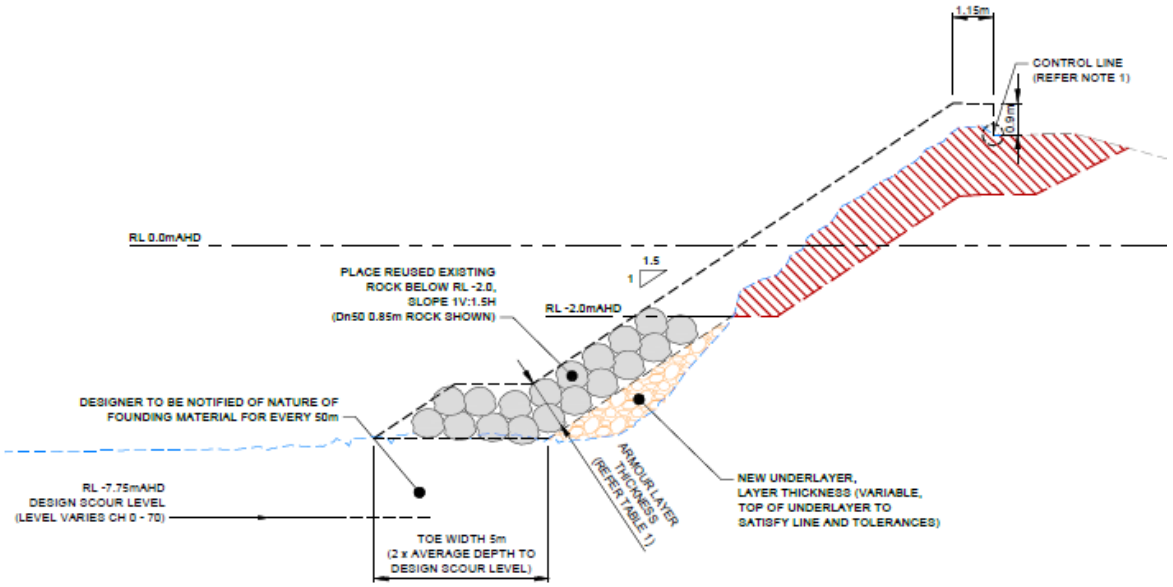


Figure 3: Step 2 – Place Lower Breakwall (Source: Royal Haskoning DHV)

Step 3 – Place Upper Breakwall

1. Lay geo-fabric over rock forming lower breakwall and extent of excavation for upper wall;
2. New underlayer (layer thickness variable);
3. Place new armour rock (slope 1V:1.5H);
4. Place containment unit (1.3m diameter).

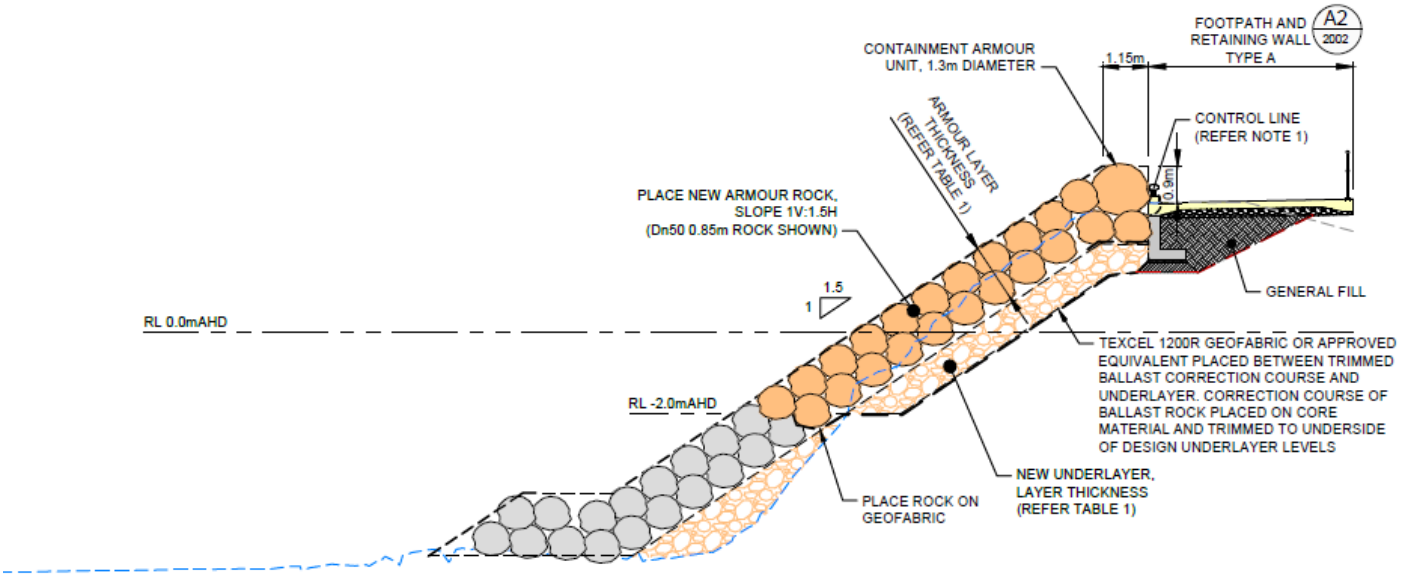


Figure 4: Step 3 – Place Upper Breakwall (Source: Royal Haskoning DHV)

Footpath upgrades

The proposal would also include upgrades to the existing footpath located adjacent the breakwall to meet current safety and accessibility standards and would align with strategic objectives identified in management plans specific to this area. More specifically, the upgrade works would involve the following:

- Widening of the existing footpath from approximately 2.4 metres to a width of 5 metres;
- Construction of ramps and stairs which would provide access to the footpath from adjacent recreation areas;
- Landscaping of the inner embankment;
- Signage and line-marking;
- Integrate art / collaborative local elements in pavement where feasible;
- New handrailing and fencing where required;
- Street and security lighting where required.

The above works would be contingent on available funds and may be carried out as future works.

The total length of the footpath to be upgraded is approximately 700 metres.

The following methodology is proposed:

1. Demolish existing footpath and excavations (done as part of breakwall upgrade works);
2. Construction of both seaward and landward retaining wall (dimensions variable);
3. Placement of fill;
4. Compaction of sub-base;
5. Laying of slab to create new footpath (5 metres wide);
6. Compaction of fill to create batters landward of the footpath (slope 1V:2.5H);
7. Place topsoil and lay turf over batter (150mm thick).

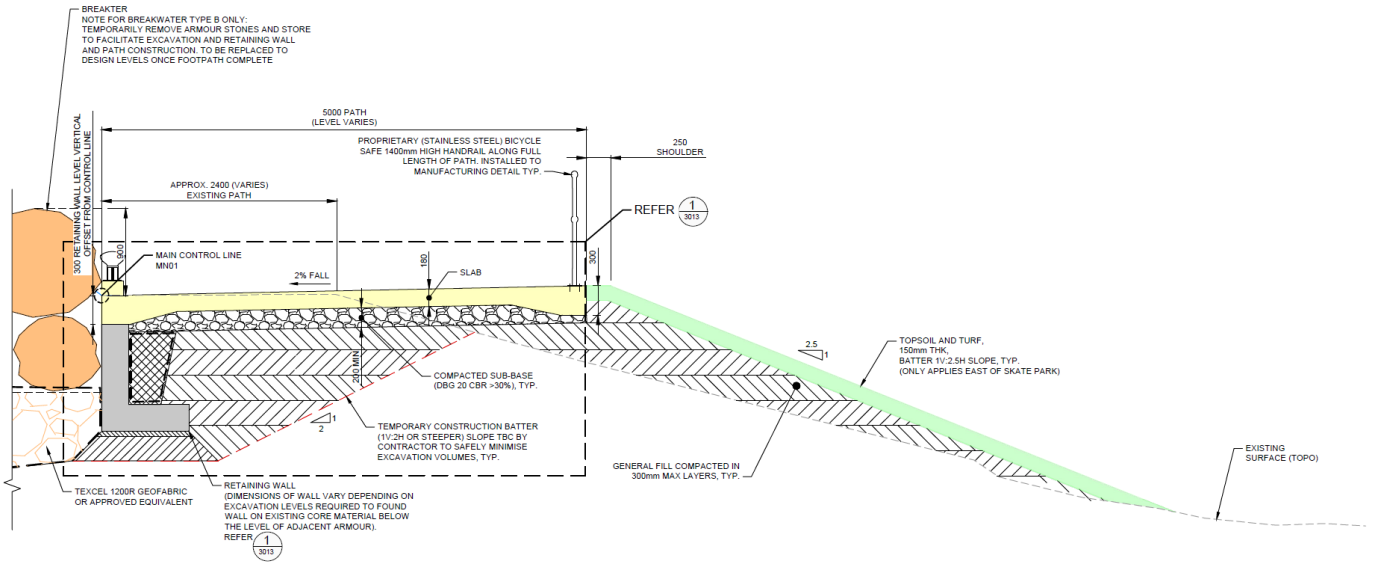


Figure 5: Footpath Upgrades (Source: Royal Haskoning DHV)

Access Ramps and Stairs

1. Lay fine crushed rock;
2. Lay new slab for access ramp and footpath and match to existing levels and footpath;
3. Construction of stairs;
4. Installation of new grate and reconstruction of ‘v’ drain.

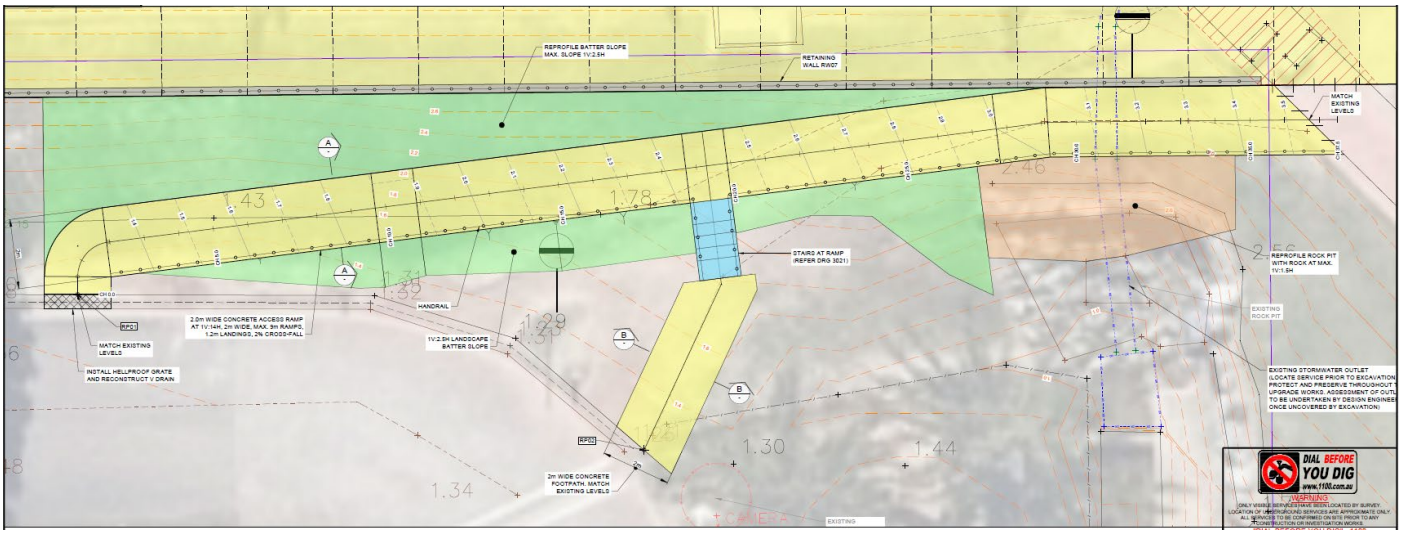


Figure 6: Access Ramps and Stairs (Source: Royal Haskoning DHV)

Vegetation removal

Extensive investigations were undertaken by an arborist to determine whether the trees beside the footpath could be retained. Options considered were retaining walls or tree relocation. The project arborist determined that retention of all trees was not feasible due to the damage that would be caused to the root system as a result of the widening, and the subsequent safety issues that would arise over time due to tree instability.

The proposal would involve the removal of 26 trees within the proposed project footprint to allow the footpath to be widened, comprising the following:

- 11 Swamp She-oaks *Casuarina glauca*; and
- 15 Norfolk Island Pines *Araucaria heterophylla*

The trees that would be removed are noted in the plans provided at Appendix A and are identified in the Tree Summary Report provided at Appendix B.

The following methodology is anticipated for the tree removal works:

1. Establish worksite communication method and pedestrian exclusion zones;
2. Incremental trimming of trees using either an elevated work platform or climbing equipment until complete removal is achieved;
3. Wood chipping for landscaping re-use on-site;
4. Stump grinding.

Stockpiling

The proposal would include the establishment of a temporary stockpile site at Lot 103 DP 1115201 John Fraser Place, Port Macquarie. This site is located approximately 2.3 kilometres south-west of the Breakwall site and is currently used by Council for stockpiling.

The site would be used for the temporary stockpiling of rock from nearby quarries for use in the Breakwall upgrade works. Rock would be transported from the stockpile site to the Breakwall site on an as needs basis as the works progress and rock would most likely be tipped at the nominated placement site either on the wall or adjacent to the wall, as space permits. Rock will be washed at the quarry before being brought to site to ensure that it is clean enough to minimise dust generated by tipping at the site. Should this prove to be insufficient for minimising dust at the work site, rock would be dampened again on site at the breakwall before being tipped.

The temporary stockpile site would have a maximum area for stockpiling of approximately 1.5 ha and the maximum volume of stockpiled rock would be approximately 25,000 tonnes. The rock to be stockpiled would be Virgin Excavated Natural Material (VENM) only. The stockpile site would also be used for the occasional sorting of rock from the breakwall to maximise the re-use of materials.

Vegetation removal required for establishment of the stockpile area will be confined to weeds and small shrubs. The proposed stockpile site is highly disturbed and has been used by Council for stockpiling for several years.

Figure 7 below depicts the off-site stockpile site and nominated stockpile area within that site.

Figure 7: Proposed off-site stockpile site and nominated stockpile area at John Fraser Place (Source: Google Maps)

A second, smaller, stockpile site would be located near the proposed project footprint, adjacent the Town Beach public car park. This stockpile site would have an area of approximately 2450m^2. This stockpile site would be used for the storage of rock transported from the main stockpile site and for processing and sorting of rock reused from the breakwall. Stockpiling, sorting and processing would be done clear of existing vegetation and structures.

Figure 8 below depicts the stockpile site located near the proposed project footprint.

Figure 8: Proposed on-site stockpile site and temporary construction compound located near proposed project footprint (Source: Royal Haskoning DHV, March 2022)

Both stockpile sites would be temporary and would be decommissioned and rehabilitated at the completion of works. The stockpile sites would be established, operated and decommissioned in accordance with the RMS *Stockpile Site Management Guidelines*, dated May 2015.

The following methodology is anticipated for the establishment and decommissioning of the temporary stockpile sites:

1. Installation of erosion and sediment control measures;
2. Clearing of scrubby vegetation located within the nominated stockpile area using an excavator;
3. Construction of temporary vehicle access and laydown area for the stockpiling using an excavator, bobcat, roller and dump truck;
4. Clearing all stockpile material from the site and recycling materials where possible;
5. Stabilising the site by re-contouring and top dressing where necessary, revegetating cleared areas with a cover crop of grass and landscaping;

6. Remove control measures such as erosion and sedimentation devices once the stabilisation has occurred;
7. Undertake an inspection of the site to assess the success of the decommissioning;
8. Decommission the stockpile site following completion of the proposal; and
9. Informing the Regional Asset Manager or their representative of the de-commissioning of the site.

Establishment of a temporary construction compound and access

The proposal would include establishment of a temporary construction compound near the proposed project footprint, which would include the area for on-site stockpiling.

The compound area would have a total footprint of approximately 1000m^2.The compound would be used for the storage of construction machinery and installation of a relocatable site office.

Access to the compound would be via an existing footpath which extends from the public car park located at the northern end of Alban Place to the proposed project footprint. Access to the proposed project footprint from the compound would also utilise this same footpath. A temporary pedestrian crossing across the access would be established.

Details and the location of the compound and associated access is depicted in Figure 8 above.

The compound area would be decommissioned, and the footpath restored following completion of the works.

The following methodology is anticipated for the establishment and decommissioning of the temporary compound site:

1. Erection of temporary fencing to secure the site;
2. Installation of vehicle gate at the entry to the public car park located at the northern end of Alban Place;
3. Establishment of temporary pedestrian crossing across access;
4. Installation of relocatable site office;
5. Decommissioning of the compound and restoration of the footpath following completion of works.

2.1.3 Objectives of works

The objectives of the proposal are:

- To provide a safe, navigable boat entrance to the river.
- To ensure the Port Macquarie southern breakwall and footpath meets current safety standards.
- To ensure the footpath along the southern breakwall continues to serve as a vital recreation feature for residents and visitors to the Port Macquarie locality.
- To align with the strategic objectives identified in the *Hastings Regional Crown Reserve -Precinct A Plan of Management and Coastal Zone Management Plan for Town Beach Coastline*.

2.1.4 Ancillary facilities

Ancillary facilities		
Will the proposal require the use or installation of a compound site? The proposal would include establishment of a temporary construction compound near the proposed project footprint.	☑ Yes	☐ No

Ancillary facilities		
The compound site would have a total area of approximately 1000m^{2,} plus additional area for stockpiling. The compound would be used for the storage of construction machinery and installation of a relocatable site office/s. Access to the compound would be via an existing footpath which extends from the public car park located at the northern end of Alban Place to the proposed project footprint. Access to the proposed project footprint from the compound would also utilise this same footpath. The compound area would be decommissioned and the footpath restored following completion of the works.		
Will the proposal require the use or installation of a stockpile site? The proposal would include the establishment of a temporary stockpile site at Lot 103 DP 1115201 John Fraser Place, Port Macquarie. The temporary stockpile site at John Fraser Place would have a maximum area for stockpiling of approximately 1.5 hectares and the maximum volume of stockpiled rock would be 25,000 tonnes. Figure 7 depicts the stockpile site and nominated stockpile area within that site. No significant vegetation removal is proposed for the off-site stockpiling area. Any vegetation removal required for establishment of the stockpile area will be confined to small shrubs, grasses and weeds. A second stockpile site would be located on-site near the proposed project footprint, adjacent the Town Beach public car park. This stockpile site would have an area of approximately 2450m^2. This stockpile site would be used for the storage of rock transported from the main stockpile site. This stockpile site would also be used for processing and sorting of rock to be used in the breakwall upgrade works and for rock removed from the existing breakwall. Whilst existing vegetation and structures exist within this stockpile site, stockpiling, sorting and processing would be done clear of existing vegetation and structures. The temporary stockpile sites would be established, operated and decommissioned in accordance with the RMS *Stockpile Site Management Guideline, dated May 2015*.	☑ Yes	☐ No
Are any other ancillary facilities required (e.g. temporary plants, parking areas, access tracks)? Access to the compound would be via an existing footpath which extends from the public car park located at the northern end of Alban Place to the proposed project footprint. Access to the proposed project footprint from the compound would also utilise this same footpath. A temporary pedestrian crossing across access would be established. Details of that access are included in Appendix A. It is likely that the public car park at the northern end of Alban Place would be closed at times to allow construction vehicle movements.	☑ Yes	☐ No

Ancillary facilities		
The footpath would be restored following completion of the works.		

2.1.5 Proposed date of commencement

The estimated date of commencement of works is in the first half 2023. The commencement dates are indicative only and contingent on a number of matters including the availability and capacity of nominated contractors, as well as avoiding clashes with major community events.

2.1.6 Estimated length of construction period

The estimated length of construction is approximately six months. The estimated length of construction is indicative only and contingent on a number of matters including resolution of any construction issues potentially encountered during the works as well as weather conditions and local events.

2.2 Need and options

2.2.1 Options considered

The options considered for the breakwall upgrades included the following:

Option A – Top Up of Armour

Option A would involve top up of the rock armour with suitable sized material and would involve minimal reworking of the existing rock which forms the breakwall.

Option A would result in a minor thickening of the armour layer and minor reduction in the channel cross section.

Whilst Option A would improve the hydrodynamic stability of the armour layer by adding armour to the outer layer, this option would not address the underlying cause of instability resulting from inadequate filtration and loss of fines.

Option B – Partial Reconstruction

Option B would involve a partial reconstruction of the breakwall. Option B would involve the following activities:

1. widening the crest of the existing breakwall to provide a platform for an excavator;
2. removal of larger rock armour from the existing breakwall;
3. regrade smaller rock armour;
4. replace the rock removed from the breakwall with imported rock armour; and
5. place rock to provide two layers of armour.

Option B would improve hydrodynamic stability of the armour layer and improve filtration, as the smaller armour would be regraded to form an underlayer filter. However, the design of the underlayer would be uncontrolled as it would comprise existing material of varying size and quality. Furthermore, the underlayer may not provide a suitable filter for the core material.

Option C – Full Reconstruction

Option C would involve full reconstruction of the breakwall. Option C would involve the following activities:

1. remove the footpath and bench the crest of the existing breakwall. This would provide a platform for an excavator while ensuring the platform is located above the highest tide;
2. remove both the rock armour layer and underlayer;
3. sort the rock for reuse;
4. place geofabric over the exposed core;
5. place two layers of underlayer material;
6. place two layers of armour material;
7. reinstate the crest level and replace the footpath; and
8. dispose of excess rock.

This option would ensure a structure that would achieve a 40 year design life, provided ongoing maintenance and repairs are undertaken. The placement of geofabric would ensure suitable filtration to prevent the loss of material which could lead to failure of the structure.

Option C would improve hydrodynamic stability of the armour layer.

The preferred option for the breakwall upgrade would utilise design optimisation and would incorporate components from each of the abovementioned options. This preferred option is the most cost effective option for achieving the identified objectives of the proposal.

The options considered for the footpath upgrades included the following:

Option 1 – Retaining Wall

Option 1 would include a retaining wall along the landward edge of the footpath. The height of the retaining wall would be approximately 1.9 metres. Consideration would need to be given to access from the roadway to the footpath. Given the height of the footpath, a guardrail would be required.

Option 2 – Battered Slope

Option 2 would comprise a battered slope. This would limit the width of the footpath to approximately 5m. The proposed slope is suitable for stairs to be constructed at the same grade. Whilst vegetation could be difficult to maintain given the slope, landscaping would provide an aesthetic outlook for the adjacent caravan park and users of the footpath.

Option 3 - Bleachers

Option 3 comprises low level bleachers to achieve an overall slope of approximately 1V:2.5H. The bleachers could then be landscaped with suitable vegetation plantings and could be designed to provide a seating area; however, the outlook would be towards the caravan park.

The preferred option for the footpath upgrade in Option 2. This option would provide a pleasant outlook from the caravan park and contribute to the overall aesthetics of the proposed project footprint.

2.2.2 Justification for the proposal

The proposal is required to:

- Increase the life of the southern breakwall
- Improve maritime accessibility and safety for vessel users of the Hastings River
- Improve community access and use of the southern breakwall
- Improve pedestrian safety, accessibility and amenity.

Hastings Regional Crown Reserve -Precinct A Plan of Management

The upgrades to the existing footpath would align with some of the identified opportunities outlined within the *Hastings Regional Crown Reserve -Precinct A Plan of Management* (POM). The southern breakwall is captured under the POM, being located within *Focal Area 3(b) - Town Green*. The following information details how the proposal would align with the identified opportunities within the POM:

- **Bicycle access and parking:** The footpath upgrades would assist in minimising conflict between pedestrian and bicycle usage along the southern breakwall, thereby encouraging greater bicycle use
- **Pedestrian access and linkages:** The footpath upgrades would enhance disability access to and along the foreshore.

The upgrade to the existing footpath, which would provide future opportunities for enhanced facilities including seating, fishing platforms and a viewing platform, would be consistent with *Principle 1* of the POM:

Community access to, and use of, the foreshore is a right that must be encouraged and further developed through the provision of enhanced facilities that provide for public safety, enjoyment and a range of recreational and consumer related experiences.

The upgrade to the existing footpath would also align with the following objective of the POM:

To improve and integrate pedestrian and visual links to and along the waterfront and associated areas of open space.

Port Macquarie Foreshore Masterplan

The proposal would also be consistent with council's *Port Macquarie Foreshore Masterplan*. More specifically, the proposal would align with features identified within the Town Beach and Rotary Park concept plan in that it would:

- Contribute to a high-quality foreshore path through widening and upgrades to the southern breakwall footpath.
- Provide landscaping.
- Provide opportunities for enhanced street furniture and recreational assets.

2.3 Statutory and planning framework

2.3.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

This SEPP aims to facilitate the effective delivery of infrastructure across the state.

The proposal would involve upgrades to the Port Macquarie southern breakwall, which is a type of '*navigation and emergency response facility*' as per the definition provided by clause 2.77 of the SEPP. The following clauses are applicable to the proposed works:

- Clause 2.79(2)(a) of the SEPP provides that development for the purposes of '*navigation and emergency response facilities*' carried out by or on behalf of a public authority, is permitted without consent on any land. The proposed upgrade of the existing southern breakwall is permitted without consent pursuant to this clause.
- Clause 2.73(2)(c) provides that development for any purpose may be carried out without consent on Crown managed land, by or on behalf of a Crown land manager of the land if the development is for the purpose of implementing an adopted plan of management in relation to Crown managed land managed by a Council. The proposed footpath upgrade would be undertaken on Crown land managed by Port Macquarie-Hastings Council. As detailed above, the footpath upgrades would align with the strategic objectives contained within the *Hastings Regional Crown Reserve -Precinct A Plan of Management*.

The proposal can be assessed under Division 5.1 of the *Environmental Planning & Assessment Act 1979* (the Act). Development consent from council is not required.

Features such as the proposed establishment of a temporary construction compound and stockpile site is considered ancillary and incidental to the proposal and therefore, is also permitted without consent.

2.3.2 Other relevant legislation and environmental planning instruments

Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) aims *'to conserve, develop and share the fishery resources of the State for the benefit of present and future generations and, in particular, to*:

- *conserve fish stocks and key fish habitats, and*
- *conserve threatened species, populations and ecological communities of fish and marine vegetation, and*

- *promote ecologically sustainable development, including the conservation of biological diversity, and*
- *promote viable commercial fishing and aquaculture industries, and*
- *promote quality recreational fishing opportunities, and*
- *appropriately share fisheries resources between the users of those resources, and*
- *provide social and economic benefits for the wider community of New South Wales.'*

To meet these objectives, Part 7 of the FM Act outlines legislative provisions to protect fish habitat and Part 7A outlines provisions to conserve threatened species of fish and marine vegetation and their habitat.

An assessment of the potential impacts of the proposal on marine ecology is provided in the Aquatic Ecology Assessment prepared by H20 Consulting Group included at Appendix C. The assessment concludes that the proposal is unlikely to have a significant impact on State and/or Commonwealth listed threatened biodiversity provided the recommended mitigation measures detailed within the assessment are implemented.

Under section 199 of the FM Act, notification to the minister is required prior to the carrying out of dredging or reclamation works by a public authority (other than a local authority). The assessment provides that a section 199 notification would be required as dredging and reclamation works may include excavations within or removal of rocks from water land.

Under section 205 of the FM Act, a permit is required to harm (cut, remove, damage, destroy, shade, etc,) marine vegetation including saltmarshes, mangroves, seagrass and seaweeds. The assessment provides that given that the works would likely result in removal of some rocks with macroalgae (seaweeds), a Section 205 permit would be required.

The above permits would be obtained prior to the commencement of any works directly related to the southern breakwall upgrade. Measures to protect the aquatic environment during the works are included in Section 3 of this REF. Note that the works are not expected to result in the obstruction of fish passage and no permit under section 219 of the FM Act would be required.

Coastal Management Act 2016

The objects of the *Coastal Management Act 2016* (CM Act) are to '*manage the coastal environment of New South Wales in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the people of the State, and in particular*:

(a) to protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience, and

(b) to support the social and cultural values of the coastal zone and maintain public access, amenity, use and safety, and

(c) to acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone, and

(d) to recognise the coastal zone as a vital economic zone and to support sustainable coastal economies, and

(e) to facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making, and

(f) to mitigate current and future risks from coastal hazards, taking into account the effects of climate change, and

(g) to recognise that the local and regional scale effects of coastal processes, and the inherently ambulatory and dynamic nature of the shoreline, may result in the loss of coastal land to the sea (including estuaries and other arms of the sea), and to manage coastal use and development accordingly, and

(h) to promote integrated and co-ordinated coastal planning, management and reporting, and

(i) to encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events, and

(j) to ensure co-ordination of the policies and activities of government and public authorities relating to the coastal zone and to facilitate the proper integration of their management activities, and

(k) to support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions, and

(l) to facilitate the identification of land in the coastal zone for acquisition by public or local authorities in order to promote the protection, enhancement, maintenance and restoration of the environment of the coastal zone, and

(m) to support the objects of the Marine Estate Management Act 2014.'

The proposed works are located in the coastal zone, as defined by the CM Act. The proposed works are consistent with the objects of the CM Act as they contribute to maintaining the coastal zone as a vital economic zone and support a sustainable coastal economy by mitigating the impacts and risks of coastal hazards.

Part 3 of the CM Act applies to any public authority that exercises functions in connection with the coastal zone. Division 4 Clause 23 states:

23 Other public authorities to have regard to coastal management program and coastal management manual:

(1) Public authorities (other than local councils) are to have regard to coastal management programs to the extent that those programs are relevant to the exercise of their functions.

(2) In particular, those public authorities are to have regard to relevant coastal management programs and the coastal management manual in the preparation, development and review of, and the contents of, any plans of management that those public authorities are required to produce and, in doing so, are to have regard to the objects of this Act.

The proposal is consistent with the *Coastal Zone Management Plan for Town Beach Coastline* (CZMP). One of the priority key management actions (Action ID #1a and # 1b) identified within the CZMP is the ongoing maintenance of the southern breakwall. The proposal would involve an upgrade to the southern breakwall for the purposes of routine maintenance works and, therefore, aligns with ongoing management actions identified within the CZMP.

Biodiversity Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) and its supporting regulations set out the environmental impact assessment framework for threatened species, threatened ecological communities and Areas of Outstanding Biodiversity Value (formerly critical habitat) for Division 5.1 activities (amongst other types of development).

Under the BC Act, an assessment of significance must be completed to determine the significance of potential impacts to threatened species, populations and/or communities or their habitat. The preparation of a Species Impact Statement (SIS) based on the provisions of the BC Act and FM Act is not required for this proposal, as detailed in the Aquatic Ecology Assessment.

The assessment of potential biodiversity impacts as a result of the proposal is described in Section 3 of this REF and in detail at Appendix C.

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) focuses on environmental protection and provisions for the reduction of water, noise and air pollution and the storage, treatment and disposal of waste. The POEO Act introduces licensing provisions for scheduled activities that are of a nature and scale that have a potential to cause environmental pollution. It also includes measures to limit pollution and manage waste.

The proposal would not involve undertaking or carrying out a scheduled activity. If the controls set out in the relevant guidelines and quality assurance specifications, and additional safeguards detailed in Section 3, are implemented and monitored, there is unlikely to be any material water, noise or air pollution impact. Appropriate waste management controls would be introduced to classify, store, transport and dispose of all construction and work-generated waste as detailed in Section 3 of this REF.

The rock used in the proposed upgrade to the southern breakwall would be classified virgin excavated natural material (VENM) prior to stockpiling and use in the works. Therefore, the storage of this rock would not be classified as a 'scheduled activity' pursuant to Schedule 1 of the POEO Act.

A licence under the POEO Act would not be required for the proposal.

Marine Safety Act 1998 and Marine Safety Regulation 2016

The objects of the *Marine Safety Act 1998* (MS Act) are:

(a) to ensure the safe operation of vessels in ports and other waterways,

(b) to promote the responsible operation of vessels in those waters so as to protect the safety and amenity of other users of those waters and the amenity of occupiers of adjoining land,

(b1) to provide an effective framework for the enforcement of marine legislation,

(c) to provide for the investigation of marine accidents and for appropriate action following any such investigation,

(d) to consolidate marine safety legislation.

Consultation was carried out with Transport Boating Operations Branch to determine the potential impacts of the proposal on the safety of maritime navigation and their recommendations have been included in Section 3 of this REF. The proposal meets the objects of the MS Act.

Under section 18 of the MS Act, the proposal is considered an aquatic activity as it would be undertaken on navigable waters and would temporarily restrict the availability of those waters for normal use by the public. As such, section 97(1) of the *Marine Safety Regulation 2016* would require the work to be subject to an aquatic licence issued by Transport and this would be sought prior to starting any work to upgrade the southern breakwall.

National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the protection of Aboriginal heritage values, national parks and ecological values. The Act makes it an offence to harm Aboriginal objects, places or sites without approval.

Aboriginal Cultural Heritage investigations undertaken for the REF included the following:

- AHIMS database search (within one kilometre of study area); and
- Transport procedure for Aboriginal cultural heritage investigations (PACHI).

A search of the AHIMS database did identify Aboriginal objects or places in the immediate vicinity of the proposal area. The *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHI) (RMS, 2011) concludes that the proposal is unlikely to have an impact on Aboriginal cultural heritage. As detailed in Section 3 of this REF safeguards would be implemented to mitigate any impacts on unidentified Aboriginal objects or places.

Heritage Act 1977

The *Heritage Act 1977* (H Act) provides for the protection or conservation of buildings, works, maritime heritage (wrecks), archaeological relics and places of heritage value through their listing on various State and local registers. The Act makes it an offence to harm any non-Aboriginal heritage values without approval.

The Port Macquarie "*training walls and breakwalls*", which includes the southern breakwall, are listed as a locally significant archaeological site (A060) under Schedule 5 of the *Port Macquarie-Hasting LEP 2011* (LEP). As an identified relic, or collection of relics, the subject site is protected under section 139 of the H Act.

An Assessment of Significance and Heritage Impact Assessment is provided in the Statement of Heritage Impact, prepared by EMM and dated April 2022 at Appendix E.

Although the assessment concludes that the southern breakwall is a locally significant structure, the assessment concludes that no permit under section 139 of the H Act is required, provided recommendations in the assessment, including archaeological monitoring and preparation of a 'archaeological work method statement'. Of note, the trees proposed to be removed along the footpath have been assessed to have little to no heritage significance.

The recommendations of the assessment are included as safeguards.

The assessment of potential heritage impacts as a result of the proposal is described in Section 3 of this REF and in detail at Appendix E.

Marine Pollution Act 2012

The Marine Pollution Act 2012 sets out provisions to prevent pollution in the marine environment.

The proposal is unlikely to result in any oil, noxious liquid, pollutant, sewage or garbage discharge as controlled under this Act, provided that safeguards are implemented and monitored as described in Section 3 of this REF.

Crown Land Management Act 2016

The *Crown Land Management Act 2016* (CLM Act) provides for the ownership, use and management of the Crown land of New South Wales, and requires environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown land.

Under section 2.18 of the CLM Act the Minister may grant a licence over dedicated or reserved Crown land or a Crown road for the purpose of any facility or infrastructure.

The works would be undertaken on Crown land. Crown Land Licence Number RN 618891 would be amended to capture the land which is subject to the proposal prior to the commencement of the works.

Water Management Act 2000

The objects of the *Water Management Act 2000* (WM Act) are to provide for the sustainable and integrated management of the water resources of the State for the benefit of both present and future generations.

Section 91E stipulates that a person who carries out a controlled activity in, on or under waterfront land, without a Controlled Activity Approval is guilty of an offence.

Section 41 of the *Water Management (General) Regulation 2018* provides that a public authority is exempt from the requirement for obtaining a Controlled Activity Approval.

Transport is a public authority and is therefore exempt from requiring a Controlled Activity Approval.

Native Title (New South Wales) Act 1994 No 45

The objects of the Native Title (New South Wales) Act 1994 No 45 (NT Act) are as follows:

> *(a) in accordance with the Commonwealth Native Title Act, to validate any past acts, and intermediate period acts, invalidated because of the existence of native title and to confirm certain rights, and*

(b) to ensure that New South Wales law is consistent with standards set by the Commonwealth Native Title Act for future dealings affecting native title.

A Native Title Vision website search indicated that there has not been any Native Title claims or determinations within the locality of Port Macquarie.

State Environmental Planning Policy (State and Regional Development) 2011

State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP) identifies development and infrastructure that is State and regionally significant.

The proposal is not Regionally Significant Development as clause 20(2)(b) states *'development for which development consent is not required is not declared to be regionally significant development*'.

Clause 14(1) of the SRD SEPP declares development to be state significant infrastructure if the development is, by the operation of a State Environmental Planning Policy, permissible without development consent and the development is specified in schedule 3 of the SRD SEPP.

Schedule 3 of the SRD SEPP does not include 'navigation and emergency response facilities' and, therefore, the proposal is not state significant infrastructure.

State Environmental Planning Policy (Resilience and Hazards) 2021

State Environmental Planning Policy (Resilience and Hazards) 2021 (Resilience and Hazards SEPP) aims to promote an integrated and coordinated approach to land use planning in the coastal zone.

Section 2.7 of the Resilience and Hazards SEPP provides that certain development within coastal wetlands and littoral rainforests areas are permitted with development consent. The proposed project footprint is not located within coastal wetlands or littoral rainforests areas and development consent is not required pursuant to the SEPP.

The proposed project footprint is located within the 'coastal environment area'. The proposal would not require development consent and the considerations of division 3 of the Resilience and Hazards SEPP are not applicable to the proposal. Notwithstanding, the table below details these matters and addresses how the proposal relates.

Division 3 matters:

Consideration	Comment
(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,.	The proposal would not have any impacts on the biophysical environment are likely. The proposal would not likely require excavations or ground penetrations likely to intercept ground water. Whilst the proposal would include additional impervious areas, these increases would be negligible. Additional impervious areas would be connected to existing drainage infrastructure serving the site where possible. No impacts on the hydrological environment are likely. As detailed elsewhere in this Report, no ecological impacts are likely.
(b) coastal environmental values and natural coastal processes,	As concluded in the Aquatic Ecology Assessment, no significant adverse impacts on the coastal environmental values would be likely provided safeguards are implemented. The design of the breakwall upgrade works have been informed by coastal process studies which includes analysis of hydraulic loading, wave climate and setup, tidal currents. No adverse impacts on coastal processes would be likely.
(c) the water quality of the marine estate (within the meaning of the ***Marine Estate Management Act 2014***), in particular, the cumulative impacts of the proposed	As detailed elsewhere in this Report, no impacts on water quality would be likely provided safeguards are implemented.

Consideration	Comment
development on any of the sensitive coastal lakes identified in Schedule 1,	
(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,	As concluded in the Aquatic Ecology Assessment, no significant adverse impacts on the marine vegetation, native vegetation and fauna and their habitats would be likely provided safeguards are implemented. The proposed project footprint is not located within proximity to any undeveloped headlands and no adverse impacts on undeveloped headlands would be likely.
(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	Whilst temporary impacts on public open space and access would be experienced during construction, the proposal would significantly enhance useability and access along the foreshore for members of the public, including persons with a disability.
(f) Aboriginal cultural heritage, practices and places,	As detailed elsewhere in this Report, no impacts on Aboriginal cultural heritage would be likely provided safeguards are implemented.
(g) the use of the surf zone.	No significant impacts on use of the surf zone are likely.

The proposed project footprint is located within the 'coastal use area'. The proposal would not require development consent and the considerations of division 4 of the Resilience and Hazards SEPP are not applicable to the proposal. Notwithstanding, the table below details these matters and addresses how the proposal relates.

Division 4 matters:

Consideration	Comment
(i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	Whilst temporary impacts on public open space and access would be experienced during construction, the proposal would significantly enhance useability and access along the foreshore for members of the public, including persons with a disability.
(ii) overshadowing, wind funnelling and the loss of views from public places to foreshores,	The proposal would not involve construction of any significant built structures and no overshadowing, wind funnelling and the loss of views from public places to foreshores would be likely.
(iii) the visual amenity and scenic qualities of the coast, including coastal headlands,	Whilst temporary impacts on the visual amenity and scenic qualities of the locality would be experienced during construction, the proposal would significantly enhance visual amenity and scenic qualities of the locality.
(iv) Aboriginal cultural heritage, practices and places,	As detailed elsewhere in this Report, no impacts on Aboriginal cultural heritage would be likely provided safeguards are implemented.
(v) cultural and built environment heritage,	As detailed elsewhere in this Report, no impacts on cultural and built environment heritage would be likely provided safeguards are implemented.

Figure 9: Proposal footprint within the coastal environment (blue) and coastal use (orange) areas (Source: NSW Planning Portal)

State Environmental Planning Policy (Biodiversity and Conservation) 2021

The State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP) aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

The proposal would be located within a koala management area specified in Schedule 2 of the Biodiversity and Conservation SEPP.

The proposal would not impact on any known koala feed trees, with only She-oaks *Casuarina glauca* and Norfolk Island Pines *Araucaria heterophylla* being impacted. These species are not listed as koala feed trees in the Biodiversity and Conservation SEPP. Vegetation will be retained where possible and it is unlikely that these have habitat value for koalas.

The vegetation removal associated with stockpiling at John Fraser Place would be limited to weeds and a small number of regrowth shrubs. No threatened species habitat would be removed for any stockpiling activities.

Port Macquarie-Hastings Local Environmental Plan (LEP) 2011

The proposed project is located within the following land use zones:

W2 (Recreational Waterways) zone –Breakwall upgrade works

RE1 (Public Recreation) zone – Footpath upgrade works

SP2 (Infrastructure) zone – Temporary stockpile site

The LEP defines a set of objectives for land use zones. The proposal would be consistent with the objectives of the relevant zones as outlined in the table below:

Zone	Objectives	Compliance
W2	• To protect the ecological, scenic and recreation values of recreational waterways. • To allow for water-based recreation and related uses. • To provide for sustainable fishing industries and recreational fishing.	The proposal would facilitate the ongoing viability of the southern breakwall allowing for the continuation of water-based recreation and the sustainability of fishing industries and recreational fishing.
RE1	• To enable land to be used for public open space or recreational purposes. • To provide a range of recreational settings and activities and compatible land uses. • To protect and enhance the natural environment for recreational purposes.	The proposal would enable ongoing use of the land to be used as public open space for recreational purposes. The proposal would enhance a recreational setting and associated activities, while protecting the natural environment.
SP2	• To provide for infrastructure and related uses. • To prevent development that is not compatible with or that may detract from the provision of infrastructure.	The stockpiling of rock would facilitate the maintenance of maritime infrastructure. The stockpiling of rock would not be incompatible with the existing use of the land.

The proposal is permissible without development consent. Therefore, the consent requirements of the LEP do not apply and the proposal may be determined under Division 5.1 of the EP&A Act.

2.4 Community and agency consultation

2.4.1 Consultation Strategy

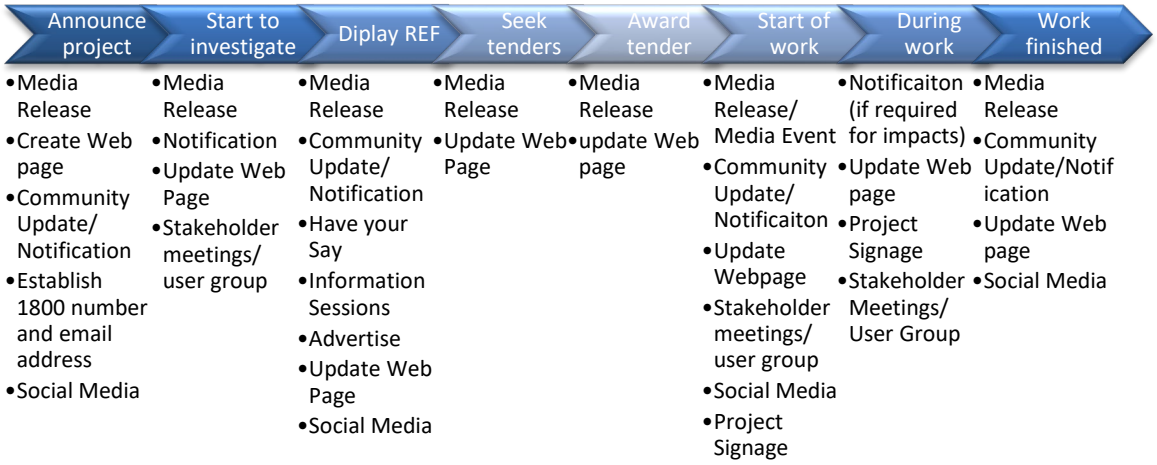
Consultation activities are programmed to align with key project milestones to keep the community updated and informed throughout the project.

A dedicated project web page has been developed to be a central location for all community information relating to the project. A project specific email inbox and 24 hour free call number has been established for the project so that the community has the ability to contact the project team for complaints and inquiries at any stage during the project.

The consultation strategy is to engage and involve the community in a “have your say” process during the display period of this REF; a minimum of three weeks. This strategy is preferred as it allows the community to not only review the concept plan and project proposal but also the REF, which contains more extensive project details and outlines all identified potential impacts. This gives the community the opportunity to provide more informed feedback.

Once the “have your say” period is completed the project team will review all feedback received and provide a response or make changes to the project if needed. A consultation summary or submissions report will be made publicly available and added to this document as part of the finalisation of the REF prior to the determination of this document and approval of the project to proceed is obtained.

The graphic below is an example of communication activities which may take place at key project milestones. As the project progresses, a decision will be made on which activities are appropriate to be used.



2.4.2 Values

The values of Transport underpin decisions and behaviours when working with customers, colleagues, stakeholders and partners as described below:

Customer focus *- We place the customer at the centre of everything we do*

Collaboration *- We value each other and create better outcomes by working together*

Solutions *- We deliver sustainable and innovative solutions to NSW's transport needs*

Integrity *- We take responsibility and communicate openly*

2.4.3 Consultation objectives

Transport will consult with the community and key stakeholders on the proposal to:

- inform the community and stakeholders of the proposal of the upgrade of the Port Macquarie Southern Breakwall;
- seek feedback on the concept design and REF, thereby giving the community the opportunity to raise issues of concern for consideration in developing the project. The feedback will inform the finalised proposal and design of the project;
- to better understand community values and desired outcomes for the Port Macquarie.

2.4.4 Engagement tools and techniques

- Media releases for local media to push the "reach" of notifications beyond a local level
- Project notifications and project updates for nearby residents, businesses and stakeholders
- Information sessions and face-to-face or online meetings with key stakeholders to brief the community on progress and updates.
- Site inductions, training and tool box sessions
- Letters, emails and targeted correspondence
- Project updates on the TfNSW website: ***http://nswroads.work/portmacquariebreakwall***
- A project phone number **1800 571 311** and email address **portmacquariebreakwall@transport.nsw.gov.au** for inquiries, information and complaints
- Database to record stakeholders and contacts

- Signage around work area, announcing any upcoming closures or start of work. This signage should appear at least two weeks ahead of any interruption.

2.4.5 Community Involvement

Transport is committed to establishing genuine relationships with the community. This is underpinned by the belief that effective communications is a crucial element in the successful delivery of its projects. The following stakeholder consultation is being undertaken:

Stakeholder group	Stakeholder	Interest
Federal Government	• Mr Pat Conaghan MP	Overall project
State Government	• The Hon Leslie Williams MP • DPIE-Crown Lands • NSW Environment, Energy and Science • NSW Department of Primary Industries Fisheries • TfNSW Maritime Operations	Overall project
Local Government	• Port Macquarie Hastings Council • Birpai Local Aboriginal Land Council	Overall project, Scope of work/ Concept design, Construction Impacts
Emergency services	• Police, • Fire and Rescue, • MAC • Ambulance • Marine Rescue	Scope of work/ Concept design Construction Impacts
Local residents	• 17,000 letterboxes in Port Macquarie locality as identified by Australia Post	Scope of work/ Concept design Construction Impacts
Local business	• NRMA Port Macquarie Holiday Park • Breakwall HQ Café • Little Shack • PM Chamber of Commerce • Commercial fishers • Commercial divers • Hotel and accommodation businesses in close proximity to the project. • CBD businesses in close proximity to the project.	Scope of work/ Concept design Construction Impacts
Local community groups	• Port Macquarie Board Riders Association • Boating Industry Association; • Boat Owners Association • Australian Sailing • Event managers • Port Macquarie Park Run • Iron Man Australia • Port Macquarie Surf Life Saving Club	Scope of work/ Concept design Construction Impacts
Wider community	• Tourist and visitor community	Scope of work/ Concept design Construction Impacts

Following the community “have your say” a more detailed consultation summary will be compiled as part of the submissions report and published. Below is a high level summary of consultation that has been completed to date on the project and upcoming planned.

Activity to date	Date
Initial announcement of the project by local members ***https://www.lesliewilliams.com.au/port-macquarie-breakwall-to-be-upgraded***	November 2020
Meetings with MidCoast Council	September 2021 – ongoing
Establish and regularly update project website	September 2021 – ongoing
Establish and monitor project specific information line	September 2021 – ongoing
Early investigation work Media Release	September 2021
Community Update of project overviewed – Delivered to 2700 Port Macquarie CBD area and available online. ***https://roads-waterways.transport.nsw.gov.au/documents/maritime/projects/port-macquarie-breakwall-upgrade/port-macquarie-breakwall-upgrade-community-update-2021-10.pdf***	October 2021
Key Stakeholder meetings	October 2021 – ongoing
Upcoming Activities in line with project milestones (also refer to figure 5.1)	
Community Update "have your say" concept design and REF display	June 2022
Advertise and conduct 2 x Community Information sessions	June 2022
Publish Community consultation submission report	TBA
Community Update on outcome of consultation "have your say" process.	TBA
Community update prior to start of construction	TBA
Notifications during construction to inform the community of any local changes or impacts	TBA

2.4.6 Transport and Infrastructure SEPP consultation

The Transport and Infrastructure SEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. This is detailed below:

Is consultation with Council required under clauses 13-15 of the infrastructure SEPP?		
Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	☐ Yes	☑ No
Are the works likely to generate traffic to an extent that will strain the capacity of the existing road system in a local government area? It is likely that minor traffic impacts would be experienced during transportation of the rock from the primary stockpile site to the proposed project footprint. The duration of any traffic impacts would be dispersed	☑ Yes	☐ No

Is consultation with Council required under clauses 13-15 of the infrastructure SEPP?		
as the rock would be delivered on an 'as needs basis' and there would be many days when there would be few or no truck movements to or from site. Consultation with Port Macquarie-Hastings has been conducted and nor concerns relating to traffic impacts have been raised in this respect. Prior to commencement of works, consultation would be undertaken with Council to ensure that no events are being held which would be affected by the increased heavy vehicle traffic.		
Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system?	☐ Yes	☑ No
Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water?	☐ Yes	☑ No
Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow? The works will temporarily impact a local recreation area. This will disrupt pedestrian and vehicular flow over the duration of the proposed works. Consultation with Port-Macquarie Hastings Council has been carried out in preparing the REF. Consideration of the comments received from Council are detailed in Section 2.4.2.	☑ Yes	☐ No
Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	☐ Yes	☑ No
Is there a local heritage item (that is not also a state heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential? The breakwall is a locally listed archaeological item. The archaeological assessment at Appendix E assesses the impacts of the proposal as minor, subject to the implementation of a suite of safeguards.	☐ Yes	☑ No
Does the proposal include a car park intended for the use by commuters using regular bus services?	☐ Yes	☑ No
Does the project propose a bus depot?	☐ Yes	☑ No
Does the project propose a permanent road maintenance depot or associated infrastructure, such as garages, sheds, tool houses, storage yards, training facilities and workers amenities?	☐ Yes	☑ No

Is consultation with Council required under clauses 13-15 of the infrastructure SEPP?		
Is the proposal within the coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land? See interactive map here: *https://www.planning.nsw.gov.au/policy-and-legislation/coastal-management*. Note the coastal vulnerability area has not yet been mapped.	☐ Yes	☑ No/NA
Are the works located on flood liable land? If so, will the works change flooding patterns to more than a minor extent? Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled *Floodplain Development Manual: the management of flood liable* land published by the New South Wales Government. The works are located on flood liable land mapped by Council, however the breakwall is existing and the proposal is unlikely to alter flooding patterns.	☐ Yes	☑ No
Is consultation with a public authority (other than Council) required under clause 15 and 16 of the Infrastructure SEPP?		
Are the works located on flood liable land? (to any extent) If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance. As above.	☐ Yes	☑ No/NA
Are the works adjacent to a national park, nature reserve or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	☐ Yes	☑ No
Are the works on land in Zone C1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	☐ Yes	☑ No
Are the works adjacent to an aquatic reserve or a marine park declared under the *Marine Estate Management Act 2014*?	☐ Yes	☑ No
Is the proposal in the foreshore area as defined by the *Sydney Harbour Foreshore Authority Act 1998* (now known as the *Place Management NSW Act 1998*)?	☐ Yes	☑ No
Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	☐ Yes	☑ No
Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on	☐ Yes	☑ No

Is consultation with Council required under clauses 13-15 of the infrastructure SEPP?		
the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)		
Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in clause 5.15 of Lockhardt LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	☐ Yes	☑ No
Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	☐ Yes	☑ No

2.4.7 Other agency and community consultation

Agency consultation

The following outlines formal consultation that has been undertaken with various government agencies including:

- NSW Crown Lands
- Department of Primary Industries (DPI Fisheries)
- Department of Planning Industry and Environment (Biodiversity Conservation Division and Heritage Division)
- NTS Corp (Native Title Search)
- Transport for NSW (Maritime Safety)
- Port Macquarie-Hasting Council

Issues that have been raised as a result of consultation with these agencies and stakeholders are outlined in the table below.

Agency	Issues raised	Response/where addressed in REF
NSW Crown Lands	Written response not received	Although a written response was not received from Crown Lands, a series of meetings was held to discuss Crown licensing issues.
Department of Primary Industries (DPI Fisheries)	Ensure any relevant permits under the *Fisheries Management Act 1994* are obtained.	All required permits under the *Fisheries Management Act 1994* as detailed in Section 2.3.2 would be obtained prior to the start of work to upgrade the southern breakwall. Relevant permits have been ascertained through review of *the Fisheries Management Act 1994* and preparation of an Aquatic Ecology Assessment.
	Minimise the extent of additional footprint within key fish habitat (except where an additional footprint is required to facilitate upgrades to an existing or installation of a new multi-use or eco-feature)	The proposal footprint would be only to the extent necessary to effectively achieve the upgrade to the southern breakwall and provide for new multi-use or eco-features.
	Utilise construction methodology that is consistent with best management	As detailed in Section 3, construction methodology associated with the upgrade of the

Agency	Issues raised	Response/where addressed in REF
	practice and minimises impacts of construction works on key fish habitat	southern breakwall would involve best management practice.
	Incorporate best practice environmental impact mitigation measures such as the implementation of erosion and sediment control measures in accordance with the 'Blue Book'.	As detailed in Section 3, the proposal would involve best practice environmental impact mitigation measures such as the implementation of erosion and sediment control measures in accordance with the 'Blue Book'. This would include installation of sediment control measures during the footpath upgrade works.
	Additional multi-use and eco-features that may be incorporated into the upgrade works to maximise value and to mitigate unwanted impacts	Multi-use features such as stairs, seating, fishing platforms and a viewing platform along the southern breakwall may be constructed in the future only subject to funding availability and consultation with Council and the community.
Department of Planning Industry and Environment Biodiversity Conservation Division and Heritage Division	Impacts on koalas	Assessment of the proposal against the relevant SEPP is provided in Section 2.3.2. This assessment concludes that the proposal is likely to have low or no impact on koalas or koala habitat.
	Impacts on coastal processes	The design of the breakwall upgrade works have been informed by coastal process studies which includes analysis of hydraulic loading, wave climate and setup, tidal currents. No adverse impacts on coastal processes would be likely.
	The REF should fully and clearly describe the proposed activity, including any environmental impacts mitigation measures, and identify all the processed and activities intended for the site during the life of the proposed activity.	The REF satisfies this requirement.
	The REF must assess the impacts of the proposed activity on biodiversity values to determine if the proposed activity is likely to affect threatened species, for the purposes of Section 7.8 of the *Biodiversity conservation Act 2016*.	The Aquatic Ecology Assessment provided at Appendix C concludes that the proposal is considered unlikely to have a significant impact on State and/or Commonwealth listed threatened biodiversity. The preparation of a Species Impact Statement (SIS) based on the provisions of the *Biodiversity Conservation Act 2016* is not required.
	The potential impacts of the proposal on Acid Sulfate Soils	Any acid sulfate soils below the mean high water mark disturbed during the upgrade of the southern breakwall would not be exposed to the elements and would not oxidise. The remainder of the proposed project footprint is located on land identified as containing potential Class 3 Acid Sulfate Soils. Excavations within this area would unlikely exceed one metre below natural ground surface

Agency	Issues raised	Response/where addressed in REF
		or lower the watertable more than one metre below the natural ground surface. A safeguard has been included to ensure that any excavations that would exceed one metre below natural ground surface or would lower the watertable more than one metre below the natural ground surface, would require an Acid Sulfate Management Plan to be prepared prior to the start of work. The Acid Sulfate Management Plan would be required to be implemented during the works.
	Cumulative impacts	The proposal is consistent with the strategic direction of both Crown Lands and Council. More specifically, the proposal would align with objectives both the *Hastings Regional Crown Reserve -Precinct A Plan of Management* and *Port Macquarie Foreshore Masterplan*. The construction timeframes would be co-ordinated with Port Macquarie Hastings Council to ensure there are no conflicts with other intended projects within the area and to minimise cumulative impacts on the environment and community.
NTS Corp	N/A – Response not received	N/A – Response not received. The works are not located within a registered Native Title claim area.
Transport for NSW (Maritime safety)	Existing aids to navigation will need to remain unobstructed and operational throughout the works stage of the project.	A safeguard has been included to ensure that existing aids to navigation will need to remain unobstructed and operational during works. If the proposal necessitated obstruction to the aids, then further consultation with Transport (Maritime Safety) would be required.
Port Macquarie-Hasting Council.	The material palette to be a continuation of Town Green developments (lighting, seating, concrete etc.).	The material palettes associated with the footpath upgrades would integrate with existing Town Green developments where possible (i.e. available funds and availability of materials).
	The use of shade structures as opposed to trees along the embankment - trees are unlikely to eventually provide significant shade over the pathway in this harsh coastal exposed site.	The proposal does not include construction of shade structures. The construction of shade structures may undermine the natural setting and views of the area. These may be considered further for future works, subject to funding, consultation with Council and the community.
	Additional trees along the inner bank to provide wind reduction and visual buffer from the Tourist Park.	The inner bank would be landscaped. This additional landscaping, coupled with the retention of existing trees, would provide wind reduction and visual buffers from the Tourist Park.
	Elements that cannot be afforded now, could be considered and designed in the overall plan to include and avoid components that	Provision for future elements that cannot be afforded now would be incorporated where

Agency	Issues raised	Response/where addressed in REF
	would negate future need for demolition works to construct these at a later stage.	possible subject to future funding and consultation with Council and the community.
	Include interest points - integrate art / collaborative local Aboriginal elements in pavement.	Provision for future elements that cannot be afforded now would be incorporated where possible subject to future funding and consultation with Council and the key stakeholders.
	Impacts on events	Consultation with Council would be conducted to ensure the proposal would minimise impacts on community events. Any impacts on community events would be temporary, being confined to the construction timeframe only. It is not intended to undertake construction while the Port Macquarie Iron Man event is on, or any other major local event that utilises the breakwall and footpath. Any impacts would be outweighed by the benefits provided by the proposal. For example, the upgrade would enhance the event attendee experience and accommodate more participants at any one time, allowing events to grow and provide a vantage point for spectators. Monthly progress meetings are being held between Transport and Council to ensure that disruption of local events is minimised.
	The shared pedestrian cycleway along the southern breakwall will require the correct signage and pavement markings for pedestrians and cyclists.	Signage and line-marking would be undertaken as part of the proposal.

3. Environmental assessment

This section provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposal, including both the works site at the breakwall and the stockpile site at John Fraser Place. All aspects of the environment potentially impacted by the proposed project are considered. This includes consideration of the factors specified in the guidelines *Is an EIS required?* (DUAP 1999) and *Roads and Related Facilities EIS Guideline* (DUAP, 1996). The factors specified in clause 171(2) of the *Environmental Planning and Assessment Regulation 2021* and the matters of national environmental significance under the Federal *Environment Protection and Biodiversity Conservation Act 1999* are also considered in section 5. Site-specific safeguards are provided to ameliorate the identified potential impacts.

3.1 Soils

Description of existing environmental and potential impacts		
Are there any known occurrences of salinity or acid sulfate soils in the area? The proposed project footprint below the mean high water mark is mapped as potentially containing Class 1 Acid Sulfate Soils. The remainder of the proposed project footprint is located on land identified as containing potential Class 3 Acid Sulfate Soils.	☑ Yes	☐ No
Does the proposal involve the disturbance of large areas (e.g. >2ha) for earthworks?	☐ Yes	☑ No
Does the site have constraints for erosion and sedimentation controls such as steep gradients or narrow corridors? Although the site is constrained by its location within a public recreation area, measures are able to be implemented in accordance with the appropriate guidelines and manuals.	☑ Yes	☐ No
Are there any sensitive receiving environments that are located in or nearby the likely proposed project footprint or that would likely receive stormwater discharge from the project? Sensitive receiving environments include (but are not limited to) wetlands, state forests, national parks, nature reserves, rainforests, drinking water catchments). The proposed project footprint is located within and adjacent to the Hastings River. Water quality controls would be implemented to ensure sensitive receiving environments are protected.	☑ Yes	☐ No
Is there any evidence within or nearby the likely proposed project footprint of potential contamination?	☐ Yes	☑ No
Is the likely proposed project footprint in or nearby highly sloping landform?	☐ Yes	☑ No

Description of existing environmental and potential impacts		
Is the proposed project likely to result in more than 2.5ha (area) of exposed soil?	☐ Yes	☑ No

Any acid sulfate soils below the mean high water mark disturbed during the proposed upgrade to the southern breakwall would not be exposed to the elements and would not oxidise. The remainder of the proposed project footprint is located on land identified as containing potential Class 3 Acid Sulfate Soils. Excavations within this area would unlikely exceed one metre below natural ground surface or lower the watertable more than one metre below the natural ground surface.

Although acid sulfate soils are unlikely to be exposed, safeguards have been included to ensure that any excavations that would exceed one metre below natural ground surface or would lower the watertable more than one metre below the natural ground surface, would require an Acid Sulfate Soils Management Plan to be prepared prior to commencement of that component of the works. The Acid Sulfate Soil Management Plan would be required to be implemented during the works.

The Hasting River would not be adversely impacted provided that safeguards are implemented, including but not limited to, the installation of erosion and sediment control measures.

In relation to the installation of erosion and sediment control measures, the proposed project footprint may be slightly constrained by the presence of the existing skate park and infrastructure and structures associated with the existing caravan park. However, this would not preclude the ability to install effective erosion and sediment control measures.

Safeguards

Safeguards to be implemented are:

1. Erosion and sediment control measures are to be implemented and maintained to:
    - Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets
    - Reduce water velocity and capture sediment on site
    - Minimise the amount of material transported from site to surrounding pavement surfaces
    - Divert clean water around the site.

2. Erosion and sediment controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and regular records kept and provided on request.

3. Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised.

4. Work areas are to be stabilised progressively during the works.

5. The maintenance of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10).

6. Any excavations that would exceed one metre below natural ground surface or would lower the watertable more than one metre below the natural ground surface requires the preparation of an Acid Sulfate Management Plan prior to the start of such works. The Acid Sulfate Soils Management Plan is required to be implemented during the works.

7. Potential or actual acid sulfate soils are to be managed in accordance with the *Roads and Maritime Services Guidelines for the Management of Acid Sulphate Materials 2005*.

8. If suspected contaminated areas are encountered during excavations on land, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with Transport and the NSW EPA.

9. A progressive erosion and sediment control plan is to be prepared for all relevant components of the works. All safeguards related to erosion and sediment control would be undertaken in accordance with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book).

3.2 Waterways and water quality

Description of existing environment and potential impacts		
Is the proposal located within, adjacent to or near a waterway? The proposed project footprint is located within and adjacent part of the Hastings River. This waterbody would not be adversely impacted given the implementation of safeguards, including but not limited to, the installation of erosion and sediment control measures and management of spills from plant and machinery.	☑ Yes	☐ No
Is the location known to flood or be prone to water logging? The site is mapped as flood prone (NSW Government ePlanning Spatial Viewer March 2022). The proposed upgrade to the southern breakwall has been designed to withstand coastal processes and flood velocities.	☑ Yes	☐ No
Is the proposal located within or immediately adjacent to the area managed by Sydney Catchment Authority covered by State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011?	☐ Yes	☑ No
Would the proposal be undertaken on a bridge or ferry?	☐ Yes	☑ No
Is the proposal likely to require the extraction of water from a local water course (not mains)?	☐ Yes	☑ No

Description of existing environment and potential impacts
Potential impacts during construction may include turbidity at the southern breakwall site through the placement of rock and fuel and oil spills during works. The potential water quality impacts associated with the proposed upgrade to the southern breakwall are likely to be minor as the coarse nature of the clean marine sands will likely facilitate their settlement out of the water column quickly in comparison to finer sediments. Safeguards including the use of a turbidity barrier, and the use of clean rock, will mitigate any water quality impacts associated with the works. Other impacts on water quality can occur as the result of unplanned discharge and accidental spills on construction sites, such as hydrocarbon-based products accidentally entering the marine environment. Safeguards including preventative checks and adherence to controls during construction works will be undertaken to minimise the potential for unplanned discharge and accidental spills that could affect water quality. The site is subject to riverine flooding. Although the breakwall would be designed to withstand flood velocities, safeguards will be required to ensure that temporary construction works are not impacted by flooding.

Safeguards

Safeguards to be implemented are:

1. There is to be no release of dirty water into drainage lines and/or waterways.

2. Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls. During the upgrade to the southern breakwall water turbidity or suspended solids should be regularly monitored at the source, as well as100 metres and 500 metres from the source. Visual monitoring of any pluming should also be routinely monitored. When allocated thresholds are reached, works will cease until plumes have cleared.

3. Water quality control measures are to be used to prevent any materials (e.g. concrete, grout, sediment etc) entering drain inlets or waterways.

4. Measures to control pollutants from stormwater and spills would be investigated and incorporated in the pavement drainage system at locations where it discharges to the receiving drainage lines. Measures aimed at reducing flow rates during rain events and potential scour would also be incorporated into the design of the pavement drainage system.

5. Excess debris from cleaning and washing is to be removed immediately.

6. Vessels (including barges) are only to be used at suitable tides when no less than 600mm clearance is available between the underside of the vessel and the bed of the waterway.

7. A Soil and Water Management Plan (SWMP) would be prepared and implemented as part of the Construction Environmental Management Plan (CEMP). The SWMP will identify all reasonably foreseeable risks relating to soil and water pollution and describe how these risks would be addressed during construction. This would include, but not be limited to, measures relating to the following activities to minimise the risk of pollution:

    - Training of personnel to identify ASS and contaminated sediment

- Spills from concrete pouring
- Oil/fuel/chemical storage and spill management
- Machinery and engine maintenance schedule to reduce oil/fuel leakage.

8. All rock brought to site is to be clean and free of fines and sediments prior to being placed in the water or on the banks. Any washing of rock on site prior to placement is to be undertaken in a bunded area, with sediment regularly collected and removed from site.

9. All fuels, chemicals and liquids are to be stored in an impervious bunded area a minimum of 50 metres away from any water.

10. Refuelling of plant and equipment and storage of hazardous materials is to occur within a double-bunded area.

11. Land and marine spill response kits, including hydrocarbons booms, must be readily available at the work site.

3.3 Noise and vibration

Description of existing environmental and potential impacts		
Are there any residential properties or other noise sensitive areas near the location of the proposed project that may be affected by the work (i.e. church, school, hospital): A residential property is located approximately 60 metres from the proposed project footprint. This separation distance is confined to the westernmost point of the proposed project footprint, with this separation distance significantly increasing along the eastern section of the southern breakwall. A tourist development exists immediately adjacent to the proposed project footprint. Residential noise receivers also exist to the north and east of the nominated stockpile site at John Fraser Place at a distance of greater than 100 metres.	☑ Yes	☐ No
Is the proposal going to be undertaken only during standard working hours? Standard working hours are: Monday-Friday: 7:00am to 6.00pm Saturday: 8.00am to 1.00pm Sunday and Public Holidays: no work	☑ Yes	☐ No
Is any explosive blasting required for the proposal?	☐ Yes	☑ No

Description of existing environmental and potential impacts		
Would construction noise or vibration from the proposal affect sensitive receivers? It is likely that there would be some minor noise impacts during construction works. Noise impacts would be confined to standard construction activities and operation of heavy machinery during standard working hours. Noise impacts may also be experienced during the loading and unloading of rock at the nominated stockpile sites and placement of the rock onto the breakwall.	☑ Yes	☐ No
Would operation of the proposal alter the noise environment for sensitive receivers? This might include, but not be limited to, altering the line or level of an existing carriageway, changing traffic flow, adding extra lanes, increasing traffic volume, increasing the number of heavy vehicles, removing obstacles that provide shielding including changing the angle of view of the traffic, changing the type of pavement, increasing traffic speeds by more than 10km/hr or installing audio-tactile line markings.	☐ Yes	☑ No
Would the proposal result in vibration being experienced by any surrounding properties or infrastructure during operation?	☐ Yes	☑ No

It is likely that there would be some noise impacts during construction works, however these impacts are likely to be minor, short term and intermittent. Noise impacts would be restricted to standard construction activities and operation of heavy machinery during standard construction hours.

Any noise impacts would be transient in nature, being confined to the total duration of works which would be approximately 5 months. Delivery of rock would be intermittent as breakwall rock placement is a lengthy process.

Works would likely be conducted during standard working hours. If out of hours works are required for safety and efficiency reasons, these would be subject to approval, notification to the community and a management plan.

Noise impacts would likely be experienced by residential development to the north and east of the nominated stockpile site at John Fraser Place, though impacts associated with operations at the nominated stockpile site will be mitigated by generous separation distances. Existing landscape screening and fencing would afford an element of noise attenuation to nearby noise receivers. Additionally, noise generating activities currently conducted next to the nominated stockpile site include a landscape yard and a gas supplies business. Any noise impacts on the surrounding environment generated by stockpiling would be diluted by existing background noise currently emitted from the site.

Noise impacts would be mitigated where possible through implementation to safeguards outlined below.

Any temporary noise impacts would be outweighed by the long-term public benefit provided by the proposal.

Figure 10: Proximity to sensitive noise receivers at the breakwall

Safeguards

Safeguards to be implemented are:

1. Works, including the loading and unloading of rock from the nominated stockpile sites, is to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays).

   Any work that is performed outside normal work hours or on Sundays or public holidays must have measures in place to minimise noise impacts. Any works proposed outside of standard working hours for safety and efficiency reasons, would be subject to approval, notification and preparation of a management plan.

2. Noise impacts are to be minimised in accordance with Transport's construction noise estimator and include:
   - Notification is required for residents within 110 metres not less than 14 days prior to the commencement of works.
   - Notification is required for businesses within 40 metres not less than 14 days prior to the commencement of works.
   - Notification is required for passive recreation area within 70 metres.
   - Notification is required for residents within 80m of the John Fraser off-site stockpiling area.

3. Vibratory rollers and other vibration producing equipment will not be used within 50 metres of adjacent buildings to minimise or prevent vibration impacts. If this distance cannot be achieved, dilapidation surveys are to be conducted of buildings within 50 metres.

4. A management procedure will be in place for noise and vibration complaints that may arise from the construction work. Each complaint must be investigated and appropriate noise and/or vibration amelioration measures be put in place to mitigate future exceedances. This may include noise level monitoring if required.

3.4 Air quality

Description of existing environmental and potential impacts		
Is the proposal likely to result in large areas (>2ha) of exposed soils?	☐ Yes	☑ No
Are there any dust sensitive receivers located within the vicinity of the proposal during the construction period? Dust sensitive receivers include the existing caravan park, playground and cafes located adjacent the proposed project footprint, nearby commercial premises and residential development to the south of the site. Dust sensitive receivers also include residential development located to the north and east of the nominated stockpile site.	☑ Yes	☐ No
Is there likely to be an emission to air during construction? Air quality impacts include emissions of CO, NO2 and SO2 associated with combustion of diesel fuel and petrol from construction vehicles, vessels, plant and equipment and dust emissions associated with preparation and operations of the nominated stockpile sites.	, a ☑ Yes	☐ No
Air quality impacts during construction of the proposal would include temporary impacts associated with dust particles and combustion sources. Anticipated sources of dust and dust-generating activities include dust from the loading and transfer of material from trucks and removal and placement of rock associated with the upgrade to the southern breakwall and dust emissions associated with preparation and operations of the nominated stockpile sites. Minimal and very localised excavation and soil stockpiling is expected as a result of the proposal. As such the dust load generated over a typical construction day is likely to be minor and is not expected to result in reduced local air quality. The southern breakwall site is subject to prevailing north-easterly winds and dust generation would likely be blown away from sensitive dust receivers to the south. Dust emissions associated with the preparation and operations of stockpile sites would be minimised through implementation of *Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10)*. Dust emissions associated with transportation and placement of rock would be minimised by the rock being cleaned free of fines and sediments. Other potential air quality impacts include emissions of CO, NO_2 and SO_2 associated with combustion of fuel from construction vehicles, plant and equipment. Based on the duration of works, the number of emission sources and the scheduling of machinery (i.e., not all machinery would be operating simultaneously), potential emissions affecting air quality are expected to be minimal and would not affect the long-term air quality in the vicinity of the proposal. Potential construction air quality and odour impacts can be adequately managed.		

Safeguards

Safeguards to be implemented are:

1. Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust at both the breakwall site and John Fraser Place.

2. Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely.

3. All rock brought to the stockpile site at the breakwall is to be clean and free of fines and sediments.

4. Vegetation or other materials are not to be burnt on site.

5. Vehicles and vessels transporting waste or other materials that may produce odours or dust are to be covered during transportation.

6. Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the *Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10*).

7. Construction vehicles, vessels, plant and equipment should be maintained in good working order and switched off when not in use. No idling of construction vehicles or vessels is to be permitted.

8. Where removed rock has marine or algae growth it would be replaced back into the wall or removed from site within one week of being removed.

3.5 Non-Aboriginal heritage

Description of existing environmental and potential impacts		
Have online heritage database searches been completed? • Transport for NSW section 170 register • NSW Heritage database • Commonwealth EPBC heritage list • Australian Heritage Places Inventory • Local Environmental Plan(s) heritage items The Heritage Impact Assessment was prepared using various sources including online archives, the State Library of NSW and the National Library. Included are the Historic Lands Records Viewer, Port Macquarie Historical Society/Museum archive, Port Macquarie-Hastings Council, and the Heritage NSW website.	☑ Yes	☐ No
Are there any items of non-Aboriginal heritage or heritage conservation areas listed on relevant heritage databases/registers that are located within the vicinity of the proposal? A list of all items within or close to the proposed project footprint is provided in the Heritage Impact Assessment at Appendix E.	☑ Yes	☐ No

Description of existing environmental and potential impacts		
Are there any items of potential non-Aboriginal heritage significance which are not listed on relevant heritage databases/registers that are in the vicinity of the proposal?	☐ Yes	☑ No
Is the proposal likely to occur in or near features that indicate potential archaeological remains? The archaeological assessment at Appendix E details that archaeological remains are likely to be located in the proposed works area, but that impacts are likely to be minor.	☑ Yes	☐ No

Safeguards

Safeguards to be implemented are:

1. Boulders and materials used in the remediation should be in keeping with the original materials used in the construction of the breakwall, i.e. local bluestone and concrete. If not possible the introduced material should complement the size, shape and colour of the original materials.

2. Original breakwall materials should be kept and reused during the reconstruction process. If the full reconstruction of the breakwall involves dismantling sections of the outer revetment the original breakwall stone should be used in the reconstruction. To minimise visual impacts, it is suggested the original stones be located in the upper, visible sections of the breakwall. If original breakwall stones area not suitable to be replaced than they should remain within the project area, i.e. used for landscaping. If possible original construction techniques should be used in the reconstruction.

3. Memorial plaques will be removed and stored for a nominated period of time and can be collected by the community where prior arrangements are made with Transport and it's principal contractor.

4. A photographic record of the painted rocks will be made prior to works commencing. The photos will be made available for viewing by the public.

5. A Section 140 Excavation permit would be required if significant and intact relics with research potential are uncovered during works. There is potential for evidence of the breakwall tramline to be uncovered during the proposed remediation and upgrade work. If found to be an in situ feature, the tramline should be archivally recorded and incorporated into the breakwall design. The tramline is a work and a Section 140 will not be needed if exposed.
6. If unexpected finds of historical nature are discovered during any work, work within 5m of the find must cease and the following steps taken:

    • stop work immediately;

    • secure the area so as to avoid further harm to the relic; and

    • contact an archaeologist for further information.

7. In the event that known or suspected human remains (generally in skeletal form) are encountered during the activity, the following procedure will be followed immediately upon discovery:

    • all work in the immediate vicinity will cease and the find will be immediately reported to the works supervisor who will advise the Environment Manager or other nominated senior staff member;

- the Environment Manager or other nominated senior staff member will promptly notify the police (as required for all human remains discoveries);
- the Environment Manager or other nominated senior staff member will contact OEH for advice;
- if it is determined that the human remains are Aboriginal ancestral remains, the Local Aboriginal Land Council will be contacted, and consultative arrangements will be made to discuss ongoing care of the remains; and
- if it is determined that the human remains are not Aboriginal ancestral remains, further investigation will be conducted to determine if the remains represent a historical grave or if police involvement is required.

8. A digital archival photographic record would be prepared prior to any changes to the landscape and heritage items in the project area. Photographic archival recording is important in recording change, for posterity and future research, and in keeping a record of the place's state before that change. A record of the works, and at completion will also be undertaken to complete the record.

   The digital photographic record will be prepared in accordance with the *Heritage Manual guidelines, Photographic Recording Of Heritage Items Using Film or Digital Capture* (Heritage Office 2006) and *How to prepare archival records of heritage items* (NSW Heritage Office 1998).

   Photographic archival recording will be undertaken by an archaeologist and will include the entirety of the southern breakwall and surrounding landscape. This will include photographs from both the land and water, and will capture the public graffiti, east and west termination and contextual photographs to and from the holiday park.

   Photographs will be taken from ground level and, if necessary, will also incorporate drone photography to capture discrete sites with more detail than current ground photography allows.

9. Should excavation become necessary an archaeological research design (ARD) will be prepared. ARD is a theoretical framework to support archaeological field investigations with the aim of extracting information that is relevant to the development and function of the site. It will also form the most appropriate excavation methods to be used within the site.

   The research design is to be based on the outcomes of the archival and documentary research and the existing environment and seeks to develop questions that will contribute to current knowledge about a place, a theme or perhaps individuals that documentary sources cannot contribute to. These questions should be compatible with the nature of the predicted archaeological resource and realistic in terms of the sites ability to produce answers.

10. Archaeological monitoring of the south-west termination of the southern breakwall should be undertaken to ensure inadvertent impacts are avoided in the event that cultural material is identified. In the event that cultural material is observed through these works, the development would be required to cease – or be redesigned – until the resource's significance is determined.

11. Should relics be identified during excavation, heritage interpretation may become necessary as per the Burra Charter (ICOMOS (Australia), 2013b). The aims of the Interpretation Strategy would be to:

    • interpret the heritage significance of the uncovered relics;

    • enhance the understanding of the relics through publicly available interpretation;

    • identify opportunities to increase collaboration and engagement with key community members and stakeholders; and

    • enact best practice interpretation, consistent with State, National and internationals standards and guidelines.

3.6 Aboriginal heritage

Description of existing environmental and potential impacts		
Would the proposal involve disturbance in any area that has not been subject to previous ground disturbances?	☐ Yes	☑ No
Have online AHIMS search been completed? An AHIMS search (ID# 624538) has been conducted. The AHIMS search did indicate known Aboriginal objects or places in the immediate project areas.	☑ Yes	☐ No
Is there potential for the proposal to impact on any items of Aboriginal heritage?	☐ Yes	☑ No
Would the proposal involve the removal of mature native trees? No evidence of scarring has been identified.	☑ Yes	☐ No
Would the proposal impact on any features that may indicate any potential archaeological remains?	☐ Yes	☑ No
Is the proposal consistent with the requirements of Transport's procedure for Aboriginal cultural heritage consultation and investigation (PACHCI)? A Stage 1 procedure for Aboriginal cultural heritage consultation and investigation (PACHCI) has been conducted and is provided as Appendix D. The PACHI reveals that the proposal is unlikely to have an impact on Aboriginal cultural heritage.	☑ Yes	☐ No

A Stage 1 procedure for Aboriginal cultural heritage consultation and investigation (PACHCI) has been conducted and is provided as Appendix D.

The PACHI provides the following:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did indicate known Aboriginal objects or places in the immediate proposed project footprint however, there will be no direct impacts of the identified Aboriginal sites that have been highlighted in the area.
- The proposed project footprint does contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's *Due diligence Code of Practice for the Protection of Aboriginal objects in NSW* and Transport's procedure.
- The cultural heritage potential of the proposed project footprint appears to be reduced due to past disturbance.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

The work was assessed as being unlikely to have an impact on Aboriginal cultural heritage.

The safeguards provided below would further minimise potential impacts on Aboriginal cultural heritage.

Safeguards

Safeguards to be implemented are:

1. If Aboriginal heritage items are uncovered during the upgrade, all works in the vicinity of the find must cease and Transport's Aboriginal cultural heritage officer and regional environment manager contacted immediately. Steps in *Transport's procedure: Unexpected Heritage items* must be followed.

3.7 Biodiversity

Description of existing environmental and potential impacts		
Have relevant database searches been carried out? Relevant databases were searched in August 2021, applying a five kilometre radius around the proposed project area and John Fraser Place stockpile site to identify threatened biodiversity and migratory species that may potentially occur within the locality. The following databases and information sources were searched: • Bionet, Atlas of NSW Wildlife. • EPBC Act Protected Matters Report tool. • NSW DPI Fisheries Threatened species lists. • Sightings data for various species from the Atlas of Living Australia. • NSW WeedWise	☑ Yes	☐ No
Did the database searches identify any endangered ecological communities, threatened flora and/or threatened or protected fauna, or migratory species in or within the vicinity of the proposed works? Both Federal and State listed matters must be considered. Searches of the NSW Bionet database identified sightings database for 40 species within five kilometres of the proposed project footprint. These included sightings for: • 34 marine birds and shorebirds listed as threatened or migratory under the BC Act and/or EPBC Acts • Two marine mammals listed as threatened under the BC and/or EPBC Acts • One threatened insect under the BC Act and/or EPBC Acts • Three marine turtles listed as threatened under the BC Act and/or EPBC Acts. • The koala, green and golden bell frog and natïve guava at John Fraser Place. In addition, review of threatened items listed under the FM Act identified the following requiring further consideration: • Seven fish, sharks and rays • One alga • One soft coral.	☑ Yes	☐ No

Description of existing environmental and potential impacts		
The EPBC Protected Matters Report search identified the following MNES within five kilometres of the proposed project footprint: • 78 listed threatened species • 68 listed migratory species • Four threatened ecological communities (TECs). Threatened species and communities listed under the EPBC act relevant to this study included: • 32 birds (marine and shorebirds) • Two fish (marine species only) • Three marine mammals • Five marine turtles • Three sharks • One TEC. Migratory species listed under the EPBC act included: • 22 migratory birds (marine birds and shorebirds) • 18 migratory marine species. Other matters protected under the EPBC Act identified in the search included: • 89 listed marine species • 12 cetaceans (whales, dolphins and porpoises). Although three threatened species have been recorded in close proximity to the John Fraser Place stockpile site, stockpiling operations would be limited to a previously disturbed area.		
Is the proposal likely to impact nationally listed threatened species, ecological communities or migratory species? The upgrade to the southern breakwall would involve disturbances to existing artificial habitat provided by the rock armouring. Habitat associated with rock armouring is used by some marine birds and fish, and at times this may include some migratory and/or threatened species.	☑ Yes	☐ No
Would the proposal require the removal of any other vegetation? A small number of trees would be removed from beside the existing footpath as detailed elsewhere in this report. These were planted for landscaping purposes and would be replaced with suitable species. Some weeds and shrub regrowth will be removed from the John Fraser Place stockpile site.	☑ Yes	☐ No
Would the proposal affect any tree hollows or hollow logs?	☐ Yes	☑ No
Are there any known areas of outstanding biodiversity value or areas mapped as 'littoral rainforest' or 'coastal wetland' in the Coastal Management SEPP in or within the vicinity of the proposed work?	☐ Yes	☑ No
Would the proposal provide any additional barriers to the movement of wildlife?	☐ Yes	☑ No

Description of existing environmental and potential impacts		
Would the proposal disturb any natural waterways or aquatic habitat? The upgrade to the southern breakwall would have minor impacts on the water quality of the Hastings River as detailed elsewhere in this report. The southern breakwall upgrade would also disturb rock armouring which provides aquatic habitat.	☑ Yes	☐ No
Would the proposal disturb any crevices or other locations (such as on bridges and culverts) for potential bat habitat?	☐ Yes	☑ No

Direct impacts within the proposed project footprint would be restricted to disturbances to existing artificial habitat provided by the rock armouring of the breakwall. Habitat associated with rock armouring is used by some marine birds and fish, and at times this may include some migratory and/or threatened species. Therefore, there remains some potential for some minor disturbances to habitat used by these species. However, the placement of additional rock associated with the work would provide for additional habitat in the long-term.

The removal and replacement of rocks would also have a direct impact on marine growth present in the proposed project footprint, including sessile invertebrates and macroalgae. These assemblages would, however, likely recover within 12-24 months following construction works.

Sensitive habitats adjacent to the proposed project footprint include seagrass beds that occur in close proximity to the western end of the southern breakwall. Care would need to be taken during construction to ensure that these seagrass beds are not directly impacted as part of the proposal.

Existing trees within the proposed project footprint would be retained where possible. The ecological significance of those trees that would be removed as part of this proposal is minor. These trees are not considered to provide an effective wildlife corridor and provide limited habitat value; rather they provide landscape and amenity value. Any ecological significance or habitat value provided by those trees proposed to be removed are well represented by existing vegetation within the vicinity of the site which would not be impacted by the proposal.

Figure 11: NSW Bionet Database identified sightings of marine fauna (Source: H20 Consulting Group)

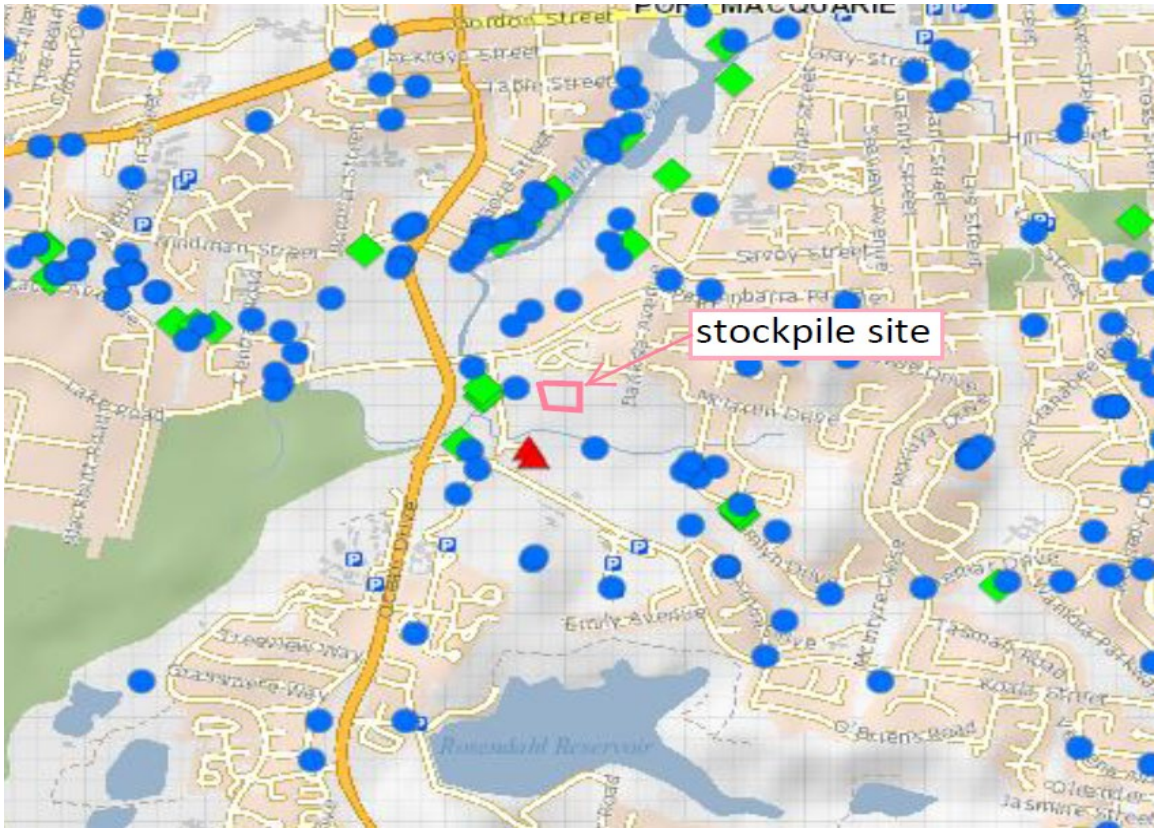


Figure 11a: NSW Bionet Database identified sightings of koala (blue dot), green and golden bell frog (red triangle) and native guava (green diamond) close to the proposed off-site stockpile site

Common Name	Scientific Name	NSW Status	Comm. Status	Likelihood of Occurrence
Marine and shore birds				
Common Sandpiper	*Actitis hypoleucos*	P	C,J,K,B	Low – Occasional records in the locality. Typically a wetland species with occurrences most likely well inside the estuary.
Fork-tailed Swift	*Apus pacificus*	P	C,J,K	**Moderate** – Sightings recorded within the locality. May forage across the proposed project footprint at times.
Flesh-footed Shearwater	*Ardenna carneipes*	V, P	J,K	Low – Occasional records in the locality. Likely only to be a transient visitor within the Study Area
Sooty Shearwater	*Ardenna grisea*	P	J	**High** – Sightings recorded within the locality and around the estuary entrance.
Wedge-tailed Shearwater	*Ardenna pacifica*	P	J	**High** – Sightings recorded within the locality and around the estuary entrance
Short-tailed Shearwater	*Ardenna tenuirostris*	P	C,J,K	Low – Occasional records in the locality. Likely only to be a transient visitor within the Study Area.
Australasian Bittern	*Botaurus poiciloptilus*	E, P	E	Low – Occasional records in the locality. Typically a wetland species occurring well inside the estuary.
Bush Stone-curlew	*Burhinus grallarius*	E, P		Low – Occasional records in the locality. Habitat within the Study Area is only very marginal for this species.

Common Name	Scientific Name	NSW Status	Comm. Status	Likelihood of Occurrence
Sharp-tailed Sandpiper	*Calidris acuminata*		C,J,K,B	Low – No sightings recorded in the locality. Habitat within the Study Area is only very marginal for this species.
Red Knot	*Calidris canutus*	P	E,C,J,K	Low – Occasional sightings recorded in the locality. Typically a wading species, with only very marginal habitat in the Study Area.
Red-necked Stint	*Calidris ruficollis*	P	C,J,K	Low – Sightings recorded in the locality, however habitat within the Study Area is only very marginal for this species.
Lesser Sand-plover	*Charadrius mongolus*	V, P	E,C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Antipoden Albatross	*Diomedea antipodensis*	V	V, B	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Wandering Albatross	*Diomedea exulans*	E,P	V, B	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Northern Royal Albatross	*Diomedea sanfordi*	E	E, B	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Black-necked Stork	*Ephippiorhynchus asiaticus*	E, P		Low – Sightings recorded in the locality, however typically a wading species, with only very marginal habitat in the Study Area.
White-bellied Storm-Petrel	*Fregetta grallaria grallaria*	V	V	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Latham's Snipe	*Gallinago hardwickii*	P	J,K	Low – Occasional records in the locality. Typically a wetland species with occurrences most likely well inside the estuary.
Gull-billed Tern	*Gelochelidon nilotica*	P	C	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Sooty Oystercatcher	*Haematopus fuliginosus*	V, P		**Known** – Observed foraging on the breakwall in the Study Area during site investigations.
Pied Oystercatcher	*Haematopus longirostris*	E, P		Low – Sightings recorded within the locality. Habitat within the Study Area is only marginal for this species.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V, P		Low – Regular sightings in the locality but any use of the Study Area is likely to be entirely aerial.
White-throated Needletail	*Hirundapus caudacutus*	P	V,C,J,K	Low –Sightings in the locality but any use of the Study Area is likely to be entirely aerial.
Caspian Tern	*Hydroprogne caspia*	P	J	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.

Common Name	Scientific Name	NSW Status	Comm. Status	Likelihood of Occurrence
Bar-tailed Godwit	*Limosa lapponica*	P	C,J,K	Low – Sightings recorded in the locality. Habitat within the Study Area is only marginal for this species.
Square-tailed Kite	*Lophoictinia isura*	V, P		Low – Regular sightings in the locality but any use of the study area is likely to be entirely aerial.
Southern Giant Petrel	*Macronectes giganteus*	P	E	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Eastern Curlew	*Numenius madagascariensis*	P	CE,C,J,K	Low – Regular sightings in the locality but typically a wetland species with occurrences most likely well inside the estuary.
Whimbrel	*Numenius phaeopus*	P	C,J,K	Low – Regular sightings in the locality but habitat within the Study Area is only marginal for this species.
Sooty Tern	*Onychoprion fuscata*	V,P		Low – Occasional sightings recorded in the locality. Typically an oceanic species confined to offshore Islands and only seen on the coast during rare transient visits.
Eastern Osprey	*Pandion cristatus*	V,P		Low – Regular sightings in the locality but any use of the Study Area is likely to be entirely aerial
Pacific Golden Plover	*Pluvialis fulva*	P	C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Australian Painted Snipe	*Rostratula australis*	P,E	E	Low – No Sightings recorded in the locality. Typically a wetland species with occurrences most likely well inside the estuary.
Arctic Jaeger	*Stercorarius parasiticus*	P	C,J,K	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Common Tern	*Sterna hirundo*	P	C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species
Little Tern	*Sternula albifrons*	E,P	C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Buller's Albatross	*Thalassarche bulleri*	P	V,B	Low – No sightings recorded in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.
Shy Albatross	*Thalassarche cauta*	V,P	V,B	Low – Occasional records in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.
Chatham Albatross	*Thalassarche eremita*	P	E,B	Low – No sightings recorded in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.

Common Name	Scientific Name	NSW Status	Comm. Status	Likelihood of Occurrence
Campbell Albatross	*Thalassarche impavida*	P	V,B	Low – No sightings recorded in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.
Black-browed Albatross	*Thalassarche melanophris*	V,P	V,B	Low – No sightings recorded in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.
White-capped Albatross	*Thalassarche steadi*	P	V,B	Low – No sightings recorded in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.
Crested Tern	*Thalasseus bergii*	P	J	**Known** – Observed during the site survey. Some marginal foraging habitat occurring within the Study Area.
Hooded Plover	*Thinornis rubricollis rubricollis*	V		Low – No sightings recorded in the locality. Typically a wading species, with only very marginal habitat in the Study Area.
Grey-tailed Tattler	*Tringa brevipes*	P	C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Common Greenshank	*Tringa nebularia*	P	C,J,K, B	Low – Occasional records in the locality. Habitat within the Study Area is very marginal for this wading species.
Terek Sandpiper	*Xenus cinereus*	V,P	C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is very marginal for this wading species.
Marine mammals				
New Zealand Fur-seal	*Arctocephalus forsteri*	V,P	.	Low – No sightings recorded within the locality. Only marginal foraging and refuge habitat occurring within the Study Area
Australian Fur-seal	*Arctocephalus pusillus doriferus*	V,P		Low – No sightings recorded within the locality. Only marginal foraging and refuge habitat occurring within the Study Area.
Bryde's Whale	*Balaenoptera edeni*	P	B	Low – No sightings recorded in the locality. Typically remains offshore and very unlikely to enter the estuary.
Blue Whale	*Balaenoptera musculus*	E, P	B	Low – No sightings recorded in the locality. Typically remains offshore and very unlikely to enter the estuary.
Dugong	*Dugong dugon*	E,P	E	Low – No recent sightings recorded in the locality. Rarely seen in NSW waters. Only likely to be a transient visitor to the Study Area.
Southern Right Whale	*Eubalaena australis*	E,P	E	Low – No sightings recorded in the locality. Typically remains offshore and very unlikely to enter the estuary.
Humpback Whale	*Megaptera novaeangliae*	V,P	E	Low – Regularly seen in coastal waters during migration period. Unlikely to enter the bar and estuary.

Common Name	Scientific Name	NSW Status	Comm. Status	Likelihood of Occurrence
Killer Whale (Orca)	*Orcinus orca*	P	B	Low – No sightings recorded in the locality. Typically remains offshore and very unlikely to enter the estuary.
Indo-Pacific Humpback Dolphin	*Sousa chinensis*	P	B	Low – No recent sightings recorded in the locality. The lack of any seagrasses in the vicinity of the proposal means there is only very marginal habitat for this species and it is only likely to be a transient visitor to the Study Area.
Marine reptiles				
Green Turtle	*Chelonia mydas*	V, P	V	**Moderate** – Occasional sightings within the locality. The species may use habitat to forage or for refuge within the Study Area at times.
Loggerhead Turtle	*Caretta caretta*	E, P	E	**Moderate** – Occasional sightings within the locality. The species may use habitat to forage or for refuge within the Study Area at times.
Leatherback Turtle	*Dermochelys coriacea*	E, P	E,B	Low – No sightings recorded in the locality. Typically remains offshore and rarely enters estuaries.
Flatback Turtle	*Natator depressus*	P	V,B	Low – No sightings recorded in the locality. Typically confined to more tropical waters, only likely to be a transient visitor to the Study Area.
Hawksbill Turtle	*Eretmochelys imbricata*	P	V	**Moderate** – Occasional sightings within the locality. The species may use habitat to forage or for refuge within the Study Area at times.
Fish, sharks, and rays.				
Oceanic Whitetip Shark	*Carcharhinus longimanus*		CE,B	Low – Occasionally recorded in coastal areas, but rarely known to enter estuaries. Only likely to be a transient visitor in the Study Area.
Grey nurse Shark	*Carcharias taurus*	CE, P	CE	Low – Occasionally recorded in coastal areas, but rarely known to enter estuaries. Only likely to be a transient visitor in the Study Area.
White Shark	*Carcharodon carcharias*	V,P	V	**Moderate** – Occasionally recorded within the locality. The Study Area includes some marginal habitat for foraging.
Black Rockcod	*Epinphelus daemelii*	E, P	V	**Moderate** – Occasionally recorded within the locality. The Study Area includes some marginal habitat for foraging and refuge.
White's Seahorse	*Hippocampus whitei*	E, P	E	**Low** – Has not been sighted in the Hasting River. Some potential habitat for this species is provided by seagrasses within the Study Area but tidal velocities and regular flooding make it unlikely the species would be able to establish and persist.
Mackeral Shark	*Lamna nasus*	P	B	Low – Rarely recorded in coastal areas. Typically remains offshore near the continental shelf edge and very unlikely to enter the estuary.

Common Name	Scientific Name	NSW Status	Comm. Status	Likelihood of Occurrence
Coastal Reef Manta Ray	*Manta alfredi*	P	B	Low – Occasionally recorded within the locality, typically remains offshore and unlikely to enter the estuary.
Giant Manta Ray	*Manta birostris*	P	B	Low – Occasionally recorded within the locality, typically remains offshore and unlikely to enter the estuary.
Whale Shark	*Rhincodon typus*	P	V	Low – Occasionally recorded within the locality, typically remains offshore and unlikely to enter the estuary.
Scalloped Hammerhead Shark	*Sphyrna lewini*	E	E	Low – Occasionally recorded within the locality, typically remains offshore and unlikely to enter the estuary.
Greater Hammerhead Shark	*Sphyrna mokarran*	V		Low – Occasionally recorded in coastal areas, but rarely known to enter estuaries. Only likely to be a transient visitor in the Study Area.
Southern Bluefin Tuna	*Thunnus maccoyii*	E	E	Low – Occasionally recorded within the locality, typically remains offshore and unlikely to enter the estuary.
Other				
Marine Brown Alga	*Nereia lophocladia*	CE		Low – Typically confined to areas around Coffs Harbour. Habitat within the Study Area is very marginal for this species.
Soft Coral	*Dendronephthya australis*	E	E	Low – No records in the locality. Typically confined to more estuarine/harbour habitats then river systems.
Terrestrial fauna and flora				
Koala	*Phascolarctos cinereus*	E	V	Low – although this species has been recorded in close proximity to the site, no suitable habitat exists on site.
Green and Golden Bell Frog	*Litoria aurea*	E	V	Low – although this species has been recorded in close proximity to the site, no suitable habitat exists on site.
Native Guava	*Rhodomyrtus psidioides*	CE		Low – although this species has been recorded in close proximity to the site, no suitable habitat exists on site.

CD = Conservation Dependent, P = Protected, V = Vulnerable, E Endangered, CE = Critically Endangered, M= Migratory species under Bonn Agreement

Safeguards

Safeguards to be implemented are:

1. There is to be no disturbance or damage to threatened species or areas of outstanding value.

2. Works are not to harm threatened fauna (including where they inhabit bridges or other structures e.g. timber fence posts or maritime piles).

3. If unexpected threatened fauna or flora species are discovered, stop works immediately and follow Transport's Unexpected Threatened Species Find procedure in the *Roads and Maritime Services Biodiversity Guidelines 2011* – Guide 1 (Pre-clearing process).

4. Vegetation that has been protected or planted as part of offset works provided as part of an approved project (e.g. in association with fauna crossings) is not to be removed.

5. All pathogens (e.g. Chytid, Myrtle Rust and Phytophthora) are to be managed in accordance with the *Roads and Maritime Services Biodiversity Guidelines* - Guide 7 (Pathogen Management) and DECC Statement of Intent 1: Infection of native plants by *Phytophthora cinnamomi* (for Phytophthora).

6. Declared noxious weeds are to be managed according to requirements under the Biosecurity Act, 2015 and Guide 6 (Weed Management) of the *Roads and Maritime Services Biodiversity Guidelines 2011*

7. Fauna handling must be carried out in accordance with the requirements the *Roads and Maritime Services Biodiversity Guidelines* - Guide 9 (Fauna Handling).

8. Works are not to create an ongoing barrier to the movement of wildlife.

9. Pruning of mature trees is to be in accordance with Part 5 of the *Australian Standard 4373-2007 Pruning of amenity trees*.

10. Anchoring and/or use of construction vessels (including barges) is not permitted over sensitive marine vegetation or rocky reef habitat.

11. All activities are to minimise disturbance to shallow water habitats under, and in the immediate vicinity of water based structures, including disturbance of seabed sediments and smothering habitats from propeller strike or excessive propeller wash.

12. All activities are to be carried out to avoid spreading marine pests including:
    - Removal of weeds, animals or sediment from equipment and disposal to an appropriate waste receptacle or facility
    - Disposal of sewage and bilge water at an approved pump out facility.

13. Any works within a marine park or aquatic reserve is to be carried out in accordance with the requirements of the *Marine Estate Management Act 2014*.

14. Any harm to marine vegetation is to be carried out in accordance with a permit under the *Fisheries Management Act 1994*.

15. Sediment fencing should be put in place in any areas in close proximity to any drains or natural drainage lines above the HWM that have a high risk of erosion during construction works, particularly between any work sites along the southern breakwall and Town Beach or the main stormwater drain that discharges to the west of the breakwall. The above erosion and sediment control measures should be implemented in accordance with the 'Blue Book' (Landcom 2004).

16. An exclusion zone should also be established around the seagrass beds on the western side of the proposed project footprint before construction works start.

17. No construction equipment should moor, anchor or operate in less than one metre water depth or within two metres of seagrass habitat.

18. Construction works should be confined to daylight hours with minimal lighting associated with plant and site compounds to be left on during night-time hours.

19. Where practical, silt curtains should be put in place and maintained to minimise sedimentation and contain any unplanned spills.

20. All equipment should be thoroughly cleaned before being brought to site to minimise the potential to spread weed seeds or soil-based pathogens.

21. Procedures to adequately manage and store waste products and material in designated areas on the site should be established.

22. All construction and work locations are to have designated litter disposal bins to avoid potential for marine debris.

23. All machinery should be routinely checked for leaks, with an emergency land and marine spill kits, including hydrocarbon booms, to be kept on site at all times. All staff are to be made aware of the location of the spill kits and trained in their use.

24. No stockpiling or storing of materials should occur within mangrove or saltmarsh habitat.

25. All fuels and hydrocarbon-based products are to be stored in a bunded area away from the waters edge.

26. No domestic animals are to be brought onto site during construction works to minimise potential for disturbance of any shorebirds.

27. Should shorebirds be foraging in intertidal areas within 50 metres of active construction works, reasonable care should be taken to ensure that the birds are not harmed in any way.

28. If any marine or shorebirds are found to be nesting, or fur-seals resting within 100 metres of the proposed project footprint during construction works, the works should cease immediately and the local NPWS office notified.

29. All waste and construction materials are removed from the site and disposed of at a licensed facility.

30. All environmental controls such as sediment fencing are removed from the site once stabilisation has occurred.

31. The upgrade to the southern breakwall works will adopt best management practice.

3.8 Trees

Description of existing environmental and potential impacts		
Does the proposal involve pruning, trimming or removal of any tree/s? Trees proposed to be removed are identified in the proposal plans provided at Appendix A and detailed within the tree summary report provided at Appendix B.	☑ Yes	☐ No
Do the trees form part of a streetscape, an avenue or roadside planting? Although the trees to be removed form a sparse avenue along the footpath, they are a minor component of the landscape which comprises larger, more mature trees in the adjoining caravan park.	☐ Yes	☑ No
Have the trees been planted by a community group, Landcare group or by council or is the tree a memorial or part of a memorial group e.g. has a plaque? There is no evidence that the trees to be removed have cultural significance.	☐ Yes	☑ No
Do the trees form part of a heritage listing or have other heritage value?	☐ Yes	☑ No

The Norfolk Pines along the footpath are a minor contribution to the landscape setting of the area and assist in characterising the Port Macquarie locality. Larger, more mature trees exist in the caravan park and characterise the skyline. It is possible to retain some of the Norfolk Pines adjacent the footpath, however most are causing structural damage or would have their root systems damaged and create a safety hazard as a result of the footpath widening.

The upgrade works would necessitate removal of a total of 26 trees comprising the following:

- 11 Swamp She-oaks *Casuarina glauca*; and
- 15 Norfolk Island Pines *Araucaria heterophylla*.

Any trees that would be removed are well represented by existing trees located within the vicinity of the proposed project footprint.

The footpath upgrade works would include landscape planting along the new embankment. Landscaping and selection of plant and tree species would be carried out in consultation with Council. This landscaping would partly offset any mature trees required to be removed as part of the proposal.

No significant vegetation removal would be required for the establishment of the stockpile site. Any vegetation removal required for establishment of the stockpile area would be confined to small shrubbery and minor regrowth.

Safeguards

Safeguards to be implemented are:

1. Selection of trees and plants used in the landscaping along the inner embankment must be done in consultation with Council.

2. Tree protection fencing must be erected to protect trees that are to be retained within the proposed project footprint and must be maintained for the duration of the works. No building materials or

other items are to be placed or stored within the fenced off areas and all measures must be taken to prevent damage to trees and other vegetation (including root systems).

3. No soil or fill material is to be placed within the dripline of a tree proposed to be retained or to cause changes in the surface level.

3.9 Traffic and transport

Description of existing environmental and potential impacts		
Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during construction? Construction works associated with the upgrade to the southern breakwall and footpath improvements would require pedestrian exclusion zones. Alternative routes and detours would be agreed with Council and would be located as close as possible to the current footpath, whilst ensuring pedestrian safety. Minor traffic impacts associated with the transporting of rock to the nominated stockpile site and the proposed project footprint would be likely. There would potentially be up to 7 truck movements per day, averaged over 5 months, though this would be intermittent and there will be many days when there are few or no truck movements.	☑ Yes	☐ No
Is the proposal likely to result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation?	☐ Yes	☑ No
Is the proposal likely to affect any other transport nodes or transport infrastructure (e.g. bus stops, bus routes) in the surrounding area? Or result in detours or disruptions to traffic flow (vehicular, cycle and pedestrian) or access during operation?	☐ Yes	☑ No

Description of existing environmental and potential impacts
Construction works associated with the upgrade to the southern breakwall and footpath improvements would require pedestrian exclusion zones to ensure pedestrian safety during works. These would be clearly marked and signposted. Construction works would be staged to minimise impacts on pedestrians. Pedestrian detours would be in place to further minimise impacts on pedestrians. Detours would be agreed with Council and would be clearly marked and signposted. Transport of rock from the stockpile site to the proposed project footprint would be undertaken using the nominated transport route as depicted in the figure below and would be undertaken intermittently on an “as needs” basis. Transport of rock would be undertaken using medium rigid trucks. The road infrastructure along the nominated transport route is sufficient to support these vehicles. Any traffic impacts associated with the transport of rock would be temporary, being restricted to the construction timeframes only. The establishment of the temporary construction compound would impact on the availability of approximately 20 public car parking spaces, located at the northern end of Alban Place. However, the majority of car parking spaces along Alban Place would not be impacted by the compound. Sufficient car parking areas are located at James Martin Reserve and Lions Park and would not be impacted. Any restrictions to car parking spaces would be temporary, being restricted to the construction timeframes only. The safeguards detailed below would minimise any traffic impacts, including impacts on pedestrians.

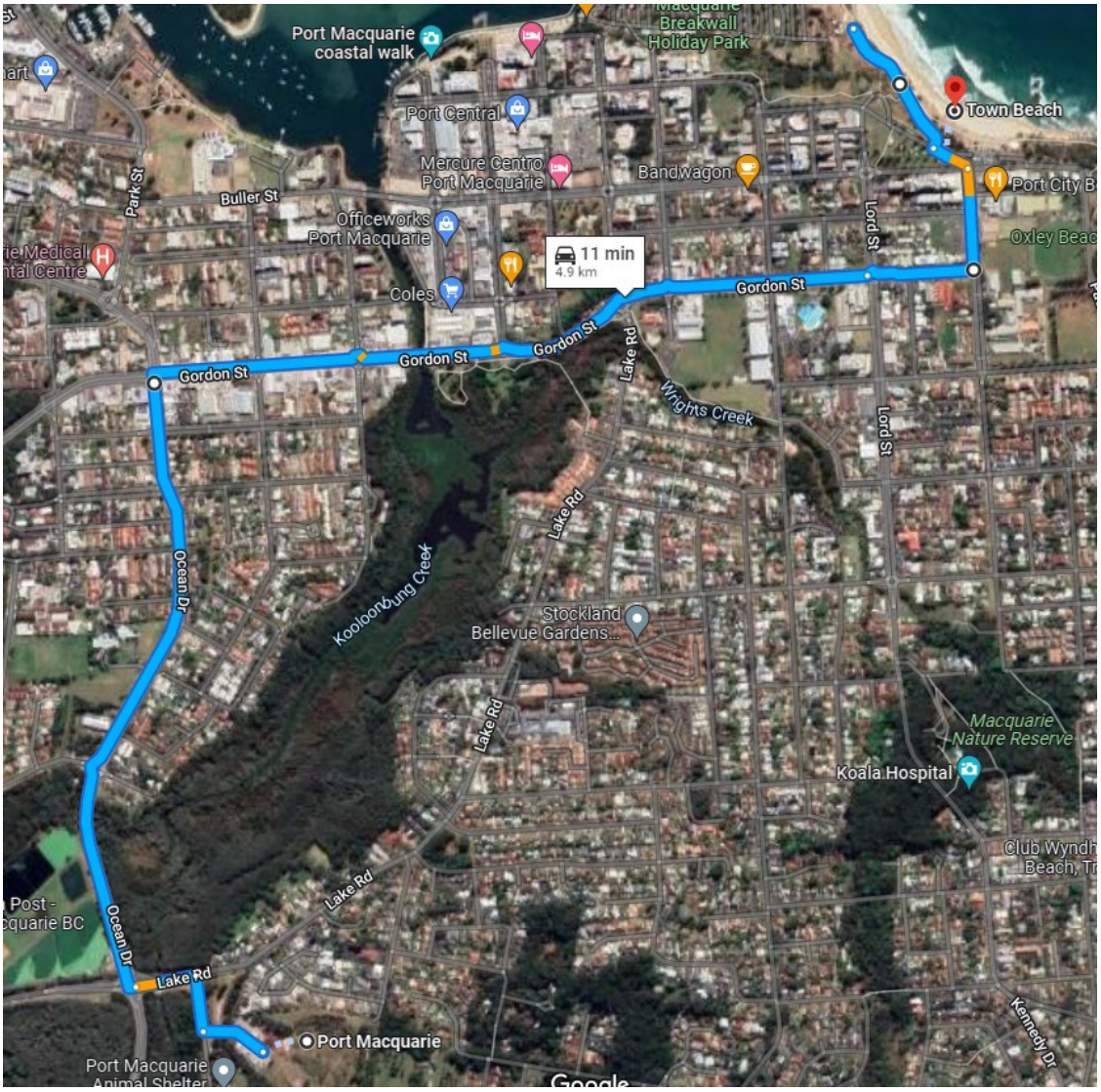


Figure 12: Likely haulage route (Source: Google Maps)

Safeguards

Safeguards to be implemented are:

1. Where possible, current traffic movements and property accesses are to be maintained during the works. Any disturbance is to be minimised to prevent unnecessary traffic delays.

2. Where possible, current vessel movements and public accesses to the waterway and foreshore are to be maintained during works. Any disturbance is to be minimised as much as practicable.

3. A traffic control plan will be prepared in accordance with the '*Traffic control at work sites manual'* (RTA, 2010a) and *Australian Standard 1742.3 Manual of uniform control devices*.

4. Existing aids to navigation will need to remain unobstructed and operational throughout the works stage of the project. If the proposal necessitates obstruction to the aids, then further consultation with Transport's (Maritime Safety) is required.

5. Works associated with proposed project should be staged where possible to minimise impacts on pedestrians and recreational users.

6. Pedestrian detours should be established and clearly identified where necessary.

3.10 Socio-economic

Description of existing environmental and potential impacts		
Is the proposal likely to impact on local business? The proposal may have minor impacts on existing business during the construction phase, including the existing caravan park located adjacent the southern breakwall and the cafés located at the eastern and western ends of the proposal. Direct consultation with affected business will be occurring. These impacts would be temporary, and local businesses would achieve long-term benefits from the infrastructure upgrade and improvements. Where businesses identify a potential significant economic impact during consultation, a specialist socio-economic impact assessment would be undertaken to confirm impacts and identify suitable mitigation measures.	☑ Yes	☐ No
Is the proposal likely to require any property acquisition?	☐ Yes	☑ No
Is the proposal likely to alter any access for properties (either temporarily or permanently)? The adjacent caravan park is leased Crown land. The existing MIDO Crown land licence will be adjusted to cover the area of Crown land impacted by the proposal. The formal access to the caravan park will not be affected by the proposal, however improved pedestrian access would be provided for the caravan park along the breakwall. The caravan park have requested that access into the caravan park be restricted to patrons of the parks as part of the works, therefore the proposal would include the installation of fences and gates in consultation with the park managers.	☐ Yes	☑ No
Is the proposal likely to alter any on-street parking arrangements (either temporarily or permanently)? As discussed previously, the construction of the proposal would restrict approximately 20 public car parking spaces located at the northern end of Alban Place. These impacts would be temporary.	☑ Yes	☐ No
Is the proposal likely to change pedestrian movements or pedestrian access (either temporarily or permanently)? Construction works associated with the proposal would require pedestrian exclusion zones. These impacts would be temporary.	☑ Yes	☐ No
Is the proposal likely to impact on any items or places of social value to the community (either temporarily or permanently)? The proposal would temporarily impact the recreational use of the southern breakwall. Although there would be temporary disruptions to the use of the park, the long-term impacts for the community would be beneficial through improved infrastructure and facilities in a popular public recreation area. Access to playground facilities would be maintained throughout the proposed works, however part of the skate park would be closed.	☑ Yes	☐ No

Description of existing environmental and potential impacts		
Is the proposal likely to reduce or change visibility of any businesses, farms, tourist attractions or the like (either temporarily or permanently)? The proposal is located in a popular tourist area. Painted rocks along the breakwall have value for tourists and the local community. Safeguards detailed in Section 3.5 are appropriate for managing the impacts of this. There may be some short term disruption to local cafes as the area will be restricted to visitors, however the improved amenity and use of the area would be likely to have long term beneficial impacts.	☑ Yes	☐ No
The proposal would likely have minor temporary impacts on existing businesses and recreational facilities in relation to amenity and deterrence of patrons during construction activities. These temporary impacts would likely be restricted to the construction timeframes only. Any temporary impacts would be outweighed by the long-term benefits of the proposal which would improve visitation to the area, and accessibility, and encourage use of the recreational features of the southern breakwall. The installation of security lighting would improve the accessibility and attractiveness of the area in the evening. Minor reductions in the availability of public car parking would be experienced during the construction phase. However, car parking areas located within proximity to the site would remain available. The proposal would have minor temporary impacts on pedestrians and recreational users of the breakwall. Construction works would be staged to minimise impacts on pedestrians. Pedestrian detours would be in place to minimise impacts on pedestrian safety. Part of the skate park would be closed during the works. The playground would remain open and would be fenced during works. On-site security would be in place when required. Some minor impacts on community events would likely result during the construction phase. Construction timeframes would be co-ordinated with Council to minimise impacts on community events.		

Safeguards

Safeguards to be implemented are:

1. Notification is to be given to affected key stakeholders and the community prior to the works taking place. The notification is to include:

   - Details of the proposal
   - The duration of works and working hours
   - Any changed traffic or access arrangements
   - How to lodge a complaint or obtain more information
   - Contact name and details.

   Notification should be a minimum of five calendar days prior to the start of works.

2. All complaints are to be recorded on a complaints register and attended to promptly.

3. Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.

4. The construction timeframes must be co-ordinated with Council to minimise conflicts with other intended projects and community events within the area and to minimise cumulative impacts on the community.

5. Where businesses identify a potential significant economic impact during consultation, a specialist socio-economic impact assessment would be undertaken to confirm impacts and identify suitable mitigation measures.

3.11 Landscape character and visual amenity

Description of existing environmental and potential impacts		
Is the proposed work over or near an important physical or cultural element or landscape? (heritage items and areas, distinctive or historic built form, National Parks, conservation areas, scenic highways etc)? The Port Macquarie breakwall group is recognised as a significant heritage item representative of government investment in improving coastal/riverine navigation on the North Coast and indicative of technologies of associated with navigation and harbour works (SHI A060 Training walls and breakwalls).	☑ Yes	☐ No
Would the proposal obstruct or intrude upon the character or views of a valued landscape or urban area. For example locally significant topography, a rural landscape or a park, a river, lake or the ocean or a historic or distinctive townscape or landmark? Although the proposed works will involve the removal of an avenue of Norfolk Pines, these are less mature than the adjoining stand of Norfolk Pines, and their removal is insignificant in the context of the wider landscape.	☐ Yes	☑ No
Would the proposal require the removal of mature trees or stands of vegetation, either native or introduced? The upgrade works would necessitate removal of a total of 26 trees comprising the following: • 11 Swamp She-oaks *Casuarina glauca*; and • 15 Norfolk Island Pines *Araucaria heterophylla*.	☑ Yes	☐ No
Would the proposal result in large areas of shotcrete visible from the road or adjacent properties?	☐ Yes	☑ No
Would the proposal involve new noise walls or visible changes to existing noise walls?	☐ Yes	☑ No
Would the proposal involve the removal or reuse of large areas of road corridor, landscape, either verges or medians?	☐ Yes	☑ No
Would the proposal involve substantial changes to the appearance of a bridge (including piers, girders, abutments and parapets) that are visible from the road or residential areas?	☐ Yes	☑ No

Description of existing environmental and potential impacts		
If involving lighting, would the proposal create unwanted light spillage on residential properties at night (in construction or operation)? There would be no intrusive lighting installed along the breakwall. The installation of lighting would be undertaken in consultation with Council and the caravan park and will likely be low level bollard lighting to minimise light intrusion and improve safety and accessibility for the community. The compound site will have security lighting at night, but this will be confined only to the compound area and would not result in light spill at any residential property.	☐ Yes	☑ No
Would any new structures or features being constructed result in over shadowing to adjoining properties or areas?	☐ Yes	☑ No
The proposal is located in a site of high visual amenity. As with any construction works, there will be a temporary loss of amenity during the works phase. The short-term negative impacts of the works will likely be outweighed by the long-term positive impacts. Trees located within the proposal footprint would be retained where possible. The upgrade works would necessitate removal of a total of 26 trees comprising the following: • 11 Swamp She-oaks *Casuarina glauca*; and • 15 Norfolk Island Pines *Araucaria heterophylla*. Any trees that would be removed are well represented by existing trees located within the vicinity of the proposed project footprint.		

Safeguards

Safeguards to be implemented are:

1. The material palettes associated with the footpath upgrades will integrate with existing Town Green developments.

2. Tree and plant selection associated with the landscaping of the inner bank should be carried out in consultation with Council.

3. Landscaping is to be managed in accordance with Transport's landscape guideline, 2013.

4. Any security lighting of the site will minimise light spill and ensure that no residential property is affected by additional lighting.

3.12 Waste

Description of existing environmental and potential impacts		
Is the proposal likely to generate >200 tonnes of waste material (contaminated and /or non-contaminated material)?	☐ Yes	☑ No
Is the proposal likely to require a licence from EPA?	☐ Yes	☑ No
Is the proposal likely to require the removal of asbestos?	☐ Yes	☑ No

Safeguards

Safeguards to be implemented are:

1. A Waste Management Plan must be prepared that follows the *Roads and Maritime Services Technical Guide: Management of road construction and maintenance waste*.

2. Lead paint materials are to be managed in accordance with the Australian Standard AS4361.1 'Guide to Lead Paint Management – Part 1 Industrial Applications 1995'.

3. Resource management hierarchy principles are to be followed:
   - Avoid unnecessary resource consumption as a priority.
   - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery).
   - Disposal is undertaken as a last resort (in accordance with the Waste Avoidance & Resource Recovery Act 2001).

4. If vegetation is to be mulched and transported off site for beneficial reuse, it is to be assessed for the presence of weeds, pest, and other disease and a Mulch Management Plan prepared in accordance with the *Roads and Maritime Technical Procedure: Mulch Management*

5. Bulk project waste (e.g. fill) sent to a site not owned by Transport (excluding EPA licensed landfills and resource recovery facilities) is to have prior formal written approval from the landowner, in accordance with *Environmental Direction No. 20 – Legal Off-site Disposal of Roads and Maritime Services Waste*. This includes waste transported for reuse, recycling, disposal or stockpiling.

6. If coal tar asphalt is identified and is to be removed, it is to be disposed of to landfill in accordance with *Roads and Maritime Environmental Direction No.21 – Coal Tar Asphalt Handling and Disposal*.

7. There is to be no disposal or re-use of construction waste on to other land.

8. Waste is not to be burnt on site.

9. Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed.

10. Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.

11. All wastewater from vessels is to be discharged at an approved vessel wastewater disposal facility. No vessel wastewater is to be discharged (i.e. pumped out) directly into the water or onto any land adjacent.

12. Although no asbestos is known to be present on site removal of this material must be undertaken in accordance with *Working with Asbestos: Guide 2008* published by WorkCover Australia, if encountered.

3.13 General

Safeguards

Safeguards to be implemented are:

1. If the scope of the works changes at any time, review the project under the *Roads and Maritime Services Environmental assessment procedure for routine and minor works (EIA-PO5-1)* and complete any further requirements prior to undertaking works associated with the changed scope.

2. A Construction Environmental Management Plan is to be prepared in accordance with the specifications set out in the *QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan) and QA Specification G10 - Traffic Management* and implemented prior to the commencement of works.

3. Parking of vehicles and storage of plant/equipment is to occur on existing paved areas. Where this is not possible, vehicles and plant/equipment are to be kept away from environmentally sensitive areas and outside the dripline of trees.

4. Any access to waterways using barges/boats or similar is to be via an existing boat ramp with no disturbance to the bank or surrounding vegetation.

4. Consideration of State and Commonwealth environmental factors

4.1 Environmental Planning and Assessment Regulation 2021 checklist

In addition to the requirements of the Is an EIS required?, the following factors listed in Section 171 of the *Environmental Planning and Assessment Regulation, 2021* have also been considered to assess the likely impacts of the proposal on the natural and built environment. This consideration is required to comply with sections 5.5 and 5.7 of the EP&A Act.

Environmental factor	Impact
(a) Any environmental impact on a community? The proposed work may cause short-term environmental impacts on the community, such as restrictions on public car parking spaces, access to the skate park, minor traffic impacts, restriction of pedestrian pathways and noise impacts on residents, however the potential impacts would be minimised with the implementation of the safeguards as detailed in this REF. The maintenance works would have a positive environmental impact on the community in the long-term as the safety, accessibility and functionality of the footpath and breakwall would be improved.	Negative, short-term. Positive, long-term.
(b) Any transformation of a locality? The proposed work would transform the locality temporarily during construction works. Impacts would be minimised with the implementation of the safeguards as detailed in this REF. The proposal would result in long-term, positive impacts by enhancing the appearance and features of the southern breakwall which is a significant tourist attraction.	Negative, short-term. Positive, long-term.
(c) Any environmental impact on the ecosystems of a locality? The proposal would have potential environmental impacts on the ecosystems of the locality, however the potential impacts would be minimised with the implementation of the safeguards given in Section 3 of this REF. The proposal would result in long-term, positive impacts on the eco-system by providing long-term eco-features within the breakwall.	Negative, short-term. Positive, long-term.

Environmental factor	Impact
(d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The proposal would result in a temporary reduction of the aesthetic and recreational value of the area during construction works, however impacts would be minimised with the implementation of the safeguards provided in Section 3 of this REF. The proposal would result in long-term, positive impacts to the aesthetic and recreational value of the area through improvements to the existing footpath. Commercial and recreational fishers would benefit from the upgrade of the southern breakwall by ensuring the ongoing functionality of this important piece of maritime infrastructure and providing fishing platforms.	Negative, short-term. Positive, long-term.
(e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? The proposal would potentially have an effect on the breakwall, which is a significant heritage item, however the effect would be minimal due to the minor changes to the form of the structure. Potential impacts would be minimised with the implementation of the safeguards given in Section 3 in this REF.	Minor
(f) Any impact on habitat of any protected animals (within the meaning of the *Biodiversity Conservation Act 2016*)? Direct impacts within the proposed project footprint would be restricted to disturbances to existing artificial habitat provided by the rock armouring of the breakwall. Habitat associated with rock armouring is used by some marine birds and fish, and at times this may include some migratory and/or threatened species. Therefore, there remains some potential for some minor disturbances to habitat used by these species. However, the placement of additional rock associated with the upgrade to the southern breakwall would provide for additional habitat and provide long-term benefits. The removal and replacement of rocks would also have a direct impact on marine growth present in the proposal footprint, including sessile invertebrates and macroalgae. These assemblages would likely recover within 12-24 months following construction works. Sensitive habitats adjacent to the proposal footprint include seagrass beds that occur in close proximity to the western end of the breakwall. Care would be taken during construction to ensure that these seagrass beds are not directly impacted as part of the proposal	Negative, short-term.

Environmental factor	Impact
(g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The proposal would not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air due to the limited scope of works for the proposed activities and the implementation of the safeguards given in Section 3 of this REF.	Nil
(h) Any long-term effects on the environment? The proposal would have positive long-term effects on the environment due to improved maritime safety. There are no anticipated negative long-term effects on the environment from the maintenance works due to the limited scope of these works and the implementation of the safeguards given in Section 3 of this REF.	Positive, long-term.
(i) Any degradation of the quality of the environment? The proposal would potentially degrade the quality of the environment in the short-term, however the potential impacts would be minimised with the implementation of the safeguards given in Section 3 of this REF.	Negative, short-term.
(j) Any risk to the safety of the environment? The proposal would have minimal risk to the safety of the environment due to the limited scope of works for the maintenance activities covered in this REF, and the potential impacts would be minimised with the implementation of the safeguards given in Section 3 in this REF. The proposal would result in positive, long-term impacts in relation to the safety of the environment, including increased maritime safety and increased pedestrian safety resulting from better access and a reduction in conflict between pedestrians and cyclists.	Negative, short-term. Positive, long-term.
(k) Any reduction in the range of beneficial uses of the environment? The proposal would cause a minor reduction in the use of the southern breakwall during construction, however there would be a long-term improvement in the range of beneficial uses of the environment as a result of the works.	Negative, short-term. Positive, long-term.
(l) Any pollution of the environment? The proposal would potentially cause pollution of the environment resulting from reduced water quality associated with turbidity, however the potential impacts would be minimised with the implementation of the safeguards given in Section 3 of this REF. Accidental spills may also occur from machinery, however safeguards would be implemented to minimise associated impacts.	Negative, short-term.

Environmental factor	Impact
(m) Any environmental problems associated with the disposal of waste? Most materials can be recycled or re-used on site. The waste generated during the works would be contained and removed for disposal to approved recycling facilities or to licensed landfill in accordance with the safeguards in Section 3 of this REF. No environmental problems are anticipated for the disposal of waste.	Nil
(n) Any increased demands on resources, natural or otherwise which are, or are likely to become, in short supply? The proposal would not significantly increase demands on resources, which are, or are likely to become, in short supply. Most materials can be recycled or re-used on site. Relatively small amounts of new materials (primarily rock and concrete) would be required for the proposed work. The safeguards listed in Section 3 of this REF would be implemented to minimise any impacts.	Nil
(o) Any cumulative environmental effect with other existing or likely future activities? The proposal has the potential to have cumulative environmental effects with other existing or likely future activities, however the effects would be minimal due to the limited scope of works for the activities covered in this REF, and the potential impacts on the environment would be minimised with the implementation of the safeguards given in Section 3 in this REF.	Negative, short-term.
(p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The design of the breakwall upgrade works have been informed by coastal process studies which includes analysis of hydraulic loading, wave climate and setup, and tidal currents. No adverse impacts on coastal processes would be likely.	Nil

4.2 Matters of National Environmental Significance checklist

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance are required to be considered to:

- Assist in determining whether the proposal should be referred to the Australian Government Department of the Environment and Energy
- For nationally listed threatened species, ecological communities and migratory species, whether the impacts are significant and should be assessed via a project REF.

Factor	Impact
(a) Any impact on a World Heritage property?	Nil
(b) Any impact on a National Heritage place?	Nil
(c) Any impact on a wetland of international importance (often called 'Ramsar' wetlands)?	Nil
(d) Any impact on nationally threatened species, ecological communities or migratory species? There are likely to be some minor impacts on nationally threatened species, ecological communities or migratory species associated with the construction phase. Direct impacts within the proposed project footprint would be restricted to disturbances to existing artificial habitat provided by the rock armouring of the breakwall. Habitat associated with rock armouring is used by some marine birds and fish, and at times this may include some migratory and/or threatened species. This impact would be localised given the minor works associated with the proposal. Safeguards provided in Section 3 of this report would mitigate such impacts. The placement of additional rock associated with the proposal would provide for additional habitat in the long-term. The removal and replacement of rocks would also have a direct impact on marine growth present within the proposal footprint, including sessile invertebrates and macroalgae. These assemblages would likely recover within 12-24 months following construction works. Sensitive habitats adjacent to the proposal footprint include seagrass beds that occur in close proximity to the western end of the breakwall. Care would be taken during construction to ensure that these seagrass beds are not directly impacted as part of the proposal.	Minor short-term
(e) Any impact on a Commonwealth marine area?	Nil
(f) Does the proposal involve a nuclear action (including uranium mining)?	Nil
Additionally, any impact (direct or indirect) on the environment of Commonwealth land?	Nil

5. Summary of safeguards and environmental management measures

This section provides a summary of the site specific environmental safeguards and management measures identified in described in chapters 3 and 4 of this REF. These safeguards will be implemented to reduce potential environmental impacts throughout construction and operation. A framework for managing the potential impacts is provided with reference to environmental management plans and relevant Transport QA specifications. Any potential licence and/or approval requirements required prior to construction are also listed.

Table 5-1: Summary of site-specific safeguards for proposed work

Safeguards for the proposed work	
Soils	1. Erosion and sediment control measures are to be implemented and maintained to: • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets • Reduce water velocity and capture sediment on site • Minimise the amount of material transported from site to surrounding pavement surfaces • Divert clean water around the site. 2. Erosion and sediment controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and regular records kept and provided on request. 3. Erosion and sediment control measures are not to be removed until the works are complete and areas are stabilised. 4. Work areas are to be stabilised progressively during the works. 5. The maintenance of established stockpile sites is to be in accordance with the Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10). 6. Any excavations that would exceed one metre below natural ground surface or would lower the watertable more than one metre below the natural ground surface requires the preparation of an Acid Sulfate Management Plan prior to the start of such works. The Acid Sulfate Soils Management Plan is required to be implemented during the works. 7. Potential or actual acid sulfate soils are to be managed in accordance with the Roads and Maritime Services Guidelines for the Management of Acid Sulphate Materials 2005. 8. If suspected contaminated areas are encountered during excavations on land, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with Transport and the NSW EPA. 9. A progressive erosion and sediment control plan is to be prepared for all relevant components of the works. All safeguards related to erosion and sediment control would be undertaken in accordance

Safeguards for the proposed work	
	with the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book).
Waterways and water quality	1. There is to be no release of dirty water into drainage lines and/or waterways. 2. Visual monitoring of local water quality (i.e. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient silt curtains or erosion and sediment controls. During the upgrade to the southern breakwall water turbidity or suspended solids should be regularly monitored at the source, as well as100 metres and 500 metres from the source. Visual monitoring of any pluming should also be routinely monitored. When allocated thresholds are reached, works will cease until plumes have cleared. 3. Water quality control measures are to be used to prevent any materials (e.g. concrete, grout, sediment etc) entering drain inlets or waterways. 4. Measures to control pollutants from stormwater and spills would be investigated and incorporated in the pavement drainage system at locations where it discharges to the receiving drainage lines. Measures aimed at reducing flow rates during rain events and potential scour would also be incorporated into the design of the pavement drainage system. 5. Excess debris from cleaning and washing is to be removed immediately. 6. Vessels (including barges) are only to be used at suitable tides when no less than 600mm clearance is available between the underside of the vessel and the bed of the waterway. 7. A Soil and Water Management Plan (SWMP) would be prepared and implemented as part of the Construction Environmental Management Plan (CEMP). The SWMP will identify all reasonably foreseeable risks relating to soil and water pollution and describe how these risks would be addressed during construction. This would include, but not be limited to, measures relating to the following activities to minimise the risk of pollution: • Training of personnel to identify ASS and contaminated sediment • Spills from concrete pouring • Oil/fuel/chemical storage and spill management • Machinery and engine maintenance schedule to reduce oil/fuel leakage. 8. All rock brought to site is to be clean and free of fines and sediments prior to being placed in the water or on the banks. Any washing of rock on site prior to placement is to be undertaken in a bunded area, with sediment regularly collected and removed from site. 9. All fuels, chemicals and liquids are to be stored in an impervious bunded area a minimum of 50 metres away from any water. 10. Refuelling of plant and equipment and storage of hazardous materials is to occur within a double-bunded area.

Safeguards for the proposed work	
	11. Land and marine spill response kits, including hydrocarbons booms, must be readily available at the work site.
Noise and vibration	1. Works, including the loading and unloading of rock from the nominated stockpile sites, is to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays must have measures in place to minimise noise impacts. Any works proposed outside of standard working hours for safety and efficiency reasons, would be subject to approval, notification and preparation of a management plan. 2. Noise impacts are to be minimised in accordance with Transport's construction noise estimator and include: • Notification is required for residents within 110 metres not less than 14 days prior to the commencement of works. • Notification is required for businesses within 40 metres not less than 14 days prior to the commencement of works. • Notification is required for passive recreation area within 70 metres. • Notification is required for residents within 80m of the John Fraser off-site stockpiling area. 3. Vibratory rollers and other vibration producing equipment will not be used within 50 metres of adjacent buildings to minimise or prevent vibration impacts. If this distance cannot be achieved, dilapidation surveys are to be conducted of buildings within 50 metres. 4. A management procedure will be in place for noise and vibration complaints that may arise from the construction work. Each complaint must be investigated and appropriate noise and/or vibration amelioration measures be put in place to mitigate future exceedances.
Air quality	1. Measures (including watering or covering exposed areas) are to be used to minimise or prevent air pollution and dust. 2. Works (including the spraying of paint and other materials) are not to be carried out during strong winds or in weather conditions where high levels of dust or air borne particulates are likely. 3. All rock brought to the stockpile site is to be clean and free of fines and sediments. 4. Vegetation or other materials are not to be burnt on site. 5. Vehicles and vessels transporting waste or other materials that may produce odours or dust are to be covered during transportation. 6. Stockpiles or areas that may generate dust are to be managed to suppress dust emissions in accordance with the *Roads and Maritime Services Stockpile Site Management Guideline (EMS-TG-10*). 7. Construction vehicles, vessels, plant and equipment should be maintained in good working order and switched off when not in

Safeguards for the proposed work	
	use. No idling of construction vehicles or vessels is to be permitted. 8. Where removed rock has marine or algae growth it would be replaced back into the wall or removed from site within one week of being removed.
Non-Aboriginal Heritage	1. Boulders and materials used in the remediation should be in keeping with the original materials used in the construction of the breakwall, i.e. local bluestone and concrete. If not possible the introduced material should complement the size, shape and colour of the original materials. 2. Original breakwall materials should be kept and reused during the reconstruction process. If the full reconstruction of the breakwall involves dismantling sections of the outer revetment the original breakwall stone should be used in the reconstruction. To minimise visual impacts, it is suggested the original stones be located in the upper, visible sections of the breakwall. If original breakwall stones area not suitable to be replaced than they should remain within the project area, i.e. used for landscaping. If possible original construction techniques should be used in the reconstruction. 3. Memorial plaques will be removed and stored for a nominated period of time and can be collected by the community where prior arrangements are made with Transport and its principal contractor. 4. A photographic record of the painted rocks will be made prior to works commencing. The photos will be made available for viewing by the public. 5. A Section 140 Excavation permit would be required if significant and intact relics with research potential are uncovered during works. There is potential for evidence of the breakwall tramline to be uncovered during the proposed remediation and upgrade work. If found to be an in situ feature, the tramline should be archivally recorded and incorporated into the breakwall design. The tramline is a work and a Section 140 will not be needed if exposed. 6. If unexpected finds of historical nature are discovered during any work, work within 5m of the find must cease and the following steps taken: • stop work immediately; • secure the area so as to avoid further harm to the relic; and • contact an archaeologist for further information. 7. In the event that known or suspected human remains (generally in skeletal form) are encountered during the activity, the following procedure will be followed immediately upon discovery: • all work in the immediate vicinity will cease and the find will be immediately reported to the works supervisor who will advise the Environment Manager or other nominated senior staff member;

Safeguards for the proposed work	
	• the Environment Manager or other nominated senior staff member will promptly notify the police (as required for all human remains discoveries); • the Environment Manager or other nominated senior staff member will contact OEH for advice; • if it is determined that the human remains are Aboriginal ancestral remains, the Local Aboriginal Land Council will be contacted, and consultative arrangements will be made to discuss ongoing care of the remains; and • if it is determined that the human remains are not Aboriginal ancestral remains, further investigation will be conducted to determine if the remains represent a historical grave or if police involvement is required. 8. A digital archival photographic record would be prepared prior to any changes to the landscape and heritage items in the project area. Photographic archival recording is important in recording change, for posterity and future research, and in keeping a record of the place's state before that change. A record of the works, and at completion will also be undertaken to complete the record. The digital photographic record will be prepared in accordance with the *Heritage Manual guidelines, Photographic Recording Of Heritage Items Using Film or Digital Capture* (Heritage Office 2006) and *How to prepare archival records of heritage items* (NSW Heritage Office 1998). Photographic archival recording will be undertaken by an archaeologist and will include the entirety of the southern breakwall and surrounding landscape. This will include photographs from both the land and water, and will capture the public graffiti, east and west termination and contextual photographs to and from the holiday park. Photographs will be taken from ground level and, if necessary, will also incorporate drone photography to capture discrete sites with more detail than current ground photography allows. 9. Should excavation become necessary an archaeological research design (ARD) will be prepared. ARD is a theoretical framework to support archaeological field investigations with the aim of extracting information that is relevant to the development and function of the site. It will also form the most appropriate excavation methods to be used within the site. The research design is to be based on the outcomes of the archival and documentary research and the existing environment and seeks to develop questions that will contribute to current knowledge about a place, a theme or perhaps individuals that documentary sources cannot contribute to. These questions should be compatible with the nature of the predicted archaeological resource and realistic in terms of the sites ability to produce answers. 10. Archaeological monitoring of the south-west termination of the southern breakwall should be undertaken to ensure inadvertent impacts are avoided in the event that cultural material is identified.

Safeguards for the proposed work	
	In the event that cultural material is observed through these works, the development would be required to cease – or be redesigned – until the resource's significance is determined. 11. Should relics be identified during excavation, heritage interpretation may become necessary as per the Burra Charter (ICOMOS (Australia), 2013b). The aims of the Interpretation Strategy would be to: • interpret the heritage significance of the uncovered relics; • enhance the understanding of the relics through publicly available interpretation; • identify opportunities to increase collaboration and engagement with key community members and stakeholders; and • enact best practice interpretation, consistent with State, National and internationals standards and guidelines.
Aboriginal Heritage	1. If Aboriginal heritage items are uncovered during the works, all works in the vicinity of the find must cease and the Roads and Maritime Services Aboriginal cultural heritage officer and regional environment manager contacted immediately. Steps in the Roads and Maritime *Standard management procedure: Unexpected heritage items* must be followed.
Biodiversity	1. There is to be no disturbance or damage to threatened species or areas of outstanding value. 2. Works are not to harm threatened fauna (including where they inhabit bridges or other structures e.g. timber fence posts or maritime piles). 3. If unexpected threatened fauna or flora species are discovered, stop works immediately and follow Transport's Unexpected Threatened Species Find procedure in the *Roads and Maritime Services Biodiversity Guidelines 2011* – Guide 1 (Pre-clearing process). 4. Vegetation that has been protected or planted as part of offset works provided as part of an approved project (e.g. in association with fauna crossings) is not to be removed. 5. All pathogens (e.g. Chytid, Myrtle Rust and Phytophthora) are to be managed in accordance with the *Roads and Maritime Services Biodiversity Guidelines* - Guide 7 (Pathogen Management) and DECC Statement of Intent 1: Infection of native plants by *Phytophthora cinnamomi* (for Phytophthora). *6.* Declared noxious weeds are to be managed according to requirements under the Biosecurity Act, 2015 and Guide 6 (Weed Management) of the *Roads and Maritime Services Biodiversity Guidelines 2011* 7. Fauna handling must be carried out in accordance with the requirements the *Roads and Maritime Services Biodiversity Guidelines* - Guide 9 (Fauna Handling). 8. Works are not to create an ongoing barrier to the movement of wildlife.

Safeguards for the proposed work	
	9. Pruning of mature trees is to be in accordance with Part 5 of the *Australian Standard 4373-2007 Pruning of amenity trees*. 10. Anchoring and/or use of construction vessels (including barges) is not permitted over sensitive marine vegetation or rocky reef habitat. 11. All activities are to minimise disturbance to shallow water habitats under, and in the immediate vicinity of water based structures, including disturbance of seabed sediments and smothering habitats from propeller strike or excessive propeller wash. 12. All activities are to be carried out to avoid spreading marine pests including: • Removal of weeds, animals or sediment from equipment and disposal to an appropriate waste receptacle or facility • Disposal of sewage and bilge water at an approved pump out facility. 13. Any works within a marine park or aquatic reserve is to be carried out in accordance with the requirements of the *Marine Estate Management Act 2014*. 14. Any harm to marine vegetation is to be carried out in accordance with a permit under the *Fisheries Management Act 1994*. 15. Sediment fencing should be put in place in any areas in close proximity to any drains or natural drainage lines above the HWM that have a high risk of erosion during construction works, particularly between any work sites along the southern breakwall and Town Beach or the main stormwater drain that discharges to the west of the breakwall. The above erosion and sediment control measures should be implemented in accordance with the 'Blue Book' (Landcom 2004). 16. An exclusion zone should also be established around the seagrass beds on the western side of the proposed project footprint before construction works start. 17. No construction equipment should moor, anchor or operate in less than one metre water depth or within two metres of seagrass habitat. 18. Construction works should be confined to daylight hours with minimal lighting associated with plant and site compounds to be left on during night-time hours. 19. Where practical, silt curtains should be put in place and maintained to minimise sedimentation and contain any unplanned spills. 20. All equipment should be thoroughly cleaned before being brought to site to minimise the potential to spread weed seeds or soil-based pathogens. 21. Procedures to adequately manage and store waste products and material in designated areas on the site should be established. 22. All construction and work locations are to have designated litter disposal bins to avoid potential for marine debris. 23. All machinery should be routinely checked for leaks, with an emergency land and marine spill kits, including hydrocarbon

Safeguards for the proposed work	
	booms, to be kept on site at all times. All staff are to be made aware of the location of the spill kits and trained in their use. 24. No stockpiling or storing of materials should occur within mangrove or saltmarsh habitat. 25. All fuels and hydrocarbon-based products are to be stored in a bunded area away from the waters edge. 26. No domestic animals are to be brought onto site during construction works to minimise potential for disturbance of any shorebirds. 27. Should shorebirds be foraging in intertidal areas within 50 metres of active construction works, reasonable care should be taken to ensure that the birds are not harmed in any way. 28. If any marine or shorebirds are found to be nesting, or fur-seals resting within 100 metres of the proposed project footprint during construction works, the works should cease immediately and the local NPWS office notified. 29. All waste and construction materials are removed from the site and disposed of at a licensed facility. 30. All environmental controls such as sediment fencing are removed from the site once stabilisation has occurred. 31. The upgrade to the southern breakwall works will adopt best management practice.
Trees	1. Selection of trees and plants used in the landscaping along the inner embankment must be done in consultation with Council. 2. Tree protection fencing must be erected to protect trees that are to be retained within the proposed project footprint and must be maintained for the duration of the works. No building materials or other items are to be placed or stored within the fenced off areas and all measures must be taken to prevent damage to trees and other vegetation (including root systems). 3. No soil or fill material is to be placed within the dripline of a tree proposed to be retained or to cause changes in the surface level.
Traffic and transport	1. Where possible, current traffic movements and property accesses are to be maintained during the works. Any disturbance is to be minimised to prevent unnecessary traffic delays. 2. Where possible, current vessel movements and public accesses to the waterway and foreshore are to be maintained during works. Any disturbance is to be minimised as much as practicable. 3. A traffic control plan will be prepared in accordance with the '*Traffic control at work sites manual*' (RTA, 2010a) and *Australian Standard 1742.3 Manual of uniform control devices*. 4. Existing aids to navigation will need to remain unobstructed and operational throughout the works stage of the project. If the proposal necessitates obstruction to the aids, then further consultation with Transport's (Maritime Safety) is required. 5. Works associated with proposed project should be staged where possible to minimise impacts on pedestrians and recreational users.

Safeguards for the proposed work	
	6. Pedestrian detours should be established and clearly identified where necessary.
Socio-economic	1. Notification is to be given to affected key stakeholders and the community prior to the works taking place. The notification is to include: • Details of the proposal • The duration of works and working hours • Any changed traffic or access arrangements • How to lodge a complaint or obtain more information • Contact name and details. 2. Notification should be a minimum of five calendar days prior to the start of works. 3. All complaints are to be recorded on a complaints register and attended to promptly. 4. Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner. 5. The construction timeframes must be co-ordinated with Council to minimise conflicts with other intended projects and community events within the area and to minimise cumulative impacts on the community. 6. Where businesses identify a potential significant economic impact during consultation, a specialist socio-economic impact assessment would be undertaken to confirm impacts and identify suitable mitigation measures.
Landscape character and visual amenity	1. The material palettes associated with the footpath upgrades will integrate with existing Town Green developments. 2. Tree and plant selection associated with the landscaping of the inner bank should be carried out in consultation with Council. 3. Landscaping is to be managed in accordance with Transport's landscape guideline, 2013. 4. Any security lighting of the site will minimise light spill and ensure that no residential property is affected by additional lighting.
Waste	1. A Waste Management Plan must be prepared that follows the Roads and Maritime Services Technical Guide: Management of road construction and maintenance waste. 2. Lead paint materials are to be managed in accordance with the Australian Standard AS4361.1 'Guide to Lead Paint Management – Part 1 Industrial Applications 1995'. 3. Resource management hierarchy principles are to be followed: • Avoid unnecessary resource consumption as a priority. • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery). • Disposal is undertaken as a last resort (in accordance with the Waste Avoidance & Resource Recovery Act 2001).

Safeguards for the proposed work	
	4. If vegetation is to be mulched and transported off site for beneficial reuse, it is to be assessed for the presence of weeds, pest, and other disease and a Mulch Management Plan prepared in accordance with the Roads and Maritime Technical Procedure: Mulch Management 5. Bulk project waste (e.g. fill) sent to a site not owned by Transport (excluding EPA licensed landfills and resource recovery facilities) is to have prior formal written approval from the landowner, in accordance with Environmental Direction No. 20 – Legal Off-site Disposal of Roads and Maritime Services Waste. This includes waste transported for reuse, recycling, disposal or stockpiling. 6. If coal tar asphalt is identified and is to be removed, it is to be disposed of to landfill in accordance with Roads and Maritime Environmental Direction No.21 – Coal Tar Asphalt Handling and Disposal. 7. There is to be no disposal or re-use of construction waste on to other land. 8. Waste is not to be burnt on site. 9. Waste material, other than vegetation and tree mulch, is not to be left on site once the works have been completed. 10. Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day. 11. All wastewater from vessels is to be discharged at an approved vessel wastewater disposal facility. No vessel wastewater is to be discharged (i.e. pumped out) directly into the water or onto any land adjacent. 12. Although no asbestos is known to be present on site removal of this material must be undertaken in accordance with Working with Asbestos: Guide 2008 published by WorkCover Australia, if encountered.
General	1. If the scope of the works changes at any time, review the project under the *Roads and Maritime Services Environmental assessment procedure for routine and minor works (EIA-PO5-1)* and complete any further requirements prior to undertaking works associated with the changed scope. 2. A Construction Environmental Management Plan is to be prepared in accordance with the specifications set out in the *QA Specification G36 – Environmental Protection (Management System), QA Specification G38 – Soil and Water Management (Soil and Water Plan) and QA Specification G10 - Traffic Management* and implemented prior to the commencement of works. 3. Parking of vehicles and storage of plant/equipment is to occur on existing paved areas. Where this is not possible, vehicles and plant/equipment are to be kept away from environmentally sensitive areas and outside the dripline of trees. 4. Any access to waterways using barges/boats or similar is to be via an existing boat ramp with no disturbance to the bank or surrounding vegetation.

5.1 Licensing and approvals

List of licences and/or approvals required for the proposal:

Instrument	Requirement	Timing
Fisheries Management Act 1994 (s199)	Notification to the Minister for Primary Industries prior to any dredging or reclamation works.	A minimum of 28 days prior to the start of work.
Fisheries Management Act 1994 (s205)	Permit to harm marine vegetation from the Minister for Primary Industries.	Prior to start of the activity.
Crown Land Management Act 2016 (Division 3.4, 5.5 and 5.6)	Licence or lease to occupy areas of Crown land.	Prior to start of the activity
Marine Safety Regulation 2016 (s97(1))	Aquatic license for works on navigable waters.	Prior to start of the activity.

Approval from Council will be required for the use of Council's stockpile site at John Fraser Place. A copy of this REF will be provided to Council to assist with obtaining that approval.

6. Certification, review and decision

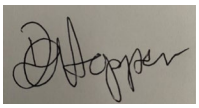
6.1 Certification

This minor works REF provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal.

Prepared by:

Lisa Proctor
Director
Blue Sky Planning and Environment
24 May 2022

Minor Works REF reviewed by:



Dave Hopper
Project Manager
Date: 24 May 2022

6.2 Environment staff review

The Minor Works REF has been reviewed and considered against the requirements of sections 5.5 and 5.7 of the EP&A Act.

In considering the proposal this assessment has examined and taken into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity as addressed in the Minor Works REF and associated information. This assessment is considered to be in accordance with the factors required to be considered under clause 228 of the Environmental Planning and Assessment Regulation 2000.

The proposal described in the Minor Works REF will have some environmental impacts which can be ameliorated satisfactorily. Having regard to the safeguard and management measures proposed, this assessment has considered that these impacts are unlikely to be significant and therefore an approval for the proposal does not need to be sought under Division 5.2 of the EP&A Act.

The assessment has considered the potential impacts of the activity on areas of outstanding value and on threatened species, ecological communities or their habitats for both terrestrial and aquatic species as defined by the *Biodiversity Conservation Act 2016* and the *Fisheries Management Act 1994*.

The proposal described in the Minor Works REF will not affect areas of outstanding value. The activity described in the Minor Works REF will not significantly affect threatened species ecological communities or their habitats. Therefore a species impact statement is not required.

The assessment has also addressed the potential impacts on the activity on matters of national environmental significance and any impacts on the environment of Commonwealth land and concluded that there will be no significant impacts. Therefore there is no need for a referral to be made to the Australian Government Department of the Environment and Energy for a decision by the Commonwealth Minister for the Environment and Energy on whether assessment and approval is required under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Minor Works REF is considered to meet all relevant requirements.

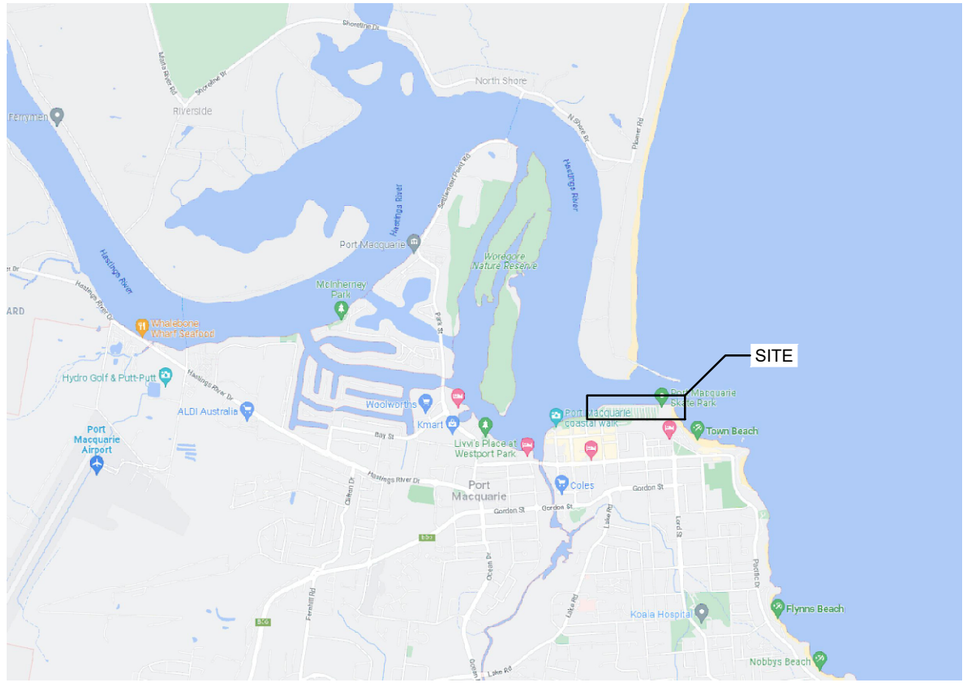
Appendix A

Plans of Proposal

DRAWING No.
PA2696-RHD-00-00-DR-ME-0001

DO NOT SCALE

PORT MACQUARIE
SOUTHERN BREAKWATER UPGRADE
FOR
TRANSPORT FOR NSW



LOCALITY PLAN

DRAWING LIST	
PA2696-RHD-00-00-DR-ME-0001	TITLE SHEET, LOCALITY AND DRAWING LIST
PA2696-RHD-00-00-DR-ME-0011	GENERAL NOTES
PA2696-RHD-00-00-DR-ME-1000	OVERVIEW PLAN
PA2696-RHD-00-00-DR-ME-1012	CONSTRUCTION AND SITE ESTABLISHMENT PLAN
PA2696-RHD-00-00-DR-ME-1101	DEMOLITION PLAN SHEET 1
PA2696-RHD-00-00-DR-ME-1102	DEMOLITION PLAN SHEET 2
PA2696-RHD-00-00-DR-ME-1103	DEMOLITION PLAN SHEET 3
PA2696-RHD-00-00-DR-ME-1104	DEMOLITION PLAN SHEET 4
PA2696-RHD-00-00-DR-ME-1201	DETAIL PLAN SHEET 1
PA2696-RHD-00-00-DR-ME-1202	DETAIL PLAN SHEET 2
PA2696-RHD-00-00-DR-ME-1203	DETAIL PLAN SHEET 3
PA2696-RHD-00-00-DR-ME-1204	DETAIL PLAN SHEET 4
PA2696-RHD-00-00-DR-ME-1301	SETOUT TABLE
PA2696-RHD-CI-00-DR-ME-2000	BREAKWATER TYPICAL SECTIONS SHEET 1
PA2696-RHD-CI-00-DR-ME-2001	BREAKWATER TYPICAL SECTIONS SHEET 1
PA2696-RHD-CI-00-DR-ME-2002	FOOTPATH AND SEASIDE RETAINING WALL TYPICAL SECTIONS
PA2696-RHD-CI-00-DR-ME-2301	ACCESS RAMP DETAIL PLAN
PA2696-RHD-CI-00-DR-ME-2302	ACCESS RAMP LONG SECTION AND JOINT PLAN
PA2696-RHD-CI-00-DR-ME-2311	ACCESS RAMP TYPICAL SECTION
PA2696-RHD-CI-00-DR-ME-2401	RETAINIG WALL LONG-SECTIONS SHEET 1
PA2696-RHD-CI-00-DR-ME-2402	RETAINIG WALL LONG-SECTIONS SHEET 2
PA2696-RHD-CI-00-DR-ME-2403	RETAINIG WALL LONG-SECTIONS SHEET 3
PA2696-RHD-ST-00-DR-ME-3011	STRUCTURAL DETAILS RETAINING WALL
PA2696-RHD-ST-00-DR-ME-3012	STRUCTURAL DETAILS LANDSIDE RETAINING WALL
PA2696-RHD-ST-00-DR-ME-3013	STRUCTURAL DETAILS FOOTPATH AND SEASIDE RETAINING WALL
PA2696-RHD-ST-00-DR-ME-3014	STRUCTURAL DETAILS KERB OPENING
PA2696-RHD-ST-00-DR-ME-3015	TYPICAL JOINT DETAILS FOOTPATH AND RETAINING WALLS
PA2696-RHD-ST-00-DR-ME-3021	STRUCTURAL DETAILS STAIRS
PA2696-RHD-ST-00-DR-ME-3022	STRUCTURAL DETAILS ADJACENT TO SKATE PARK
PA2696-RHD-CI-00-DR-ME-4000	BREAKWATER AND FOOTPATH CONTROL LINE LONG SECTION
PA2696-RHD-CI-00-DR-ME-4001	LANDSIDE DETAIL CROSS SECTIONS SHEET 1
PA2696-RHD-CI-00-DR-ME-4002	LANDSIDE DETAIL CROSS SECTIONS SHEET 2
PA2696-RHD-CI-00-DR-ME-4003	LANDSIDE DETAIL CROSS SECTIONS SHEET 3
PA2696-RHD-CI-00-DR-ME-4004	LANDSIDE DETAIL CROSS SECTIONS SHEET 4
PA2696-RHD-CI-00-DR-ME-4101	BREAKWATER CROSS SECTIONS SHEET 1
PA2696-RHD-CI-00-DR-ME-4102	BREAKWATER CROSS SECTIONS SHEET 2
PA2696-RHD-CI-00-DR-ME-4103	BREAKWATER CROSS SECTIONS SHEET 3
PA2696-RHD-CI-00-DR-ME-4104	BREAKWATER CROSS SECTIONS SHEET 4
PA2696-RHD-CI-00-DR-ME-4105	BREAKWATER CROSS SECTIONS SHEET 5
PA2696-RHD-CI-00-DR-ME-4106	BREAKWATER CROSS SECTIONS SHEET 6
PA2696-RHD-CI-00-DR-ME-4107	BREAKWATER CROSS SECTIONS SHEET 7
PA2696-RHD-CI-00-DR-ME-4108	BREAKWATER CROSS SECTIONS SHEET 8
PA2696-RHD-CI-00-DR-ME-4109	BREAKWATER CROSS SECTIONS SHEET 9
PA2696-RHD-CI-00-DR-ME-4110	BREAKWATER CROSS SECTIONS SHEET 10
PA2696-RHD-CI-00-DR-ME-4111	BREAKWATER CROSS SECTIONS SHEET 11

NOT FOR CONSTRUCTION | **D2** | **FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

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WARNING

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"DIAL BEFORE YOU DIG" - 1100

IT IS ESSENTIAL THAT BEFORE ANY EXCAVATION WORK IS UNDERTAKEN, FURTHER INVESTIGATION INTO THE LOCATION OF SERVICES SHOULD BE CARRIED OUT WITH THE RELEVANT AUTHORITY.

REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.JUL.2022	ISSUED FOR TENDER	BAM	DM	
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

TITLE SHEET, LOCALITY AND DRAWING LIST

Royal HaskoningDHV
Enhancing Society Together

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99209960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	02.02.2022
SCALE	REF: PA2696-RHD-00-00-M2-TITLE SHEET		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-0001	D2	P03

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DRAWING No.
PA2696-RHD-00-00-DR-ME-0011

DO NOT SCALE

GENERAL NOTES

1. THE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS, SPECIFICATIONS AND WITH SUCH OTHER WRITTEN INSTRUCTIONS AS MAY BE ISSUED DURING THE COURSE OF THE CONTRACT.
2. THE CONTRACTOR'S WORK AREA IS CONFINED TO THE SITE AS SHOWN ON THESE DRAWINGS UNLESS NOTED OTHERWISE AND TO BE CONFIRMED BY THE PRINCIPAL'S REPRESENTATIVE PRIOR TO CONSTRUCTION. NO WORK IS TO BE CARRIED OUT ON ADJOINING PROPERTIES WITHOUT WRITTEN PERMISSION FROM THE OWNER(S).
3. NO WORKS ARE TO BE UNDERTAKEN OUTSIDE OF THE EXTENT OF WORKS SHOWN ON THE DRAWINGS UNLESS INSTRUCTED BY THE PRINCIPAL'S REPRESENTATIVE.
4. ALL NEW WORKS SHALL MAKE A SMOOTH TRANSITION WITH THE EXISTING SITE.
5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL WORKS ARE CARRIED OUT IN ACCORDANCE WITH WORKPLACE HEATH & SAFETY (WHS) LEGISLATION APPLICABLE IN NSW.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.
7. ALL LEVELS ARE IN METRES RELATIVE TO AUSTRALIAN HEIGHT DATUM (AHD) UNLESS OTHERWISE NOTED.
8. A DETAILED TOPOGRAPHIC AND BATHYMETRIC SURVEY WAS PROVIDED BY NORTH COAST SURVEYS. UNLESS STATED OTHERWISE, ALL TOPOGRAPHIC AND BATHYMETRIC INFORMATION USED FOR THIS DESIGN WAS SOURCED FROM THIS SURVEY. HORIZONTAL POSITIONING IS TO THE MAP GRID OF AUSTRALIA (MGA) ZONE 56.
9. ANY DISCREPANCIES BETWEEN THESE DRAWINGS AND OTHER DOCUMENTATION SHALL BE REFERRED TO THE PRINCIPAL'S REPRESENTATIVE AS APPOINTED BY THE PRINCIPAL PRIOR TO PROCEEDING WITH THE WORK.
10. ALL MATERIALS AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE RELEVANT AND CURRENT AUSTRALIAN STANDARDS AND WITH THE BY-LAWS AND ORDINANCES OF THE RELEVANT BUILDING AUTHORITIES EXCEPT WHERE VARIED BY THE SPECIFICATION AND THE DRAWINGS.
11. ALL CRITICAL ARRANGEMENTS AND DIMENSIONS, INCLUDING SURVEY SHALL BE VERIFIED BY THE CONTRACTOR ON SITE BEFORE WORK COMMENCES. DRAWINGS SHALL NOT BE SCALED FOR DIMENSIONS.
12. DURING CONSTRUCTION THE STRUCTURE SHALL BE MAINTAINED IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED. TEMPORARY BRACING AND BATTERS SHALL BE PROVIDED BY THE CONTRACTOR TO KEEP THE WORKS AND EXCAVATIONS STABLE AT ALL TIMES.
13. THE CONTRACTOR SHALL PROVIDE WRITTEN EVIDENCE THAT THE MATERIALS USED COMPLY WITH THE SPECIFICATION.
14. THE CONTRACTOR SHALL CARRY OUT THE WORKS COGNISANT OF THE SITE BEING SUBJECT TO TIDALLY VARIANT MARINE CONDITIONS INCLUDING ESTUARINE AND METOCEAN VARIATIONS (WIND, WAVES, STORM TIDE, FLOOD FLOWS).
15. THE CONTRACTOR SHALL PRESERVE EXISTING INFRASTRUCTURE TO REMAIN, INCLUDING ALL EXISTING SERVICES.
16. ALL EXISTING SERVICES AND UTILITIES SHALL BE LOCATED, EXPOSED, LEVELLED AND RECORDED PRIOR TO COMMENCEMENT OF ANY WORKS. ALL INFORMATION SHOWING SERVICES AND UTILITIES ON THESE DRAWINGS IS FOR GUIDANCE ONLY AND ITS ACCURACY IS NOT GUARANTEED.
17. ALL EXCAVATED, DEMOLISHED AND EXCESS MATERIALS SHALL BE LAWFULLY DISPOSED OF BY THE CONTRACTOR UNLESS NOTED OTHERWISE BY THE SPECIFICATION HEREIN OR BY THE DRAWINGS.
18. ALL WORK SHOWN ON THE DRAWINGS IS NEW, TO BE SUPPLIED AND INSTALLED BY THE CONTRACTOR, UNLESS NOTED AS "EXISTING".

QUALITY ASSURANCE

19. THE CONTRACTOR SHALL IMPLEMENT A QUALITY ASSURANCE SYSTEM TO THE PRINCIPAL'S REQUIREMENTS AND SUCH THAT SATISFIES ISO 9001.
20. RECORDS SHALL BE KEPT OF ALL ASPECTS AND STAGES OF THE WORK. DURING THE COURSE OF CONSTRUCTION, THE CONTRACTOR SHALL MAINTAIN ACCURATE AND UP TO DATE RECORDS AND SHALL CONVEY SUCH RECORDS TO THE PRINCIPAL'S REPRESENTATIVE.

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

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P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

GENERAL NOTES

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel: +61 2 88545000
Fax: +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	02.02.2022
SCALE	REF	PA2696-RHD-00-00-M2-TITLE SHEET	

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-0011	D2	P03

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DRAWING No.
PA2696-RHD-00-00-DR-ME-1000

DO NOT SCALE

SURVEY LEGEND

BM	BENCH MARK
CPIT	COMMS PIT
CPL	COMMS PILLAR
EPIL	ELECTRICAL PILLAR
EPIT	ELECTRICAL PIT
FFL	FINISHED FLOOR LEVEL
FH	HYDRANT
GLY	STORM WATER GRATE
LP	LIGHT POLE
MH	MAN HOLE
RDG	RIDGE HEIGHT
SGN	SIGN
SV	STOP VALVE
SVR	STOP VALVE (RECYCLED)
TAP	TAP
WM	WATER METER
BIN	BIN
TR	TREE

- TITLE BOUNDARY
- KERB
- KERB INVERT
- ROAD CENTRELINE
- ROAD EDGE
- BOTTOM BANK
- TOP BANK
- FENCE
- ELECTRICAL (U/G)
- DRAINAGE (U/G)
- EDGE CONCRETE
- EDGE ROCK

NOTES

1. COORDINATE SYSTEM: GDA94 MGA56
2. AERIAL PHOTOGRAPH SOURCED FROM NEARMAP, DATED 29/08/2021.
3. TOPOGRAPHIC AND BATHYMETRIC SURVEY BY NORTH COAST SURVEYS, DATED 29/07/2021.
4. REFER DRG 3011 TO 3012 FOR RETAINING WALL DETAILS. REFER DRG 2401 TO 2403 FOR RETAINING WALL LONG-SECTIONS.
5. 3D MODEL FILES WILL BE PROVIDED TO ASSIST IN LOCATING AREA FOR PLACEMENT OF TOP UP (TYPE B AND C) ARMOUR UNITS. CONTRACTOR TO CONFIRM PRE AND POST CONSTRUCTION SURVEY.
6. CONTRACTOR TO UNDERTAKE DIAL BEFORE YOU DIG. ALL SERVICES ARE TO BE IDENTIFIED, MARKED, LOCATED AND PROTECTED. ROOTS OF TREES ARE NOT TO BE COVERED WITH FILL, CUT OR DISTURBED. IF REQUIRED THIS CONSTITUENTS A HOLD POINT WITH AN ARBORIST AND DESIGNER TO INSPECT THE TREE ROOTS.

ROCK AND FILL QUANTITIES		
ITEM	QTY	UNITS
TO BE COMPLETED		m^3
		m^3

LEGEND

- BATHYMETRIC SURVEY (MULTI-BEAM)
- BATHYMETRY + DRONE PHOTOGRAMMETRY)
- TOPOGRAPHIC SURVEY (DETAIL TOPO SURVEY)
- SOLAR LIGHT AT 7.5m INTERVALS (HALFWAY BETWEEN DCJs) (NOT SHOWN TO SCALE FOR CLARITY)
- BREAKWATER - INDIVIDUAL ROCKS TYPE B AND C (REFER DRG 2001 AND NOTE 5)
- BREAKWATER - TYPE A (REFER DRG 2001)
- LANDSCAPE (REFER DRG 2002)
- FOOTPATH AND ACCESS RAMP (5m FOOTPATH - REFER DRG 2002) (RAMP - REFER DRG 2301 - 2311)
- RETAINING WALLS (REFER DRG 3011 AND 3012)
- CONCRETE STAIRS (REFER DRG 3021)
- EXCAVATION
- HANDRAIL

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

20 0 20 40 60 80 100m

1:2000 (A3) 1:1000 (A1)

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REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

OVERVIEW PLAN

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF.		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1000	D2	P03

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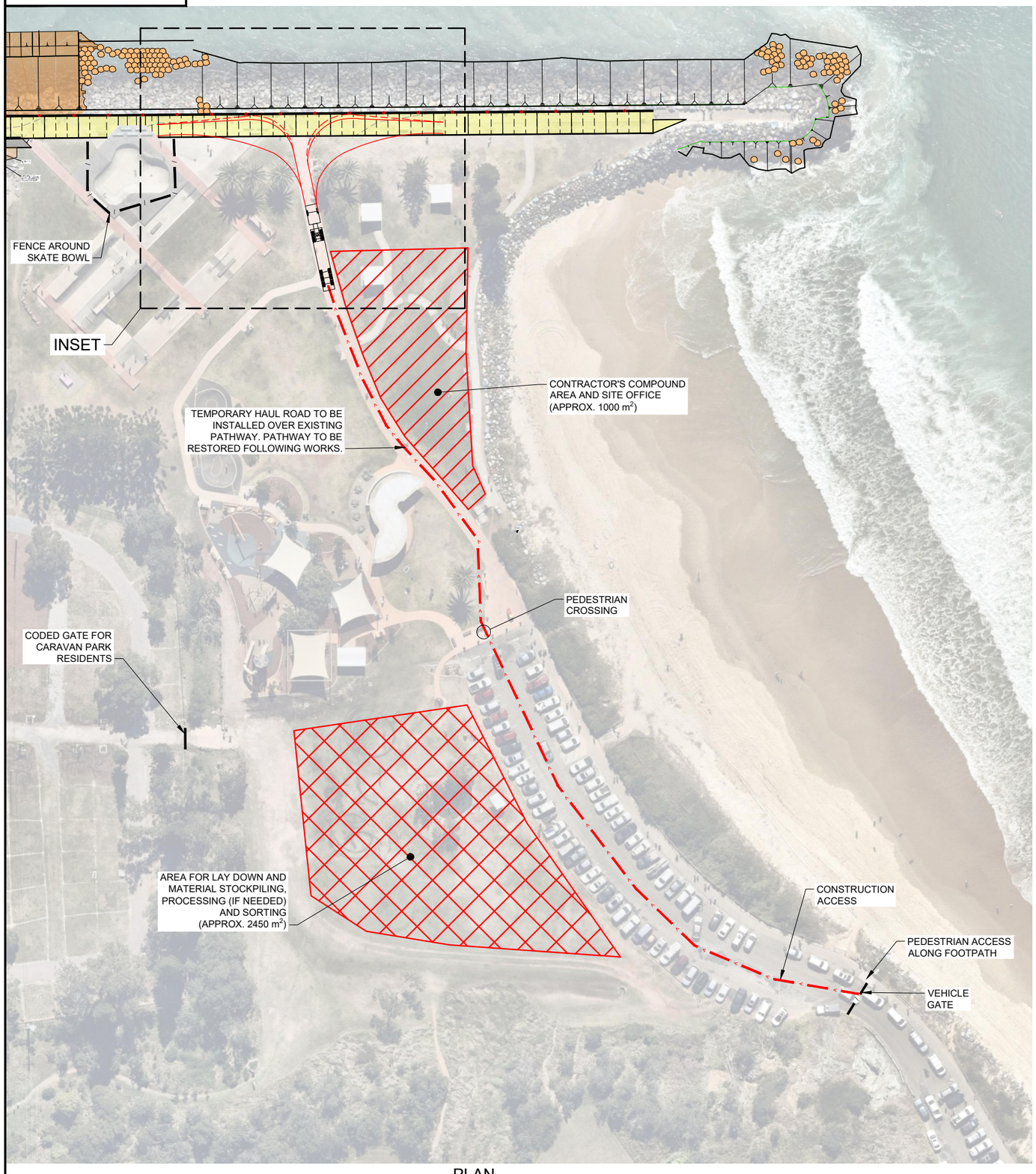
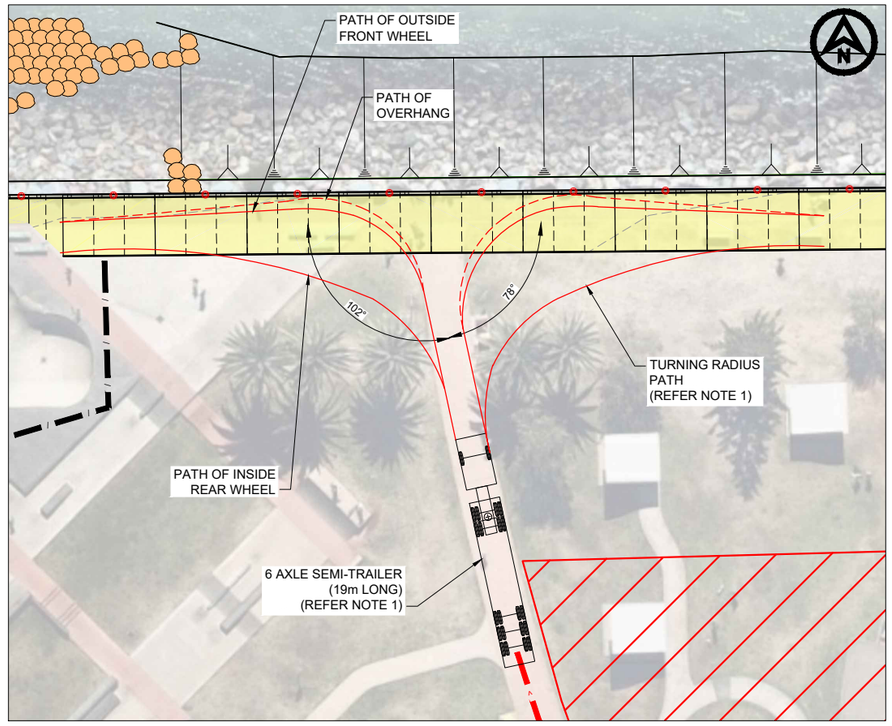
DRAWING No.
PA2696-RHD-00-00-DR-ME-1001

DO NOT SCALE



PLAN
1:500 (A1)



INSET
1:250 (A1)

NOTES

1. VEHICLE SIZE AND TURNING RADIUS BASED ON AUSTROADS DESIGN PRIME MOVER & SEMI-TRAILER (19m), TURNING SPEED 0-5 km/h
2. CONTRACTOR TO BE RESPONSIBLE FOR INSTALLATION OF TEMPORARY BARRIERS AS REQUIRED FOR SAFE ACCESS OF CONSTRUCTION VEHICLES.
3. CONSTRUCTION TRAFFIC MANAGEMENT IS THE RESPONSIBILITY OF THE CONTRACTOR. SWEPT PATH INFORMATION IS PROVIDED FOR INFORMATION ONLY.

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

10 0 10 20 30 40 50m
1:1000 (A3) 1:500 (A1)

5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

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REVISIONS

CLIENT
NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
CONSTRUCTION AND SITE ESTABLISHMENT PLAN

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com
Royal HaskoningDHV
Enhancing Society Together

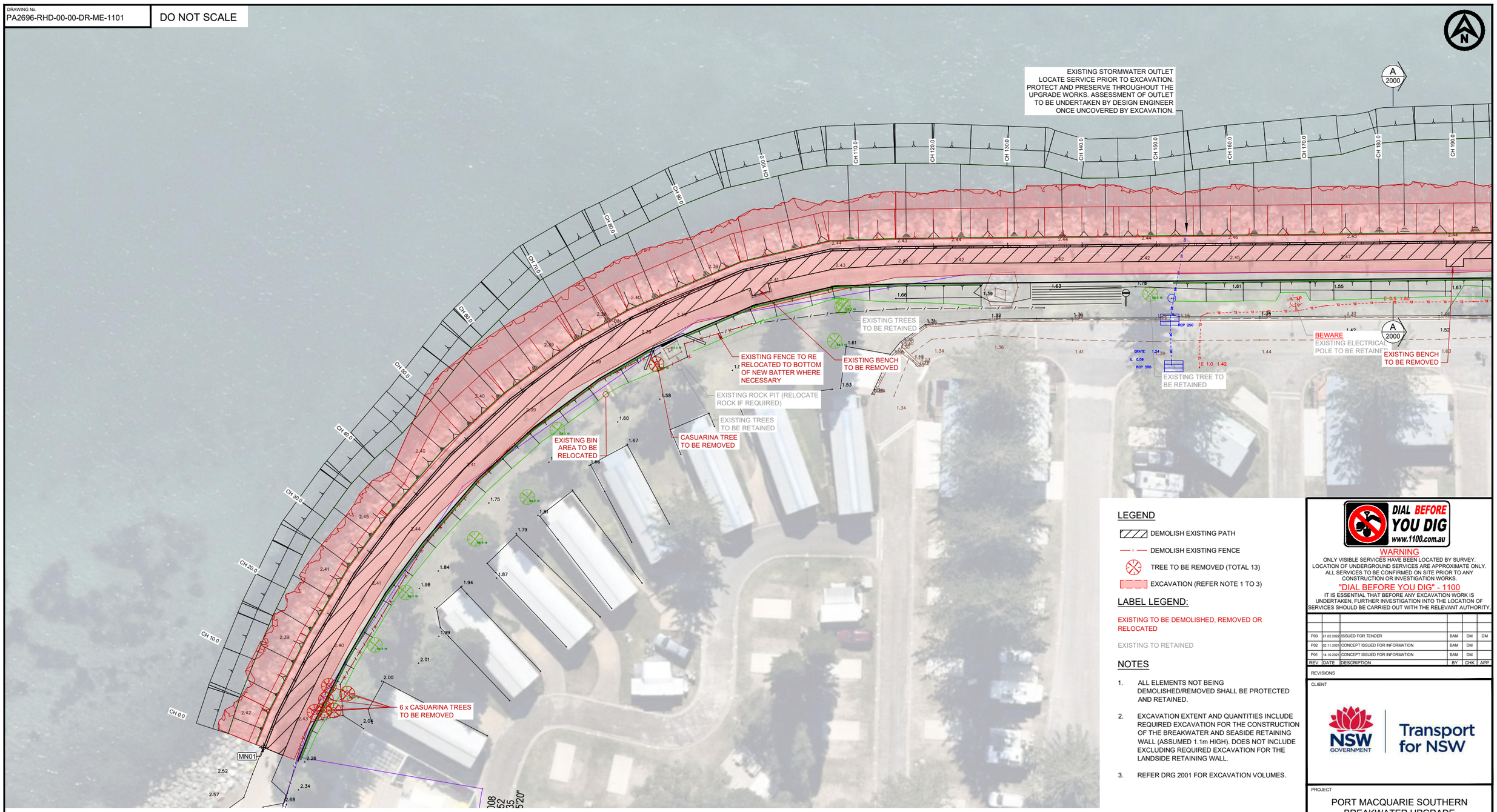
DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	21.02.2022
SCALE	REF:		
AS SHOWN	PA2696-RHD-CI-00-M3-CIVIL-SITE COMPOUND		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1001	S2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-CI-00-M3-CIVIL-SITE COMPOUND

DRAWING No.
PA2696-RHD-00-00-DR-ME-1101

DO NOT SCALE



PLAN
1:250 (A1)

LEGEND

- DEMOLISH EXISTING PATH
- DEMOLISH EXISTING FENCE
- TREE TO BE REMOVED (TOTAL 13)
- EXCAVATION (REFER NOTE 1 TO 3)

LABEL LEGEND:

EXISTING TO BE DEMOLISHED, REMOVED OR RELOCATED

EXISTING TO RETAINED

NOTES

1. ALL ELEMENTS NOT BEING DEMOLISHED/REMOVED SHALL BE PROTECTED AND RETAINED.
2. EXCAVATION EXTENT AND QUANTITIES INCLUDE REQUIRED EXCAVATION FOR THE CONSTRUCTION OF THE BREAKWATER AND SEASIDE RETAINING WALL (ASSUMED 1.1m HIGH). DOES NOT INCLUDE EXCLUDING REQUIRED EXCAVATION FOR THE LANDSIDE RETAINING WALL.
3. REFER DRG 2001 FOR EXCAVATION VOLUMES.

5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

DEMOLITION PLAN
SHEET 1

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF.		
AS SHOWN	PA2696-RHD-00-00-M3-DEMO PLANS		

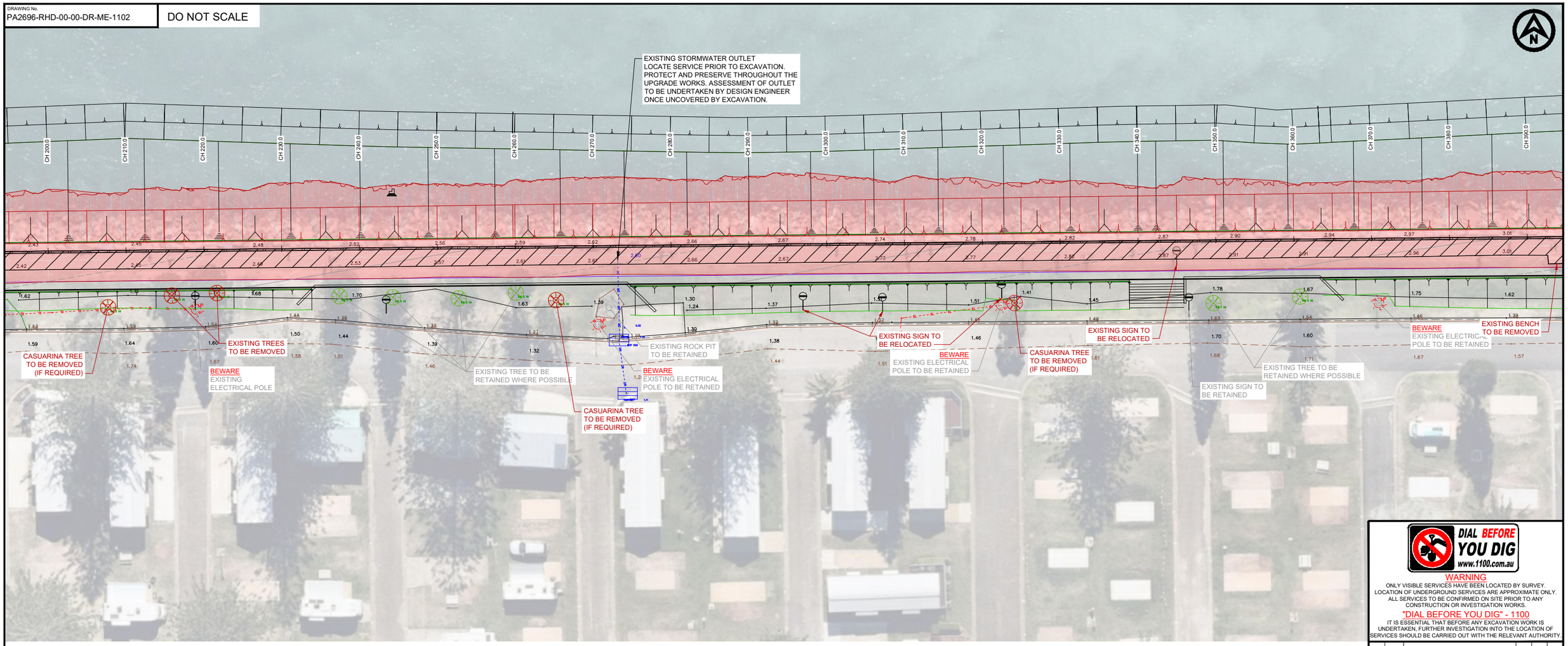
DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1101	D2	P03

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-DEMO PLANS

DRAWING No.
PA2696-RHD-00-00-DR-ME-1102

DO NOT SCALE



PLAN
1:250 (A1)

LEGEND

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- DEMOLISH EXISTING FENCE
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LABEL LEGEND:

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5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT
NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
DEMOLITION PLAN
SHEET 2

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com
Royal HaskoningDHV
Enhancing Society Together

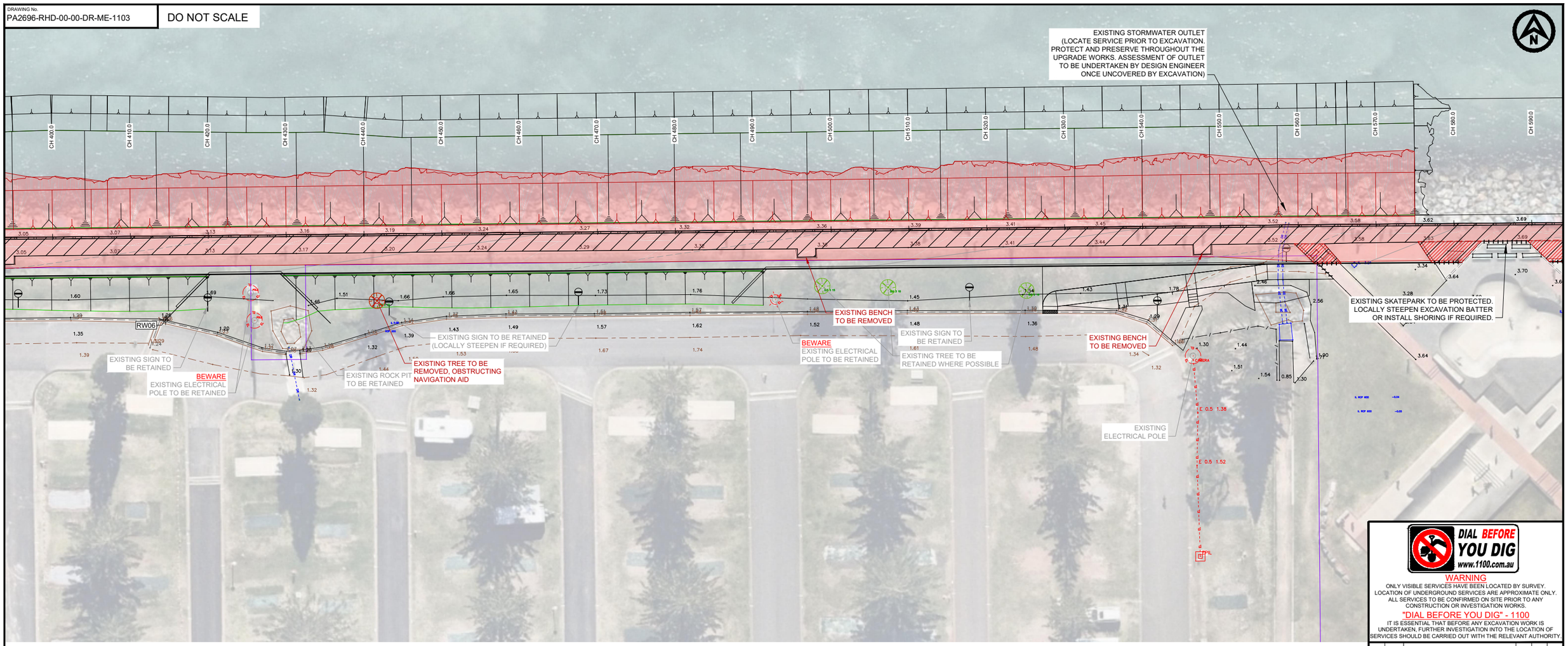
DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-DEMO PLANS		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1102	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-DEMO PLANS

DRAWING No.
PA2696-RHD-00-00-DR-ME-1103

DO NOT SCALE



PLAN
1:250 (A1)

LEGEND

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- DEMOLISH EXISTING FENCE
- TREE TO BE REMOVED (TOTAL 13)
- EXCAVATION (REFER NOTE 1 TO 3)

LABEL LEGEND:

EXISTING TO BE DEMOLISHED, REMOVED OR RELOCATED

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5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

DIAL BEFORE YOU DIG www.1100.com.au

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REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

DEMOLITION PLAN
SHEET 3

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99200960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF:		
AS SHOWN	PA2696-RHD-00-00-M3-DEMO PLANS		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1103	D2	P03

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DRAWING No.
PA2696-RHD-00-00-DR-ME-1104

DO NOT SCALE

PLAN
1:250 (A1)

LEGEND

- DEMOLISH EXISTING PATH
- DEMOLISH EXISTING FENCE
- TREE TO BE REMOVED (TOTAL 13)
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1:500 (A3) 1:250 (A1)

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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
DEMOLITION PLAN
SHEET 4

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
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SCALE	REF.		
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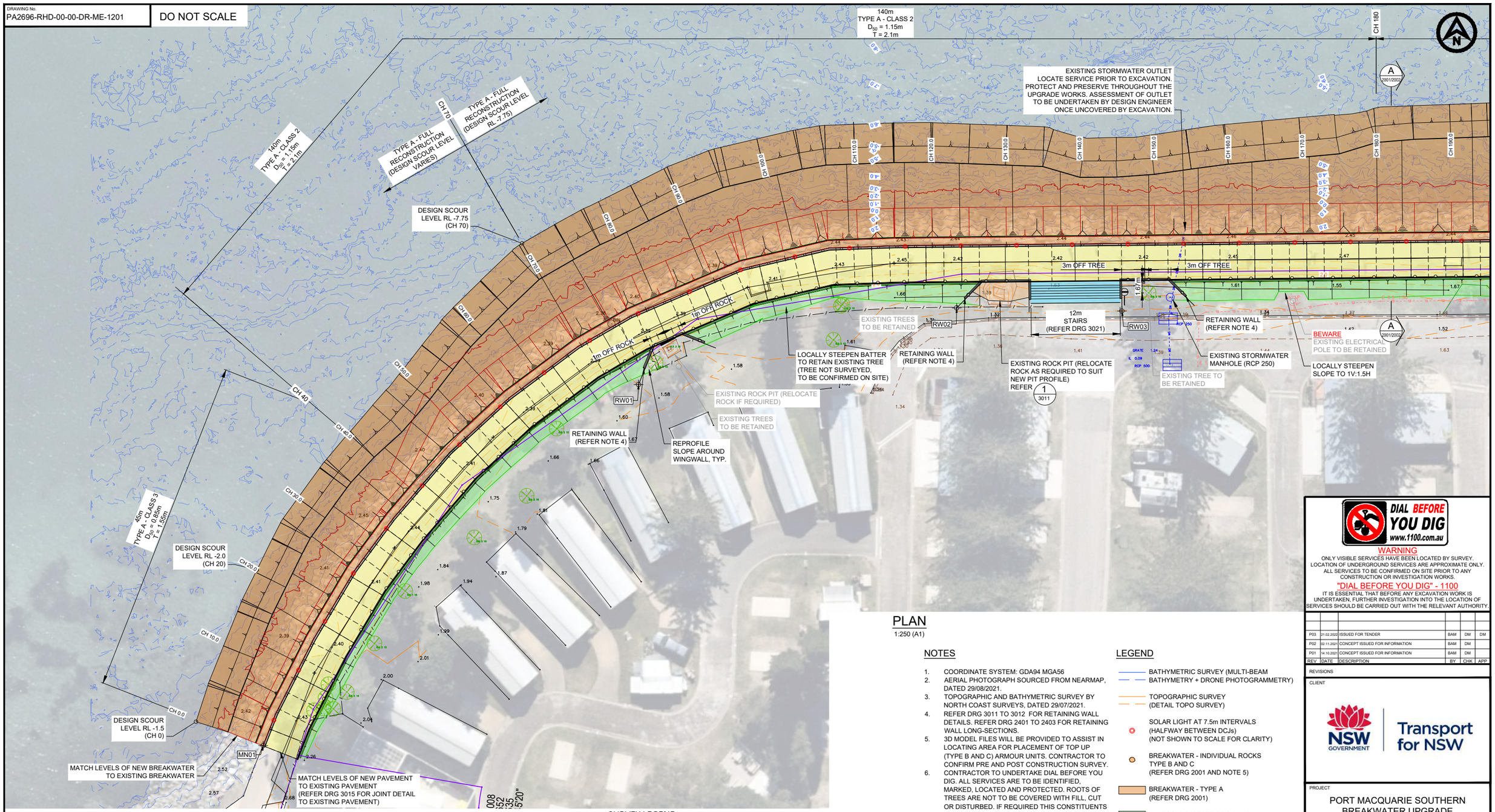
DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1104	D2	P03

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-DEMO PLANS

DRAWING No.
PA2696-RHD-00-00-DR-ME-1201

DO NOT SCALE



PLAN
1:250 (A1)

NOTES

1. COORDINATE SYSTEM: GDA94 MGA56
2. AERIAL PHOTOGRAPH SOURCED FROM NEARMAP, DATED 29/08/2021.
3. TOPOGRAPHIC AND BATHYMETRIC SURVEY BY NORTH COAST SURVEYS, DATED 29/07/2021.
4. REFER DRG 3011 TO 3012 FOR RETAINING WALL DETAILS. REFER DRG 2401 TO 2403 FOR RETAINING WALL LONG-SECTIONS.
5. 3D MODEL FILES WILL BE PROVIDED TO ASSIST IN LOCATING AREA FOR PLACEMENT OF TOP UP (TYPE B AND C) ARMOUR UNITS. CONTRACTOR TO CONFIRM PRE AND POST CONSTRUCTION SURVEY.
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LEGEND

- BATHYMETRIC SURVEY (MULTI-BEAM / BATHYMETRY + DRONE PHOTOGRAMMETRY)
- TOPOGRAPHIC SURVEY (DETAIL TOPO SURVEY)
- SOLAR LIGHT AT 7.5m INTERVALS (HALFWAY BETWEEN DCJs) (NOT SHOWN TO SCALE FOR CLARITY)
- BREAKWATER - INDIVIDUAL ROCKS TYPE B AND C (REFER DRG 2001 AND NOTE 5)
- BREAKWATER - TYPE A (REFER DRG 2001)
- LANDSCAPE (REFER DRG 2002)
- FOOTPATH AND ACCESS RAMP (5m FOOTPATH - REFER DRG 2002) (RAMP - REFER DRG 2301 - 2311)
- RETAINING WALLS (REFER DRG 3011 AND 3012)
- CONCRETE STAIRS (REFER DRG 3021)
- EXCAVATION
- HANDRAIL

SURVEY LEGEND

BM	BENCH MARK
CPIT	COMMS PIT
CPL	COMMS PILLAR
EPIL	ELECTRICAL PILLAR
EPIT	ELECTRICAL PIT
FFL	FINISHED FLOOR LEVEL
FH	HYDRANT
GLY	STORM WATER GRATE
LP	LIGHT POLE
MH	MAN HOLE
RDG	RIDGE HEIGHT
SGN	SIGN
SV	STOP VALVE
SVR	STOP VALVE (RECYCLED)
TAP	TAP
WM	WATER METER
BIN	BIN
TR	TREE

- TITLE BOUNDARY
- KERB
- KERB INVERT
- ROAD CENTRELINE
- ROAD EDGE
- BOTTOM BANK
- TOP BANK
- FENCE
- ELECTRICAL (U/G)
- DRAINAGE (U/G)
- EDGE CONCRETE
- EDGE ROCK

5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

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NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

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REVISIONS

CLIENT
NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
DETAIL PLAN
SHEET 1

Royal HaskoningDHV
Enhancing Society Together
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North Sydney NSW 2060
Australia
Tel +61 2 88545000
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DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF.		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1201	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-00-00-DR-ME-1202

DO NOT SCALE

260m
TYPE A - CLASS 3
D_{50} = 0.85m
T = 1.55m

EXISTING STORMWATER OUTLET
LOCATE SERVICE PRIOR TO EXCAVATION.
PROTECT AND PRESERVE THROUGHOUT THE UPGRADE WORKS. ASSESSMENT OF OUTLET TO BE UNDERTAKEN BY DESIGN ENGINEER ONCE UNCOVERED BY EXCAVATION.

CH 200.0 CH 210.0 CH 220.0 CH 230.0 CH 240.0 CH 250.0 CH 260.0 CH 270.0 CH 280.0 CH 290.0 CH 300.0 CH 310.0 CH 320.0 CH 330.0 CH 340.0 CH 350.0 CH 360.0 CH 370.0 CH 380.0 CH 390.0

D 2002

3m OFF TREE

RW04

RETAINING WALL (REFER NOTE 4)

1.17m 1.38m 1.58m 0.94m

EXISTING ROCK PIT TO BE RETAINED

BEWARE EXISTING ELECTRICAL POLE

EXISTING TREE TO BE RETAINED WHERE POSSIBLE

BEWARE EXISTING ELECTRICAL POLE TO BE RETAINED

BEWARE EXISTING ELECTRICAL POLE TO BE RETAINED

LOCALLY STEEPEN SLOPE TO 1V:1.5H

RW05

7m STAIRS (REFER DRG 3021)

3.13m

EXISTING SIGN TO BE RETAINED

3m OFF TREE

2.38m

RETAINING WALL (REFER NOTE 4)

EXISTING TREE TO BE RETAINED WHERE POSSIBLE

BEWARE EXISTING ELECTRICAL POLE TO BE RETAINED

LOCALLY STEEPEN SLOPE TO 1V:1.5H

PLAN
1:250 (A1)

SURVEY LEGEND

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CPIT	COMMS PIT
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GLY	STORM WATER GRATE
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- EDGE CONCRETE
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NOTES

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- EXCAVATION
- HANDRAIL

5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

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REVISIONS

CLIENT
NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
DETAIL PLAN
SHEET 2

Level 15, 99 Mount Street
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SCALE	REF		
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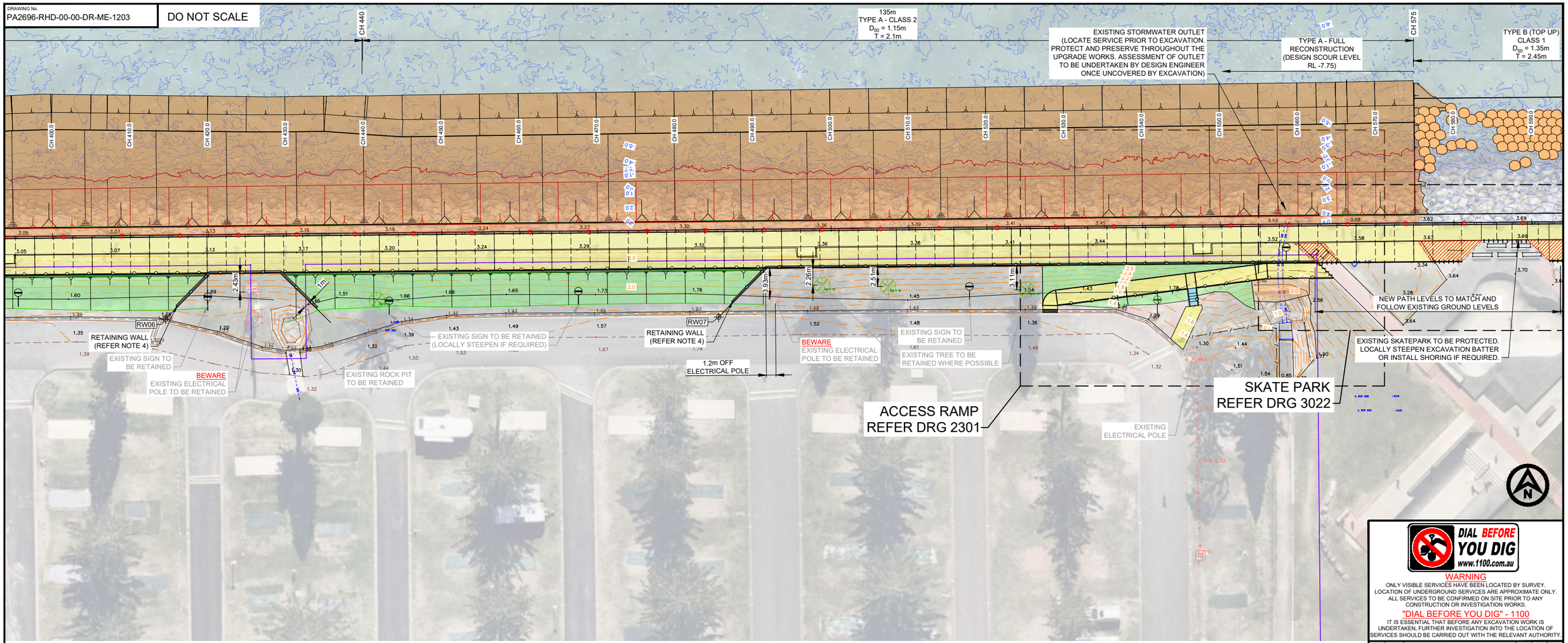
DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1202	D2	P03

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-00-00-DR-ME-1203

DO NOT SCALE



PLAN
1:250 (A1)

SURVEY LEGEND

BM	BENCH MARK
CPIT	COMMS PIT
CPL	COMMS PILLAR
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FFL	FINISHED FLOOR LEVEL
FH	HYDRANT
GLY	STORM WATER GRATE
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MH	MAN HOLE
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SGN	SIGN
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SVR	STOP VALVE (RECYCLED)
TAP	TAP
WM	WATER METER
BIN	BIN
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- TITLE BOUNDARY
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4. REFER DRG 3011 TO 3012 FOR RETAINING WALL DETAILS. REFER DRG 2401 TO 2403 FOR RETAINING WALL LONG-SECTIONS.
5. 3D MODEL FILES WILL BE PROVIDED TO ASSIST IN LOCATING AREA FOR PLACEMENT OF TOP UP (TYPE B AND C) ARMOUR UNITS. CONTRACTOR TO CONFIRM PRE AND POST CONSTRUCTION SURVEY.
6. CONTRACTOR TO UNDERTAKE DIAL BEFORE YOU DIG. ALL SERVICES ARE TO BE IDENTIFIED, MARKED, LOCATED AND PROTECTED. ROOTS OF TREES ARE NOT TO BE COVERED WITH FILL, CUT OR DISTURBED. IF REQUIRED THIS CONSTITUENTS A HOLD POINT WITH AN ARBORIST AND DESIGNER TO INSPECT THE TREE ROOTS.

LEGEND

- BATHYMETRIC SURVEY (MULTI-BEAM)
- BATHYMETRY + DRONE PHOTOGRAMMETRY)
- TOPOGRAPHIC SURVEY (DETAIL TOPO SURVEY)
- SOLAR LIGHT AT 7.5m INTERVALS (HALFWAY BETWEEN DCJs) (NOT SHOWN TO SCALE FOR CLARITY)
- BREAKWATER - INDIVIDUAL ROCKS TYPE B AND C (REFER DRG 2001 AND NOTE 5)
- BREAKWATER - TYPE A (REFER DRG 2001)
- LANDSCAPE (REFER DRG 2002)
- FOOTPATH AND ACCESS RAMP (5m FOOTPATH - REFER DRG 2002) (RAMP - REFER DRG 2301 - 2311)
- RETAINING WALLS (REFER DRG 3011 AND 3012)
- CONCRETE STAIRS (REFER DRG 3021)
- EXCAVATION
- HANDRAIL

3 0 3 6 9 12 15m
1:300 (A3) 1:150 (A1)

5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT
NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
DETAIL PLAN
SHEET 3

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com
Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1203	D2	P03

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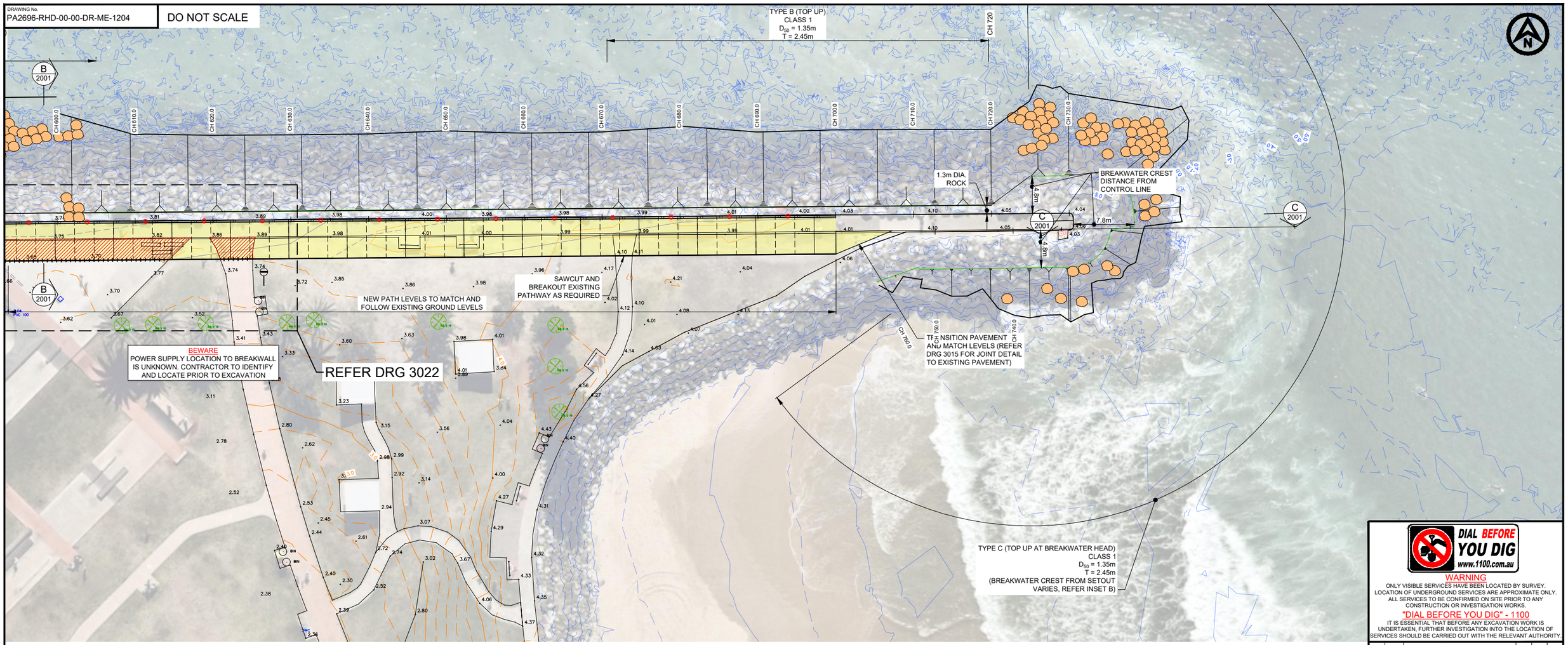
DRAWING No.
PA2696-RHD-00-00-DR-ME-1204

DO NOT SCALE



PLAN
1:250 (A1)

SURVEY LEGEND

BM	BENCH MARK
CPIT	COMMS PIT
CPL	COMMS PILLAR
EPIL	ELECTRICAL PILLAR
EPIT	ELECTRICAL PIT
FFL	FINISHED FLOOR LEVEL
FH	HYDRANT
GLY	STORM WATER GRATE
LP	LIGHT POLE
MH	MAN HOLE
RDG	RIDGE HEIGHT
SGN	SIGN
SV	STOP VALVE
SVR	STOP VALVE (RECYCLED)
TAP	TAP
WM	WATER METER
BIN	BIN
TR	TREE

- TITLE BOUNDARY
- KERB
- KERB INVERT
- ROAD CENTRELINE
- ROAD EDGE
- BOTTOM BANK
- TOP BANK
- FENCE
- ELECTRICAL (U/G)
- DRAINAGE (U/G)
- EDGE CONCRETE
- EDGE ROCK

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NOTES

1. COORDINATE SYSTEM: GDA94 MGA56
2. AERIAL PHOTOGRAPH SOURCED FROM NEARMAP, DATED 29/08/2021.
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- FOOTPATH AND ACCESS RAMP (5m FOOTPATH - REFER DRG 2002) (RAMP - REFER DRG 2301 - 2311)
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- CONCRETE STAIRS (REFER DRG 3021)
- EXCAVATION
- HANDRAIL

5 0 5 10 15 20 25m
1:500 (A3) 1:250 (A1)

NOT FOR CONSTRUCTION | **D2** | **FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

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NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
DETAIL PLAN
SHEET 4

Royal HaskoningDHV
Enhancing Society Together
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Australia
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Email: project.admin.australia@rhdhv.com
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DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF.		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1204	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-00-00-DR-ME-1301

DO NOT SCALE

MAIN CONTROL LINE
(BREAKWATER, 5m FOOTPATH AND SEASIDE RETAINING WALL)
(FOR LONG-SECTIONS - REFER DRG 4000)

MN01			
START	END	Length	Line Direction
CH 0.000, E 491471.256, N 6523020.561	CH 4.576, E 491472.928, N 6523024.820	4.58	N21° 26' 02.57"E
CH 4.576, E 491472.928, N 6523024.820	CH 15.950, E 491478.077, N 6523034.962	11.37	N26° 54' 47.85"E
CH 15.950, E 491478.077, N 6523034.962	CH 26.604, E 491483.522, N 6523044.120	10.65	N30° 44' 10.65"E
CH 26.604, E 491483.522, N 6523044.120	CH 35.403, E 491488.769, N 6523051.183	8.80	N36° 36' 22.30"E
CH 35.403, E 491488.769, N 6523051.183	CH 47.063, E 491496.365, N 6523060.028	11.66	N40° 39' 21.57"E
CH 47.063, E 491496.365, N 6523060.028	CH 57.932, E 491504.356, N 6523067.396	10.87	N47° 19' 15.30"E
CH 57.932, E 491504.356, N 6523067.396	CH 69.538, E 491513.666, N 6523074.326	11.61	N53° 20' 23.79"E
CH 69.538, E 491513.666, N 6523074.326	CH 77.731, E 491520.755, N 6523078.433	8.19	N59° 54' 57.27"E
CH 77.731, E 491520.755, N 6523078.433	CH 94.057, E 491535.772, N 6523084.840	16.33	N66° 53' 35.49"E
CH 94.057, E 491535.772, N 6523084.840	CH 106.084, E 491547.480, N 6523087.592	12.03	N76° 46' 27.77"E
CH 106.084, E 491547.480, N 6523087.592	CH 114.911, E 491556.301, N 6523087.907	8.83	N87° 57' 22.64"E
CH 114.911, E 491556.301, N 6523087.907	CH 259.732, E 491701.115, N 6523089.363	144.82	N89° 25' 26.14"E
CH 259.732, E 491701.115, N 6523089.363	CH 330.332, E 491771.712, N 6523089.976	70.60	N89° 30' 08.04"E
CH 330.332, E 491771.712, N 6523089.976	CH 407.121, E 491848.497, N 6523090.751	76.79	N89° 25' 18.10"E
CH 407.121, E 491848.497, N 6523090.751	CH 454.429, E 491895.803, N 6523091.197	47.31	N89° 27' 36.43"E
CH 454.429, E 491895.803, N 6523091.197	CH 495.673, E 491937.046, N 6523091.586	41.24	N89° 27' 35.43"E
CH 495.673, E 491937.046, N 6523091.586	CH 555.850, E 491997.219, N 6523092.194	60.18	N89° 25' 16.16"E
CH 555.850, E 491997.219, N 6523092.194	CH 566.430, E 492007.799, N 6523092.304	10.58	N89° 24' 10.48"E
CH 566.430, E 492007.799, N 6523092.304	CH 599.463, E 492040.831, N 6523092.562	33.03	N89° 33' 08.81"E
CH 599.463, E 492040.831, N 6523092.562	CH 611.661, E 492053.028, N 6523092.671	12.20	N89° 29' 17.63"E
CH 611.661, E 492053.028, N 6523092.671	CH 730.000, E 492171.363, N 6523093.661	118.34	N89° 31' 14.50"E
CH 730.000, E 492171.363, N 6523093.661	CH 730.771, E 492171.867, N 6523093.180	0.77	S46° 21' 20.73"E
CH 730.771, E 492171.867, N 6523093.180	CH 731.929, E 492171.912, N 6523092.023	1.16	S2° 13' 55.95"E
CH 731.929, E 492171.912, N 6523092.023	CH 732.727, E 492171.419, N 6523091.503	0.80	S43° 30' 46.21"W
CH 732.727, E 492171.419, N 6523091.503	CH 753.789, E 492150.359, N 6523091.230	21.06	S89° 15' 28.37"W
CH 753.789, E 492150.359, N 6523091.230	CH 759.928, E 492144.576, N 6523089.171	6.14	S70° 23' 59.34"W
CH 759.928, E 492144.576, N 6523089.171	CH 760.000, E 492144.512, N 6523089.139	0.07	S63° 14' 20.94"W

LANDSIDE RETAINING WALLS
(FOR LONG-SECTIONS - REFER DRG 2401 - 2403)

RW01			
START	END	Length	Line Direction
CH 0.000, E 491521.842, N 6523069.220	CH 5.523, E 491523.902, N 6523074.345	5.52	N21° 53' 35.49"E
CH 5.523, E 491523.902, N 6523074.345	CH 9.637, E 491527.686, N 6523075.959	4.11	N66° 53' 35.49"E
CH 9.637, E 491527.686, N 6523075.959	CH 14.533, E 491532.228, N 6523074.134	4.90	S68° 06' 24.51"E

RW02			
START	END	Length	Line Direction
CH 0.000, E 491564.692, N 6523079.537	CH 4.899, E 491568.123, N 6523083.034	4.90	N44° 27' 35.16"E
CH 4.899, E 491568.123, N 6523083.034	CH 11.195, E 491574.419, N 6523083.093	6.30	N89° 27' 35.16"E
CH 11.195, E 491574.419, N 6523083.093	CH 15.300, E 491574.456, N 6523078.988	4.11	S0° 30' 31.00"E

RW03			
START	END	Length	Line Direction
CH 0.000, E 491586.950, N 6523079.114	CH 4.105, E 491586.909, N 6523083.219	4.11	N0° 34' 18.69"W
CH 4.105, E 491586.909, N 6523083.219	CH 10.401, E 491593.205, N 6523083.278	6.30	N89° 27' 35.16"E
CH 10.401, E 491593.205, N 6523083.278	CH 15.300, E 491596.702, N 6523079.847	4.90	S45° 32' 24.84"E

RW04			
START	END	Length	Line Direction
CH 0.000, E 491672.299, N 6523080.590	CH 4.935, E 491675.754, N 6523084.113	4.93	N44° 26' 13.67"E
CH 4.935, E 491675.754, N 6523084.113	CH 44.841, E 491715.659, N 6523084.505	39.91	N89° 26' 13.67"E
CH 44.841, E 491715.659, N 6523084.505	CH 51.837, E 491720.653, N 6523079.608	7.00	S45° 33' 46.33"E

RW05			
START	END	Length	Line Direction
CH 0.000, E 491787.581, N 6523080.787	CH 4.395, E 491787.539, N 6523085.182	4.40	N0° 32' 24.84"W
CH 4.395, E 491787.539, N 6523085.182	CH 21.492, E 491804.636, N 6523085.343	17.10	N89° 27' 35.16"E
CH 21.492, E 491804.636, N 6523085.343	CH 27.578, E 491808.980, N 6523081.080	6.09	S45° 32' 24.84"E

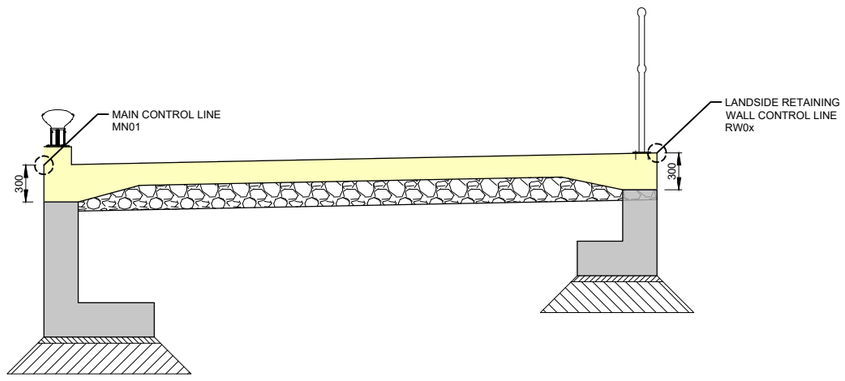
RW06			
START	END	Length	Line Direction
CH 0.000, E 491855.887, N 6523080.027	CH 8.202, E 491861.630, N 6523085.884	8.20	N44° 26' 13.67"E
CH 8.202, E 491861.630, N 6523085.884	CH 17.165, E 491870.592, N 6523085.972	8.96	N89° 26' 13.67"E
CH 17.165, E 491870.592, N 6523085.972	CH 26.250, E 491877.079, N 6523079.611	9.08	S45° 33' 46.33"E

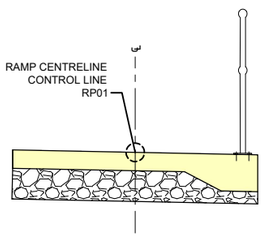
RW07			
START	END	Length	Line Direction
CH 0.000, E 491926.943, N 6523080.280	CH 8.827, E 491933.125, N 6523086.580	8.83	N44° 27' 35.16"E
CH 8.827, E 491933.125, N 6523086.580	CH 79.872, E 492004.167, N 6523087.273	71.04	N89° 26' 26.89"E

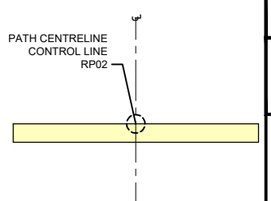
ACCESS RAMP CENTRELINES
(FOR LONG-SECTIONS - REFER DRG 2302)

RP01				
START	END	Length	Line/Chord Direction	Radius
CH 0.000, E 491969.520, N 6523081.264	CH 0.512, E 491969.521, N 6523081.775	0.51	N0° 08' 44.11"E	
CH 0.512, E 491969.521, N 6523081.775	CH 1.953, E 491970.395, N 6523082.765	1.44	N41° 26' 50.29"E	1.00
CH 1.953, E 491970.395, N 6523082.765	CH 29.185, E 491997.409, N 6523086.202	27.23	N82° 44' 56.48"E	
CH 29.185, E 491997.409, N 6523086.202	CH 37.515, E 492005.738, N 6523086.284	8.33	N89° 26' 16.51"E	

RP02			
START	END	Length	Line Direction
CH 0.000, E 491985.804, N 6523076.801	CH 5.251, E 491988.026, N 6523081.559	5.25	N25° 01' 52.72"E
CH 5.251, E 491988.026, N 6523081.559	CH 6.175, E 491987.910, N 6523082.475	0.92	N7° 10' 48.41"W
CH 6.175, E 491987.910, N 6523082.475	CH 9.673, E 491987.471, N 6523085.946	3.50	N7° 12' 11.06"W







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REVISIONS

CLIENT
NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
SETOUT TABLE

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel: +61 2 88545000
Fax: +61 2 99200960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

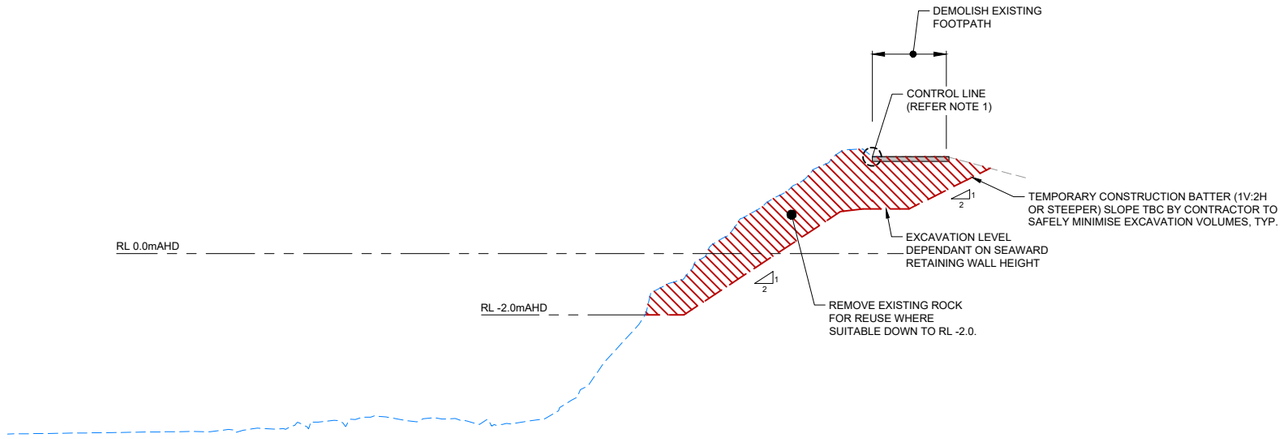
DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1301	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-CI-00-DR-ME-2000

DO NOT SCALE



TYPE A - FULL RECONSTRUCTION
(CH 0 - 575)
STEP 1 - EXCAVATE AND PLACE LOWER BREAKWATER

SECTION A/1101
1:100 (A1)

NOTES

1. CONTROL LINE MATCHES EDGE OF EXISTING FOOTPATH.

LEGEND

- BATHYMETRIC PROFILE (MULTI-BEAM BATHYMETRY + DRONE PHOTOGRAMMETRY)
- TOPOGRAPHIC PROFILE (DETAIL TOPO SURVEY)

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REVISIONS

CLIENT

NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
BREAKWATER
TYPICAL SECTIONS
SHEET 1

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com
Royal HaskoningDHV
Enhancing Society Together

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SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-2000	D2	P03

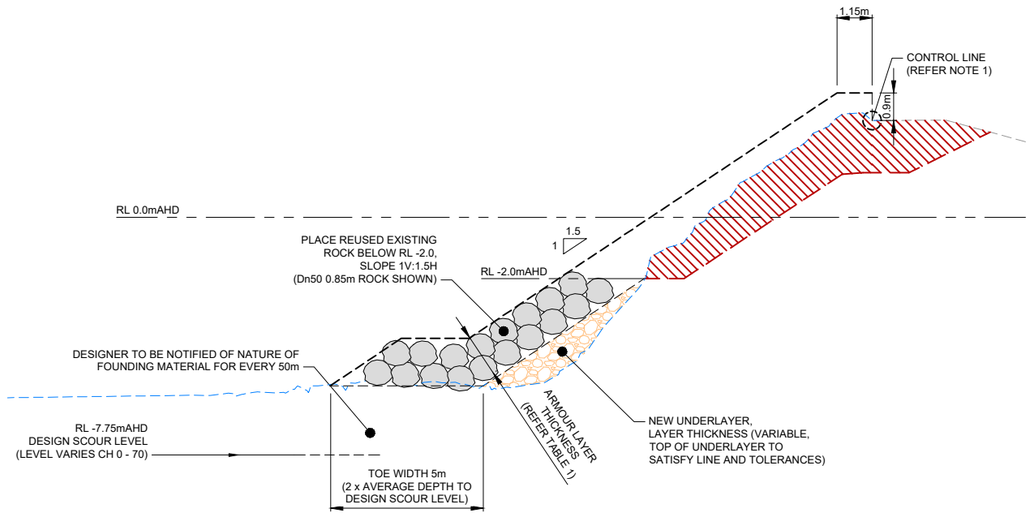
NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

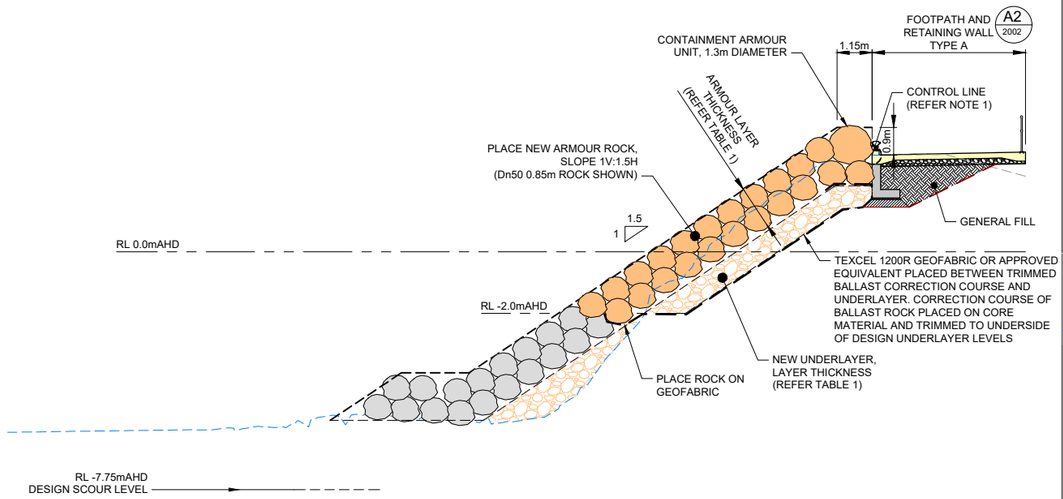
DRAWING No.
PA2696-RHD-CI-00-DR-ME-2001

DO NOT SCALE



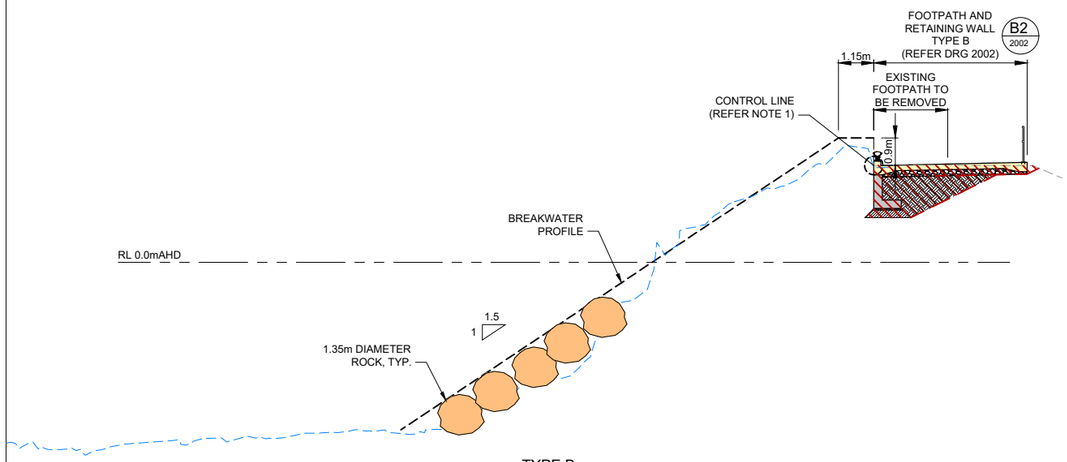
TYPE A - FULL RECONSTRUCTION
(CH 0 - 575)
STEP 2 - PLACE LOWER BREAKWATER

SECTION A 1201
1:100 (A1)



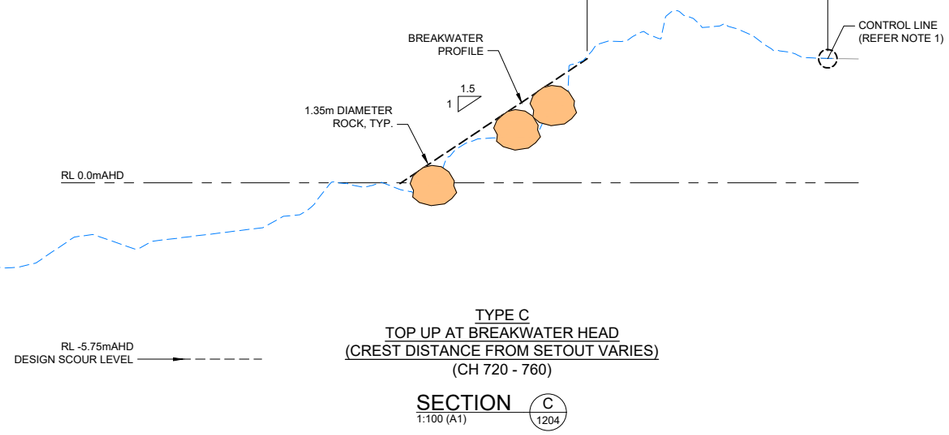
TYPE A - FULL RECONSTRUCTION
(CH 0 - 575)
STEP 3 - PLACE UPPER BREAKWATER AND FOOTPATH

SECTION A 1201
1:100 (A1)



TYPE B
TOP UP
(CREST 1.15m FROM SETOUT)
(CH 575 - 605)

SECTION B 1204
1:100 (A1)



TYPE C
TOP UP AT BREAKWATER HEAD
(CREST DISTANCE FROM SETOUT VARIES)
(CH 720 - 760)

SECTION C 1204
1:100 (A1)

TABLE 1 - BREAKWATER SPECIFICATION

					Engineered Fill	Excavation (m3)		Armour Rock						Underlayer Rock			
From CH	To CH	Length (m)	Construction Type	Armour Class	Under Path (m3)	Existing Breakwater (m3)	Under Path (m3)	Mass (t)	Dn50 (m)	Armour Layer Thickness (m)	New Armour Rock Volume (Upper) (m3)*	Existing Armour Rock Volume (Lower) (m3)*	No. Armour Rocks	Mass (t)	Dn50 (m)	Underlayer Thickness (m)	Volume (m3)*
720	760	40	Type C	1	-	-	-	6.3	1.35	2.45	-	-	62	0.63	0.6	1.15	-
575	720	145	Type B	1	372	-	654	6.3	1.35	2.45	-	-	84	0.63	0.6	1.15	-
440	575	135	Type A	2	402	1652	647	4	1.15	2.1	2105	1651	-	0.4	0.55	1	1252
70	180	110	Type A		329	1359	515				1490	971	-				820
40	70	30	Type A		102	359	137				404	147	-				184
340	440	100	Type A	3	299	1148	457	1.65	0.85	1.6	1458	1271	-	0.165	0.4	0.75	910
180	340	160	Type A	4	480	2180	721	1.15	0.75	1.4	2289	1448	-	0.115	0.35	0.65	1246
0	40	40	Type A		161	290	191				329	83	-				137
				Total	2,145	6,988	3,322				8,073	5,570					4,548

NOTES

1. CONTROL LINE MATCHES EDGE OF EXISTING FOOTPATH. REFER DRG 4000 FOR LEVELS.
2. NO BREAKWATER WORKS REQUIRED BETWEEN CH 605 TO CH 720.

LEGEND

- BATHYMETRIC PROFILE (MULTI-BEAM BATHYMETRY + DRONE PHOTOGRAMMETRY)
- TOPOGRAPHIC PROFILE (DETAIL TOPO SURVEY)

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT
NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
BREAKWATER
TYPICAL SECTIONS
SHEET 1

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
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Tel +61 2 88545000
Fax +61 2 99290960
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Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF:		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-2001	D2	P03

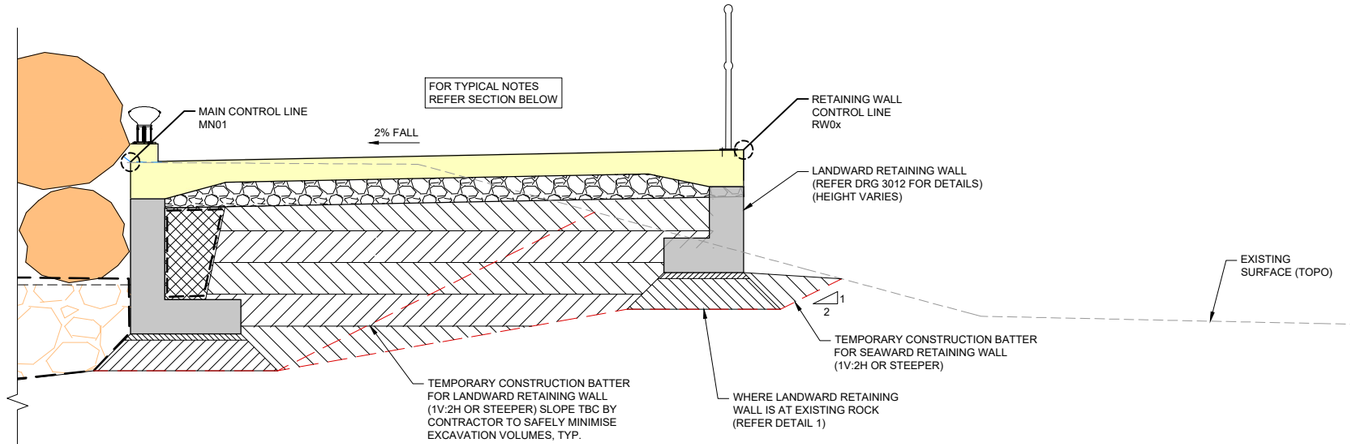
NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

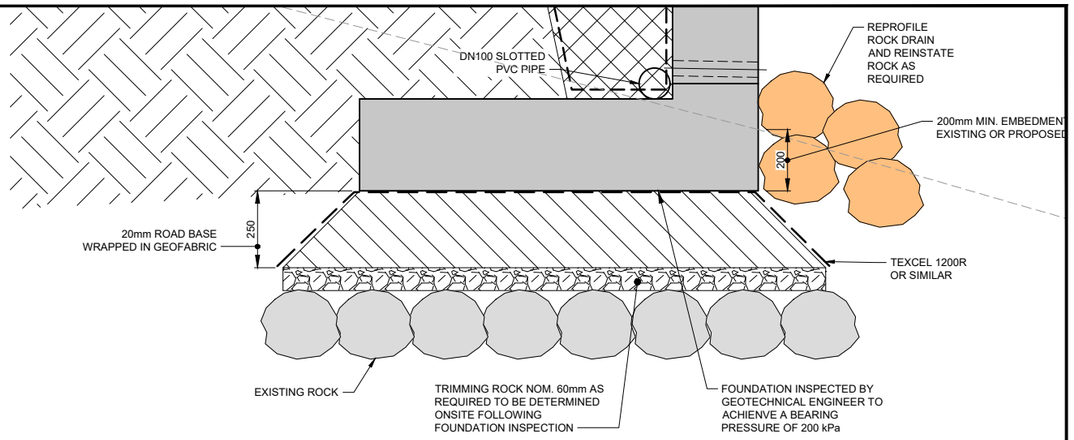
C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-CI-00-DR-ME-2002

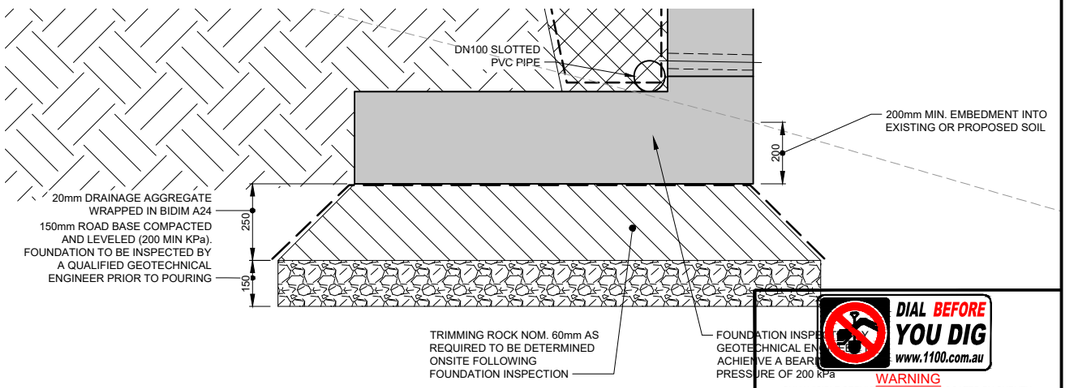
DO NOT SCALE



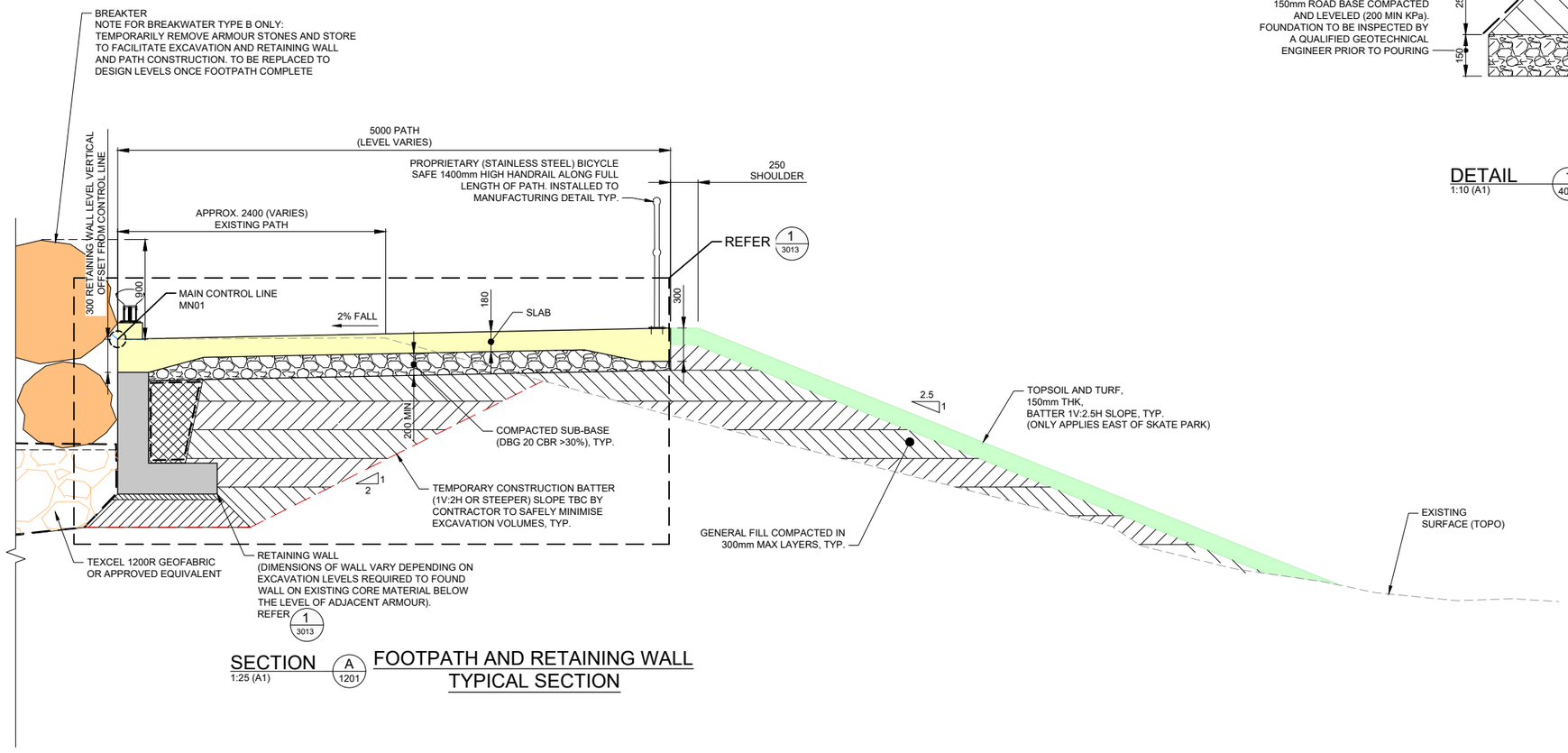
SECTION 1:25 (A1) — D / 1202 — FOOTPATH AND RETAINING WALL (AT LANDWARD RETAINING WALL)



DETAIL 1:10 (A1) — 1 / 4001 — LANDSIDE RETAINING WALL FOUNDATION AT ROCK PITS (SIMILAR FOR WINGWALLS)
1:10 (A1)



DETAIL 1:10 (A1) — 1 / 4001 — LANDSIDE RETAINING WALL FOUNDATION NOT AT ROCK PITS (SIMILAR FOR WINGWALLS)
1:10 (A1)



SECTION 1:25 (A1) — A / 1201 — FOOTPATH AND RETAINING WALL TYPICAL SECTION

NOTES

1. REFER DRG 3013 FOR FOOTPATH AND RETAINING WALL DETAILS.
2. ANY FILL SHALL BE PLACED IN MIN. 300mm COMPACTED LAYERS AND SHALL BE COMPACTED TO A MIN. DRY DENSITY OF 98% TO AS1289.5.1.1.
3. PAVEMENT IS TO BE FOUNDED ON FIRM NATURAL CUT GROUND ON COMPACTED FILL. ANY SOFT AREAS ARE TO BE REMOVED AND REPLACED WITH COMPACTED FILL.

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

500 0 500 1000 1500 2000 2500mm
1:50 (A3) 1:25 (A1)

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P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT
NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
FOOTPATH AND SEASIDE RETAINING WALL TYPICAL SECTIONS

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Website: www.royalhaskoningdhv.com
Royal HaskoningDHV
Enhancing Society Together

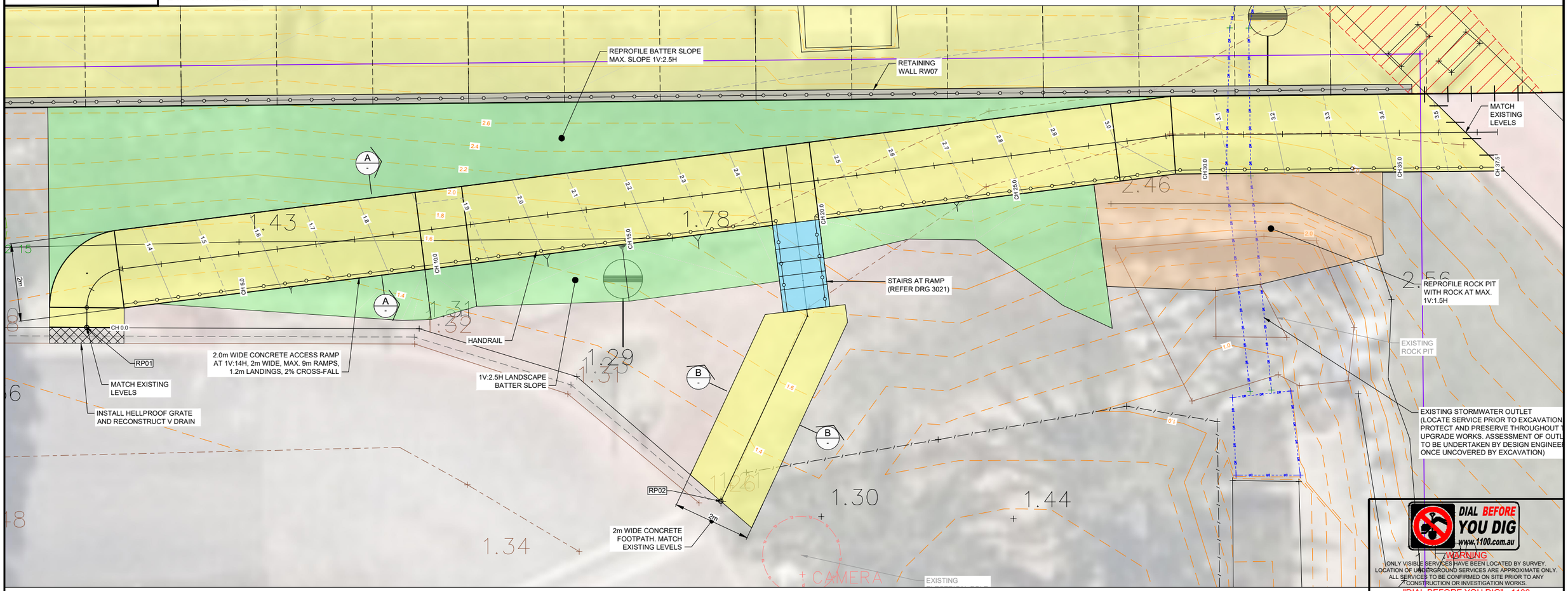
DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-2002	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-CI-00-DR-ME-2301

DO NOT SCALE



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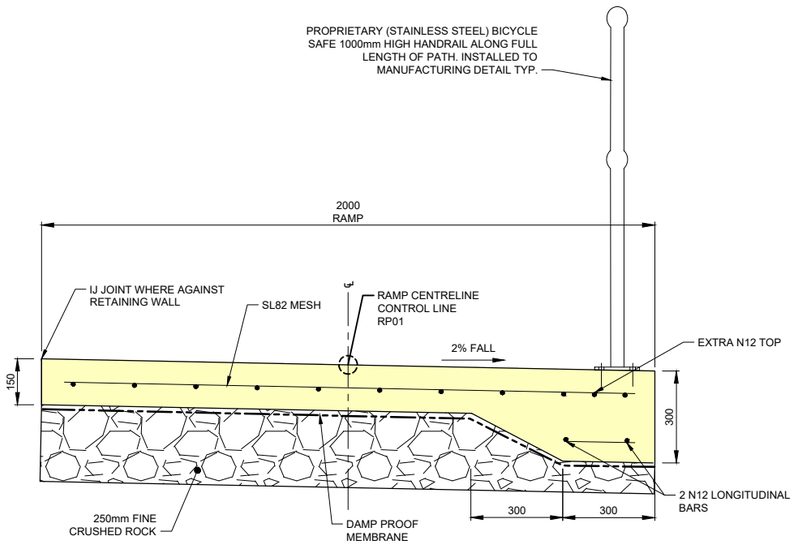
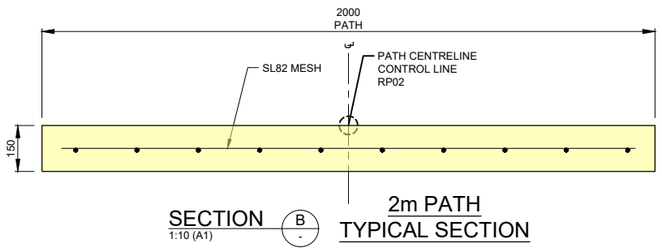
INSET A
1:50 (A1)



SECTION A (1:10 (A1)) — ACCESS RAMP TYPICAL SECTION



SECTION B (1:10 (A1)) — 2m PATH TYPICAL SECTION

NOTES

1. COORDINATE SYSTEM: GDA94 MGA56
2. AERIAL PHOTOGRAPH SOURCED FROM NEARMAP, DATED 29/08/2021.
3. TOPOGRAPHIC SURVEY BY NORTH COAST SURVEYS, DATED 29/07/2021.
4. CONTRACTOR TO UNDERTAKE DIAL BEFORE YOU DIG. ALL SERVICES ARE TO BE IDENTIFIED, MARKED, LOCATED AND PROTECTED. ROOTS OF TREES ARE NOT TO BE COVERED WITH FILL, CUT OR DISTURBED. IF REQUIRED THIS CONSTITUENTS A HOLD POINT WITH AN ARBORIST AND DESIGNER TO INSPECT THE TREE ROOTS.
5. CONCRETE COVER TO REINFORCEMENT IS 65mm.

LEGEND

- TOPOGRAPHIC SURVEY (DETAIL TOPO SURVEY)
- LANDSCAPE (REFER DRG 2002)
- FOOTPATH AND ACCESS RAMP
- RETAINING WALLS (REFER DRG 3011 AND 3012)
- CONCRETE STAIRS (REFER DRG 3021)
- HANDRAIL

REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT
NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
ACCESS RAMP DETAIL PLAN

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
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Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-2301	D2	P03

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

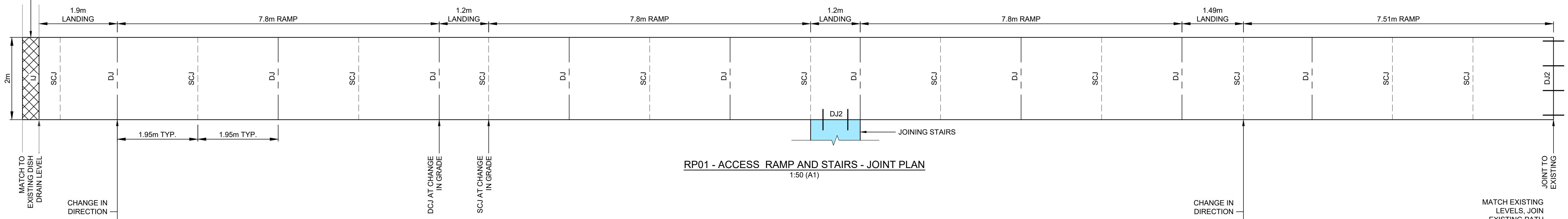
200 0 200 400 600 800 1000mm — 1:20 (A3) 1:10 (A1)

1000 0 1000 2000 3000 4000 5000mm — 1:100 (A3) 1:50 (A1)

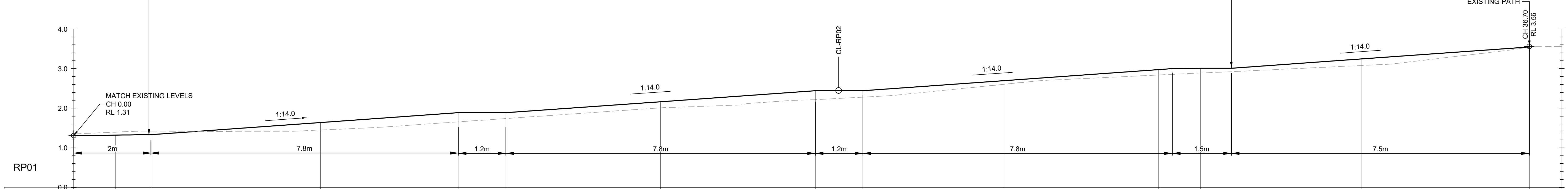
C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-CI-00-DR-ME-2302

DO NOT SCALE



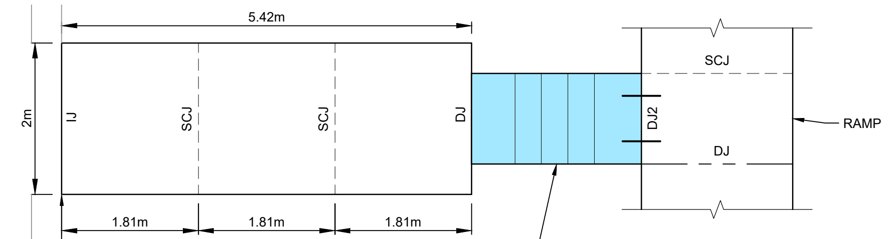
RP01 - ACCESS RAMP AND STAIRS - JOINT PLAN
1:50 (A1)



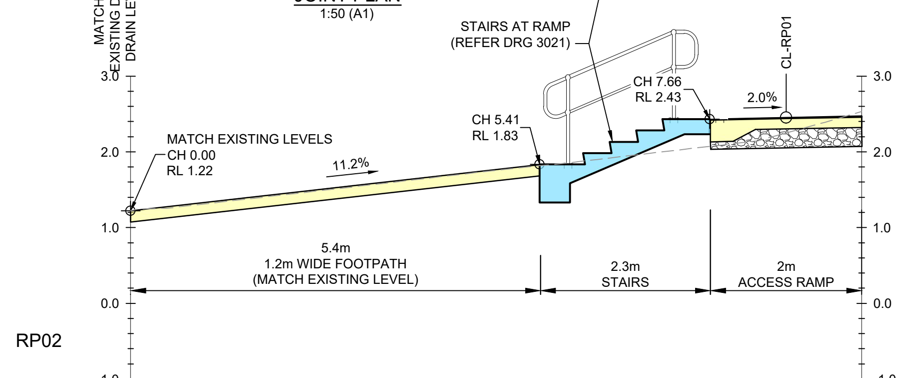
RP01: CHAINAGE	1.052	1.953	6.219	9.695	10.895	14.795	18.695	19.895	23.454	27.354	28.411	32.474	36.697
EXISTING LEVEL	1.395	1.423	1.449	1.656	1.739	2.010	2.217	2.279	2.605	2.839	2.890	3.079	3.554
FINISHED SURFACE LEVEL	1.320	1.333	1.638	1.886	1.886	2.164	2.443	2.443	2.697	2.975	3.010	3.245	3.546

HORIZONTAL: 000°08'44" L:0.512 | L:1.442 R:1.0 | L:27.232 082°44'56" | L:8.330 089°26'17"

RP01 - ACCESS RAMP AND STAIRS - LONG-SECTION
1:50 (A1)



RP02 - JOINING RAMP AND STAIRS JOINT PLAN
1:50 (A1)



RP02: CHAINAGE	7.673	8.674
EXISTING LEVEL	2.073	2.249
FINISHED SURFACE LEVEL	2.423	2.443

HORIZONTAL: L:5.251 025°01'53" | L:0.924 352°49'12" | L:3.498 352°47'49"

RP02 - JOINING RAMP AND STAIRS - LONG-SECTION
1:50 (A1)

NOT FOR CONSTRUCTION

D2 FOR TENDER

AUSTRALIAN HEIGHT DATUM

1000 0 1000 2000 3000 4000 5000mm
1:100 (A3) 1:50 (A1)

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

NOTES

1. REFER 3013 FOR ...

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LEGEND
PROPOSED RAMP CONTROL LINE PROFILE
EXISTING SURFACE PROFILE

REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT
NSW GOVERNMENT | Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
ACCESS RAMP
LONG SECTION AND JOINT PLAN

Royal HaskoningDHV
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Level 15, 99 Mount Street
North Sydney NSW 2060
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Tel +61 2 88545000
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Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE AS SHOWN	REF. PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-2302	D2	P03

DRAWING No.
PA2696-RHD-CI-00-DR-ME-2311

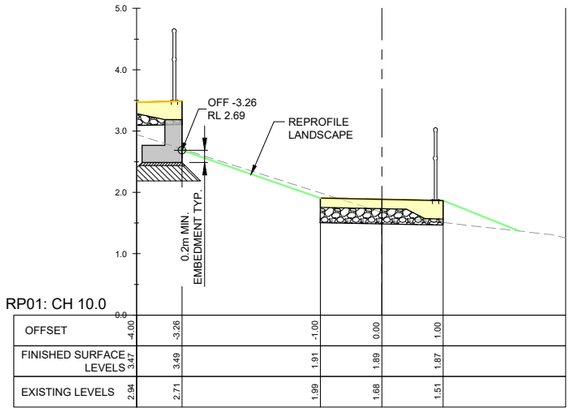
DO NOT SCALE

NOTES

1. CROSS SECTIONS ARE ALONG ALIGNMENT RP01.

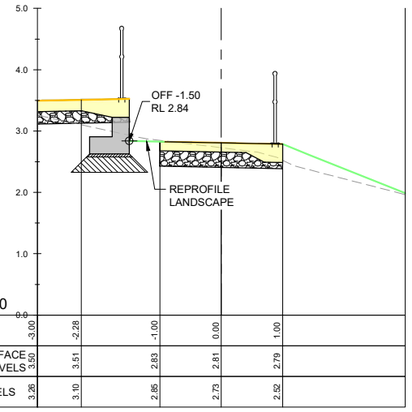
LEGEND

- PROPOSED RAMP CONTROL LINE PROFILE
- LANDSCAPE BATTER
- FOOTPATH AND ACCESS RAMP



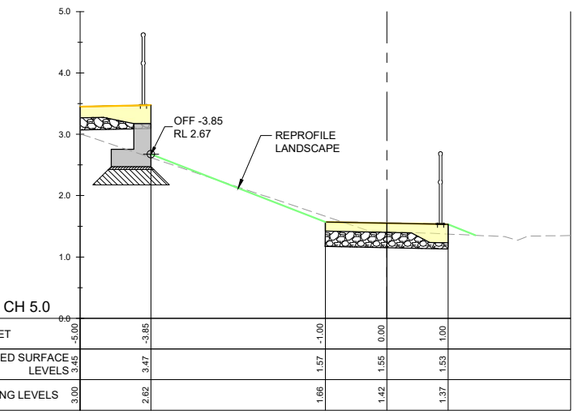
RP01: CH 10.0

OFFSET	-4.00	-3.26	-1.00	0.00	1.00	
FINISHED SURFACE LEVELS	3.47	3.49	1.91	1.89	1.87	
EXISTING LEVELS	2.94	2.71	1.99	1.68	1.51	



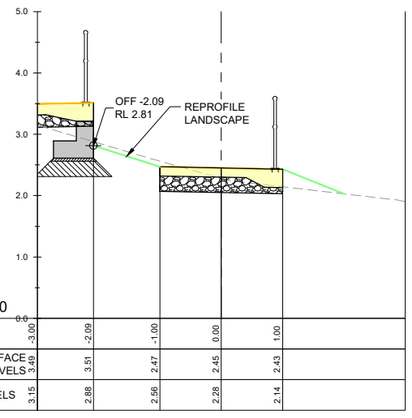
RP01: CH 25.0

OFFSET	-3.00	-2.28	-1.00	0.00	1.00	
FINISHED SURFACE LEVELS	3.50	3.51	2.83	2.81	2.79	
EXISTING LEVELS	3.26	3.10	2.85	2.73	2.52	



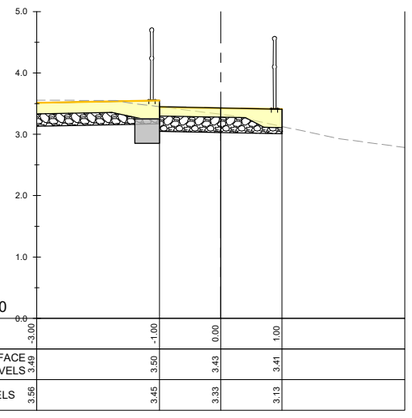
RP01: CH 5.0

OFFSET	-5.00	-3.85	-1.00	0.00	1.00	
FINISHED SURFACE LEVELS	3.45	3.47	1.57	1.55	1.53	
EXISTING LEVELS	3.00	2.62	1.66	1.42	1.37	



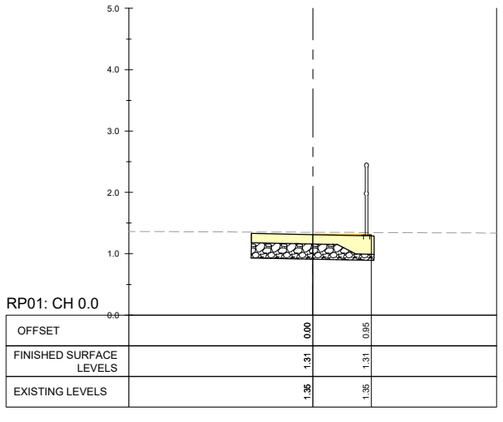
RP01: CH 20.0

OFFSET	-3.00	-2.09	-1.00	0.00	1.00	
FINISHED SURFACE LEVELS	3.49	3.51	2.47	2.45	2.43	
EXISTING LEVELS	3.15	2.88	2.56	2.28	2.14	



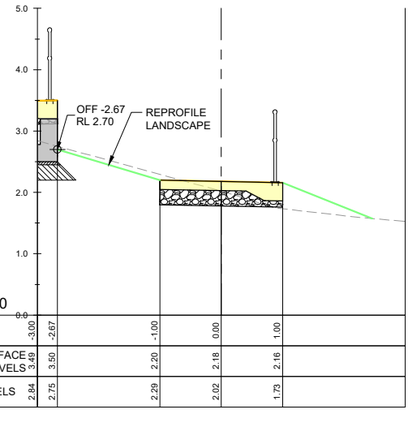
RP01: CH 35.0

OFFSET	-3.00	-1.00	0.00	1.00		
FINISHED SURFACE LEVELS	3.49	3.50	3.43	3.41		
EXISTING LEVELS	3.56	3.45	3.33	3.13		



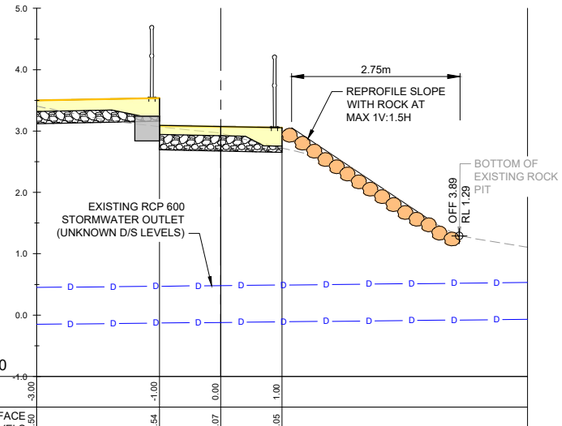
RP01: CH 0.0

OFFSET		0.00	0.95			
FINISHED SURFACE LEVELS		1.31	1.31			
EXISTING LEVELS		1.35	1.35			



RP01: CH 15.0

OFFSET	-3.00	-2.67	-1.00	0.00	1.00	
FINISHED SURFACE LEVELS	3.49	3.50	2.20	2.18	2.16	
EXISTING LEVELS	2.84	2.75	2.29	2.02	1.73	



RP01: CH 30.0

OFFSET	-3.00	-1.00	0.00	1.00		
FINISHED SURFACE LEVELS	3.50	3.54	3.07	3.05		
EXISTING LEVELS	3.41	3.07	2.96	2.72		

NOT FOR CONSTRUCTION | **D2** | **FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

CROSS SECTION ALIGNMENT RP01

1:50 (A1)

1000 0 1000 2000 3000 4000 5000mm

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

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

ACCESS RAMP
TYPICAL SECTION

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street, North Sydney NSW 2060, Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022

SCALE: AS SHOWN
REF: PA2696-RHD-00-00-M3-CIVIL MODEL

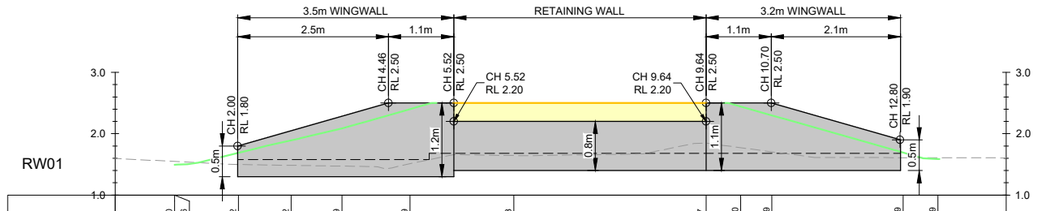
DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-2311	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-CI-00-DR-ME-2401

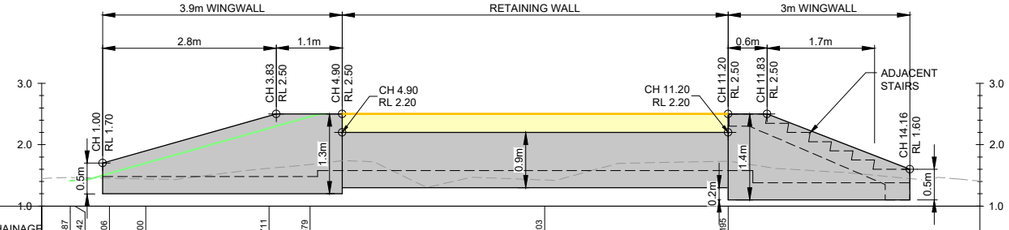
DO NOT SCALE

RW01



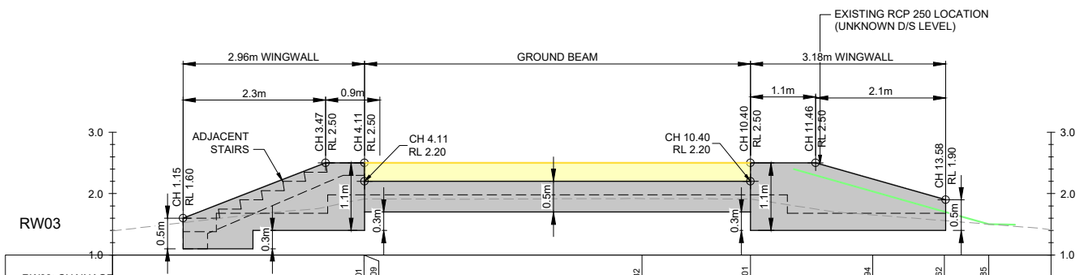
RW01: CHAINAGE	0.970	5.516	2.012	2.872	3.699	4.809	6.503	9.637	10.200	10.709	12.849	13.419
EXISTING LEVEL	1.547	1.658	1.499	1.485	1.471	1.512	1.644	1.847	1.772	1.705	1.609	1.608
FINISHED SURFACE LEVEL	1.493	2.500	1.689	1.891	2.086	2.400	2.500	2.500	2.443	2.299	1.693	1.589
DIFFERENCE	-0.054	0.841	0.190	0.406	0.615	0.888	0.856	0.653	0.670	0.593	0.084	-0.019
HORIZONTAL	L:5.523						L:4.114		L:4.896			
	021°53'35"						066°53'35"		111°53'35"			

RW02



RW02: CHAINAGE	4.887	0.542	1.106	1.700	3.711	4.379	8.203	11.165
EXISTING LEVEL	1.739	1.463	1.452	1.441	1.616	1.678	1.425	1.731
FINISHED SURFACE LEVEL	2.500	1.417	1.531	1.699	2.268	2.456	2.500	2.500
DIFFERENCE	0.761	-0.046	0.079	0.258	0.651	0.778	1.075	0.769
HORIZONTAL	L:4.899				L:6.296			L:4.105
	044°27'35"				089°27'35"			179°29'29"

RW03



RW03: CHAINAGE	4.101	11.109	8.632	10.401	12.394	13.562	14.285
EXISTING LEVEL	1.912	1.894	1.919	1.913	1.653	1.559	1.501
FINISHED SURFACE LEVEL	2.500	2.400	2.500	2.500	2.036	1.706	1.501
DIFFERENCE	0.588	0.506	0.581	0.587	0.383	0.146	0.000
HORIZONTAL	L:4.105		L:6.296		L:4.899		
	359°25'41"		089°27'35"		134°27'35"		

NOTES

1. RETAINING WALL TOE EMBEDMENT MIN. 200mm.
2. WINGWALL TOP TO BE NOMINALLY 100mm HIGHER THAN BATTER SLOPE. WINGWALL TO FOLLOW SLOPE OF ADJACENT BATTER OR STAIRS.
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LEGEND

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- PROPOSED FOOTPATH PROFILE
- PROPOSED LANDSCAPE PROFILE
- PROPOSED FOOTPATH
- PROPOSED RETAINING WALL (REFER DRG 3011 FOR DETAILS)

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REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

RETAINIG WALL
LONG-SECTIONS
SHEET 1

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-2401	D2	P03

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

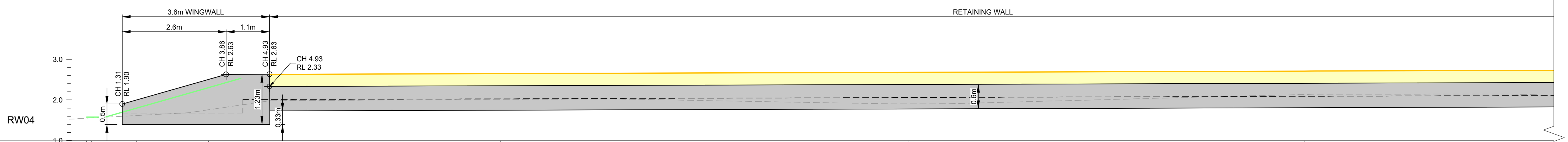
1000 0 1000 2000 3000 4000 5000mm

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

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

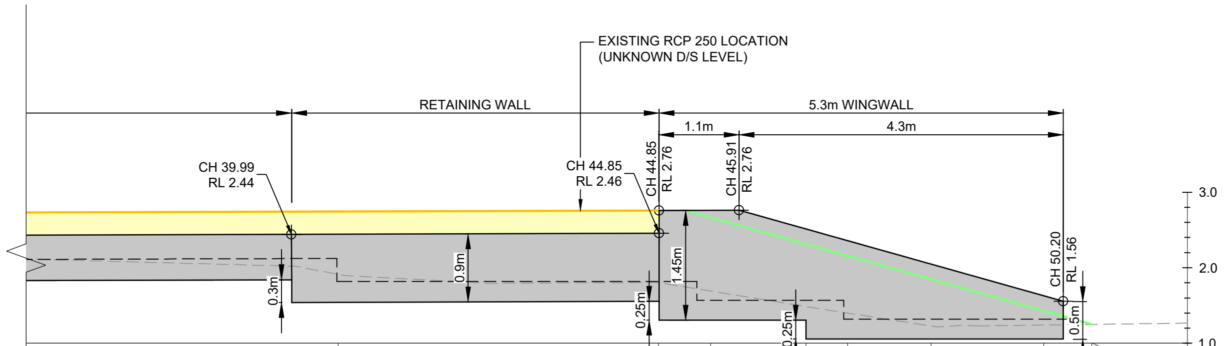
DRAWING No.
PA2696-RHD-CI-00-DR-ME-2402

DO NOT SCALE



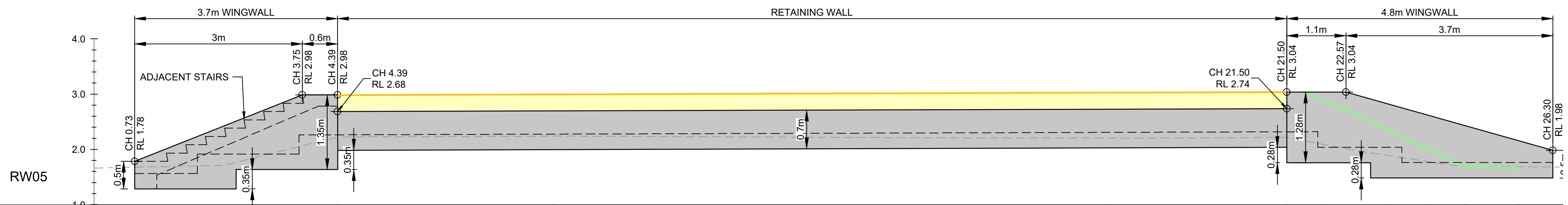
RW04: CHAINAGE	4.926	0.525	1.655	3.424	10.606	20.615	30.346
EXISTING LEVEL	1.980	1.556	1.618	1.758	2.014	1.905	2.137
FINISHED SURFACE LEVEL	2.631	1.579	1.798	2.302	2.648	2.680	2.711
DIFFERENCE	0.651	0.024	0.180	0.544	0.634	0.775	0.574

HORIZONTAL	L:4.935	L:39.906
	044°26'14"	089°26'14"



40.603	44.841	45.533	46.791	47.344	48.450	49.939	50.572	4.219
1.913	1.805	1.690	1.489	1.400	1.229	1.241	1.250	1.876
2.743	2.756	2.665	2.312	2.157	1.847	1.429	1.251	2.529
0.830	0.952	0.974	0.823	0.757	0.617	0.188	0.001	0.653

L:6.995	
134°26'14"	



RW05: CHAINAGE	4.390	8.271	18.271	21.492	22.197	23.347	24.023	24.710	25.695
EXISTING LEVEL	2.224	2.239	2.205	2.216	2.084	1.887	1.782	1.697	1.687
FINISHED SURFACE LEVEL	2.983	2.995	3.027	3.037	2.877	2.337	2.019	1.697	1.670
DIFFERENCE	0.759	0.756	0.822	0.821	0.793	0.450	0.238	0.000	-0.018

HORIZONTAL	L:4.395	L:17.097	L:6.086
	359°27'35"	089°27'35"	134°27'35"

NOTES

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REVISIONS

CLIENT
NSW GOVERNMENT | Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
RETAINIG WALL LONG-SECTIONS SHEET 2

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF.		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-2402	D2	P03

1000 0 1000 2000 3000 4000 5000mm
1:100 (A3) 1:50 (A1)

NOT FOR CONSTRUCTION

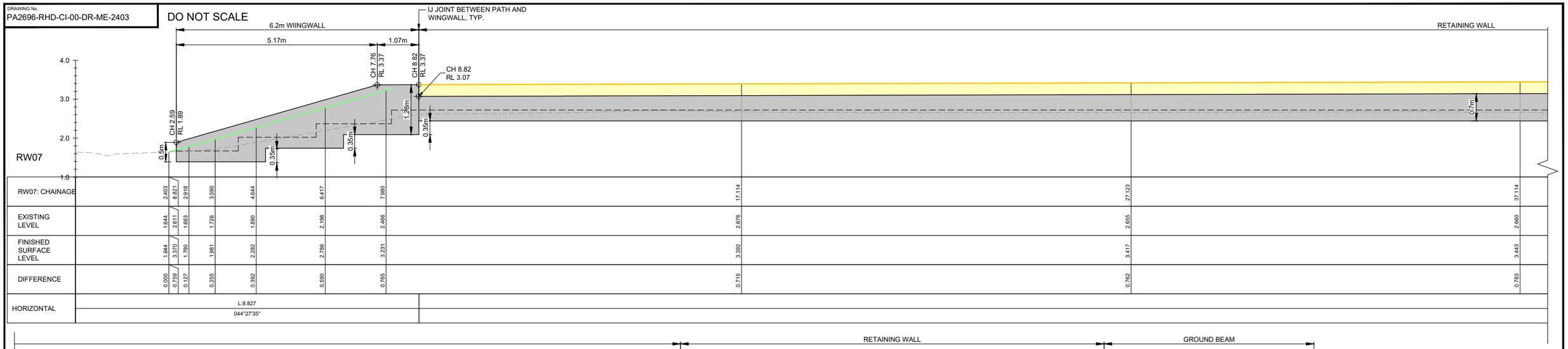
D2 FOR TENDER

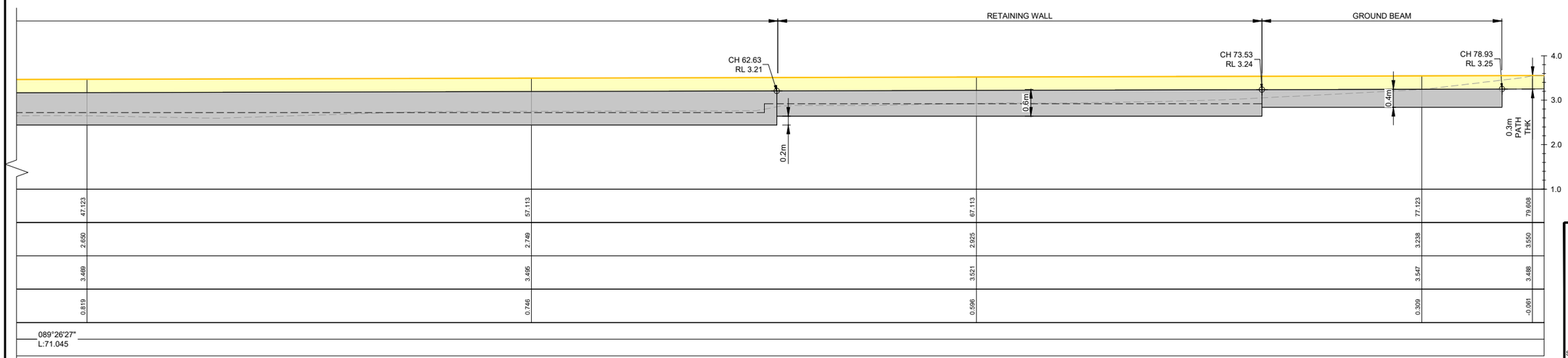
AUSTRALIAN HEIGHT DATUM

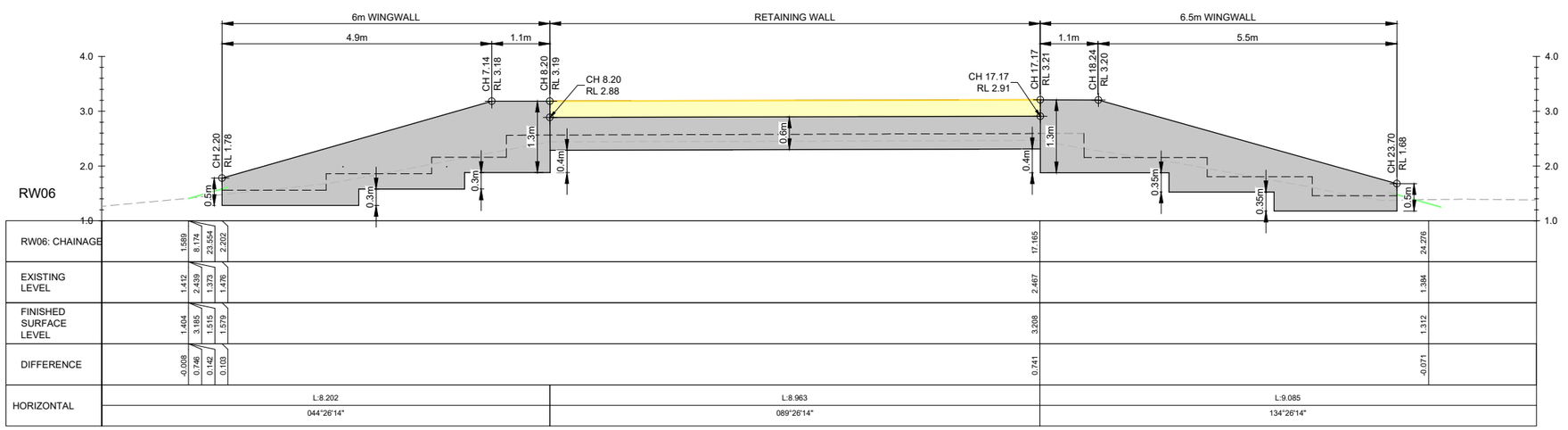
C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-CI-00-DR-ME-2403

DO NOT SCALE







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NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

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

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REVISIONS

CLIENT
NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
RETAINIG WALL LONG-SECTIONS SHEET 3

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 38545000
Fax +61 2 99295960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com
Royal HaskoningDHV
Enhancing Society Together

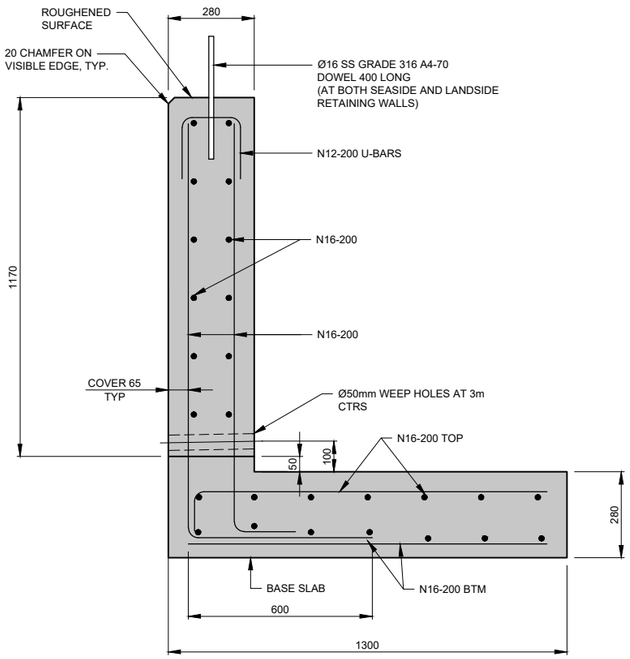
DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-2403	D2	P03

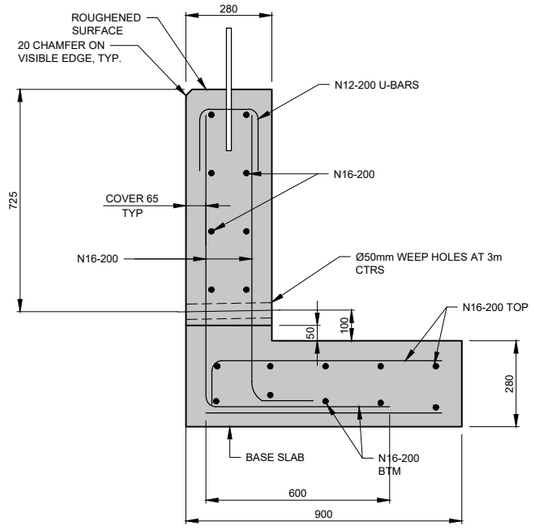
C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-ST-00-DR-ME-3011

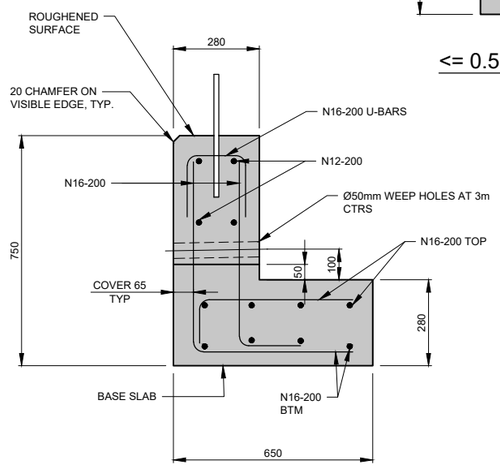
DO NOT SCALE



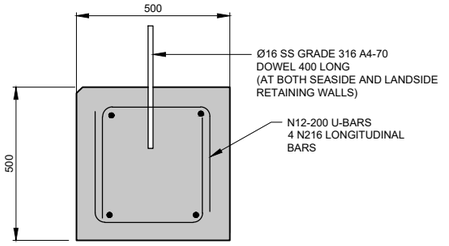
>1.1m TO ≤1.5m HIGH RETAINING WALL
1:10 (A1)



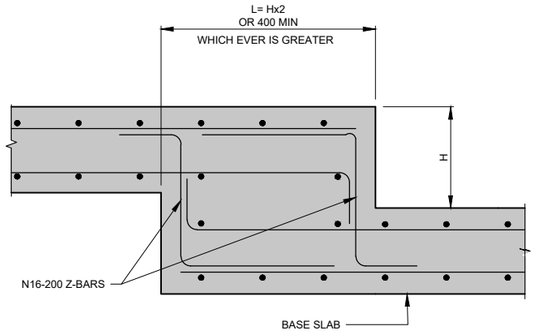
>0.75m TO ≤1.1m HIGH RETAINING WALL
1:10 (A1)



>0.5m TO 0.75m HIGH RETAINING WALL
1:10 (A1)



<= 0.5m GROUND BEAM
1:10 (A1)

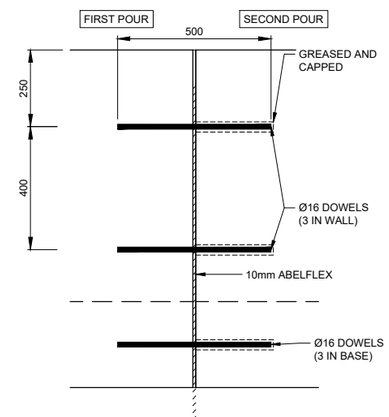


BASE SLAB STEP DETAIL
1:10 (A1)

NOTES

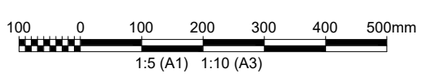
1. FOR GENERAL NOTES REFER DRG 0011.
2. ALL DIMENSIONS ARE IN MILLIMETRES.
3. CONCRETE USED IN THE WORKS TO BE F'c = 50 MPa.
4. COVER TO REINFORCEMENT IN WALL IS 65mm.
5. ALL REINFORCEMENT IN THE WORKS SHALL BE HOT DIPPED GALVANISED.
6. PAINT SEAWARD FACE OF WALL WITH 2 FLOOD COATS OF SILANE.
7. ELEVATION AND PLAN VIEWS OF REINFORCEMENT FOR WING WALLS IS GIVEN IN DWG 3012

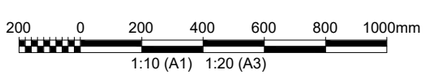
TYPICAL LANDSIDE AND SEASIDE RETAINING WALL SECTIONS (WINGWALLS SIMILAR)



NOTE: EXPANSION JOINT REQUIRED AT NOMINALLY 7.5m CTRS TO MATCH PAVEMENT JOINTS.
DOWELS TO BE Ø16 SMOOTH SS GRADE 316 500 LONG GREASE AND CAP 2ND POUR

RETAINING WALL DOWEL JOINT IN WALL AND BASE SLAB
1:10 (A1)





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REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
STRUCTURAL DETAILS RETAINING WALL

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	08.02.2022
SCALE	REF: PA2696-RHD-00-00-M2-RETAINING WALL DETAILS		

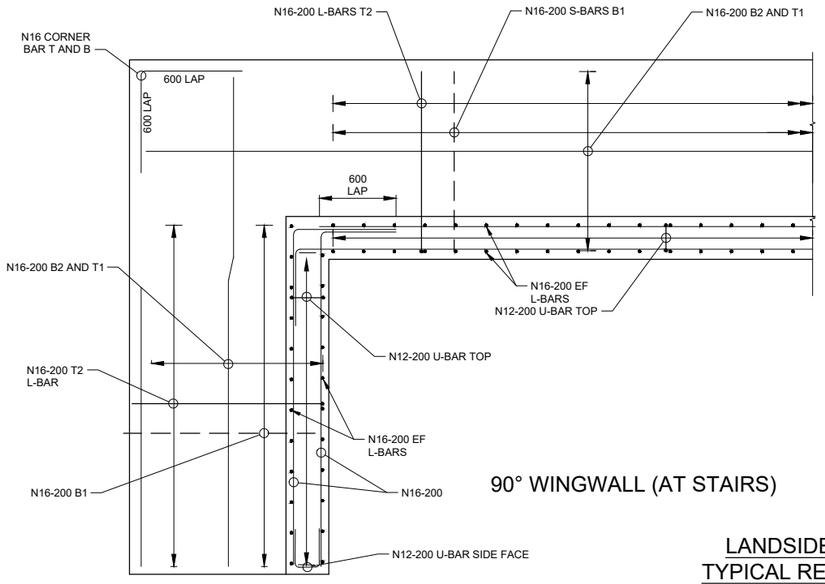
DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-ST-00-DR-ME-3011	D2	P03

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

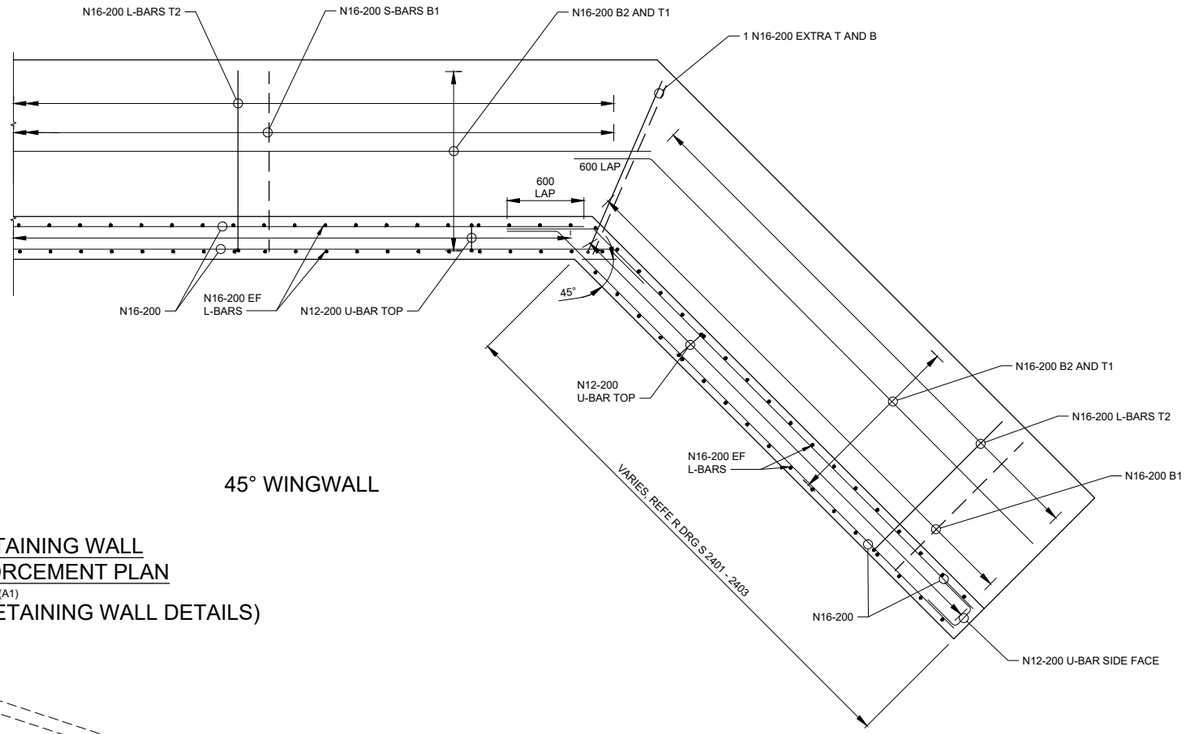
C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M2-RETAINING WALL DETAILS

DRAWING No.
PA2696-RHD-ST-00-DR-ME-3012

DO NOT SCALE



90° WINGWALL (AT STAIRS)

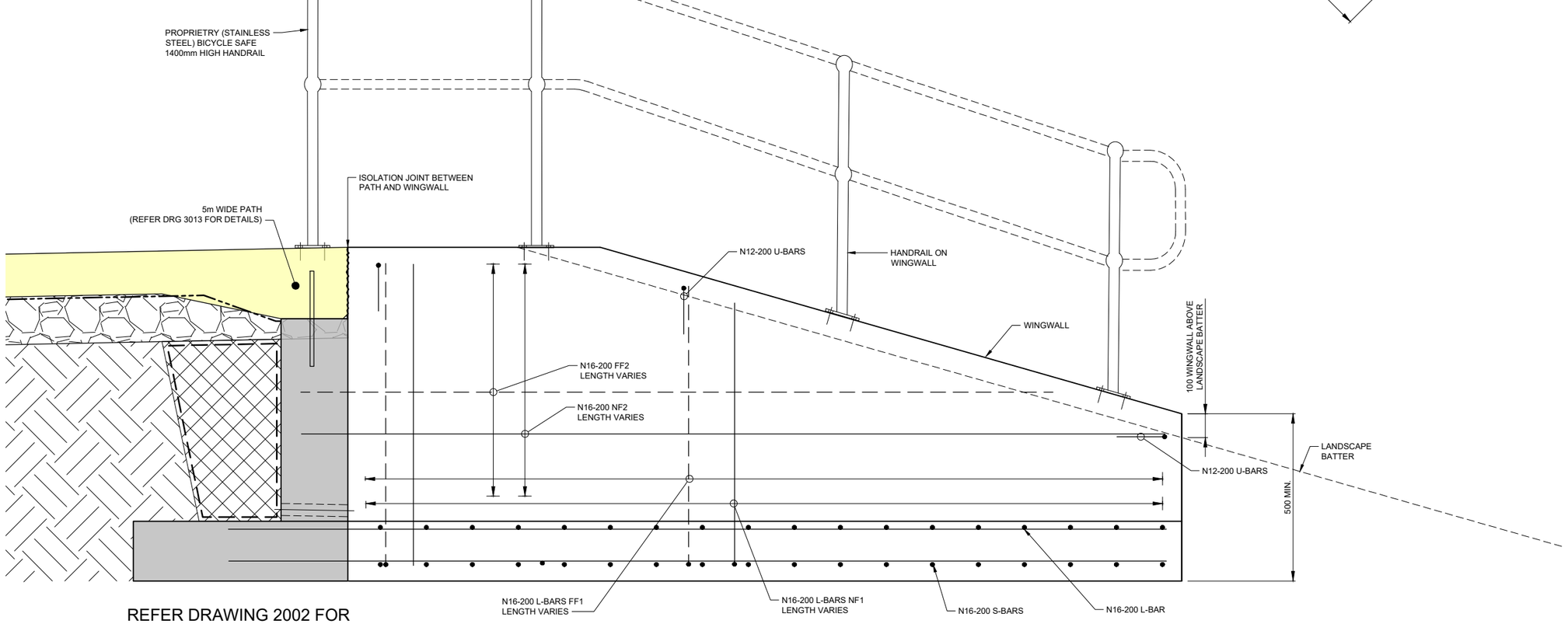


45° WINGWALL

LANDSIDE RETAINING WALL TYPICAL REINFORCEMENT PLAN

1:20 (A1)

(REFER DRG 3011 FOR RETAINING WALL DETAILS)



REFER DRAWING 2002 FOR FOUNDATION DETAILS

ELEVATION ON TYPICAL WING WALL SPLAYED END

1:10 (A1)

NOTES

1. FOR GENERAL NOTES REFER DRG 0011.
2. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES RELATIVE TO AUSTRALIAN HEIGHT DATUM U.N.O.
3. ALL REINFORCEMENT USED IN THE WORKS SHALL BE HOT DIP GALVANISED
4. CONCRETE USED IN THE WORKS TO BE F'c = 50 MPa.
5. ALL DOWELS USED IN THE WORKS SHALL BE STAINLESS STEEL GRADE 316 GRADE A4-70.
6. COVER TO REINFORCEMENT IN WALL IS 65mm.
7. SPLAY REINFORCEMENT AT CORNER, PROVIDE ADDITIONAL REINFORCEMENT AS REQUIRED TO ACHIEVE 200mm CENTRES.

REINFORCEMENT		
BAR DIA (mm)	LAP LENGTH (mm)	COG LENGTH (mm)
12	500	200
16	600	200

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

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

400 0 400 800 1200 1600 2000mm
1:20 (A1) 1:40 (A3)

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WARNING
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IT IS ESSENTIAL THAT BEFORE ANY EXCAVATION WORK IS UNDERTAKEN, FURTHER INVESTIGATION INTO THE LOCATION OF SERVICES SHOULD BE CARRIED OUT WITH THE RELEVANT AUTHORITY.

REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	TE	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
STRUCTURAL DETAILS
LANDSIDE RETAINING WALL

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

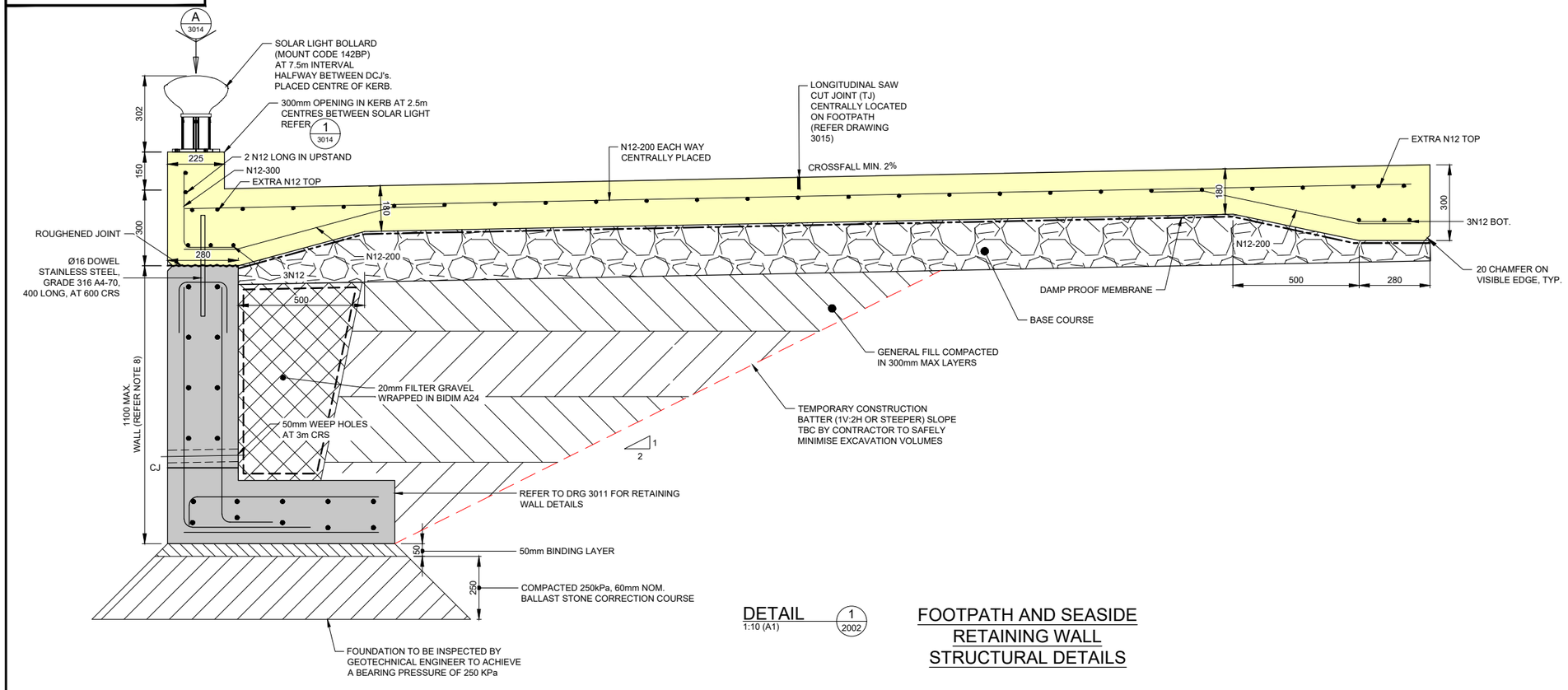
DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	08.02.2022
SCALE	REF. PA2696-RHD-00-00-M2-RETAINING WALL DETAILS		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-ST-00-DR-ME-3012	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M2-RETAINING WALL DETAILS

DRAWING No.
PA2696-RHD-ST-00-DR-ME-3013

DO NOT SCALE



DETAIL 1 / 2002
1:10 (A1)

FOOTPATH AND SEASIDE RETAINING WALL STRUCTURAL DETAILS

NOTES

1. FOR GENERAL NOTES REFER DRG 0011.
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3. ALL REINFORCEMENT USED IN THE WORKS SHALL BE HOT DIP GALVANISED.
4. SEAWARD FACE OF WALL TO BE COATED IN 2 FLOOD COATS OF SILANE.
5. CONCRETE USED IN THE WORKS TO BE F'c = 50 MPa.
6. ALL DOWELS USED IN THE WORKS SHALL BE STAINLESS STEEL GRADE 316 GRADE A4-70.
7. COVER TO REINFORCEMENT IN WALL IS 65mm.
8. HEIGHT OF RETAINING WALL TO BE CONFIRMED BY CONTRACTOR. CONTACT DESIGNER IF REQUIRED WALL HEIGHT IS GREATER THAN 1100mm.

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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

STRUCTURAL DETAILS
FOOTPATH AND
SEASIDE RETAINING WALL

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street,
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	08.02.2022

SCALE: AS SHOWN
REF: PA2696-RHD-00-00-M2-RETAINING WALL DETAILS

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-ST-00-DR-ME-3013	D2	P03

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

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

2 0 2 4 6 8 10m
1:100 (A1) 1:200 (A3)

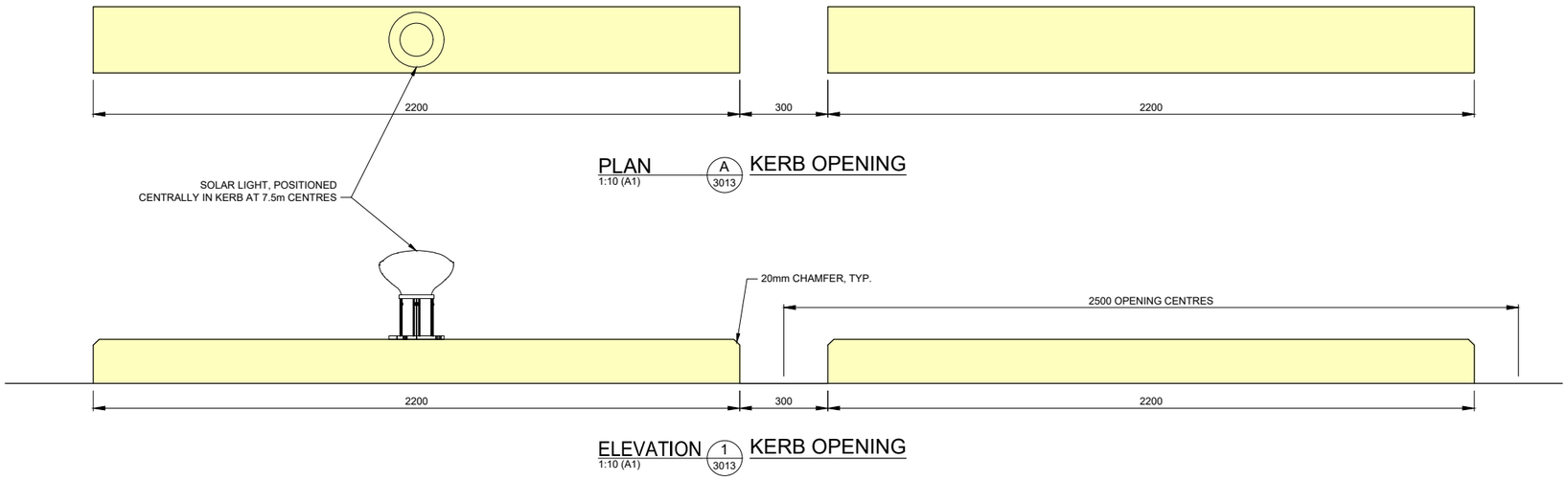
C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M2-RETAINING WALL DETAILS

DRAWING No.
PA2696-RHD-ST-00-DR-ME-3014

DO NOT SCALE

NOTES

1. BETWEEN CH 0 - CH 192, CH 592.44 - CH 630, CH 700 - 760 ONLY. FINISH FOOTPATH SURFACE TO PROVIDE FALL TO KERB OPENING.



PLAN 1:10 (A1) — A/3013 KERB OPENING

ELEVATION 1:10 (A1) — 1/3013 KERB OPENING

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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

STRUCTURAL DETAILS
KERB OPENING

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel: +61 2 88545000
Fax: +61 2 99209360
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	08.02.2022

SCALE: AS SHOWN
REF: PA2696-RHD-00-00-M2-RETAINING WALL DETAILS

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-ST-00-DR-ME-3014	D2	P03

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

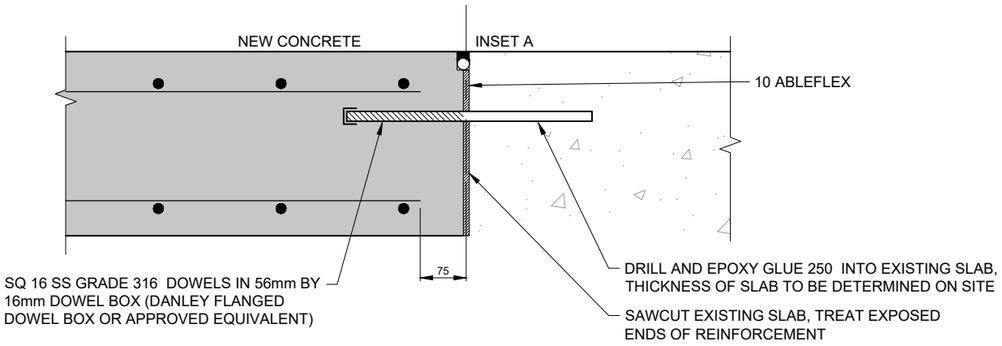
200 0 200 400 600 800 1000mm
1:10 (A1) 1:20 (A3)

2 0 2 4 6 8 10m
1:100 (A1) 1:200 (A3)

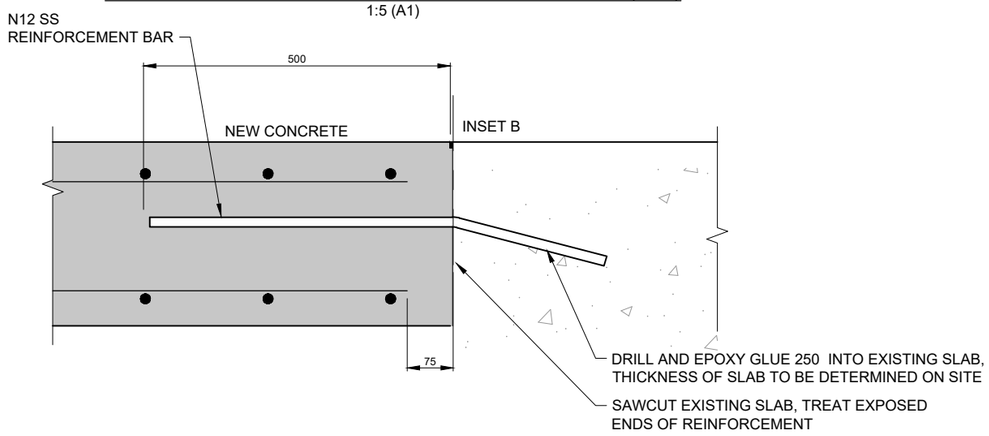
C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M2-RETAINING WALL DETAILS

DRAWING No.
PA2696-RHD-ST-00-DR-ME-3015

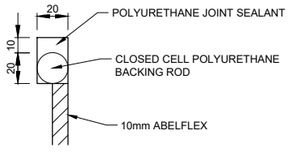
DO NOT SCALE



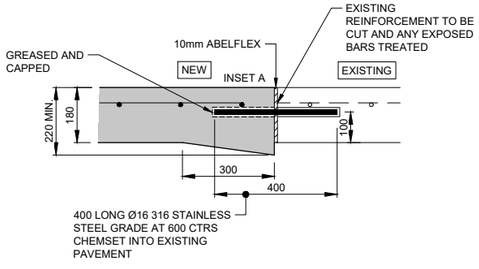
DOWELLED CONSTRUCTION JOINT IN PAVEMENT (DJ2)
1:5 (A1)



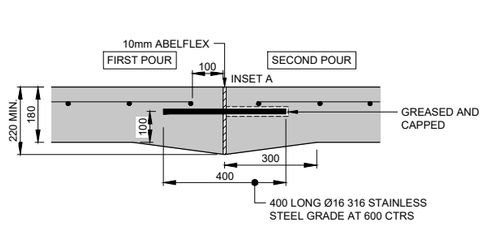
DOWELLED CONSTRUCTION JOINT (DJ3)
1:5 (A1)



INSET A

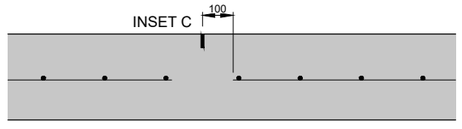


NEW PAVEMENT TO EXISTING JOINT DETAIL
1:10 (A1)



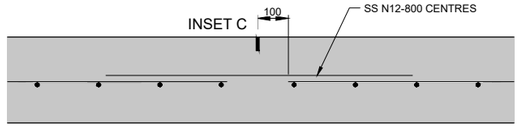
NOTE: JOINTS ARE AT 7.5m CTRS

DOWEL CONSTRUCTION JOINT (DJ) IN PAVEMENT
1:10 (A1)

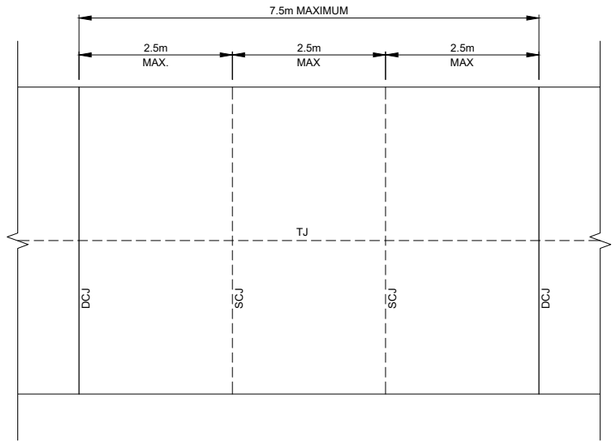


NOTE: TRANSVERYJOINTS ARE AT 2.5m CTRS

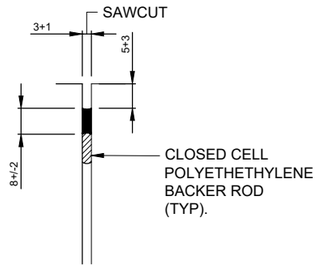
SAW CUT JOINT (SCJ)
1:10 (A1)



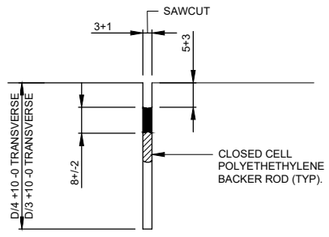
LONGITUDINAL TIED JOINT (TJ)
1:10 (A1)



5m WIDE FOOTPATH JOINT TYPICAL PLAN
1:100 (A1)



INSET B



INSET C

NOTES

1. FOR GENERAL NOTES REFER DRG 0011.
2. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES RELATIVE TO AUSTRALIAN HEIGHT DATUM U.N.O.
3. ALL REINFORCEMENT IN RETAINING WALL AND PAVEMENT TO BE HOT DIPPED GALVANISED.
4. SEAWARD FACE OF WALL TO BE COATED IN 2 FLOOD COATS OF SILANE.
5. CONCRETE USED IN THE WORKS TO BE F'c = 50 MPa.
6. ALL DOWELS USED IN THE WORKS SHALL BE STAINLESS STEEL GRADE 316 GRADE A4-70.
7. COVER TO REINFORCEMENT IN WALL IS 65mm.
8. HEIGHT OF RETAINING WALL TO BE CONFIRMED BY CONTRACTOR. CONTACT DESIGNER IF REQUIRED WALL HEIGHT IS GREATER THAN 1100mm.

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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
TYPICAL JOINT DETAILS FOOTPATH AND RETAINING WALLS

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street, North Sydney NSW 2060, Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	08.02.2022

SCALE: AS SHOWN
REF: PA2696-RHD-00-00-M2-RETAINING WALL DETAILS

DRAWING No.: PA2696-RHD-ST-00-DR-ME-3015
SUITABILITY: D2
REVISION: P03

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

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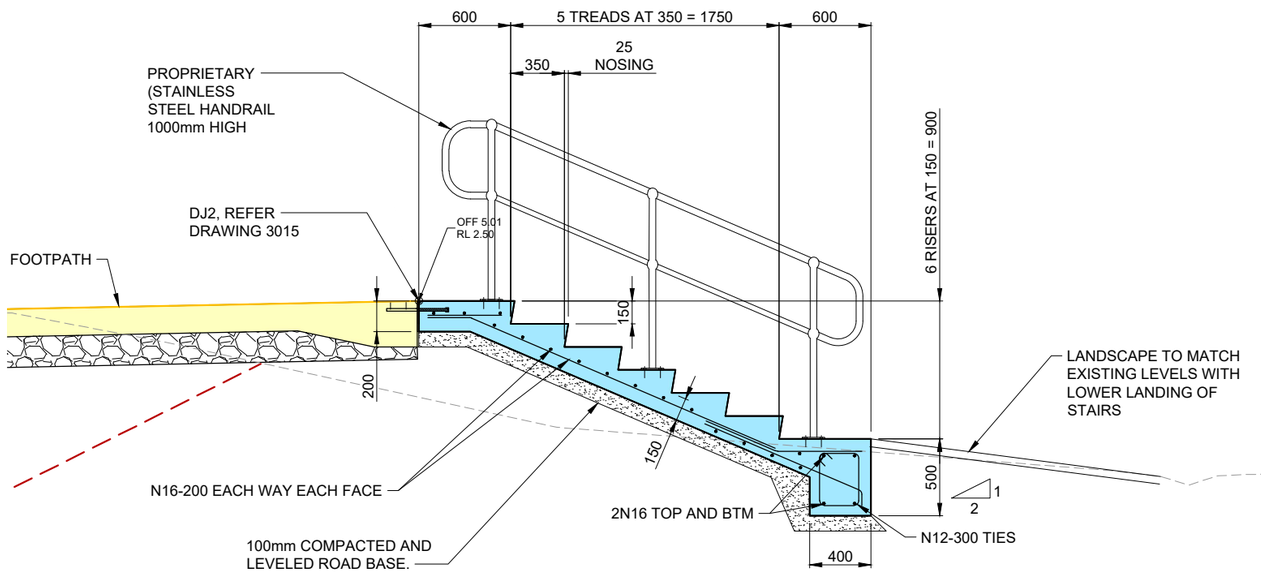
1:10 (A1) 1:20 (A3)

2 0 2 4 6 8 10m
1:100 (A1) 1:200 (A3)

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M2-RETAINING WALL DETAILS

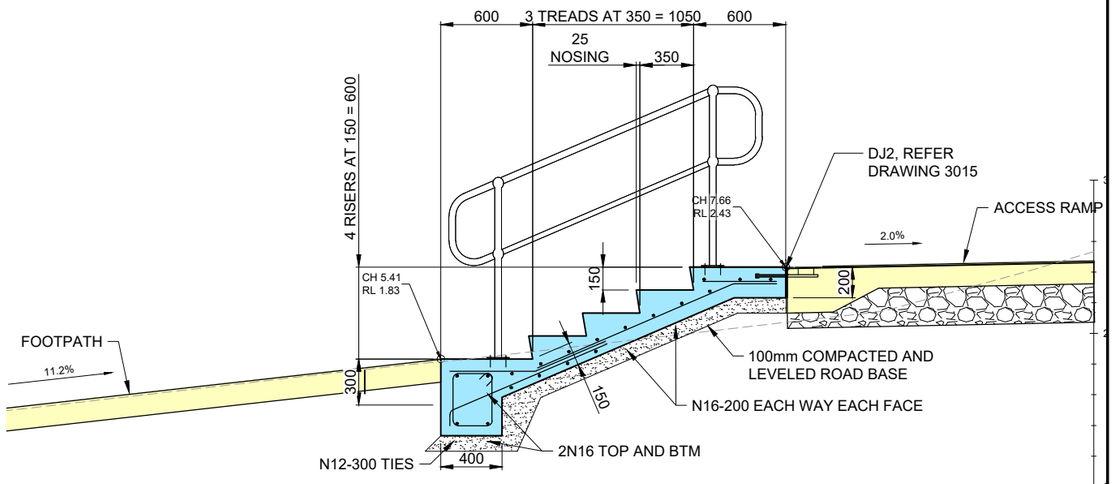
DRAWING No.
PA2696-RHD-ST-00-DR-ME-3021

DO NOT SCALE



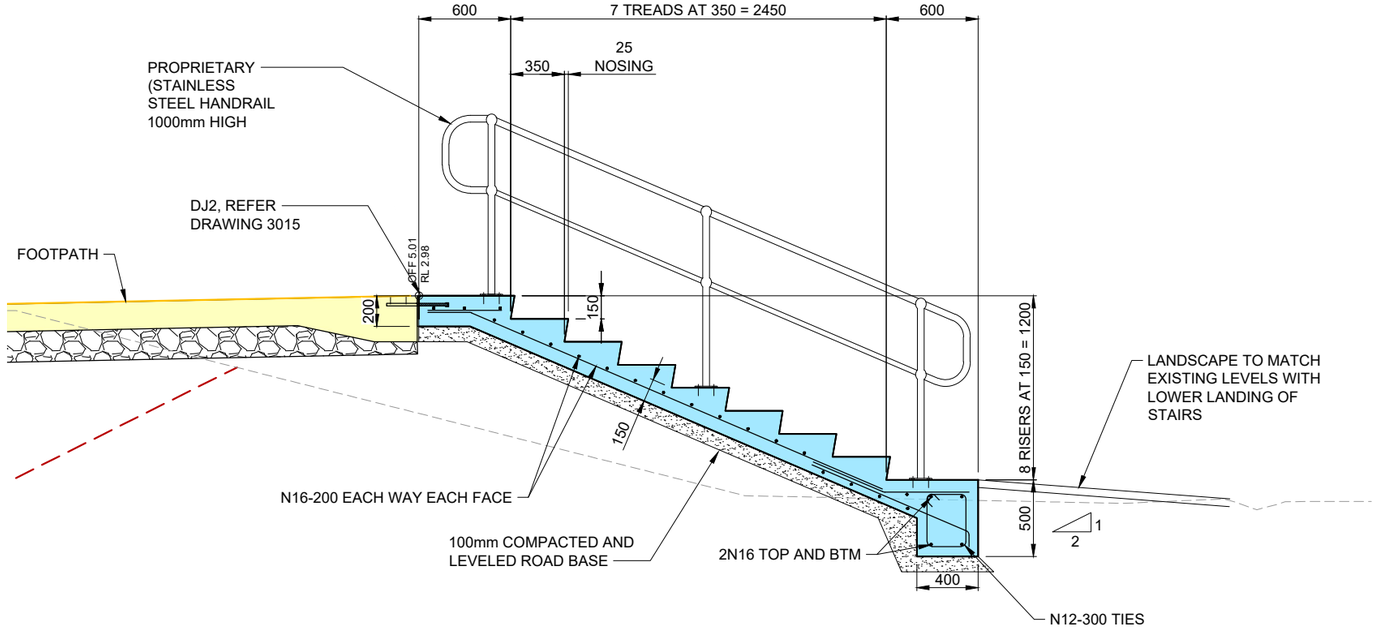
TYPICAL SECTION THROUGH 12m WIDE STAIR

1:20 (A1)



TYPICAL SECTION THROUGH STAIRS AT RAMP

1:20 (A1)



TYPICAL SECTION THROUGH 7m WIDE STAIR

1:20 (A1)

NOTES

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2. ALL DIMENSIONS ARE IN MILLIMETRES AND ALL LEVELS ARE IN METRES RELATIVE TO AUSTRALIAN HEIGHT DATUM U.N.O.
3. ALL REINFORCEMENT USED IN THE WORKS SHALL BE HOT DIP GALVANISED.
4. CONCRETE USED IN THE WORKS TO BE F'c = 50 MPa.
5. ALL DOWELS USED IN THE WORKS SHALL BE STAINLESS STEEL GRADE 316 GRADE A4-70.
6. COVER TO REINFORCEMENT IS 65mm.
7. PROVIDE ANTI SLIP STAIR NOSING ON STAIRS

400 0 400 800 1200 1600 2000mm

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

NOT FOR CONSTRUCTION | **D2** | **FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

STRUCTURAL DETAILS
STAIRS

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	28.01.2022

SCALE

REF: PA2696-RHD-00-00-M2-STAIR DETAILS

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-ST-00-DR-ME-3021	D2	P03

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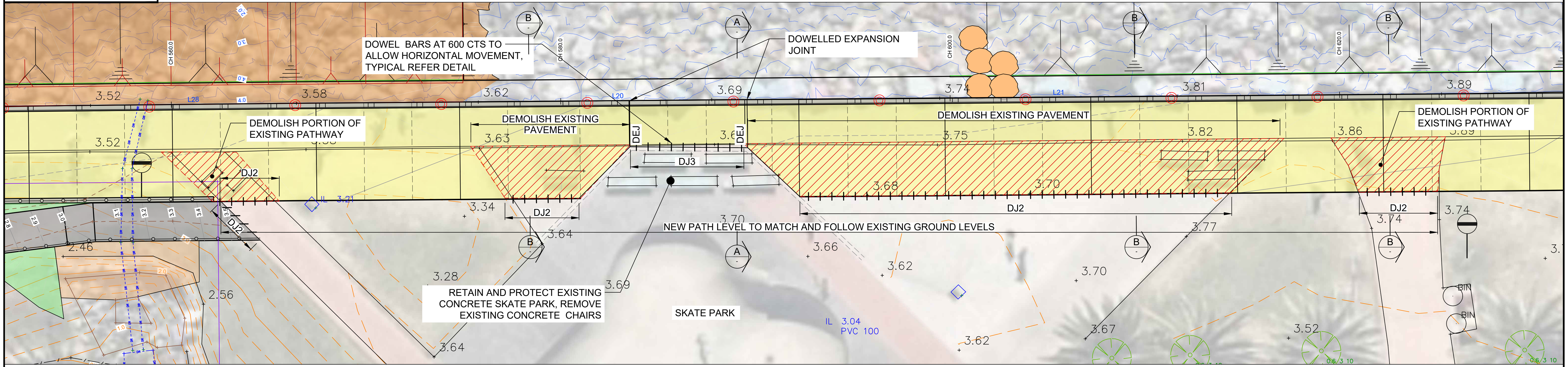
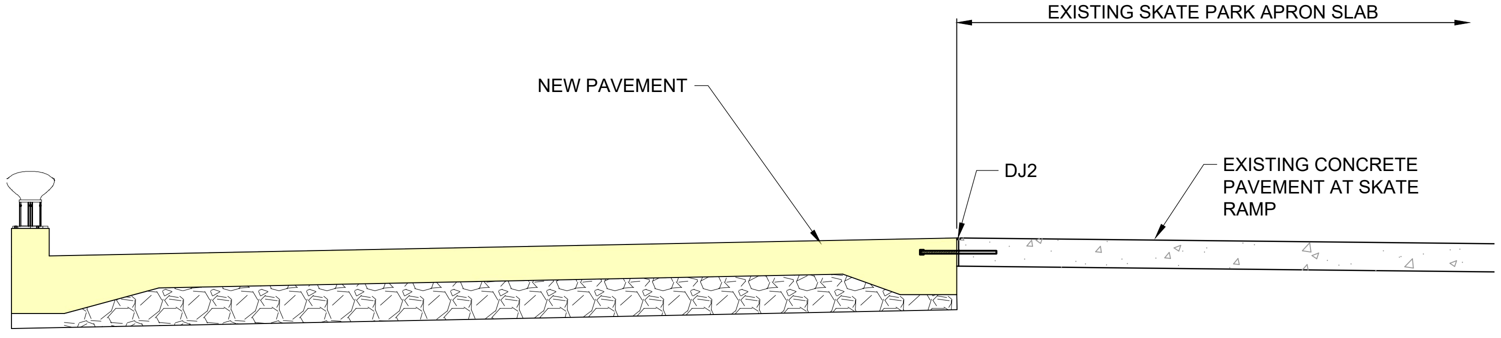
DRAWING No.
PA2696-RHD-ST-00-DR-ME-3022

DO NOT SCALE

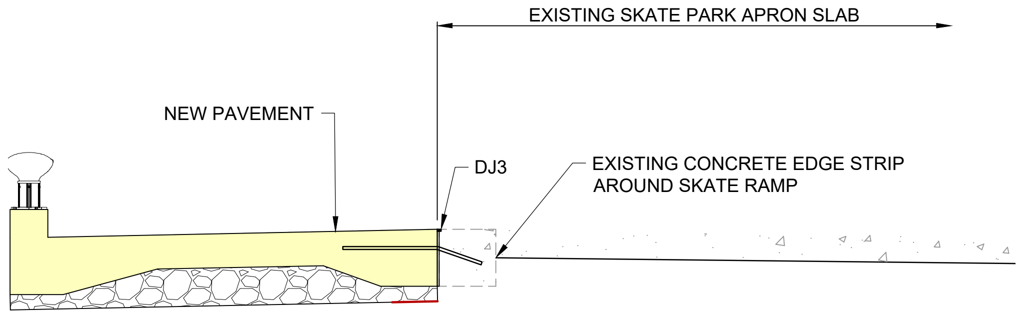


PLAN
1:100 (A1)

REFER DRAWING 3015 FOR JOINT DETAILS



SECTION B
1:20 (A1)



SECTION A
1:20 (A1)

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REVISIONS

CLIENT
NSW GOVERNMENT
Transport for NSW

PROJECT
PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE
STRUCTURAL DETAILS ADJACENT TO SKATE PARK

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM			07.02.2022

SCALE
REF. PA2696-RHD-00-00-M2-SKATE_PARK

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-ST-00-DR-ME-3022	D2	P03

© Haskoning Australia Pty Ltd

2 0 2 4 6 8 10m
1:100 (A1) 1:200 (A3)

400 0 400 800 1200 1600 2000mm
1:20 (A1) 1:40 (A3)

NOT FOR CONSTRUCTION

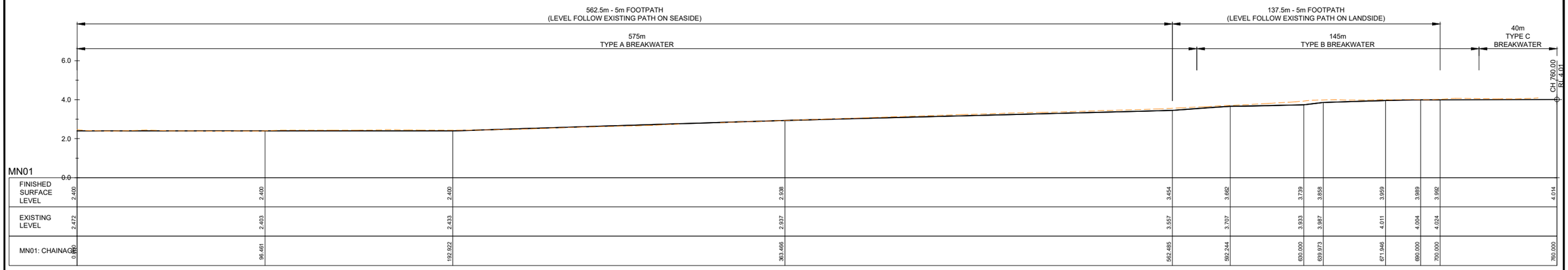
D2 FOR TENDER

AUSTRALIAN HEIGHT DATUM

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M2-SKATE_PARK

DRAWING No.
PA2696-RHD-CI-00-DR-ME-4000

DO NOT SCALE



LONG-SECTION
1:100V, 1:1,000H (A1)

NOTES

1. REFER DRG 2002 FOR CONTROL LINE LOCATION IN SECTION AT SEAWARD EDGE OF FOOTPATH.
2. PROPOSED BREAKWATER, FOOTPATH AND LANDSCAPE RELATIVE TO CONTROL LINE PROFILE LEVELS.

LEGEND

——— CONTROL LINE PROFILE

– – – EXISTING SURFACE PROFILE

DIAL BEFORE YOU DIG www.1100.com.au

WARNING

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"DIAL BEFORE YOU DIG" - 1100

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER AND FOOTPATH CONTROL LINE LONG SECTION

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel: +61 2 88545000
Fax: +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4000	D2	P03

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

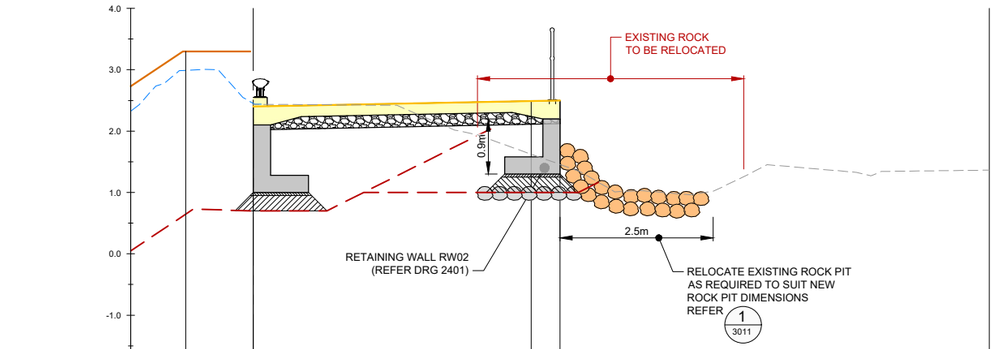
2 0 2 4 6 8 10m
1:200 (A3) 1:100 (A1)

20 0 20 40 60 80 100m
1:2000 (A3) 1:1000 (A1)

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

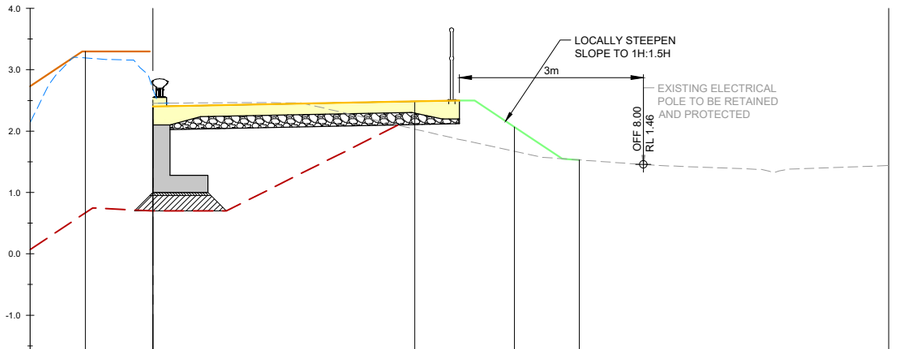
DRAWING No.
PA2696-RHD-CI-00-DR-ME-4001

DO NOT SCALE



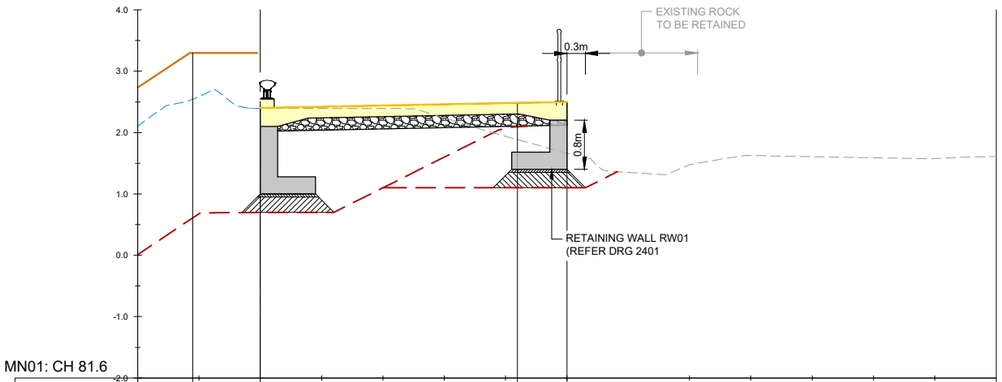
MN01: CH 129.1

FINISHED SURFACE LEVELS	2.73	3.30	2.40	2.49	2.50	
EXISTING LEVELS	2.33	2.99	2.44	1.62	1.46	
OFFSET	-2.00	-1.10	0.00	4.53	5.00	



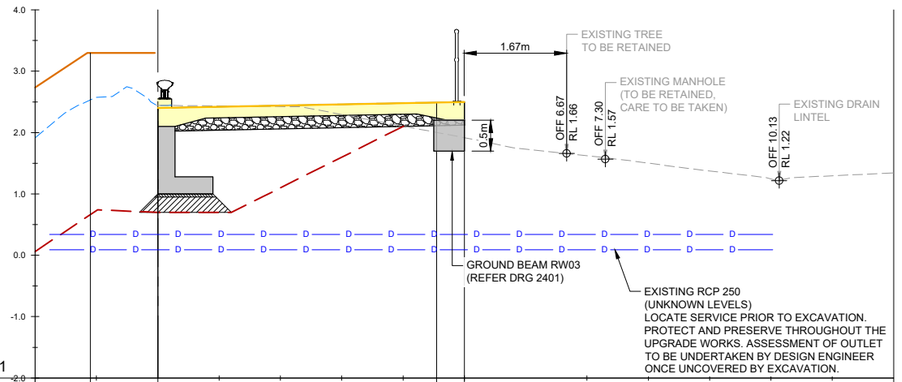
MN01: CH 168.5

FINISHED SURFACE LEVELS	2.73	3.30	2.40	2.49	2.07	1.53
EXISTING LEVELS	2.14	3.19	2.45	2.03	1.67	1.53
OFFSET	-2.00	-1.10	0.00	4.27	5.90	6.95



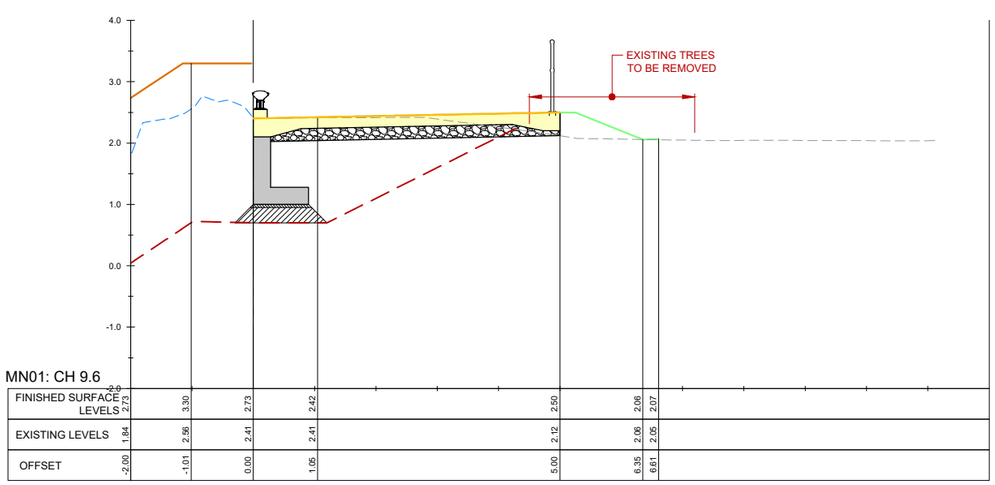
MN01: CH 81.6

FINISHED SURFACE LEVELS	2.73	3.30	2.40	2.48	2.50
EXISTING LEVELS	2.10	2.54	2.40	1.88	1.66
OFFSET	-2.00	-1.10	0.00	4.19	5.00



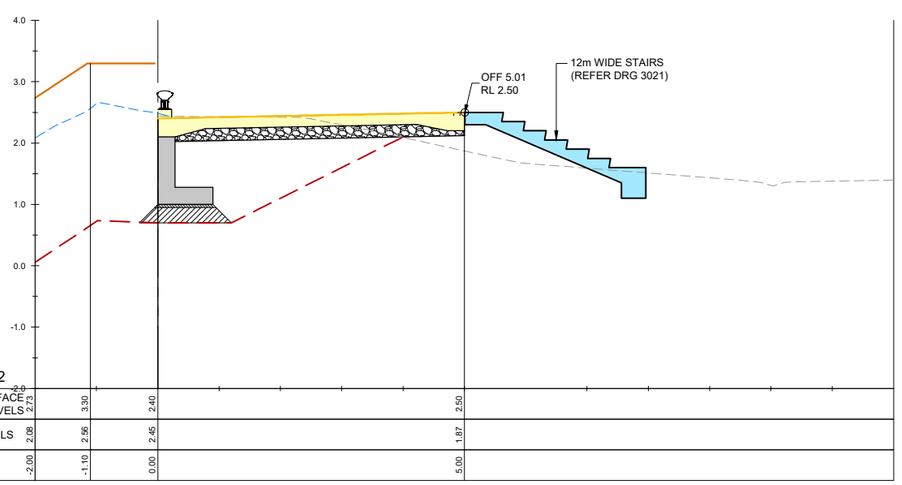
MN01: CH 149.1

FINISHED SURFACE LEVELS	2.73	3.30	2.40	2.49	2.50
EXISTING LEVELS	1.92	2.53	2.44	2.00	1.92
OFFSET	-2.00	-1.10	0.00	4.55	5.00



MN01: CH 9.6

FINISHED SURFACE LEVELS	2.73	3.30	2.73	2.42	2.50	2.06	2.07
EXISTING LEVELS	1.84	2.96	2.41	2.41	2.12	2.06	2.05
OFFSET	-2.00	-1.01	0.00	1.05	5.00	6.35	6.61



MN01: CH 139.2

FINISHED SURFACE LEVELS	2.73	3.30	2.40	2.50	
EXISTING LEVELS	2.08	2.96	2.45	1.87	
OFFSET	-2.00	-1.10	0.00	5.00	

NOTES

1. SURVEY BY NORTH COAST SURVEYS, DATED 29/07/2021.
2. CROSS-SECTIONS CUT AT KEY LOCATIONS, INCLUDING PROPOSED LANDSIDE RETAINING WALLS, EXISTING TREES AND ROCK PITS.
3. REINSTATE BATTER SLOPE TO EXISTING LINES AND LEVELS FOLLOWING THE CONSTRUCTION OF THE LANDWARD RETAINING WALL.
4. FOR REINFORCEMENT DETAILS OF RETAINING WALL REFER TO DRG 3011.
5. ARBORIST ONSITE TO INSPECT TREE ROOTS. IF TREE ROOTS ARE IMPACTED BY CONSTRUCTION, CONTACT THE SUPERINTENDED.
6. EXCAVATION LEVELS BASED ON 1.1m HIGH SEAWARD RETAINING WALL, LEVELS MAY VARY DEPENDING ON REQUIRED WALL HEIGHT.

LEGEND

- BATHYMETRIC PROFILE (MULTI-BEAM BATHYMETRY + DRONE PHOTOGRAMMETRY)
- TOPOGRAPHIC PROFILE (DETAIL TOPO SURVEY)
- IDEALISED BREAKWATER PROFILE
- PROPOSED BREAKWATER (BELOW MOST RECENT SURVEY DOWN TO DESIGN SCOUR LEVEL IF REQUIRED)
- PROPOSED FOOTPATH AND RAMP PROFILE
- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE
- 5m PATH AND SEAWARD RETAINING WALL
- LANDWARD RETAINING WALL

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

1000 0 1000 2000 3000 4000 5000mm

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

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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

LANDSIDE
DETAIL CROSS SECTIONS
SHEET 1

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 38545000
Fax +61 2 99295960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022

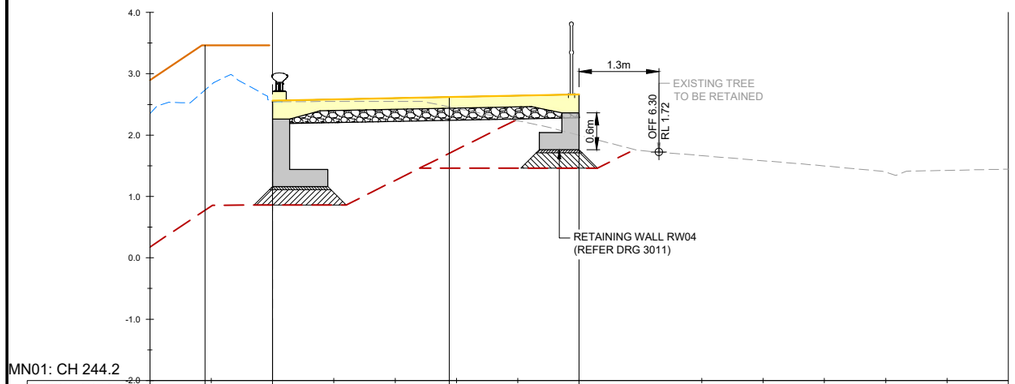
SCALE	REF
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4001	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

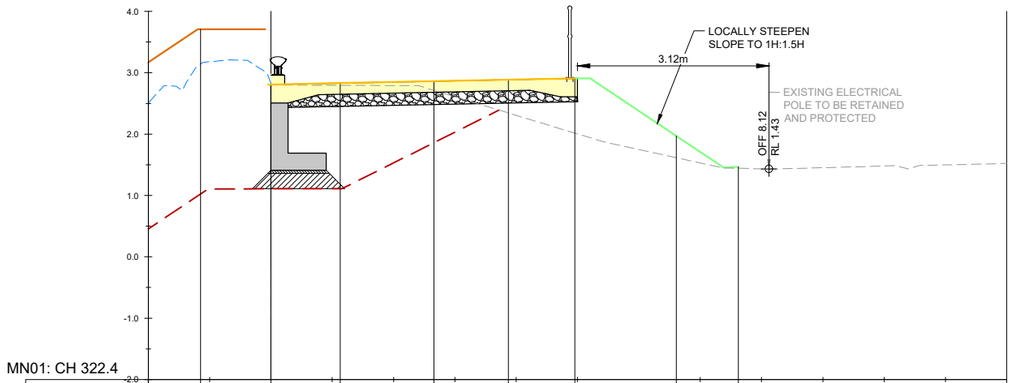
DRAWING No.
PA2696-RHD-CI-00-DR-ME-4002

DO NOT SCALE



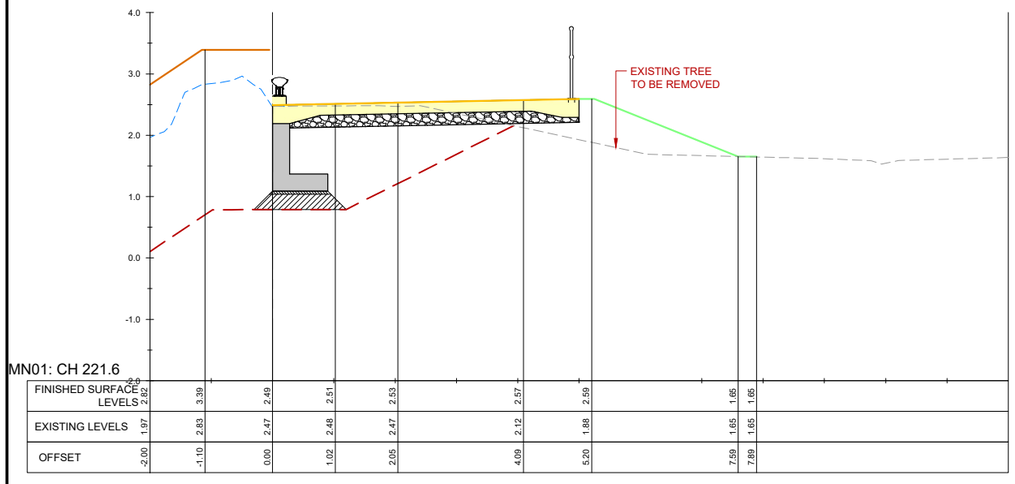
MN01: CH 244.2

FINISHED SURFACE LEVELS	2.90	3.46	2.56	2.62	2.66					
EXISTING LEVELS	2.35	2.74	2.54	2.46	2.00					
OFFSET	-2.00	-1.10	0.00	2.88	5.00					



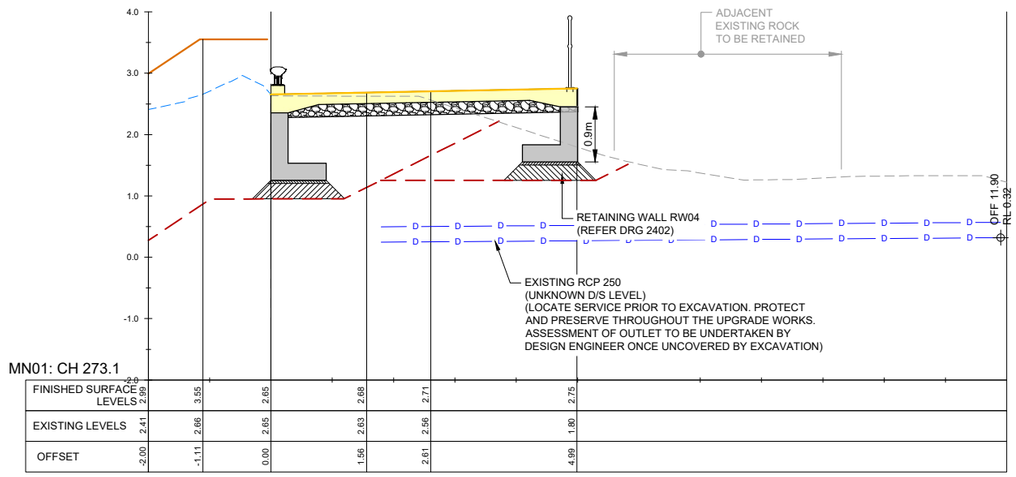
MN01: CH 322.4

FINISHED SURFACE LEVELS	3.17	3.71	2.81	2.83	2.86	2.89	2.91	1.97	1.46	
EXISTING LEVELS	2.51	3.15	2.83	2.80	2.71	2.34	2.02	1.61	1.44	
OFFSET	-2.00	-1.15	0.00	1.13	2.66	3.87	4.95	6.61	7.62	



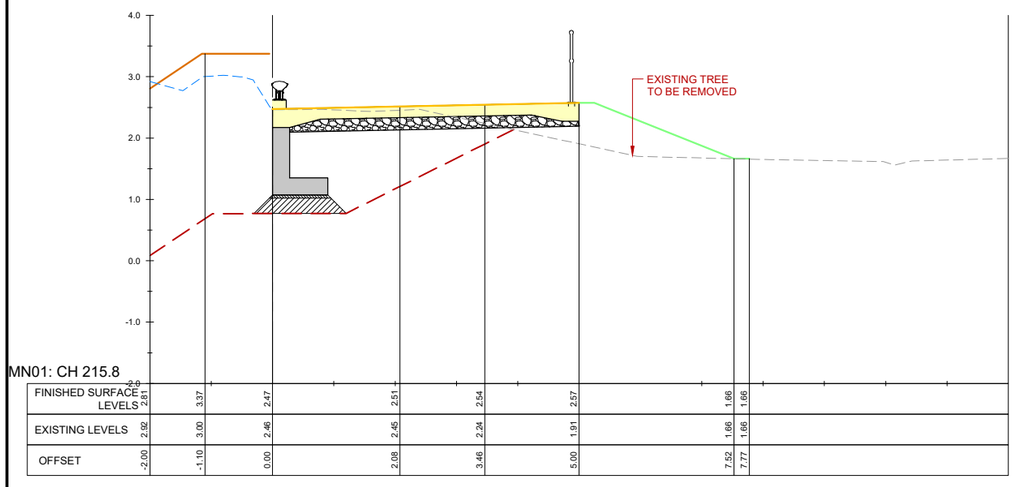
MN01: CH 221.6

FINISHED SURFACE LEVELS	2.82	3.39	2.49	2.51	2.53	2.57	2.59	1.65	1.65	
EXISTING LEVELS	1.97	2.83	2.47	2.48	2.47	2.12	1.88	1.65	1.65	
OFFSET	-2.00	-1.10	0.00	1.02	2.05	4.09	5.20	7.59	7.89	



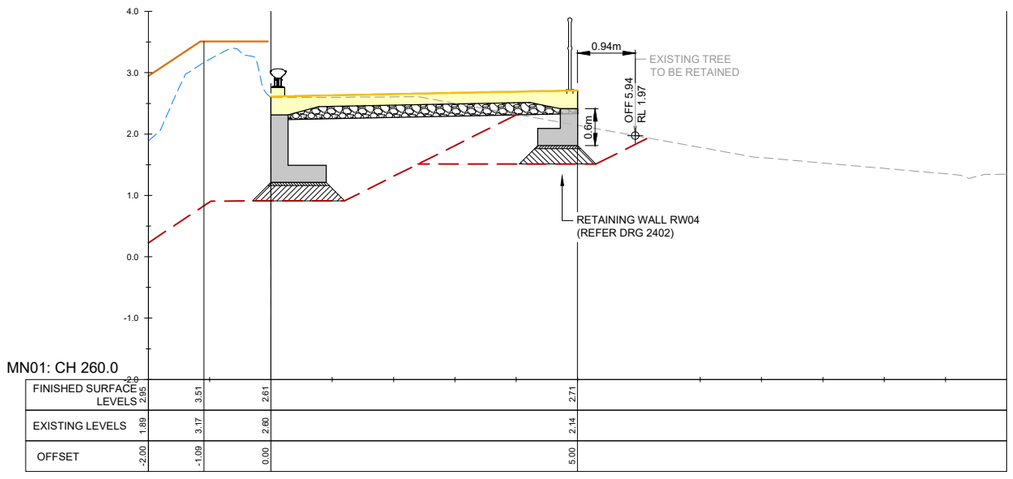
MN01: CH 273.1

FINISHED SURFACE LEVELS	2.89	3.55	2.85	2.68	2.71	2.75				
EXISTING LEVELS	2.41	2.66	2.65	2.63	2.56	1.80				
OFFSET	-2.00	-1.11	0.00	1.56	2.61	4.99				



MN01: CH 215.8

FINISHED SURFACE LEVELS	2.81	3.37	2.47	2.51	2.54	2.57	1.66	1.66		
EXISTING LEVELS	2.92	3.00	2.46	2.45	2.24	1.91	1.66	1.66		
OFFSET	-2.00	-1.10	0.00	2.08	3.46	5.00	7.52	7.77		



MN01: CH 260.0

FINISHED SURFACE LEVELS	2.95	3.51	2.61	2.71						
EXISTING LEVELS	1.89	3.17	2.60	2.14						
OFFSET	-2.00	-1.09	0.00	5.00						

NOTES

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LEGEND

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- TOPOGRAPHIC PROFILE (DETAIL TOPO SURVEY)
- IDEALISED BREAKWATER PROFILE
- PROPOSED BREAKWATER (BELOW MOST RECENT SURVEY DOWN TO DESIGN SCOUR LEVEL IF REQUIRED)
- PROPOSED FOOTPATH AND RAMP PROFILE
- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE
- 5m PATH AND SEAWARD RETAINING WALL
- LANDWARD RETAINING WALL

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

1000 0 1000 2000 3000 4000 5000mm

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

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P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
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REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

LANDSIDE
DETAIL CROSS SECTIONS
SHEET 2

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

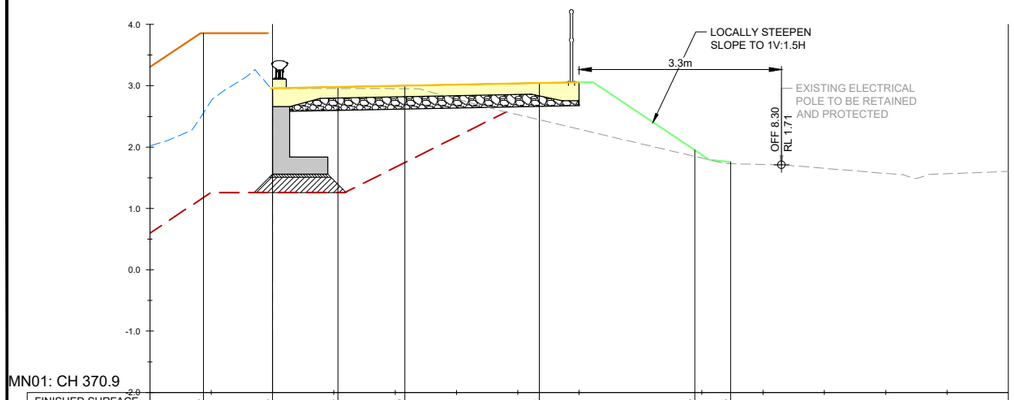
DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF.		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4002	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

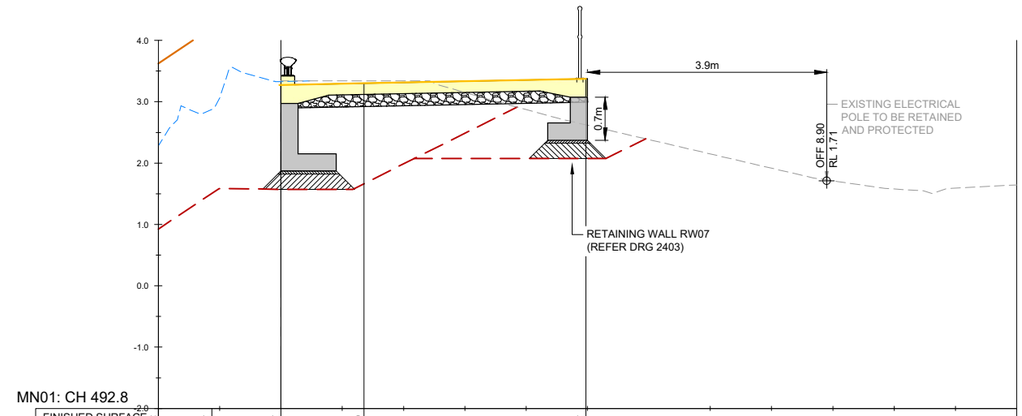
DRAWING No.
PA2696-RHD-CI-00-DR-ME-4003

DO NOT SCALE



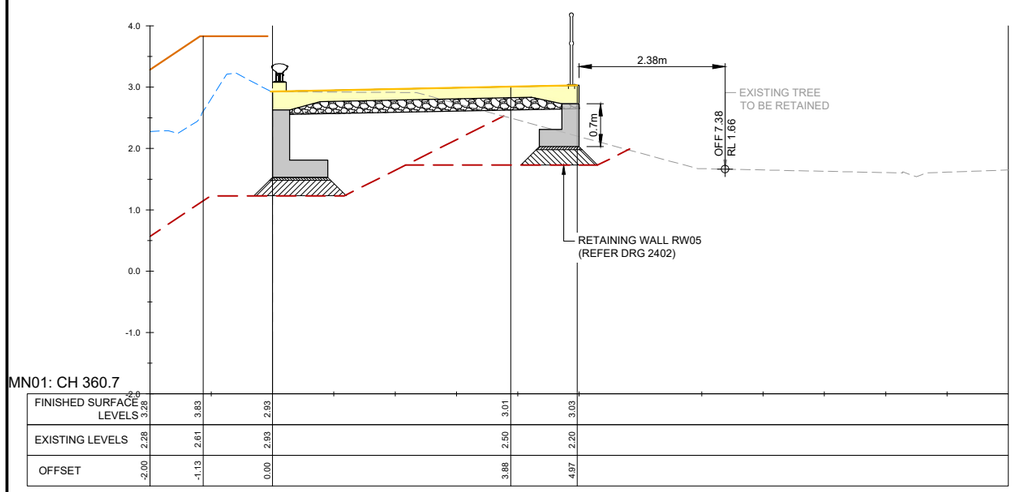
MN01: CH 370.9

FINISHED SURFACE LEVELS	3.31	3.86	2.96	2.98	3.00	3.04	1.95	1.76	
EXISTING LEVELS	2.02	2.56	2.96	2.96	2.95	2.45	1.85	1.73	
OFFSET	-2.00	-1.12	0.00	1.07	2.16	4.35	6.89	7.47	



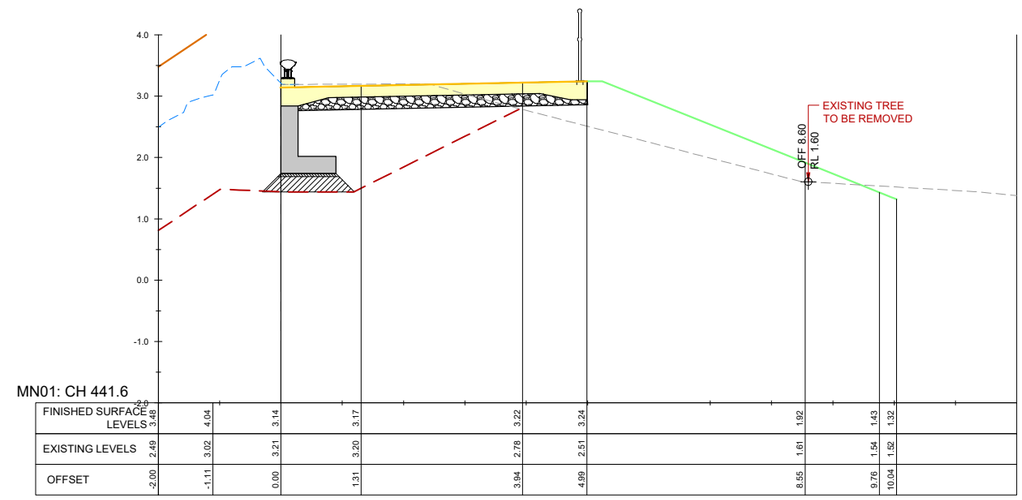
MN01: CH 492.8

FINISHED SURFACE LEVELS	3.62	4.17	3.27	3.30	3.37				
EXISTING LEVELS	2.28	2.87	3.34	3.34	2.62				
OFFSET	-2.00	-1.13	0.00	1.35	4.97				



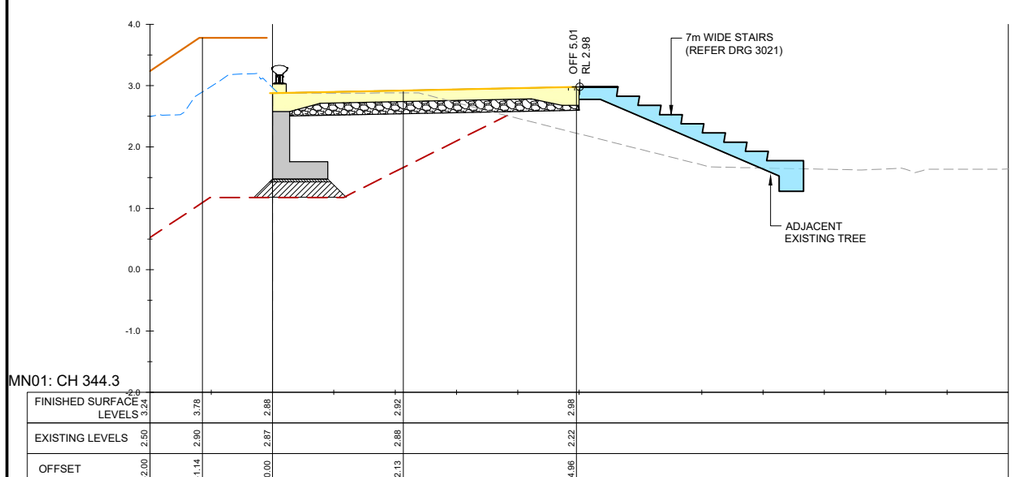
MN01: CH 360.7

FINISHED SURFACE LEVELS	3.28	3.83	2.93		3.01	3.03			
EXISTING LEVELS	2.28	2.61	2.93		2.50	2.20			
OFFSET	-2.00	-1.13	0.00		3.88	4.97			



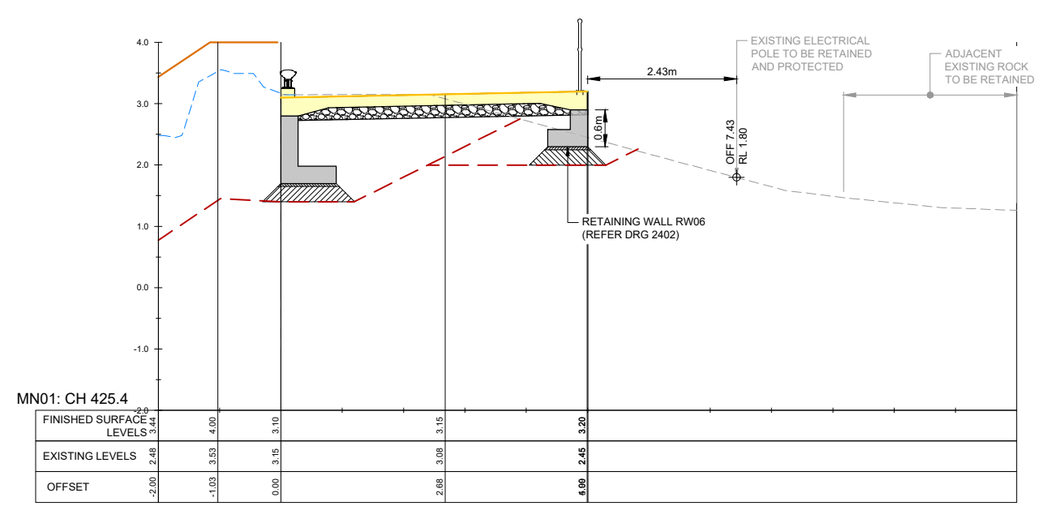
MN01: CH 441.6

FINISHED SURFACE LEVELS	3.48	4.04	3.14	3.17	3.22	3.24	1.92	1.43	1.32
EXISTING LEVELS	2.49	3.02	3.21	3.20	2.78	2.51	1.61	1.54	1.52
OFFSET	-2.00	-1.11	0.00	1.31	3.94	4.99	8.55	9.76	10.04



MN01: CH 344.3

FINISHED SURFACE LEVELS	3.24	3.78	2.88	2.92	2.98				
EXISTING LEVELS	2.50	2.90	2.87	2.88	2.22				
OFFSET	-2.00	-1.14	0.00	2.13	4.96				



MN01: CH 425.4

FINISHED SURFACE LEVELS	3.44	4.00	3.10	3.15	3.20				
EXISTING LEVELS	2.48	3.53	3.15	3.08	2.45				
OFFSET	-2.00	-1.03	0.00	2.68	6.99				

NOTES

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2. CROSS-SECTIONS CUT AT KEY LOCATIONS, INCLUDING PROPOSED LANDSIDE RETAINING WALLS, EXISTING TREES AND ROCK PITS.
3. REINSTATE BATTER SLOPE TO EXISTING LINES AND LEVELS FOLLOWING THE CONSTRUCTION OF THE LANDWARD RETAINING WALL.
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6. EXCAVATION LEVELS BASED ON 1.1m HIGH SEAWARD RETAINING WALL, LEVELS MAY VARY DEPENDING ON REQUIRED WALL HEIGHT.

LEGEND

- BATHYMETRIC PROFILE (MULTI-BEAM BATHYMETRY + DRONE PHOTOGRAMMETRY)
- TOPOGRAPHIC PROFILE (DETAIL TOPO SURVEY)
- IDEALISED BREAKWATER PROFILE
- PROPOSED BREAKWATER (BELOW MOST RECENT SURVEY DOWN TO DESIGN SCOUR LEVEL IF REQUIRED)
- PROPOSED FOOTPATH AND RAMP PROFILE
- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE
- 5m PATH AND SEAWARD RETAINING WALL
- LANDWARD RETAINING WALL

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

1000 0 1000 2000 3000 4000 5000mm

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

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REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

LANDSIDE
DETAIL CROSS SECTIONS
SHEET 3

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
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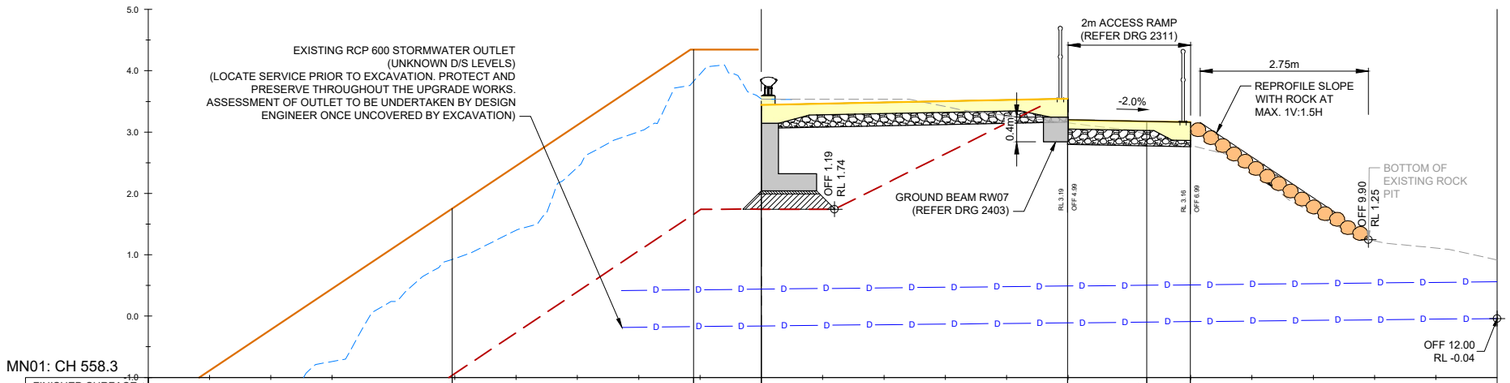
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

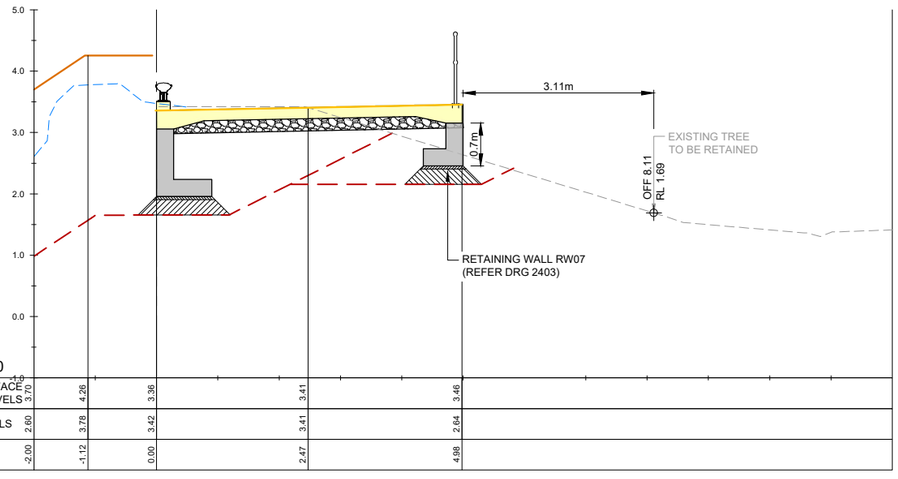
DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4003	D2	P03

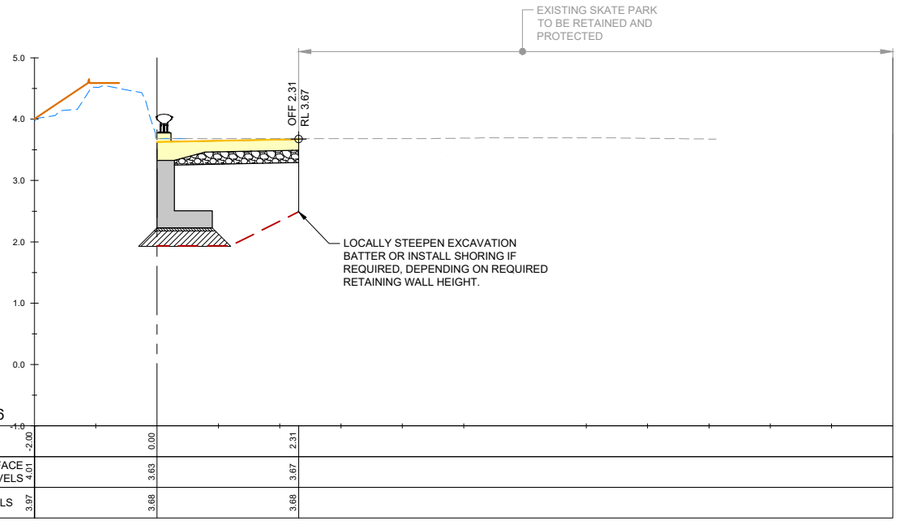
C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

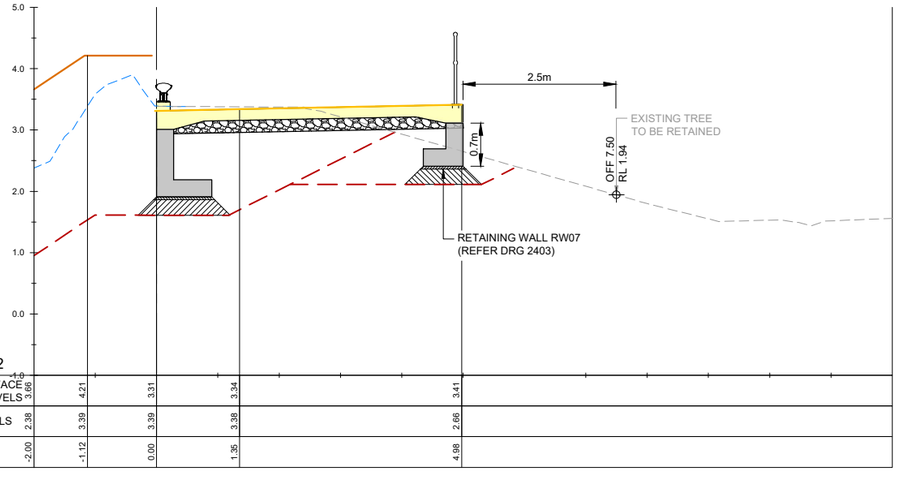
DRAWING No.
PA2696-RHD-CI-00-DR-ME-4004

DO NOT SCALE









NOTES

1. SURVEY BY NORTH COAST SURVEYS, DATED 29/07/2021.
2. CROSS-SECTIONS CUT AT KEY LOCATIONS, INCLUDING PROPOSED LANDSIDE RETAINING WALLS, EXISTING TREES AND ROCK PITS.
3. REINSTATE BATTER SLOPE TO EXISTING LINES AND LEVELS FOLLOWING THE CONSTRUCTION OF THE LANDWARD RETAINING WALL.
4. FOR REINFORCEMENT DETAILS OF RETAINING WALL REFER TO DRG 3011.
5. ARBORIST ONSITE TO INSPECT TREE ROOTS. IF TREE ROOTS ARE IMPACTED BY CONSTRUCTION, CONTACT THE SUPERINTENDED.
6. EXCAVATION LEVELS BASED ON 1.1m HIGH SEAWARD RETAINING WALL, LEVELS MAY VARY DEPENDING ON REQUIRED WALL HEIGHT.

LEGEND

- BATHYMETRIC PROFILE (MULTI-BEAM BATHYMETRY + DRONE PHOTOGRAMMETRY)
- TOPOGRAPHIC PROFILE (DETAIL TOPO SURVEY)
- IDEALISED BREAKWATER PROFILE
- PROPOSED BREAKWATER (BELOW MOST RECENT SURVEY DOWN TO DESIGN SCOUR LEVEL IF REQUIRED)
- PROPOSED FOOTPATH AND RAMP PROFILE
- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE
- 5m PATH AND SEAWARD RETAINING WALL
- LANDWARD RETAINING WALL

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WARNING

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

LANDSIDE
DETAIL CROSS SECTIONS
SHEET 4

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street,
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4004	D2	P03

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

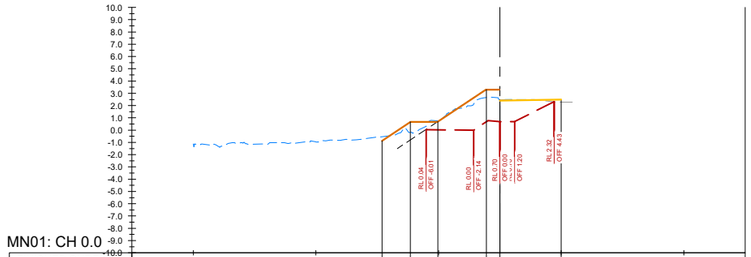
1000 0 1000 2000 3000 4000 5000mm

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

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

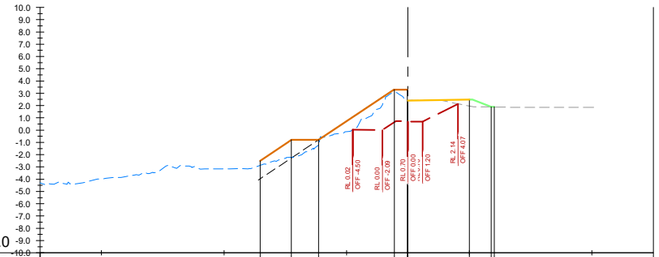
DRAWING No.
PA2696-RHD-CI-00-DR-ME-4101

DO NOT SCALE



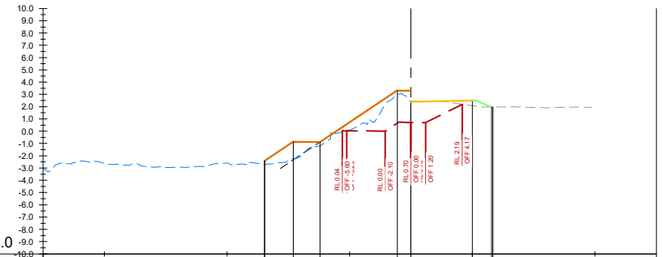
MN01: CH 0.0

FINISHED SURFACE LEVELS	-0.88	0.66	0.70	3.30	2.45	2.50	
EXISTING LEVELS	-0.55	-0.18	0.75	2.85	2.47	2.28	
OFFSET	-9.61	-7.31	-5.06	-1.09	0.00	5.00	



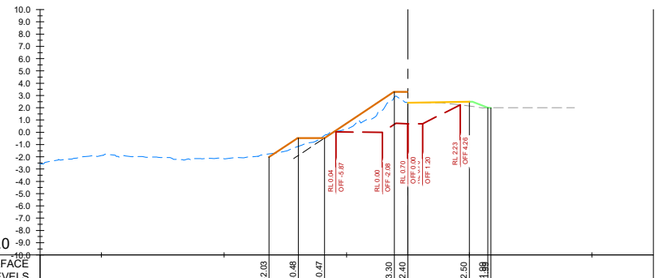
MN01: CH 40.0

FINISHED SURFACE LEVELS	-2.50	-0.80	-0.80	3.30	2.50	2.50	1.88
EXISTING LEVELS	-2.88	-2.21	-1.24	3.05	2.43	1.97	1.88
OFFSET	-12.05	-9.50	-7.30	-1.10	0.00	5.00	6.28



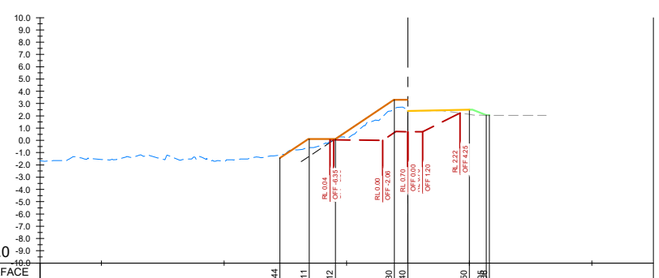
MN01: CH 30.0

FINISHED SURFACE LEVELS	-2.43	-0.87	-0.86	3.30	2.40	2.50	1.88
EXISTING LEVELS	-2.72	-2.26	-1.20	2.97	2.42	2.08	1.97
OFFSET	-11.99	-9.60	-7.41	-1.10	0.00	5.00	6.09



MN01: CH 20.0

FINISHED SURFACE LEVELS	-2.03	-0.48	-0.47	3.30	2.40	2.50	1.88
EXISTING LEVELS	-1.77	-1.15	-0.26	2.88	2.40	2.13	1.88
OFFSET	-11.33	-8.94	-6.81	-1.10	0.00	5.00	6.54



MN01: CH 10.0

FINISHED SURFACE LEVELS	-1.44	0.11	0.12	3.30	2.40	2.50	2.05
EXISTING LEVELS	-1.19	-0.58	0.12	2.57	2.40	2.12	2.05
OFFSET	-10.44	-8.05	-5.92	-1.10	0.00	5.00	6.38

NOTES

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LEGEND

- BATHYMETRIC PROFILE (MULTI-BEAM BATHYMETRY + DRONE PHOTOGRAMMETRY)
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- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE (REFER NOTE 4)

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER CROSS SECTIONS SHEET 1

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 38545000
Fax +61 2 99295960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4101	D2	P03

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

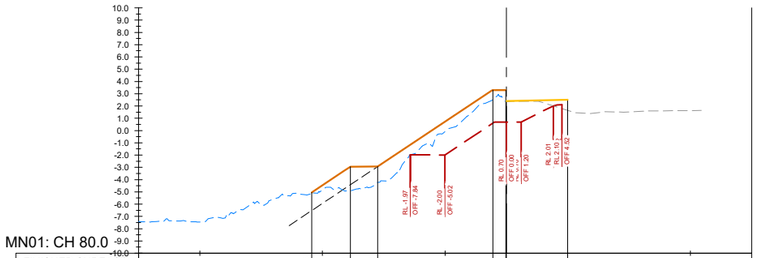
5 0 5 10 15 20 25m

1:500 (A3) 1:250 (A1)

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

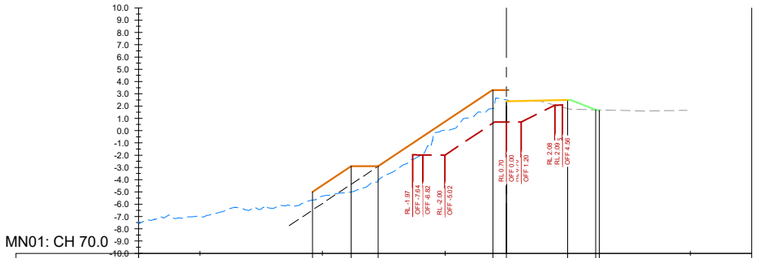
DRAWING No.
PA2696-RHD-CI-00-DR-ME-4102

DO NOT SCALE



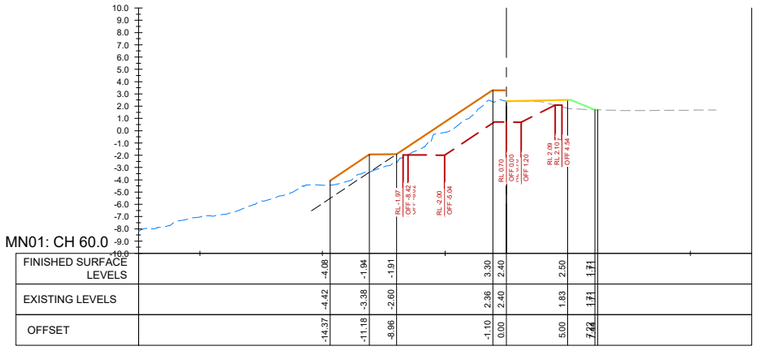
MN01: CH 80.0

FINISHED SURFACE LEVELS	-5.05	-2.94	-2.94	3.30	2.40	2.50	1.64	
EXISTING LEVELS	-5.11	-4.91	-4.24	2.54	2.39	1.64	1.64	
OFFSET	-15.88	-12.71	-10.51	-1.10	0.00	5.00	7.64	



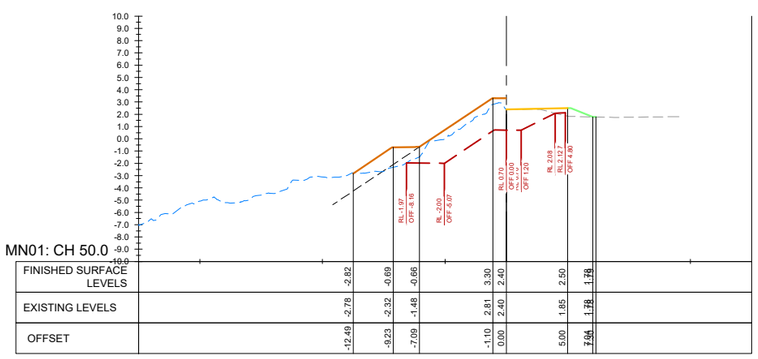
MN01: CH 70.0

FINISHED SURFACE LEVELS	-5.00	-2.90	-2.90	3.30	2.40	2.50	1.64	
EXISTING LEVELS	-5.67	-5.00	-4.09	1.80	2.39	1.80	1.68	
OFFSET	-15.80	-12.65	-10.45	-1.10	0.00	5.00	7.37	



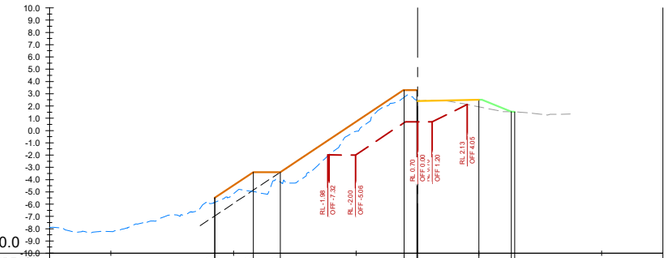
MN01: CH 60.0

FINISHED SURFACE LEVELS	-4.08	-1.94	-1.91	3.30	2.40	2.50	1.71	
EXISTING LEVELS	-4.42	-3.38	-2.60	2.36	2.40	1.83	1.71	
OFFSET	-14.37	-11.18	-8.96	-1.10	0.00	5.00	7.72	



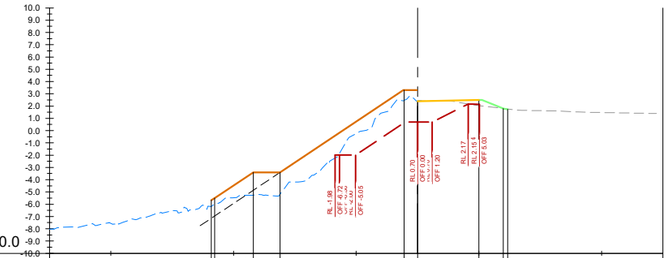
MN01: CH 50.0

FINISHED SURFACE LEVELS	-2.82	-0.69	-0.66	3.30	2.40	2.50	1.78	
EXISTING LEVELS	-2.78	-2.32	-1.48	2.81	2.40	1.85	1.78	
OFFSET	-12.49	-9.23	-7.09	-1.10	0.00	5.00	7.64	



MN01: CH 120.0

FINISHED SURFACE LEVELS	-5.49	-3.40	-3.40	3.30	2.40	2.50	1.64	
EXISTING LEVELS	-5.68	-4.68	-4.19	2.69	2.44	1.94	1.64	
OFFSET	-16.54	-13.40	-11.20	-1.10	0.00	5.00	7.64	



MN01: CH 110.0

FINISHED SURFACE LEVELS	-5.57	-3.40	-3.40	3.30	2.40	2.50	1.92	
EXISTING LEVELS	-5.68	-5.26	-5.16	2.44	2.44	2.04	1.92	
OFFSET	-16.61	-13.40	-11.20	-1.10	0.00	5.00	6.92	

MN01: CH 100.0

FINISHED SURFACE LEVELS	-5.50	-3.40	-3.40	3.30	2.40	2.50	1.92	
EXISTING LEVELS	-5.87	-5.20	-4.65	2.42	2.42	2.06	1.91	
OFFSET	-16.55	-13.40	-11.20	-1.10	0.00	5.00	6.92	

MN01: CH 90.0

FINISHED SURFACE LEVELS	-5.49	-3.40	-3.40	3.30	2.40	2.50	1.63	
EXISTING LEVELS	-5.93	-4.82	-3.89	2.73	2.40	1.97	1.63	
OFFSET	-16.54	-13.40	-11.20	-1.10	0.00	5.00	7.64	

NOTES

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LEGEND

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- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE (REFER NOTE 4)

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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER CROSS SECTIONS SHEET 2

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 38545000
Fax +61 2 99295960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4102	D2	P03

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

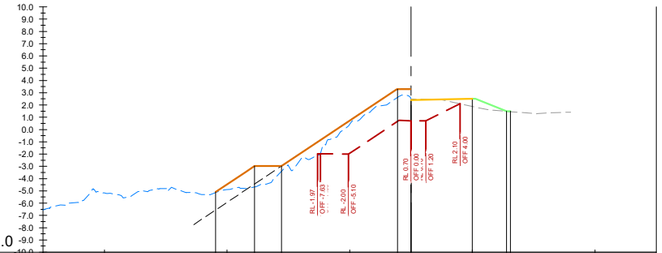
5 0 5 10 15 20 25m

1:500 (A3) 1:250 (A1)

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

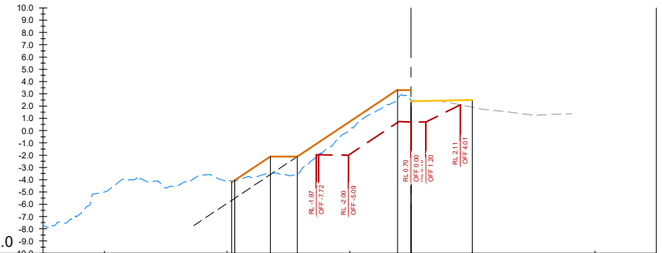
DRAWING No.
PA2696-RHD-CI-00-DR-ME-4103

DO NOT SCALE



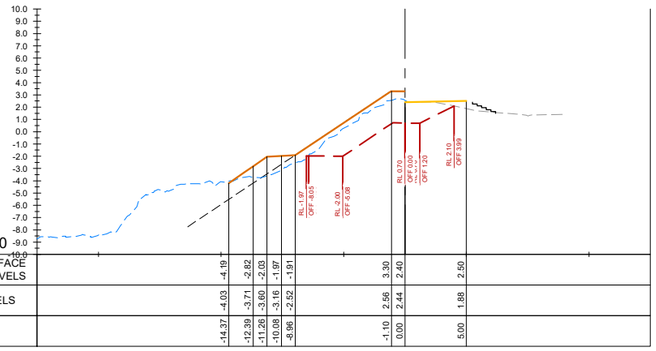
MN01: CH 160.0

FINISHED SURFACE LEVELS	-5.10	-2.98	-2.97	3.30	2.40	2.50	1.48		
EXISTING LEVELS	-5.14	-4.69	-3.41	2.63	2.46	1.89	1.48		
OFFSET	-15.93	-12.76	-10.55	-1.10	0.00	5.00	7.70		



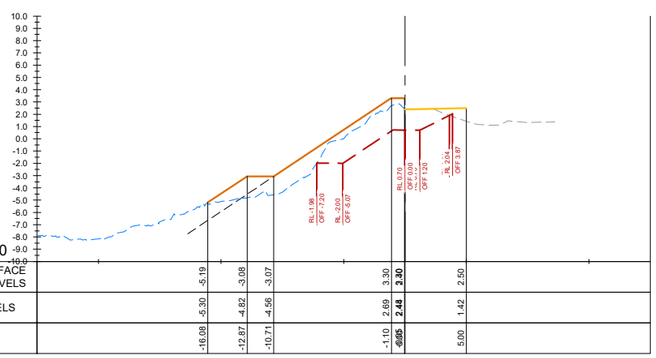
MN01: CH 150.0

FINISHED SURFACE LEVELS	-4.22	-2.12	-2.11	3.30	2.40	2.50			
EXISTING LEVELS	-4.11	-3.49	-3.52	2.54	2.44	1.92			
OFFSET	-14.58	-11.48	-9.26	-1.10	0.00	5.00			



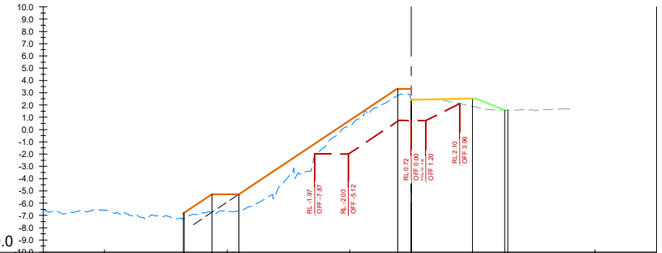
MN01: CH 140.0

FINISHED SURFACE LEVELS	-4.19	-2.82	-2.03	-1.97	-1.91	3.30	2.40	2.50	
EXISTING LEVELS	-4.03	-3.71	-3.60	-3.16	-2.52	2.56	2.44	1.88	
OFFSET	-14.37	-12.39	-11.26	-10.08	-8.96	-1.10	0.00	5.00	



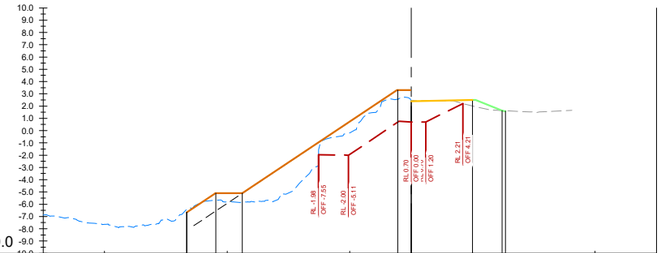
MN01: CH 130.0

FINISHED SURFACE LEVELS	-5.19	-3.08	-3.07	3.30	2.50				
EXISTING LEVELS	-5.30	-4.82	-4.56	2.69	2.48	1.42			
OFFSET	-16.08	-12.87	-10.71	-1.10	0.00	5.00			



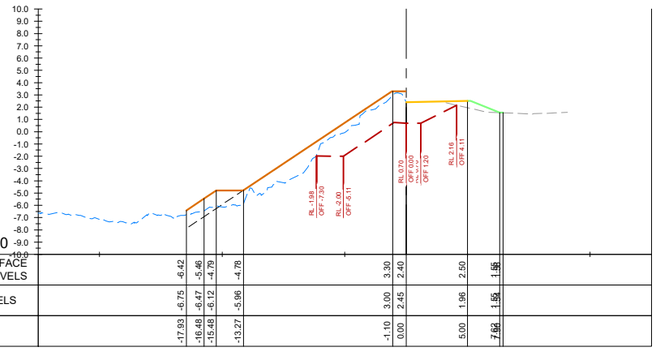
MN01: CH 200.0

FINISHED SURFACE LEVELS	-5.89	-5.28	-5.28	3.32	2.42	2.52	1.57		
EXISTING LEVELS	-7.26	-6.73	-6.63	2.77	2.44	1.89	1.57		
OFFSET	-18.53	-16.25	-14.05	-1.10	0.00	5.00	7.69		



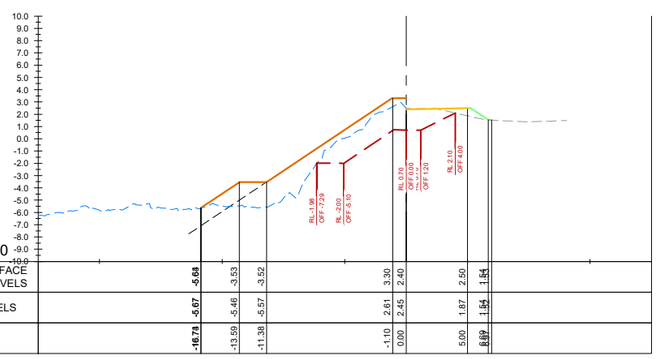
MN01: CH 190.0

FINISHED SURFACE LEVELS	-6.66	-5.11	-5.11	3.30	2.40	2.50	1.64		
EXISTING LEVELS	-6.40	-5.67	-5.80	2.54	2.44	2.01	1.64		
OFFSET	-18.29	-15.92	-13.76	-1.10	0.00	5.00	7.69		



MN01: CH 180.0

FINISHED SURFACE LEVELS	-6.42	-5.46	-4.78	-4.78	3.30	2.40	2.50	1.56	
EXISTING LEVELS	-6.75	-6.47	-6.12	-5.96	3.00	2.45	1.96	1.55	
OFFSET	-17.93	-16.48	-15.48	-13.27	-1.10	0.00	5.00	7.69	



MN01: CH 170.0

FINISHED SURFACE LEVELS	-5.68	-3.53	-3.52	3.30	2.40	2.50	1.64		
EXISTING LEVELS	-5.67	-5.46	-5.57	2.61	2.45	1.87	1.64		
OFFSET	-16.78	-13.59	-11.38	-1.10	0.00	5.00	7.69		

NOTES

1. SURVEY BY NORTH COAST SURVEYS, DATED 29/07/2021.
2. PROPOSED RETAINING WALLS NOT SHOWN IN BREAKWATER CROSS-SECTIONS.
3. EXCAVATION LEVELS BASED ON 1.1m HIGH SEAWARD RETAINING WALL, LEVELS MAY VARY DEPENDING ON REQUIRED WALL HEIGHT.

LEGEND

- BATHYMETRIC PROFILE (MULTI-BEAM BATHYMETRY + DRONE PHOTOGRAMMETRY)
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- IDEALISED BREAKWATER PROFILE
- PROPOSED BREAKWATER (BELOW MOST RECENT SURVEY DOWN TO DESIGN SCOUR LEVEL IF REQUIRED)
- PROPOSED FOOTPATH AND RAMP PROFILE
- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE (REFER NOTE 4)

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

5 0 5 10 15 20 25m

1:500 (A3) 1:250 (A1)

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WARNING

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"DIAL BEFORE YOU DIG" - 1100

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER CROSS SECTIONS SHEET 3

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 38545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

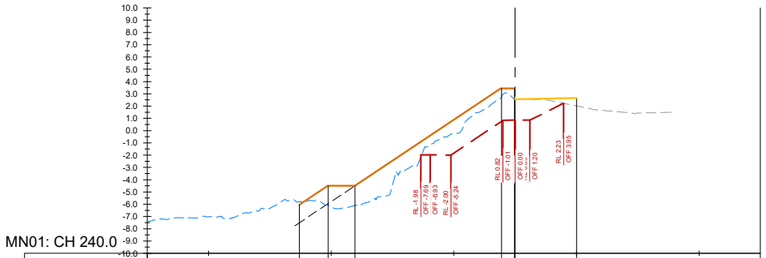
DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4103	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

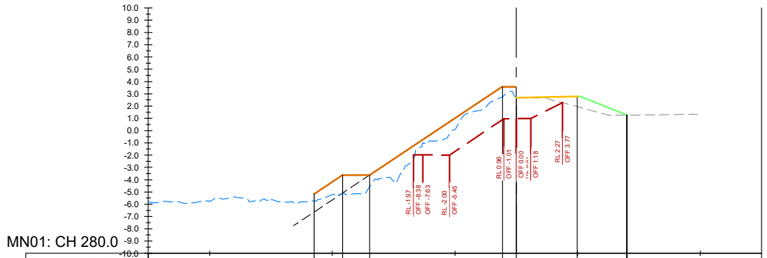
DRAWING No.
PA2696-RHD-CI-00-DR-ME-4104

DO NOT SCALE



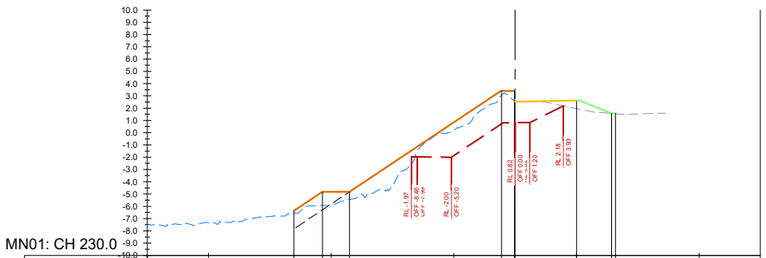
MN01: CH 240.0

FINISHED SURFACE LEVELS	-6.05	-4.50	-4.50	3.45	2.45	2.45	2.65	
EXISTING LEVELS	-5.80	-6.07	-6.10	2.79	2.54	2.54	2.01	
OFFSET	-17.60	-15.25	-13.08	-1.10	-0.05	0.00	5.00	



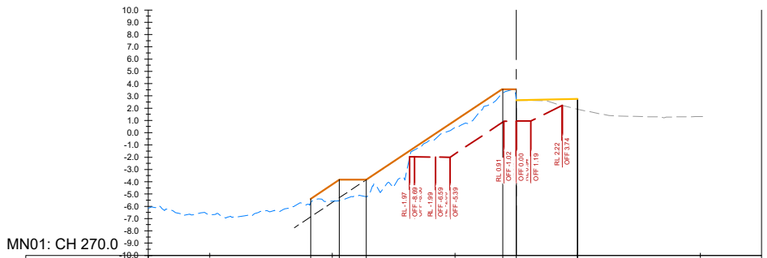
MN01: CH 280.0

FINISHED SURFACE LEVELS	-5.18	-3.62	-3.62	3.57	2.67	2.77	1.25	
EXISTING LEVELS	-5.73	-5.15	-4.57	2.74	2.69	1.95	1.27	
OFFSET	-16.49	-14.16	-11.96	-1.11	0.00	-4.98	0.00	



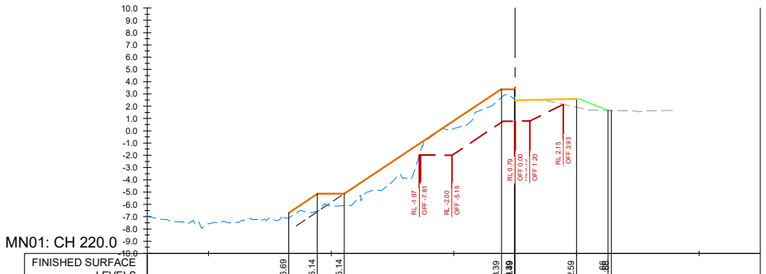
MN01: CH 230.0

FINISHED SURFACE LEVELS	-6.37	-4.82	-4.82	3.42	2.42	2.62	1.57	
EXISTING LEVELS	-6.55	-5.92	-5.44	3.05	2.40	1.95	1.57	
OFFSET	-18.03	-15.71	-13.51	-1.10	-0.05	5.00	7.87	



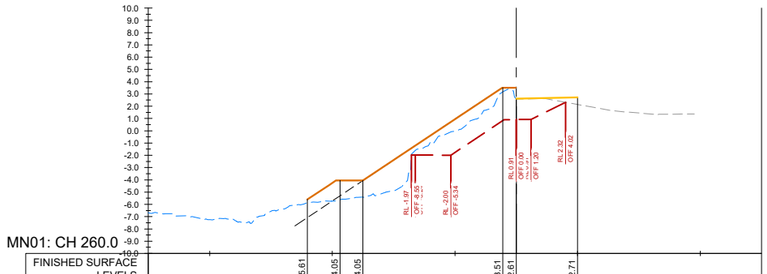
MN01: CH 270.0

FINISHED SURFACE LEVELS	-5.39	-3.84	-3.84	3.54	2.64	2.74		
EXISTING LEVELS	-5.72	-5.53	-5.23	3.19	2.67	1.91		
OFFSET	-16.76	-14.43	-12.23	-1.11	0.00	4.99		



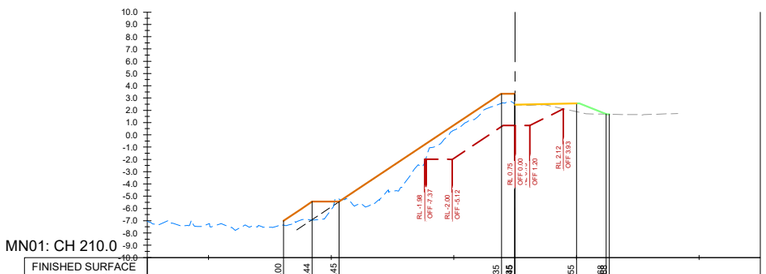
MN01: CH 220.0

FINISHED SURFACE LEVELS	-6.69	-5.14	-5.14	3.39	2.39	2.59	1.68	
EXISTING LEVELS	-7.10	-6.55	-6.08	2.71	2.48	1.92	1.68	
OFFSET	-18.46	-16.14	-13.94	-1.10	-0.05	5.00	7.87	



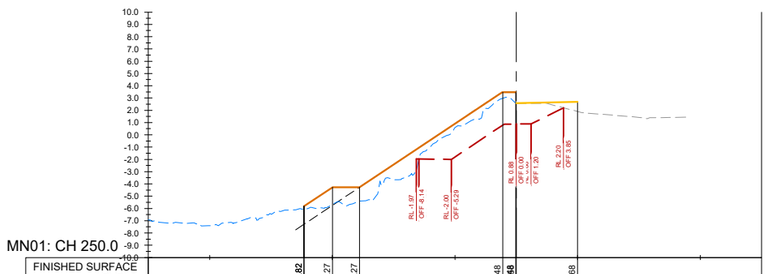
MN01: CH 260.0

FINISHED SURFACE LEVELS	-5.61	-4.05	-4.05	3.51	2.61	2.71		
EXISTING LEVELS	-5.86	-5.62	-5.41	3.16	2.60	2.14		
OFFSET	-17.03	-14.36	-12.50	-1.10	0.00	5.00		



MN01: CH 210.0

FINISHED SURFACE LEVELS	-7.00	-5.44	-5.45	3.35	2.45	2.55	1.68	
EXISTING LEVELS	-7.36	-6.96	-5.26	2.59	2.40	1.88	1.68	
OFFSET	-18.88	-16.55	-14.35	-1.10	-0.05	5.00	7.87	



MN01: CH 250.0

FINISHED SURFACE LEVELS	-5.82	-4.27	-4.27	3.48	2.58	2.68		
EXISTING LEVELS	-6.03	-5.67	-5.39	2.98	2.50	1.90		
OFFSET	-17.30	-14.98	-12.78	-1.10	-0.05	5.00		

NOTES

1. SURVEY BY NORTH COAST SURVEYS, DATED 29/07/2021.
2. PROPOSED RETAINING WALLS NOT SHOWN IN BREAKWATER CROSS-SECTIONS.
3. EXCAVATION LEVELS BASED ON 1.1m HIGH SEAWARD RETAINING WALL, LEVELS MAY VARY DEPENDING ON REQUIRED WALL HEIGHT.

LEGEND

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- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE (REFER NOTE 4)

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER CROSS SECTIONS SHEET 4

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99200960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF.		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4104	D2	P03

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

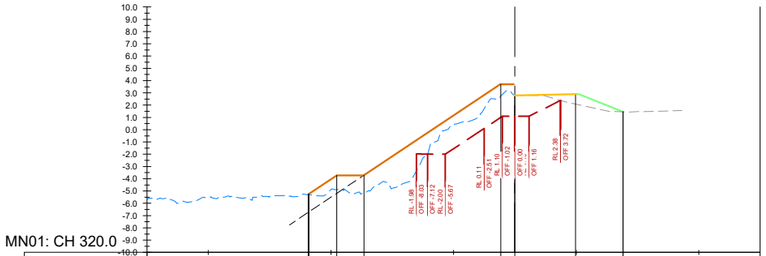
5 0 5 10 15 20 25m

1:500 (A3) 1:250 (A1)

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

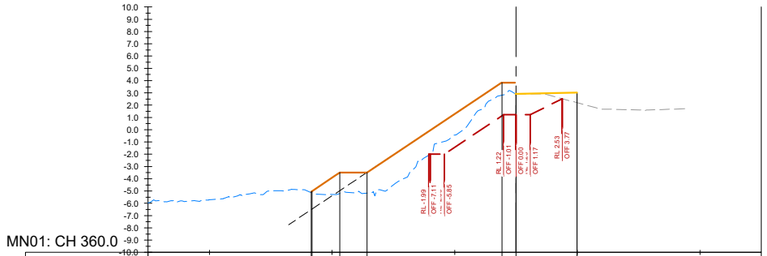
DRAWING No.
PA2696-RHD-CI-00-DR-ME-4105

DO NOT SCALE



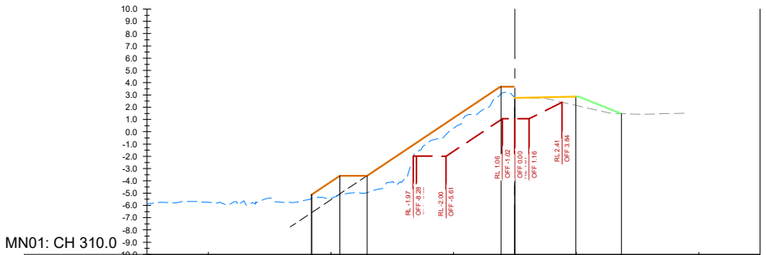
MN01: CH 320.0

FINISHED SURFACE LEVELS	-5.23	-3.72	-3.71		3.70	2.80	2.90	1.46
EXISTING LEVELS	-5.28	-4.87	-5.15		2.75	2.80	2.09	1.46
OFFSET	-16.80	-14.53	-12.31		-1.14	0.00	4.95	8.81



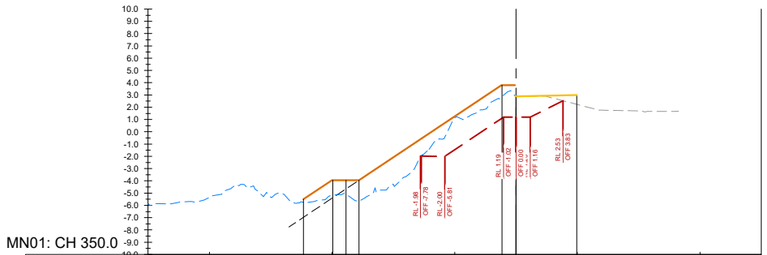
MN01: CH 360.0

FINISHED SURFACE LEVELS	-5.01	-3.50	-3.49		3.83	2.93		3.03
EXISTING LEVELS	-5.17	-5.19	-5.17		2.81	2.92		2.20
OFFSET	-16.69	-14.38	-12.15		-1.13	0.00		4.98



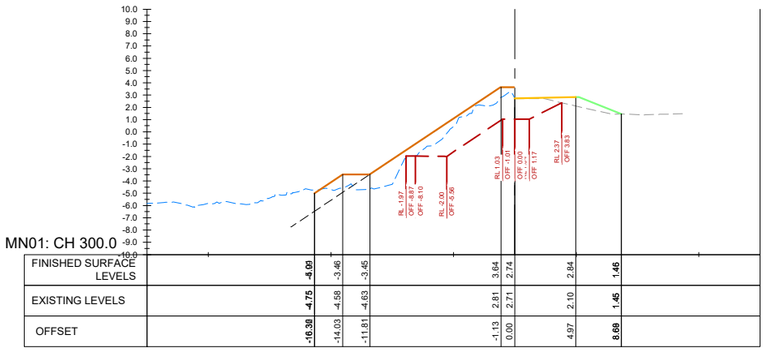
MN01: CH 310.0

FINISHED SURFACE LEVELS	-5.19	-3.59	-3.58		3.67	2.77	2.87	1.48
EXISTING LEVELS	-5.43	-5.15	-4.95		3.09	2.76	2.15	1.48
OFFSET	-16.66	-14.28	-12.06		-1.14	0.00	4.96	8.70



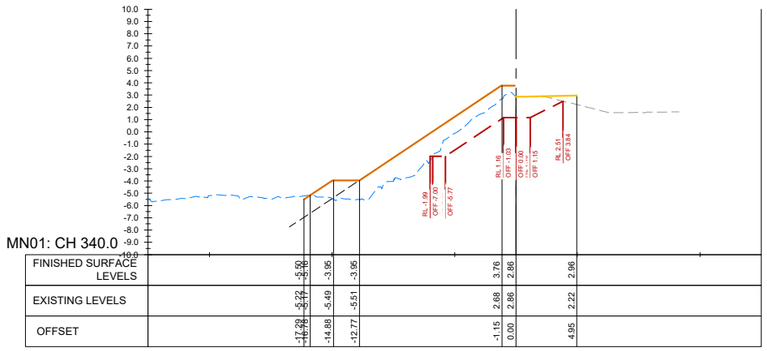
MN01: CH 350.0

FINISHED SURFACE LEVELS	-5.50	-3.95	-3.95		3.80	2.90		3.00
EXISTING LEVELS	-5.75	-5.19	-5.09	-5.67	2.87	2.89		2.24
OFFSET	-17.33	-14.93	-13.87	-12.81	-1.14	0.00		4.96



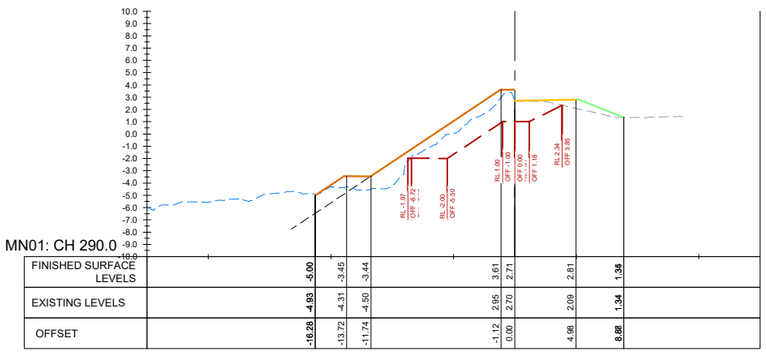
MN01: CH 300.0

FINISHED SURFACE LEVELS	-4.91	-3.46	-3.45		3.64	2.74	2.84	1.45
EXISTING LEVELS	-4.75	-4.58	-4.63		2.81	2.71	2.10	1.45
OFFSET	-16.38	-14.03	-11.81		-1.13	0.00	4.97	8.69



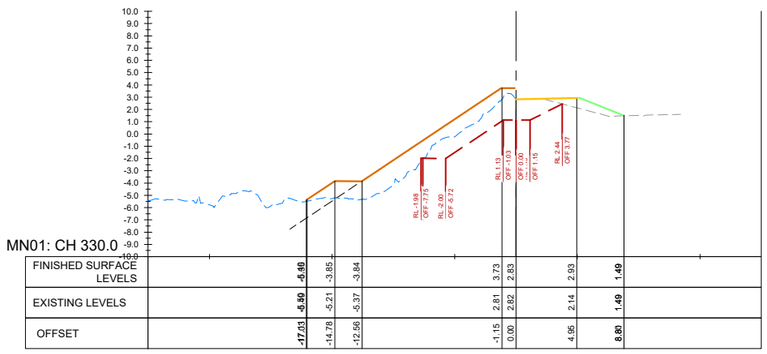
MN01: CH 340.0

FINISHED SURFACE LEVELS	-5.00	-3.65	-3.65		3.76	2.86		2.96
EXISTING LEVELS	-5.22	-5.49	-5.51		2.68	2.86		2.22
OFFSET	-17.08	-14.86	-12.77		-1.15	0.00		4.95



MN01: CH 290.0

FINISHED SURFACE LEVELS	-5.00	-3.45	-3.44		3.61	2.71	2.81	1.35
EXISTING LEVELS	-4.93	-4.31	-4.50		2.95	2.70	2.09	1.34
OFFSET	-16.28	-13.72	-11.74		-1.12	0.00	4.98	8.68



MN01: CH 330.0

FINISHED SURFACE LEVELS	-5.40	-3.85	-3.84		3.73	2.83		2.93
EXISTING LEVELS	-5.40	-5.21	-5.37		2.81	2.82		2.14
OFFSET	-17.03	-14.78	-12.56		-1.15	0.00		4.95

NOTES

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- EXCAVATION PROFILE (REFER NOTE 4)

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER CROSS SECTIONS SHEET 5

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 38545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4105	D2	P03

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

5 0 5 10 15 20 25m

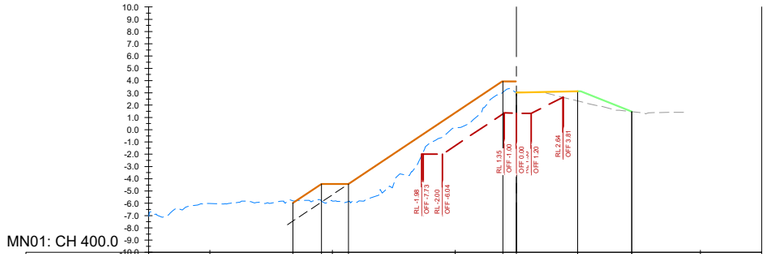
1:500 (A3) 1:250 (A1)

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-CI-00-DR-ME-4106

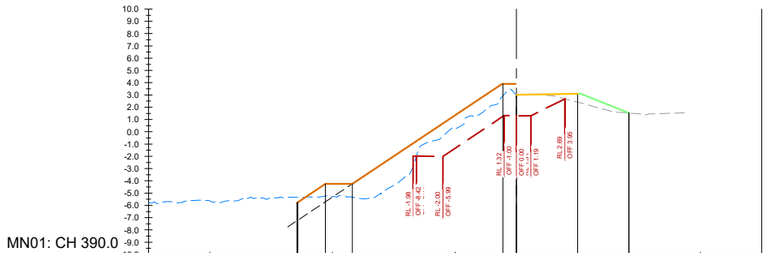
DO NOT SCALE

MN01: CH 400.0



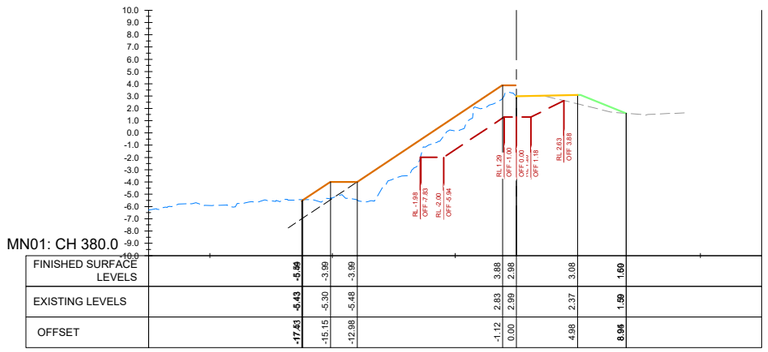
FINISHED SURFACE LEVELS		-5.97	-4.42	-4.42		3.93	3.03	3.13	1.47
EXISTING LEVELS	-5.80	-5.82	-4.42	-5.86		3.04	3.06	2.35	1.47
OFFSET	-18.22	-15.89	-13.69			-1.10	0.00	4.99	9.40

MN01: CH 390.0



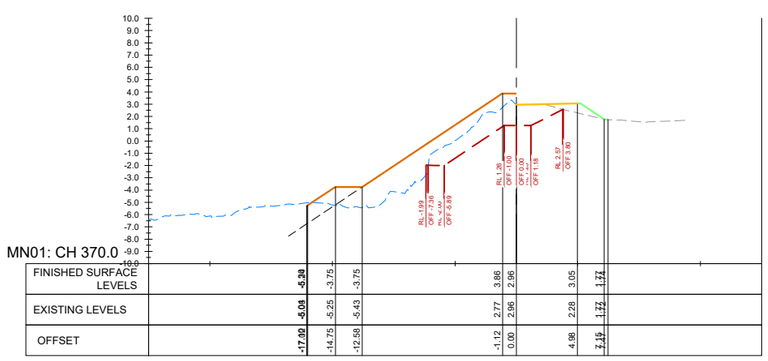
FINISHED SURFACE LEVELS	-5.78		-4.24	-4.24		3.91	3.01	3.11	1.54
EXISTING LEVELS	-5.35	-5.24	-5.33			2.93	3.04	2.43	1.53
OFFSET	-17.93	-15.59	-13.38			-1.11	0.00	4.99	9.18

MN01: CH 380.0



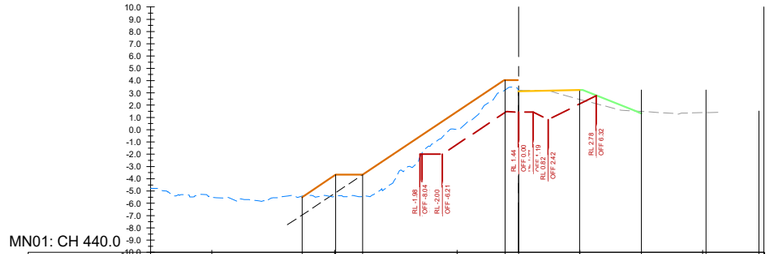
FINISHED SURFACE LEVELS	-5.99		-3.99	-3.99		3.88	2.98	3.08	1.60
EXISTING LEVELS	-5.43	-5.30	-5.48			2.83	2.99	2.37	1.59
OFFSET	-17.61	-15.15	-12.98			-1.12	0.00	4.98	8.98

MN01: CH 370.0



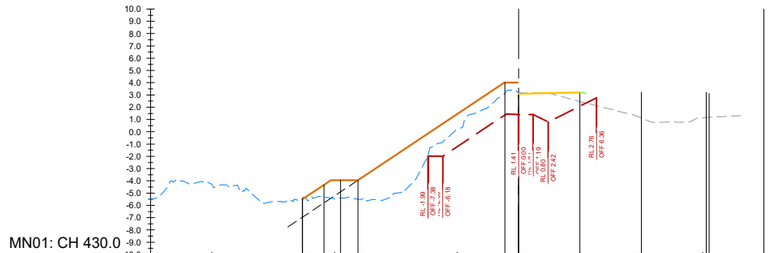
FINISHED SURFACE LEVELS	-5.38		-3.75	-3.75		3.86	2.96	3.05	1.77
EXISTING LEVELS	-5.04	-5.25	-5.43			2.77	2.96	2.28	1.72
OFFSET	-17.00	-14.75	-12.58			-1.12	0.00	4.98	7.15

MN01: CH 440.0



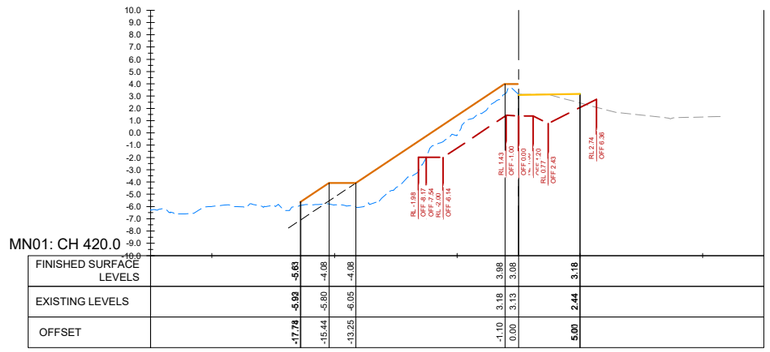
FINISHED SURFACE LEVELS		-5.50	-3.67	-3.66		4.04	3.14	3.24	3.24	3.24	1.52
EXISTING LEVELS		-5.40	-5.36	-5.42		3.22	3.21	2.46	1.49	1.40	1.52
OFFSET	-17.65	-14.92	-12.71			-1.10	0.00	4.99	10.02	15.29	19.59

MN01: CH 430.0



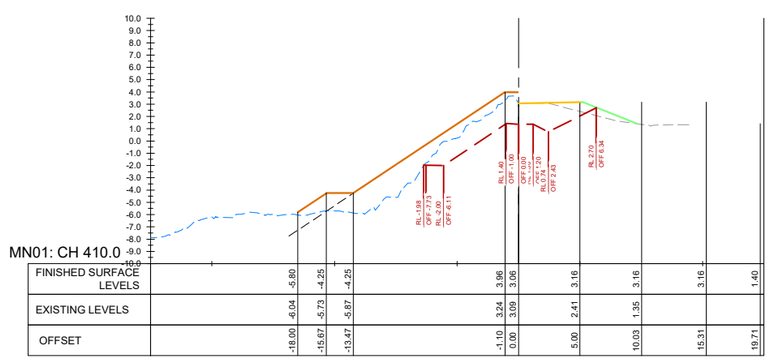
FINISHED SURFACE LEVELS		-5.50	-4.32	-3.95	-3.94	4.01	3.11	3.21	3.21	3.21	1.52
EXISTING LEVELS		-5.38	-5.31	-5.39	-5.50	3.16	3.16	2.47	1.11	1.18	1.52
OFFSET	-17.63	-15.86	-14.51	-13.09		-1.11	0.00	4.99	10.02	15.29	19.59

MN01: CH 420.0



FINISHED SURFACE LEVELS		-5.61	-4.06	-4.06		3.98	3.08	3.18			
EXISTING LEVELS		-5.93	-5.80	-6.05		3.18	3.13	2.44			
OFFSET	-17.78	-15.44	-13.25			-1.10	0.00	5.00			

MN01: CH 410.0



FINISHED SURFACE LEVELS		-5.80	-4.25	-4.25		3.96	3.06	3.16	3.16	3.16	1.40
EXISTING LEVELS		-6.04	-5.73	-5.87		3.24	3.09	2.41	1.35	1.31	1.40
OFFSET	-18.00	-15.67	-13.47			-1.10	0.00	5.00	10.03	15.31	19.71

NOTES

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LEGEND

- BATHYMETRIC PROFILE (MULTI-BEAM BATHYMETRY + DRONE PHOTOGRAMMETRY)
- TOPOGRAPHIC PROFILE (DETAIL TOPO SURVEY)
- IDEALISED BREAKWATER PROFILE
- PROPOSED BREAKWATER (BELOW MOST RECENT SURVEY DOWN TO DESIGN SCOUR LEVEL IF REQUIRED)
- PROPOSED FOOTPATH AND RAMP PROFILE
- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE (REFER NOTE 4)

DIAL BEFORE YOU DIG www.1100.com.au

WARNING

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"DIAL BEFORE YOU DIG" - 1100

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER CROSS SECTIONS SHEET 6

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 38545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4106	D2	P03

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

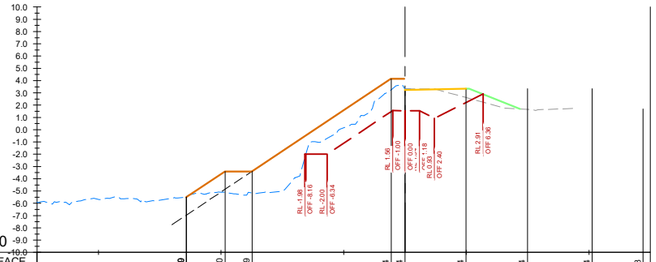
5 0 5 10 15 20 25m

1:500 (A3) 1:250 (A1)

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

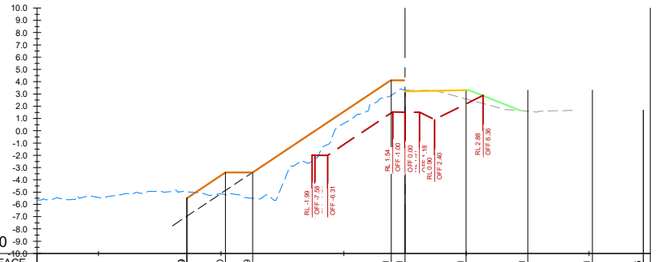
DRAWING No.
PA2696-RHD-CI-00-DR-ME-4107

DO NOT SCALE



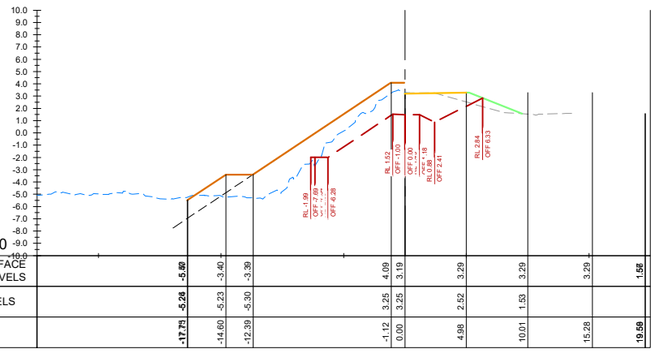
MN01: CH 480.0

FINISHED SURFACE LEVELS	-5.60	-3.40	-3.39		4.14	3.24	3.34	3.34	3.34	1.68
EXISTING LEVELS	-5.39	-5.11	-5.17		3.25	3.32	2.62	1.65		
OFFSET	-17.84	-14.66	-12.47		-1.12	0.00	4.98	10.00	15.27	19.41



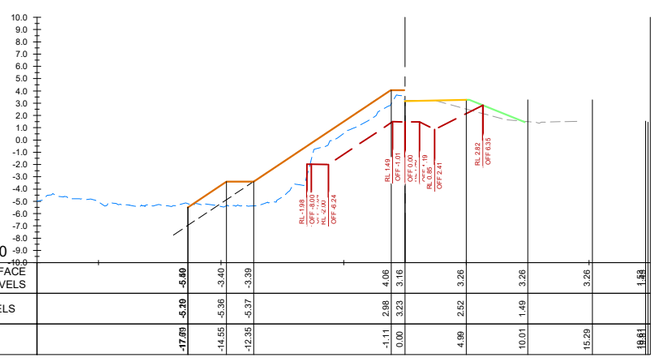
MN01: CH 470.0

FINISHED SURFACE LEVELS	-5.60	-3.40	-3.39		4.11	3.21	3.31	3.31	3.31	1.65
EXISTING LEVELS	-4.99	-5.20	-5.50		2.89	3.28	2.60	1.61		
OFFSET	-17.78	-14.64	-12.43		-1.12	0.00	4.98	10.00	15.28	19.43



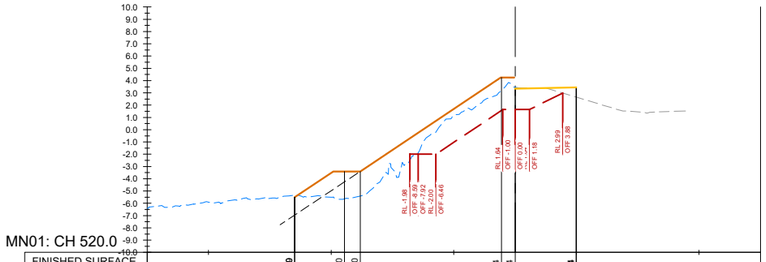
MN01: CH 460.0

FINISHED SURFACE LEVELS	-5.60	-3.40	-3.39		4.09	3.19	3.29	3.29	3.29	1.58
EXISTING LEVELS	-5.26	-5.23	-5.30		3.25	3.25	2.52	1.53		
OFFSET	-17.75	-14.60	-12.39		-1.12	0.00	4.98	10.01	15.28	19.59



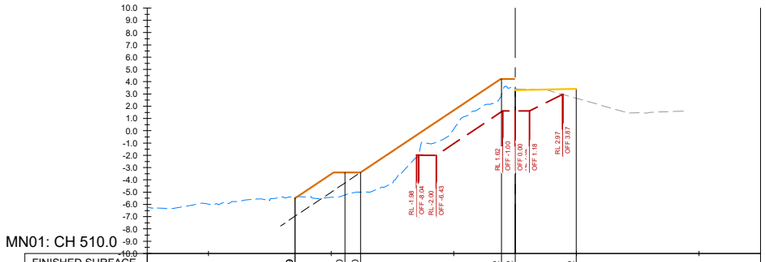
MN01: CH 450.0

FINISHED SURFACE LEVELS	-5.60	-3.40	-3.39		4.08	3.16	3.26	3.26	3.26	1.58
EXISTING LEVELS	-5.20	-5.36	-5.37		2.98	3.23	2.52	1.49		
OFFSET	-17.69	-14.55	-12.35		-1.11	0.00	4.99	10.01	15.29	19.61



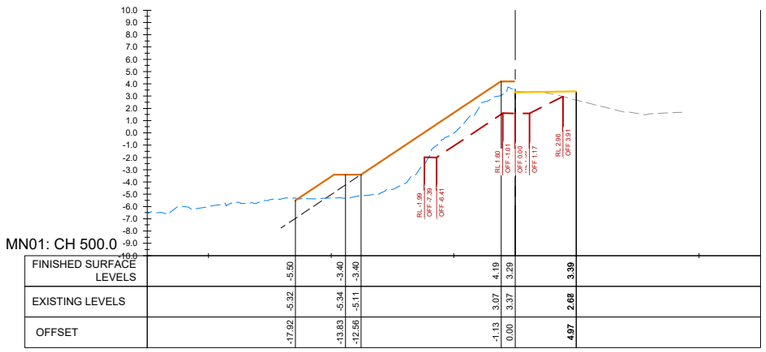
MN01: CH 520.0

FINISHED SURFACE LEVELS	-5.60	-3.40	-3.40		4.24	3.34	3.44			
EXISTING LEVELS	-5.34	-5.63	-5.40		3.20	3.42	2.66			
OFFSET	-17.98	-13.91	-12.64		-1.12	0.00	4.98			



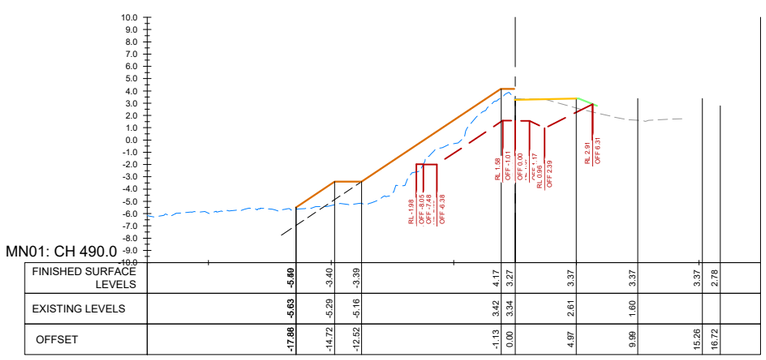
MN01: CH 510.0

FINISHED SURFACE LEVELS	-5.60	-3.40	-3.40		4.22	3.32	3.42			
EXISTING LEVELS	-5.38	-5.23	-5.00		2.89	3.40	2.65			
OFFSET	-17.98	-13.87	-12.60		-1.12	0.00	4.98			



MN01: CH 500.0

FINISHED SURFACE LEVELS	-5.60	-3.40	-3.40		4.19	3.29	3.39			
EXISTING LEVELS	-5.32	-5.34	-5.11		3.07	3.37	2.68			
OFFSET	-17.92	-13.83	-12.56		-1.13	0.00	4.97			



MN01: CH 490.0

FINISHED SURFACE LEVELS	-5.60	-3.40	-3.39		4.17	3.27	3.37	3.37	3.37	2.78
EXISTING LEVELS	-5.63	-5.29	-5.16		3.42	3.34	2.61	1.60		
OFFSET	-17.98	-14.72	-12.52		-1.13	0.00	4.97	9.99	15.26	16.72

NOTES

1. SURVEY BY NORTH COAST SURVEYS, DATED 29/07/2021.
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LEGEND

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- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE (REFER NOTE 4)

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

5 0 5 10 15 20 25m

1:500 (A3) 1:250 (A1)

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER CROSS SECTIONS SHEET 7

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 38545000
Fax +61 2 99295960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

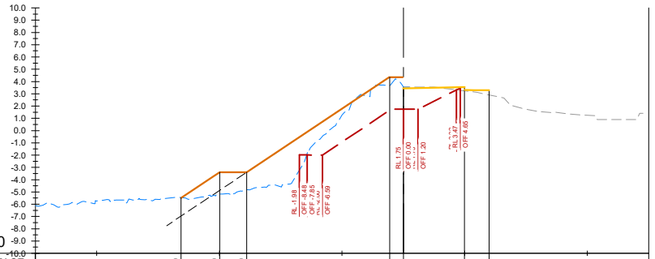
DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4107	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

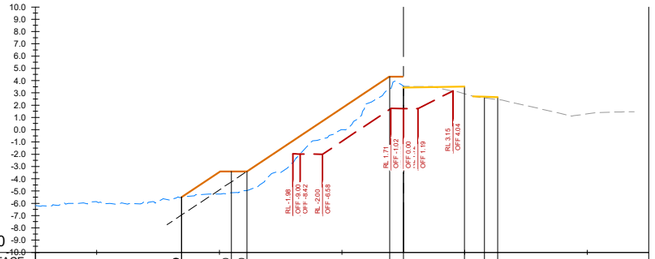
DRAWING No.
PA2696-RHD-CI-00-DR-ME-4108

DO NOT SCALE



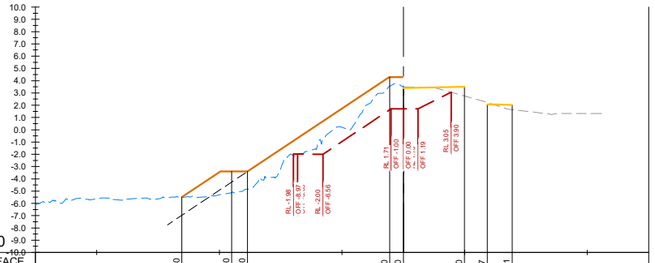
MN01: CH 560.0

FINISHED SURFACE LEVELS	-5.50	-3.40	-3.40	4.35	3.45	3.55	3.28		
EXISTING LEVELS	-5.46	-5.18	-4.82	3.67	3.54	3.24	2.90		
OFFSET	-18.13	-14.97	-12.77	-1.10	0.00	4.99	7.00		



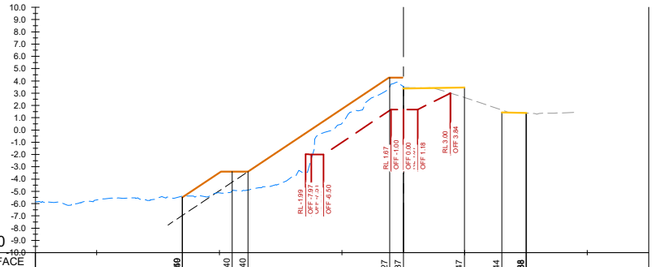
MN01: CH 550.0

FINISHED SURFACE LEVELS	-5.50	-3.40	-3.40	4.32	3.42	3.52	2.88	2.65	
EXISTING LEVELS	-5.48	-5.15	-4.96	3.30	3.54	2.92	2.69	2.45	
OFFSET	-18.09	-14.03	-12.74	-1.11	0.00	4.99	6.61	7.70	



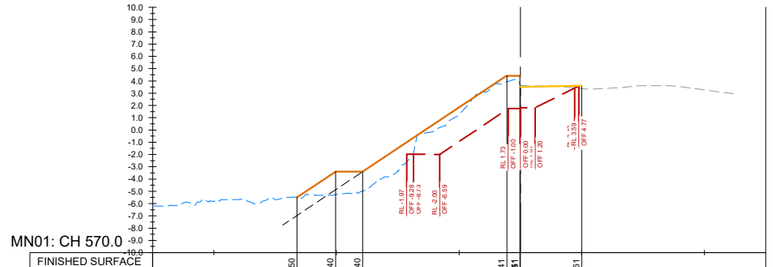
MN01: CH 540.0

FINISHED SURFACE LEVELS	-5.50	-3.40	-3.40	4.30	3.40	3.50	2.07	2.01	
EXISTING LEVELS	-5.52	-5.13	-4.84	3.54	3.50	2.75	2.22	1.64	
OFFSET	-18.06	-13.99	-12.71	-1.11	0.00	4.99	6.86	8.87	



MN01: CH 530.0

FINISHED SURFACE LEVELS	-5.50	-3.40	-3.40	4.27	3.37	3.47	1.44	1.38	
EXISTING LEVELS	-5.49	-4.95	-4.90	3.47	3.53	2.65	1.63	1.37	
OFFSET	-18.03	-13.95	-12.67	-1.12	0.00	4.98	8.03	10.06	



MN01: CH 570.0

FINISHED SURFACE LEVELS	-5.50	-3.40	-3.40	4.41	3.61	3.61			
EXISTING LEVELS	-5.48	-5.25	-4.99	3.94	3.70	3.37			
OFFSET	-18.22	-15.07	-12.87	-1.10	0.00	5.00			

NOTES

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LEGEND

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- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE (REFER NOTE 4)

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

5 0 5 10 15 20 25m

1:500 (A3) 1:250 (A1)

DIAL BEFORE YOU DIG www.1100.com.au

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER CROSS SECTIONS SHEET 8

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF:		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

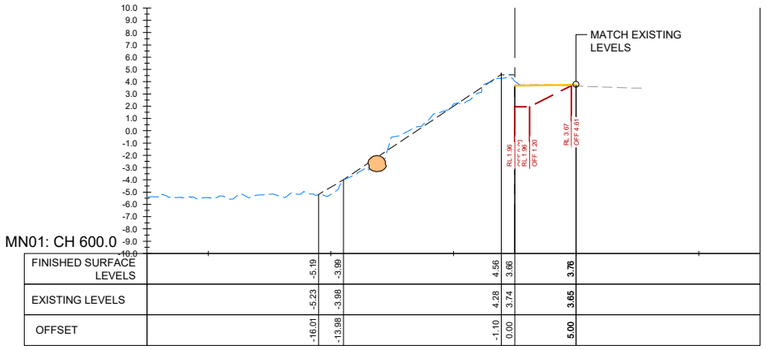
DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4108	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.
PA2696-RHD-CI-00-DR-ME-4109

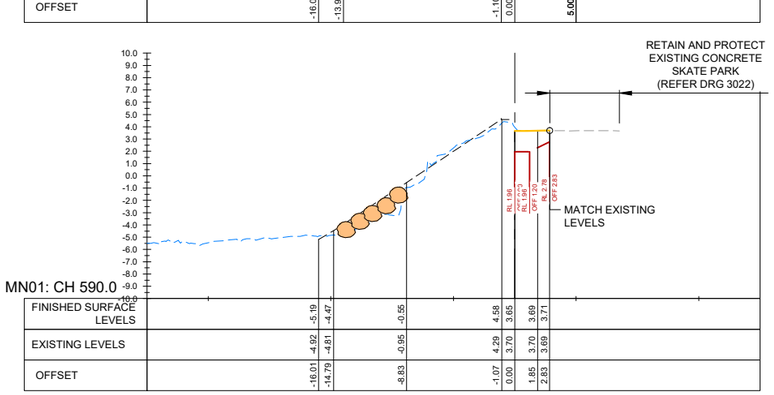
DO NOT SCALE

TYPE B - TOP UP



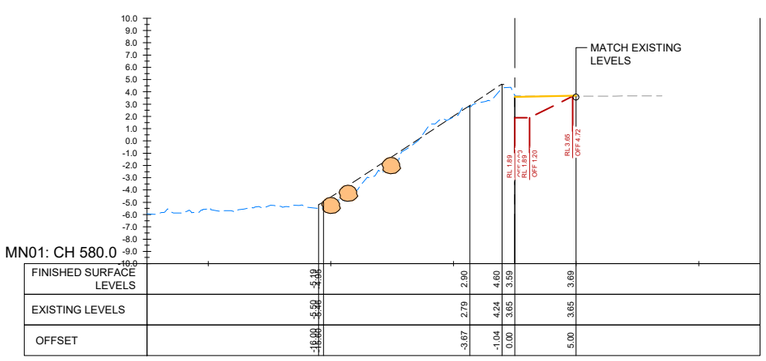
MN01: CH 600.0

FINISHED SURFACE LEVELS	-5.19	-3.99	4.56	3.66	**3.76**
EXISTING LEVELS	-5.23	-3.98	4.28	3.74	**3.65**
OFFSET	-16.01	-13.98	-1.10	0.00	**5.00**



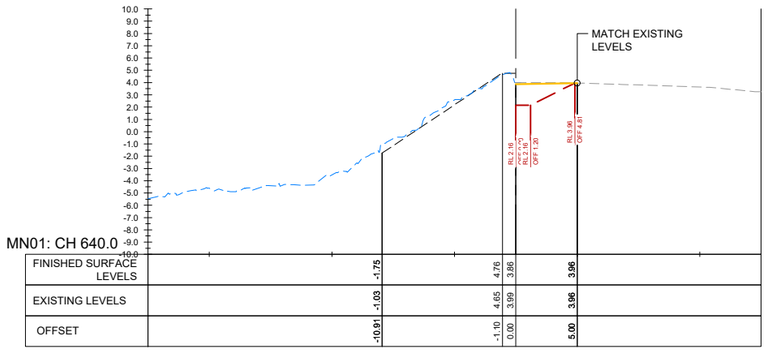
MN01: CH 590.0

FINISHED SURFACE LEVELS	-5.19	-4.47	-0.05	4.58	3.65	3.69	3.71
EXISTING LEVELS	-4.92	-4.81	-0.95	4.29	3.70	3.70	3.69
OFFSET	-16.01	-14.79	-8.83	-1.07	0.00	1.85	2.83



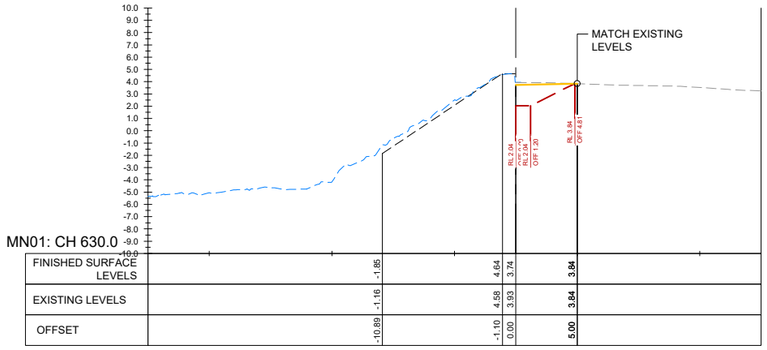
MN01: CH 580.0

FINISHED SURFACE LEVELS	-5.19	-3.98	2.90	4.60	3.59	3.69
EXISTING LEVELS	-5.50	-5.48	2.79	4.24	3.65	3.65
OFFSET	-16.00	-16.00	-3.67	-1.04	0.00	5.00



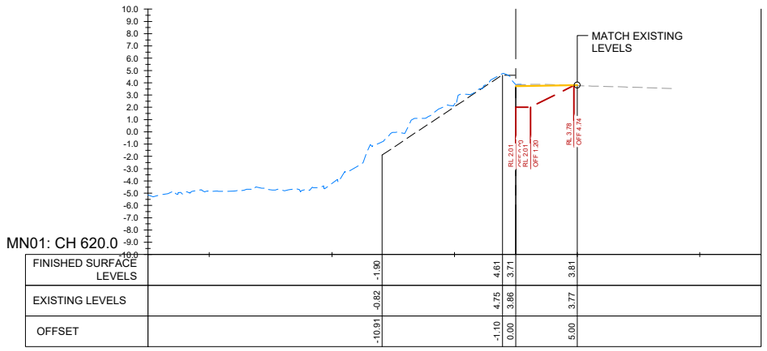
MN01: CH 640.0

FINISHED SURFACE LEVELS	-1.75	4.76	3.86	**3.96**	
EXISTING LEVELS	-1.03	4.65	3.99	**3.96**	
OFFSET	-10.91	-1.10	0.00	**5.00**	



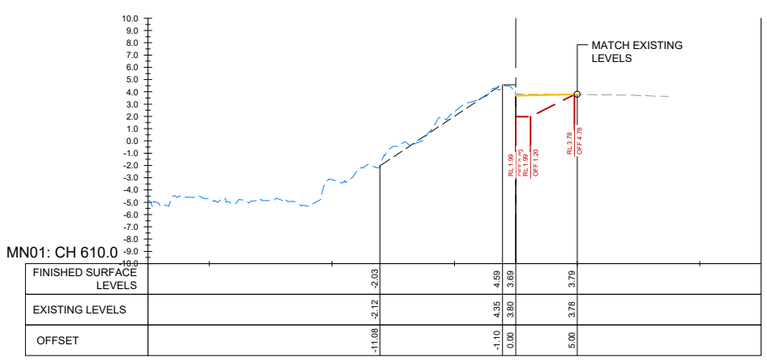
MN01: CH 630.0

FINISHED SURFACE LEVELS	-1.85	4.64	3.74	**3.84**	
EXISTING LEVELS	-1.16	4.58	3.93	**3.84**	
OFFSET	-10.89	-1.10	0.00	**5.00**	



MN01: CH 620.0

FINISHED SURFACE LEVELS	-1.90	4.61	3.71	3.81	
EXISTING LEVELS	-0.82	4.75	3.86	3.77	
OFFSET	-10.91	-1.10	0.00	5.00	



MN01: CH 610.0

FINISHED SURFACE LEVELS	-2.03	4.59	3.66	3.79	
EXISTING LEVELS	-2.12	4.35	3.80	3.78	
OFFSET	-11.08	-1.10	0.00	5.00	

NOTES

1. AERIAL PHOTOGRAPH SOURCED FROM NERAMAP, DATED 29/08/2021.
2. SURVEY BY NORTH COAST SURVEYS, DATED 29/07/2021.

LEGEND

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- PROPOSED FOOTPATH AND RAMP PROFILE
- PROPOSED LANDSCAPE PROFILE
- EXCAVATION PROFILE

NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

5 0 5 10 15 20 25m

1:500 (A3) 1:250 (A1)

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WARNING

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER CROSS SECTIONS SHEET 9

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 38545000
Fax +61 2 99295960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4109	D2	P03

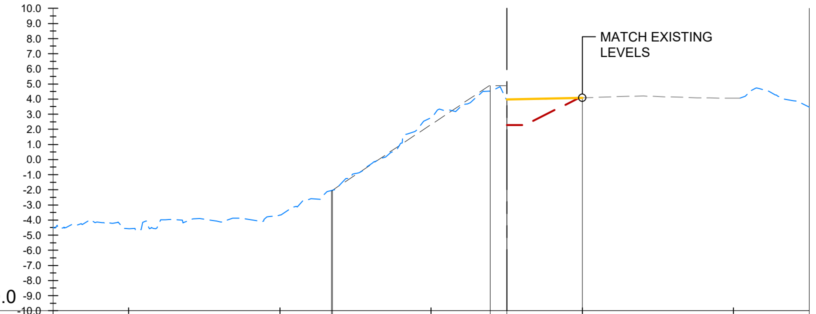
C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No. PA2696-RHD-CI-00-DR-ME-4110

DO NOT SCALE

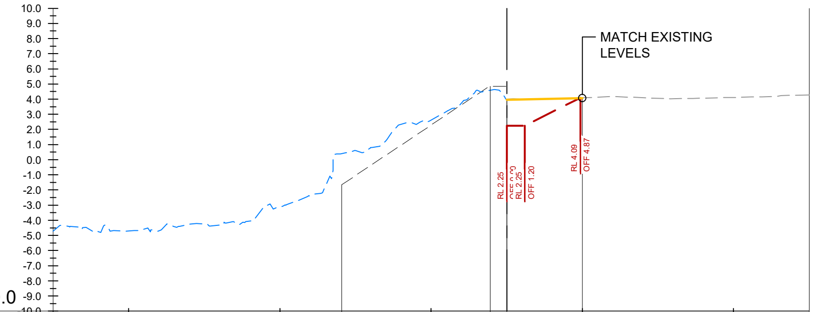
TYPE B - TOP UP

MN01: CH 680.0



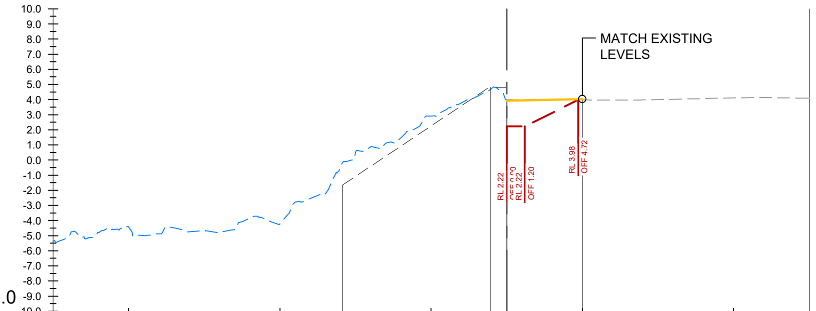
FINISHED SURFACE LEVELS	-2.08 / -2.03	4.88	3.98	4.08
EXISTING LEVELS	-2.05 / -2.03	4.53	4.00	4.09
OFFSET	-11.60 / -11.52	-1.10	0.00	5.00

MN01: CH 670.0



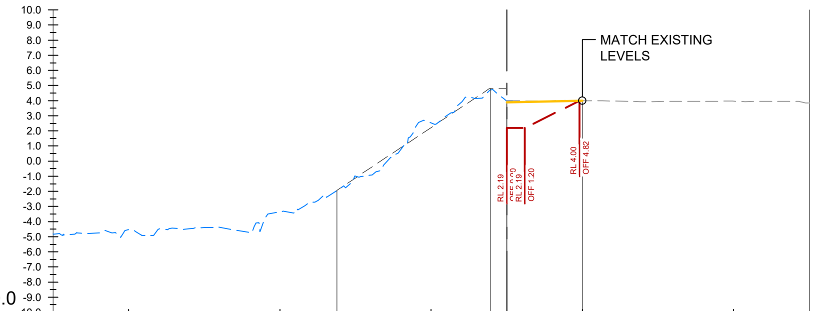
FINISHED SURFACE LEVELS	-1.66	4.85	3.95	4.05
EXISTING LEVELS	0.40	4.58	4.01	4.09
OFFSET	-10.91	-1.10	0.00	5.00

MN01: CH 660.0



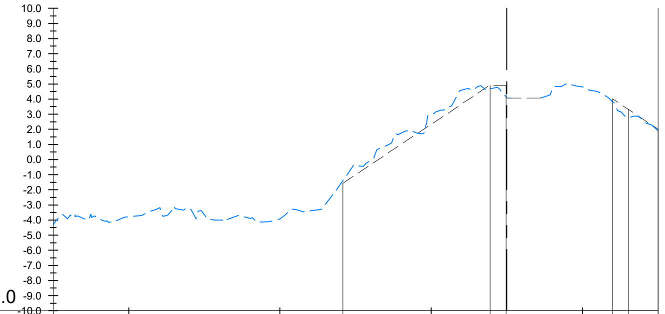
FINISHED SURFACE LEVELS	-1.65	4.82	3.92	4.02
EXISTING LEVELS	-0.17	4.64	3.98	3.98
OFFSET	-10.86	-1.10	0.00	5.00

MN01: CH 650.0



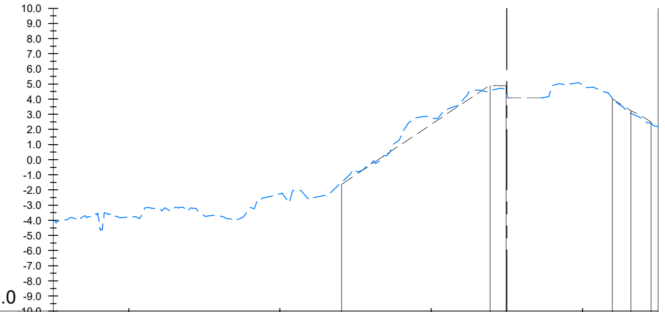
FINISHED SURFACE LEVELS	-1.94	4.79	3.89	3.99
EXISTING LEVELS	-1.95	4.69	3.99	4.00
OFFSET	-11.24	-1.10	0.00	5.00

MN01: CH 720.0



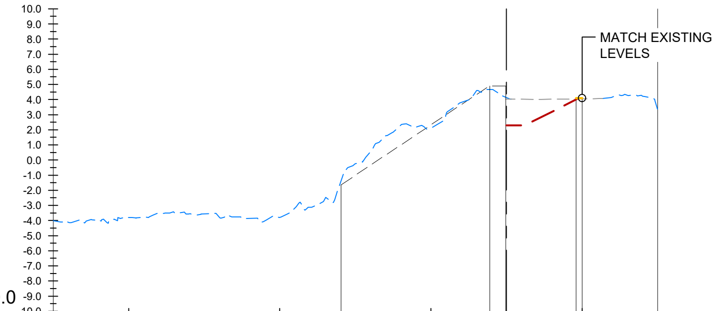
FINISHED SURFACE LEVELS	-1.56	4.90	4.90	4.01	3.32	2.01
EXISTING LEVELS	-1.39	4.67	4.16	3.82	2.78	
OFFSET	-10.84	-1.10	-0.05	7.00	8.04	10.00

MN01: CH 710.0



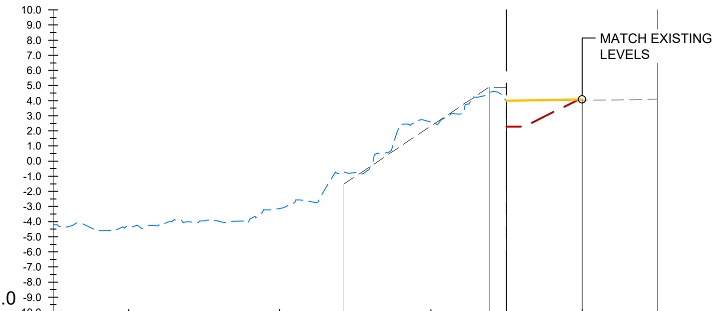
FINISHED SURFACE LEVELS	-1.62	4.90	4.90	4.01	3.24	2.49
EXISTING LEVELS	-1.49	4.56	4.54	4.06	3.07	2.39
OFFSET	-10.93	-1.10	-0.05	6.98	8.20	9.55

MN01: CH 700.0



FINISHED SURFACE LEVELS	-1.63	4.89	4.89	4.08 / 4.09
EXISTING LEVELS	-1.35	4.66	4.02	4.04 / 4.05
OFFSET	-10.94	-1.10	-0.05	4.61 / 5.00

MN01: CH 690.0



FINISHED SURFACE LEVELS	-1.51	4.89	3.99	4.09
EXISTING LEVELS	-0.73	4.57	4.00	4.03
OFFSET	-10.75	-1.10	0.00	5.00

NOTES

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REV	DATE	DESCRIPTION	BY	CHK	APP
P03	21.02.2022	ISSUED FOR TENDER	BAM	DM	DM
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER CROSS SECTIONS SHEET 10

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 88545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022
SCALE: AS SHOWN	REF.: PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4110	D2	P03

5 0 5 10 15 20 25m

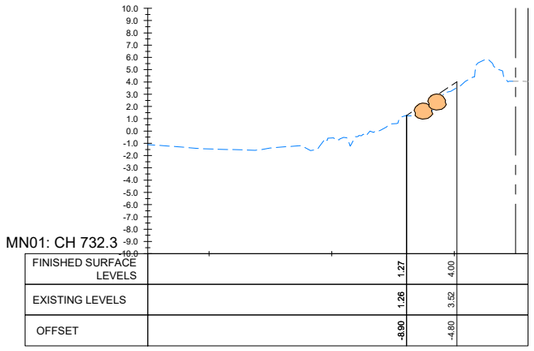
1:500 (A3) 1:250 (A1)

NOT FOR CONSTRUCTION | D2 FOR TENDER | AUSTRALIAN HEIGHT DATUM

DRAWING No.
PA2696-RHD-CI-00-DR-ME-4111

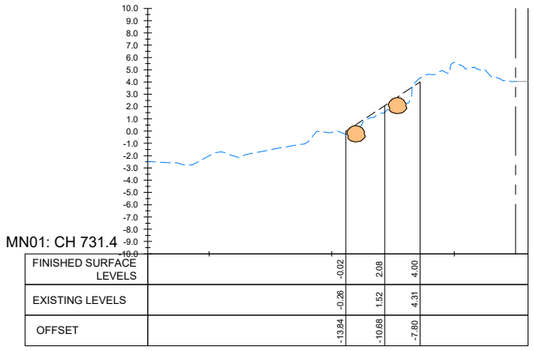
DO NOT SCALE

TYPE C - TOP UP AT BREAKWATER HEAD



MN01: CH 732.3

FINISHED SURFACE LEVELS	1.27	4.00
EXISTING LEVELS	1.26	3.52
OFFSET	-8.90	-4.80



MN01: CH 731.4

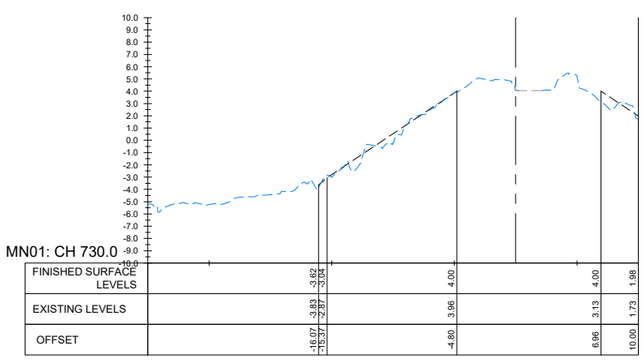
FINISHED SURFACE LEVELS	-0.02	2.08	4.00
EXISTING LEVELS	-0.26	1.52	4.31
OFFSET	-13.84	-10.68	-7.80

MN01: CH 730.4

FINISHED SURFACE LEVELS	-3.16		4.00
EXISTING LEVELS	-3.16	-3.16	3.87
OFFSET	-15.54		-7.80

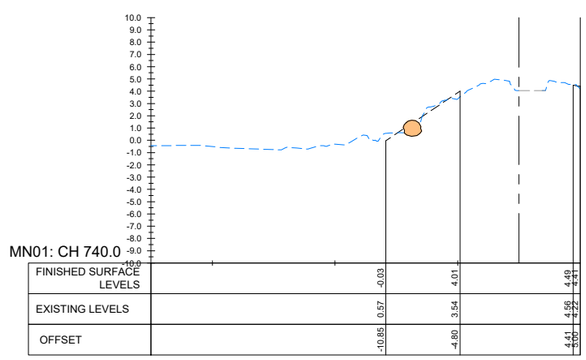
MN01: CH 750.0

FINISHED SURFACE LEVELS	2.23	4.01		4.90	4.90	3.82
EXISTING LEVELS	2.22	3.70		4.13	4.45	3.96
OFFSET	-7.47	-4.80		2.29	3.34	5.00



MN01: CH 730.0

FINISHED SURFACE LEVELS	-3.62	-3.04	4.00	4.00	1.98
EXISTING LEVELS	-3.83	-2.87	3.96	3.13	1.73
OFFSET	-16.07	-15.37	-4.80	6.96	10.00



MN01: CH 740.0

FINISHED SURFACE LEVELS	-0.03	4.01	4.49	4.41
EXISTING LEVELS	0.57	3.54	4.56	4.22
OFFSET	-10.85	-4.80	4.41	3.00

NOTES

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NOT FOR CONSTRUCTION | **D2 FOR TENDER** | **AUSTRALIAN HEIGHT DATUM**

5 0 5 10 15 20 25m

1:500 (A3) 1:250 (A1)

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P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM	DM	

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE SOUTHERN BREAKWATER UPGRADE

TITLE

BREAKWATER CROSS SECTIONS SHEET 11

Level 15, 99 Mount Street
North Sydney NSW 2060
Australia
Tel +61 2 38545000
Fax +61 2 99290960
Email: project.admin.australia@rhdhv.com
Website: www.royalhaskoningdhv.com

Royal HaskoningDHV
Enhancing Society Together

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	22.02.2022

SCALE	REF
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-CI-00-DR-ME-4111	D2	P03

C:\USERS\220025\BOX\PA2696 PORT MACQ BW\PA2696 PORT MACQ BW TEAM\PA2696 TECHNICAL DATA\02_CAD\PA2696-RHD-00-00-M3-CIVIL MODEL

Appendix B

Tree Summary Report

Port Tree Fella

Breakwall Initial Tree Summary

December 20, 2021 |
Total Tree Count: 25

Norfolk Island Pine Tree ID #346

Tree Details

Label ID:	Plan to retain
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Good
Tree Height (Estimated) [m]:	15
DBH [cm]:	38
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	Located 3.2 m to extended walkway

Management

Longitude:	152.915448
Latitude:	-31.426863
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #347

Tree Details

Label ID:	Plan to Retain
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Fair
Tree Height (Estimated) [m]:	13
DBH [cm]:	29
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	Located 3.2 m to extended walkway Was twin leader, thin canopy formation.

Management

Longitude:	152.915271
Latitude:	-31.426856
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #348

Tree Details

Label ID:	Plan to retain
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Fair
Tree Height (Estimated) [m]:	15
DBH [cm]:	29
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	Located 3.2 m to extended walkway.

Management

Longitude:	152.915171
Latitude:	-31.426855
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #349

Tree Details

Label ID:	Removed
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Fair
Tree Height (Estimated) [m]:	15
DBH [cm]:	29
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	3.7 to walkway extension. In poor location for Chanel beacon from sea.

Management

Longitude:	152.914573
Latitude:	-31.426857
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #350

1 Munster Street

Tree Details

Label ID:	Removed (Could Retain)
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	11-20 Years
Health:	Fair
Tree Height (Estimated) [m]:	15
DBH [cm]:	40
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	2.6 to extended walkway.

Management

Longitude:	152.913720
Latitude:	-31.426865
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #351

1 Munster Street

Tree Details

Label ID:	Removed- Stairs
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Good
Tree Height (Estimated) [m]:	18
DBH [cm]:	430
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	3.6 to proposed walkway, on lower flat section.

Management

Longitude:	152.913589
Latitude:	-31.426870
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Swamp She-oak Tree ID #352

1 Munster Street

Tree Details

Label ID:	Removed
Scientific Name:	Casuarina glauca
Common Name:	Swamp She-oak
Risk Rating:	
ULE:	1-5 Years
Health:	Poor
Tree Height (Estimated) [m]:	6
DBH [cm]:	50
Retention Value:	Low
Last Inspection Date:	
Observations:	Epicormic growth, Poor taper/ excessive end weight
Tree Comments:	Located 2.7 from extended pathway. 4.5 m to adjoining araucaria. Visible roots up to pathway.

Management

Longitude:	152.912709
Latitude:	-31.426859
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #353

1 Munster Street

Tree Details

Label ID:	Removed(Could Retain)
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Good
Tree Height (Estimated) [m]:	18
DBH [cm]:	47
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	1.6 from extended pathway. On lean to North, has developed larger structural roots in tension to South.

Management

Longitude:	152.912615
Latitude:	-31.426869
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #354

1 Munster Street

Tree Details

Label ID:	Removed (Could Retain)
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	
Health:	Fair
Tree Height (Estimated) [m]:	16
DBH [cm]:	43
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	2.1 to extended footpath.

Management

Longitude:	152.912535
Latitude:	-31.426865
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #355

1 Munster Street

Tree Details

Label ID:	Removed (Could Retain)
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Good
Tree Height (Estimated) [m]:	18
DBH [cm]:	50
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	1.6 to extended pathway. Large structural roots to South visible.

Management

Longitude:	152.912470
Latitude:	-31.426861
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #356

1 Munster Street

Tree Details

Label ID:	Removed (Could Retain)
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Good
Tree Height (Estimated) [m]:	17
DBH [cm]:	43
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	1.4 to extended footpath. Lean to East, large tension root developed to West.

Management

Longitude:	152.912411
Latitude:	-31.426850
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #357

1 Munster Street

Tree Details

Label ID:	Removed (May Remove close to SRZ)
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	6-10 Years
Health:	Fair
Tree Height (Estimated) [m]:	16
DBH [cm]:	50
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	Closest tree at .8m to extended pathway. Twisted form. Likely to impact structural roots but significant remaining area will be untouched. Slight slope. Further investigation.

Management

Longitude:	152.912266
Latitude:	-31.426859
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #358

Tree Details

Label ID:	Removed (Could Retain)
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Good
Tree Height (Estimated) [m]:	18
DBH [cm]:	52
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	1.1 to extended pathway.

Management

Longitude:	152.912173
Latitude:	-31.426858
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #360

1 Munster Street

Tree Details

Label ID:	Not Shown to Retain
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Good
Tree Height (Estimated) [m]:	20
DBH [cm]:	51
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	Located 2.5 from extended footpath.

Management

Longitude:	152.911017
Latitude:	-31.426889
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #361

1 Munster Street

Tree Details

Label ID:	Removed (Could Retain)
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Good
Tree Height (Estimated) [m]:	15
DBH [cm]:	40
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	2.5 to extended footpath. Near seat.

Management

Longitude:	152.910966
Latitude:	-31.426914
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Swamp She-oak Tree ID #362

1 Munster Street

Tree Details

Label ID:	Removed (Poor form)
Scientific Name:	Casuarina glauca
Common Name:	Swamp She-oak
Risk Rating:	
ULE:	1-5 Years
Health:	Poor
Tree Height (Estimated) [m]:	10
DBH [cm]:	42.43
Retention Value:	Low
Last Inspection Date:	
Observations:	Poor taper/ excessive end weight
Tree Comments:	Poor form, close to rubble pit.

Management

Longitude:	152.910781
Latitude:	-31.426986
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Swamp She-oak Tree ID #364

1 Munster Street

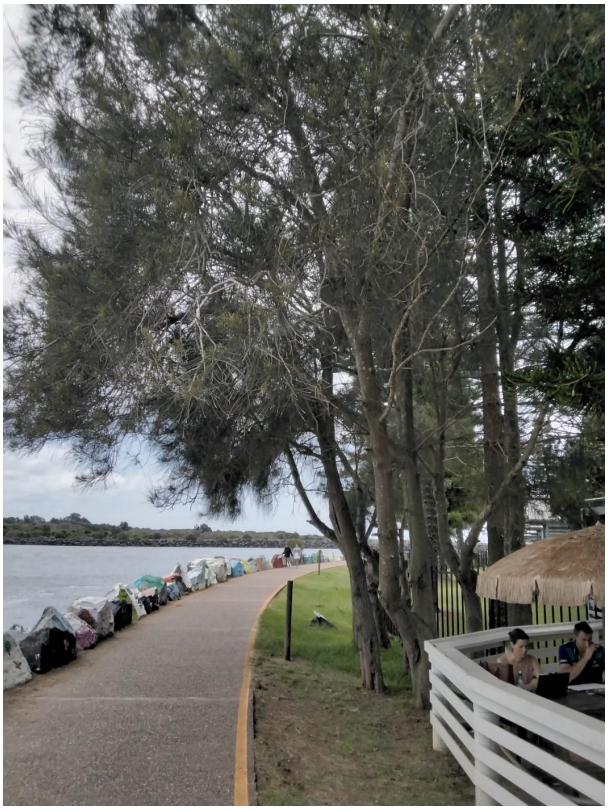
Tree Details

Label ID:	Removed (within Pathway)
Scientific Name:	Casuarina glauca
Common Name:	Swamp She-oak
Risk Rating:	
ULE:	11-20 Years
Health:	Fair
Tree Height (Estimated) [m]:	15
DBH [cm]:	30
Retention Value:	Low
Last Inspection Date:	
Observations:	
Tree Comments:	Cluster of 6 casuarinas and 1 dead. Roots invasive, close to pathway. Removal recommended, must be as a group as they are supporting each other in group.4 within 2 metre path extension.

Management

Longitude:	152.910338
Latitude:	-31.427396
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View



Swamp She-oak Tree ID #367

1 Munster Street

Tree Details

Label ID:	Not shown
Scientific Name:	Casuarina glauca
Common Name:	Swamp She-oak
Risk Rating:	
ULE:	6-10 Years
Health:	Poor
Tree Height (Estimated) [m]:	8
DBH [cm]:	40
Retention Value:	Low
Last Inspection Date:	
Observations:	
Tree Comments:	2.7 to extended pathway Windswept leaning , interesting tree being windswept.

Management

Longitude:	152.913363
Latitude:	-31.426879
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Swamp She-oak Tree ID #368

1 Munster Street

Tree Details

Label ID:	Not shown
Scientific Name:	Casuarina glauca
Common Name:	Swamp She-oak
Risk Rating:	
ULE:	1-5 Years
Health:	Poor
Tree Height (Estimated) [m]:	7
DBH [cm]:	45
Retention Value:	Low
Last Inspection Date:	
Observations:	Serious decline
Tree Comments:	Poor windswept tree not on drawing. 2.5 to extended footpath.

Management

Longitude:	152.912063
Latitude:	-31.426886
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #369

1 Munster Street

Tree Details

Label ID:	Removed (Could Retain)
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Good
Tree Height (Estimated) [m]:	16
DBH [cm]:	45
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	2.1 to extended footpath. Close to manhole, visible surface roots.

Management

Longitude:	152.911491
Latitude:	-31.426879
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #370

1 Munster Street

Tree Details

Label ID:	Inside fence
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	11-20 Years
Health:	Good
Tree Height (Estimated) [m]:	21
DBH [cm]:	50
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	Inside fence, figures estimated. 2.5 to extended pathway.Must consider root protection.

Management

Longitude:	152.910429
Latitude:	-31.427314
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #371

1 Munster Street

Tree Details

Label ID:	Inside fence
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	
Health:	Fair
Tree Height (Estimated) [m]:	18
DBH [cm]:	45
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	Inside fence, figures estimated.2.2 m to extended footpath.

Management

Longitude:	152.910485
Latitude:	-31.427257
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #372

1 Munster Street

Tree Details

Label ID:	Inside fence
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Good
Tree Height (Estimated) [m]:	16
DBH [cm]:	45
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	5.2 to extended footpath. No impact.

Management

Longitude:	152.910544
Latitude:	-31.427174
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Norfolk Island Pine Tree ID #373

1 Munster Street

Tree Details

Label ID:	Inside fence
Scientific Name:	Araucaria heterophylla
Common Name:	Norfolk Island Pine
Risk Rating:	
ULE:	20-40 Years
Health:	Good
Tree Height (Estimated) [m]:	15
DBH [cm]:	42
Retention Value:	High
Last Inspection Date:	
Observations:	
Tree Comments:	Inside fence, 5.5 from extended footpath.

Management

Longitude:	152.910601
Latitude:	-31.427121
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Swamp She-oak Tree ID #375

1 Munster Street

Tree Details

Label ID:	Inside Fence
Scientific Name:	Casuarina glauca
Common Name:	Swamp She-oak
Risk Rating:	
ULE:	
Health:	Poor
Tree Height (Estimated) [m]:	
DBH [cm]:	40
Retention Value:	Low
Last Inspection Date:	
Observations:	
Tree Comments:	Inside fence, 2.3 from extended footpath.

Management

Longitude:	152.910701
Latitude:	-31.427050
Recommended Works:	
Priority of Works:	
Maintenance Comments:	

Photos Street View Map View

Appendix C

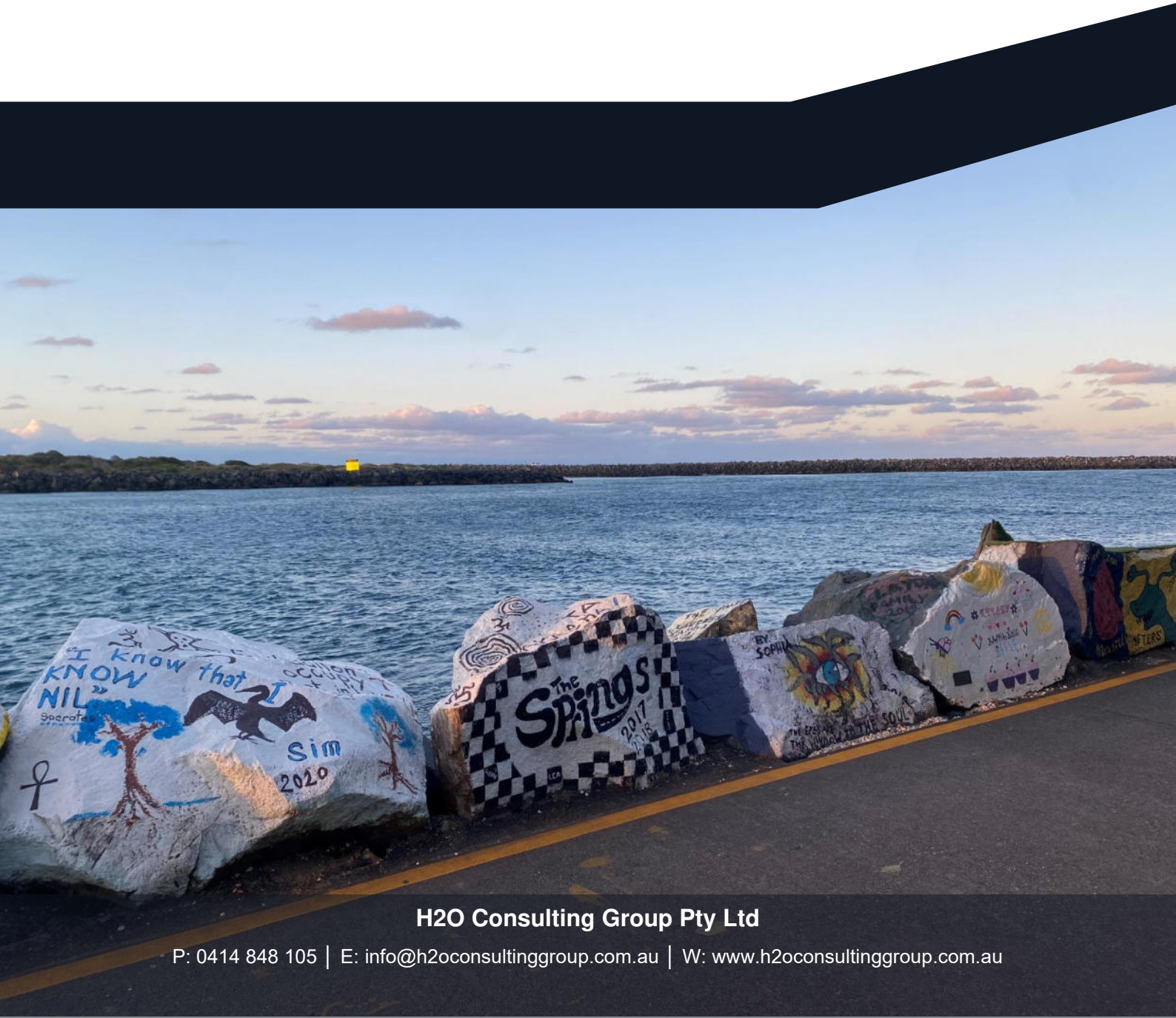
Aquatic Ecology Assessment

Aquatic Ecology Assessment

Port Macquarie Southern Breakwater Upgrade

Prepared For: Transport for NSW

Report Date: 4 April 2022



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Document Details	
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Project Title	Port Macquarie Southern Breakwater Upgrade
Prepared For	Transport for NSW
Report Date	4 April 2022
Project Team	David Cummings, Will Macbeth. Megan Rice & Simon Kirgis

Document Control				
Version	Authors	Reviewer	Approved by	Date
R0	Dr David Cummings & Megan Rice	Dr Will Macbeth	Dr David Cummings	04.04.2022

Disclaimer:

The information provided in this document is based on knowledge, understanding and field observations at the time of review of associated materials and/or site survey. The report should be read and considered in its entirety including consideration of the limitations described in the report.

H2O Consulting Group Pty Ltd has completed this assessment in accordance with the relevant federal, state and local legislation. H2O Consulting Group Pty Ltd accepts no liability or responsibility for contents of this report in respect of any use of, or reliance upon, by any third party or for any use other than the purposes for which it was commissioned. Unauthorised use of this document is prohibited.

Cover Photo: Rock art on the southern breakwater, Port Macquarie.

Executive Summary

H2O Consulting Group was engaged by Transport for NSW (TfNSW) to prepare an Aquatic Ecology Assessment (AEA) for the Port Macquarie Southern Breakwater Upgrade. The Maritime Infrastructure Delivery Office (MIDO) within TfNSW is responsible for the coordination and delivery of coastal and boating infrastructure programs and projects across NSW that support recreational boating, fishing, tourism and a range of other commercial activities. The breakwater requires remediation and potential upgrading to address issues of toe scour, movement/displacement of rock armour and consideration of climate change impacts (including sea level rise).

The proposal includes for the replacement and refurbishment of the existing breakwater and pedestrian path. The proposed works include the breakwater head and the inner river revetment and crest path with a distance of approximately 700 m.

As part of the AEA, works included threatened species searches and desktop review of mapped ecological constraints, site surveys of the structure and adjacent areas to describe the intertidal and subtidal habitats including potential for threatened species habitat, and mapping of any estuarine macrophytes.

In total 82 threatened and migratory species and one TEC were considered further as part of this assessment. Threatened and migratory species included 46 marine birds and shorebirds, nine marine mammals, five marine reptiles, 12 sharks, rays and fish, one alga, and one soft coral. The one TEC was '*Subtropical and Temperate Coastal Saltmarsh'* ecological community. Review of mapped ecological constraints identified *Zostera* seagrass to occur to the west of the southern breakwater. Site investigations determined that the southern breakwater provided potential habitat, albeit artificial, for foraging by shorebirds and marine birds, and refuge for various fish, some of which are considered threatened or migratory species. *Zostera s*eagrass also occur in close proximity to the western end of the southern breakwater, which provides ecologically sensitive Key Fish habitat, as well as potential foraging habitat for other species such as marine turtles.

Direct impacts within the Study Area from this proposal will be restricted to disturbances to existing artificial habitat provided by the rock armouring of the breakwater. Habitat associated with rock armouring is used by some marine birds and fish, and at times this may include some migratory and/or threatened species. As a result, there remains some potential for some minor disturbances to habitat used by these species. The removal and replacement of rocks will also have a direct impact on marine growth present in the Project Area, including sessile invertebrates and macroalgae. These assemblages will, however, likely recover within 12-24 months following construction works. Sensitive habitats adjacent to the Project Area include seagrass beds that occur in close proximity to the western end of the Project Area. Care will be required during construction to ensure that these seagrass beds are not directly impacted as part of the proposal, particularly in terms of construction vessels beaching, mooring and anchoring.

The proposal is considered unlikely to have a significant impact on State and/or Commonwealth listed threatened biodiversity. As such, referral to the Department of the Environment under the EPBC Act is not required. Similarly, the preparation of a Species Impact Statement (SIS) based on the provisions of the BC and FM Act should not be required. Given that removal of the rocks will likely result in removal of some macroalgae and that dredging, and reclamation works may be considered to include excavations within or

removal of rocks from water land, it is recommended that NSW DPI Fisheries is consulted further regarding this project.

Further recommendations to final design have been made to offer suggestions for potential in-water improvements to fish and threatened species habitat and improved access for recreational fishing. To manage the potential risks that this proposal may pose to marine habitat, flora and fauna, and the potential for impacts to adjacent habitat during construction, a series of recommendations have also been provided for pre-construction, during construction and post-construction phases of the project. A key component of these recommendations is the preparation and implementation of a CEMP to minimise impacts during construction works.

Table of Content

1 Background

1.1 Overview

H2O Consulting Group was engaged by Transport for NSW (TfNSW) to prepare an Aquatic Ecology Assessment (AEA) for the Port Macquarie Southern Breakwater Upgrade. The Maritime Infrastructure Delivery Office (MIDO) within TfNSW is responsible for the coordination and delivery of coastal and boating infrastructure programs and projects across NSW that support recreational boating, fishing, tourism and a range of other commercial activities. The breakwater requires remediation and potential upgrading to address issues of toe scour, movement/displacement of rock armour and consideration of climate change impacts (including sea level rise).

Funding has been made available to undertake the upgrade works to the Port Macquarie southern breakwater as part of the Maritime Infrastructure Stimulus Program announced in October 2020, which will deliver priority maritime infrastructure works across NSW. The planning process to undertake the works under *Crown Lands Act 1989* and State Environmental Planning Policy (Infrastructure) 2007, Division 25 is currently underway. As part of these planning works a Review of Environmental Factors (REF) and associated supporting studies, which include an AEA report, are required.

1.2 Locality

Port Macquarie is located on the Mid North Coast of NSW approximately 320km north of Sydney (Figure 1). The southern breakwater is located on the southern side of the entrance to the Hastings River at Port Macquarie. Original construction of the southern breakwater was completed in 1904, while the northern breakwater was constructed later, in 1932. The Hasting River provides boating access to coastal waters via a bar crossing, with the breakwaters providing safer boating access.

1.3 Description of the proposal

Transport for NSW (TfNSW) proposes upgrades to the existing southern Port Macquarie breakwall, including ancillary works such as upgrades to the existing footpath located adjacent the breakwall. The proposal is shown in plans provided as Appendix 1.

The Breakwall Upgrade works include upgrade works to the existing Port Macquarie southern breakwall. The upgrade works are necessary to provide ongoing safe navigable boat entrance to the Hastings River and assist in the breakwall infrastructure meeting current safety standards. More specifically, the breakwall requires remediation and potential upgrading to address issues of toe scour, movement/displacement of rock armour and consideration of climate change impacts (including sea level rise). The total length of breakwall subject to upgrades would be approximately 700 metres in length.

It is assumed that the water depth over the entrance bar (relative to mean sea level over time) would remain roughly the same as present. While it is also expected that the relative depth to the seabed profiles at the entrance bar and adjacent foreshores would remain constant due to progradation, as a result of the sediment supply from the Hastings River and longshore drift processes, keeping pace with SLR. Furthermore, the Basis of Design (BoD) report does not identify any expected changes in coastal processes with potential to impact on nearby shoreline areas (RHDHV 2021).

1.4 Relevant Legislation and Policies

The following legislation and policies have been considered in this ecological assessment:

- NSW *Fisheries Management Act 1994*
- NSW *Biodiversity Conservation Act 2016*
- NSW *Environmental Planning and Assessment Act* 1979
- NSW *Coastal Management Act 2016*
- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
- NSW *Protection of the Environment Operations Act 1997*

The legislative context for the assessment is outlined in the following sections.

1.4.1 Fisheries Management Act 1994

The objectives of the Fisheries Management Act 1994 (FM Act) are to conserve, develop and share the fishery resources of NSW for the benefit of present and future generations, and in particular to:

- conserve fish stocks and key fish habitats;
- conserve threatened species, populations and ecological communities of fish and marine vegetation;
- promote ecologically sustainable development, including the conservation of biological diversity, consistently with these objectives;
- promote viable commercial fishing and aquaculture industries;
- promote quality recreational fishing opportunities;
- appropriately share fisheries resources among the users of those resources;
- provide social and economic benefits for the wider community of NSW; and
- recognise the spiritual, social and customary significance of fisheries resources to Aboriginal persons, and to protect and promote the continuation of Aboriginal cultural fishing.

To meet the primary objectives, Part 7 of the FM Act deals with the protection of aquatic habitats, with Part 7A addressing the conservation of threatened species. Part 7 commonly applies to dredging and reclamation works, protection of marine vegetation including mangroves and seagrass, protection of spawning of certain fish, and noxious fish and marine vegetation.

If a public authority (including a local council or state agency) is a determining authority under Part 5 of the EP&A Act (refer to Section 1.4.3), they may still be required to obtain the following approvals or undertake consultation under the following provisions:

- Section 199 – Under s199 of the FM Act, the Minister for Primary Industries is required to be consulted over any dredging or reclamation works carried out, or proposed to be authorised, by a public authority (other than a local government authority) (i.e. any excavation within, or filling or draining of, water land or the removal of woody debris, snags, rocks or freshwater native aquatic vegetation or the removal of any other material from water land that disturbs, moves or harms these in-stream habitats).
- Section 201 – A permit is required for dredging or reclamation work carried out by a local government authority, unless these works are authorised by a relevant public authority (other than NSW DPI) or under the Crown Lands Act 1989.
- Section 205 – A permit to harm (cut, remove, damage, destroy, shade, etc.) marine vegetation (saltmarshes, mangroves, seagrass and seaweeds).

- Section 219 – A permit to obstruct the free passage of fish.

Listings of threatened species, populations and ecological communities gazetted under the FM Act are relevant to this assessment.

Key fish habitat policy

NSW DPI recognises that certain types of activities have varying degrees of impact on key fish habitats and, as such, require different levels of control and regulation. As a general principle, NSW DPI requires that proponents should, as a first priority, aim to avoid impacts upon key fish habitats. Where avoidance is impossible or impractical, proponents should then aim to minimise impacts. For any unavoidable remaining impacts consideration is to be given to establishment of suitable offsets or compensation.

Where key fish habitat is impacted by this proposal, suitable offsets or compensation will be required to be negotiated with NSW DPI Fisheries.

1.4.2 Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 (BC Act) provides for legal protections of biodiversity and threatened species in NSW. Specifically, it provides for the following:

- A process for declaring and protecting areas of outstanding biodiversity value.
- The listing of threatened species, populations and ecological communities, with critically endangered, endangered and vulnerable species under Schedule 1.
- The listing of critically endangered, endangered and vulnerable ecological communities under Schedule 2.
- The listing of extinct species, species extinct in the wild and collapsed ecological communities of animals and plants under Schedule 3.
- Requirements for the preparation of a Species Impact Statement (SIS).
- Determining where the Biodiversity Offset Scheme (BOS) applies to proposals.

The BC Act sets the criteria for determining whether a proposal is likely to have a significant impact on threatened biodiversity listed under the BC Act. If significant impacts are identified, it would necessitate the preparation of a SIS.

To identify areas with outstanding biodiversity value the Biodiversity Values (BV) Map has been prepared under Part 7 of the BC Act to protected land sensitive to impacts from development and clearing. The map forms part of the BOS Threshold, which is one of the triggers for determining whether the BOS applies to a clearing or development proposal. Types of land the Environment Agency Head can include on the BV Map include the following:

- Coastal wetlands and littoral rainforest mapped under the State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP).
- Core koala habitat identified in a plan of management under State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44).
- Declared Ramsar wetlands defined by the EPBC Act (refer to Section 1.4.5).
- Land containing threatened species or threatened ecological communities identified as having potential for serious and irreversible impacts (SAII) under section 6.5 of the BC Act.
- Protected riparian land.
- High conservation value grasslands or groundcover.

- Old growth forest identified in mapping developed under the National Forests Policy Statement, but excluding areas not meeting the criteria published jointly by the Minister for the Environment and the Minister for Primary Industries.
- Rainforest identified in mapping developed under the National Forests Policy Statement, but excluding areas not meeting the criteria published jointly by the Minister for the Environment and the Minister for Primary Industries.
- Declared areas of outstanding biodiversity value.
- Council-nominated areas with connectivity or threatened species habitat that the Minister for the Environment considers will conserve biodiversity at bioregional or state scale.
- Land that, in the opinion of the Environment Agency Head, is of sufficient biodiversity value to be included.

Listed items of threatened biodiversity under the BC Act with potential to be impacted by this proposal will require further consideration. In addition, direct or indirect impacts to any adjacent areas identified as having outstanding biodiversity values may trigger the requirement for determination under the BOS.

1.4.3 Environmental Planning and Assessments Act 1979

Development in NSW falls under the provisions of the Environmental Planning and Assessment Act 1979 (EP&A Act) and subordinate legislation. Under Section 5.1 of the EP&A Act there is a duty for determining authority to consider the environmental impacts of proposed activities. The specific aspects of these environmental considerations are detailed in Clause 228 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation). Under section 5.1 of the Act determining authorities are required to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity. These include items of biodiversity listed under the BC and FM Acts.

1.4.4 Coastal Management Act 2016

The objectives of the *Coastal Management Act 2016* (CM Act) are to manage the coastal environment of NSW in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic wellbeing of the people of the State.

The CM Act defines the coastal zone, comprising four coastal management areas:

- Coastal wetlands and littoral rainforests area.
- Coastal vulnerability area.
- Coastal environment area.
- Coastal use area.

Part 2 of the CM Act establishes management objectives specific to each of these management areas, reflecting their different values to coastal communities.

The CM Act, along with the State Environmental Planning Policy (Coastal Management) 2018, forms part of the Coastal Management framework.

The proposed upgrade works will be required to be carried out in a manner that is consistent with the objectives of the CM Act.

State Environmental Planning Policy (Coastal Management) 2018

The State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP) aims to promote an integrated and coordinated approach to land use planning in the coastal zone in a manner consistent with the objectives of the CM Act. The CM SEPP provides maps of the coastal zone management areas and identifies development controls for consent authorities to apply to each coastal management area to achieve the objectives of the CM Act.

Consideration of the relevant coastal management areas and identified development controls will require consideration as part of these upgrade works.

1.4.5 *Environmental Protection and Biodiversity Conservation Act* 1999

The purpose of the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to ensure that actions likely to cause a significant impact on matters of national environmental significance (MNES) undergo an assessment and approval process. Under the EPBC Act an action includes a project, undertaking, development or activity. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a controlled action and may not be undertaken without prior approval from the Commonwealth Minister for the Department of Environment (DoE).

The EPBC Act identifies and categorises MNES as the following:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- Nuclear actions (including uranium mining)
- The Great Barrier Reef Marine Park
- A water resource, in relation to coal seam gas development and large coal mining development.

Listings of MNES deemed relevant to this proposal will require further considered under the guidance provided by the EPBC Act.

1.4.6 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is the key piece of environment protection legislation administered by the NSW Environmental Protection Authority (EPA). The POEO Act relates to noise, air and water pollution, and waste management. There is a broad allocation of responsibilities under the Act between the EPA, local councils and other public authorities. The EPA is made the regulatory authority for:

- activities listed in Schedule 1 to the POEO Act and the premises where they are carried out;
- activities carried out by a State or public authority; and
- other activities in relation to which a licence regulating water pollution is issued.

The POEO Act provides for the provision of and conditioning of activities requiring environmental protection licensing. Scheduled activities as listed under Schedule 1 of the Act require an Environmental Protection License (EPL) from the EPA, unless clauses in Schedule 1 specify otherwise.

1.5 Assessment Objectives

The objectives of this assessment are to:

- Identify any potential impacts from the proposal on threatened biodiversity, MNES, fish habitat, marine vegetation, other fauna, areas of outstanding biodiversity value, aquaculture leases, and water quality; and
- Provide recommendations regarding adoption of environmental controls and mitigation measures into the Construction Environmental Management Plan (CEMP) and identify any additional permitting and approval requirements under the FM Act, including any requirements for an SIS.

Figure 1: Location of the Southern Breakwater

2 Review of Existing Information

2.1 General

The area comprising the lower Hastings River and adjacent coastline is a significant component of the natural environment within the region. It is characterised by a biologically diverse assemblage of aquatic species, with these attributes highly valued by the local community. The area is of importance for tourism, boating and a range of recreational activities, while it also supports valuable aquaculture and commercial fishing industries (PMHC 2014). The southern breakwater/promenade structure is a popular local attraction and provides important infrastructure to support the frequent use of the area for popular recreational activities. These values have also been identified as an important part of the Port Macquarie Town Centre Master Plan (PMHC 2014).

2.2 Ecology

River entrances provide dynamic environments were estuarine and marine waters mix, which may result in elevated diversity of fishes and, in turn, greater diversity and abundance of larger, more predatory marine species. This is supported by recent Australian research that has found that predatory fish and many important commercially and recreationally targeted species may congregate at estuary mouths (Jones *et al*. 2020). Man-made structures at the mouths of rivers also provide additional, albeit artificial, habitat for marine species. Benefits may include additional rocky-reef-like habitat, resulting in more concentrated aggregations of fish and improved access for recreational fishing. In many instances these structures can replicate the ecological function of natural reefs but may also introduce surfaces and species that are extraneous to the natural environment (Airoldi and Bulleri 2011). The entrance to the Hastings River has been constrained by training walls since early in the 20th century (Umwelt 2001), so the artificial habitat that the seawalls are currently providing is likely a significant component of the existing habitat in this locality.

The upgrade works will inevitably result in removal and/or disturbance of the existing habitat. Following upgrade works to the Coffs Harbour breakwater in 2016, substantial physical changes to epibenthic taxa on the breakwater were found to occur, resulting in altered benthic assemblages and shifting functional traits of the habitat for at least two years post construction (Mamo *et al.* 2020).

The biodiverse assemblage of aquatic animals associated with the southern breakwater may also include threatened fishes, sharks and marine mammals. The vulnerable Black Rockcod (*Epinphelus daemelii*) has been found to utilise crevice habitat amongst seawall structures just inside estuaries along the NSW coast (NSW DPI 2015). Larger, predatory sharks and marine mammals may also forage on fish in these areas, while fur-seals may haul out and rest on seawalls at the mouths of estuaries. Other components of aquatic biodiversity may include macroalgae and intertidal assemblages, as well as shorebirds and marine birds that may forage in the area. In northern NSW, the endangered marine brown alga *Nereia lophocladia* has also been reported to occur at times amongst habitat associated with the rock and sand interface at the toe of breakwaters (Yee *et al.* 2017). The lower reaches of the Hastings River also include *Zostera*-dominated seagrass beds and some large mangrove and saltmarsh stands (Creese *et al.* 2009) that are all considered Type 1 Key fish habitat (Fairfull 2013).

2.3 Aquaculture

The Hastings River hosts a significant oyster industry. There are currently 28 active oyster growers across 21 oyster-industry- related land-based tenures, covering 114 ha in the Hastings River system (Lawrence 2012), with many of these located in the lower reaches of the river. Commercial fishing no longer occurs in the Hastings River since the closure in 2000, however a strong recreational fishing industry continues to utilise the area.

2.4 Water Quality

Water quality has been monitored in the Hastings River estuary since 2011. This monitoring has found that the water quality in the estuary is typically poor, with elevated nutrient concentrations, more acidic pH and low dissolved oxygen concentrations (Ryder *et al.* 2017). Many of the water quality pressures within the Hastings River are due to historically poor land management practises on the adjacent floodplains and pollution sources in higher areas of the catchment. At nearby Towns Beach, which is located on the coast immediately south of the southern breakwater, previous monitoring has reported water quality to be generally good (North Coast Region State of the Environment Report Working Group 2016). This is likely to be somewhat indicative of water quality at the entrance to the river, especially during periods of flood tide.

3 Methodology and Approach

3.1 Threatened Species Searches

Relevant databases were searched in August 2021, applying a 5 km radius around the Project Area to identify threatened biodiversity and migratory species that may potentially occur within the locality. The following databases and information sources were searched:

- Bionet, Atlas of NSW Wildlife
- EPBC Act Protected Matters Report tool
- NSW DPI Fisheries Threatened species lists
- Sightings data for various species from the Atlas of Living Australia

3.2 Ecological Mapping

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

- Fisheries NSW Spatial Data Portal – Mapping of Estuarine Macrophytes, Aquaculture, Marine Protected Areas, and Coastal Management SEPP layers
- Biodiversity Values and Threshold Tool – Biodiversity values

A review of the potential environmental constraints identified via these maps was undertaken.

3.3 Site Investigations

Consideration was given to all habitat within 50 m around the boundary of the Project Area (termed the Study Area). Site surveys completed as part of this assessment included:

- Inspection and description of general habitat within the Study Area.
- Description of intertidal flora and fauna, including opportunistic observations of marine birds and shorebirds.
- Description of subtidal flora and fauna observed during in-water inspection using snorkelling equipment.
- Review of potential habitat for threatened species, including inspection of intertidal and subtidal areas of natural habitat and artificial structures.

3.4 Mapping

The threatened species assessment was undertaken via desktop review of ‘sightings’, assessment of the habitat in the Study Area, and determination of the likelihood of occurrence of each species using the criteria outlines in Table 1. Species considered further were those in the ‘Known’, ‘High’ and ‘Moderate’ categories, and where impacts on the species from the proposed works could reasonably be considered to potentially occur.

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camera and sonar (CHIRP ClearVu and SideVu) returns to provide real-time imagery of the seabed, with additional spot inspections undertaken by a snorkeler.

Mapping data were collected *in situ* using a custom designed data form application with GPS integration for benthic mapping. Data were then imported into GIS-based mapping software, which created shapefiles and polygons based on interpretation of the following data sources:

- *In situ* habitat verification data
- Aerial imagery
- Bathymetry

3.5 Threatened Species Assessment

The threatened species assessment was undertaken via desktop review of 'sightings', assessment of the habitat in the Study Area, and determination of the likelihood of occurrence of each species using the criteria outlines in Table 1. Species considered further were those in the 'Known', 'High' and 'Moderate' categories, and where impacts on the species from the proposed works could reasonably be considered to potentially occur.

Table 1: Likelihood of occurrence criteria

Likelihood of occurrence	Criteria
Known	The species was observed within the Study Area. The species is known to inhabit the Study Area.
High	The species has frequently been recorded previously in the Study Area or similar habitats in the locality. The species is known or likely to maintain resident populations surrounding the Study Area. 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 migration.
Moderate	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, however, may seasonally use resources within the Study Area opportunistically or during migration.
Low	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 or is likely to remain entirely aerial within the Study Area. The Study Area contains only very marginal habitat for the species, which would not be relied upon for its on-going local existence.
Unlikely	The species is highly restricted to certain geographical areas not within the Study Area. The habitat within the Study Area is unsuitable for the species. The species is likely to only occur aerially in the Study Area.

3.6 Limitations

Fauna surveys were limited to the assessment of habitat values and other opportunistic observations. Habitat assessments are conservative, defaulting to assume presence where there is insufficient knowledge to determine otherwise.

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

Mapping is limited to broad-scale mapping guided by field observations taken with a GPS accuracy of approximately +/- 3m. More detailed mapping may be required to identify more precise boundaries and seasonal changes in seagrass coverage and densities.

Assessment of threatened species is limited to marine species that are reliant on marine habitat, which may include oceanic areas, pelagic waters, or shoreline habitat below the Mean High-Water Mark (MHWM).

4 Results and Findings

4.1 Threatened and Migratory Species

Searches of the NSW Bionet Database identified sightings database for 40 species within 5 km of the Study Area (Figure 2): These included sightings for:

- 34 marine birds and shorebirds listed as threatened or migratory under the BC and/or EPBC Acts;
- Two marine mammals listed as threatened under the BC and/or EPBC Acts; and
- One threatened insect under the BC and/or EPBC Acts;
- Three marine turtles listed as threatened under the BC and/or EPBC Acts.

In addition, review of threatened items listed under the FM Act identified the following requiring further consideration:

- Seven fish, sharks and rays,
- One alga, and
- One soft coral.

The EPBC Protected Matters Report Search identified the following MNES within 5 km of the Study Area (Appendix 2):

- 78 listed threatened species;
- 68 listed migratory Species; and
- Four threatened ecological communities (TECs).

Threatened species and communities listed under the EPBC act relevant to this study included:

- 32 birds (marine and shorebirds);
- Two fish (marine species only)
- Three marine mammals;
- Five marine turtles;
- Three sharks; and
- One TECs.

Migratory species listed under the EPBC act included:

- 22 migratory birds (marine birds and shorebirds); and
- 18 migratory marine species.

Other matters protected under the EPBC Act identified in the search included:

- 89 listed marine species; and
- 12 cetaceans (whales, dolphins and porpoises) (Appendix 2).

Consideration of terrestrial species, migratory terrestrial and wetland species, and terrestrial communities were not considered further as part of this AEA.

In total 82 threatened and migratory species and one TEC were considered further as part of this assessment. Threatened and migratory species included 46 marine birds and shorebirds, nine marine

mammals, five marine reptiles, 12 sharks, rays and fish, one alga and one soft coral. The one TEC was '*Subtropical and Temperate Coastal Saltmarsh'* ecological community.

Searches did not identify any wetlands of international importance (RAMSAR) to occur within the Study Area or nearby in the wider locality

Table 2: Likelihood of Occurrence table for threatened species.

Common Name	Scientific Name	NSW status	Comm. Status	Likelihood of Occurrence
Marine and shore birds				
Common Sandpiper	*Actitis hypoleucos*	P	C,J,K,B	Low – Occasional records in the locality. Typically a wetland species with occurrences most likely well inside the estuary.
Fork-tailed Swift	*Apus pacificus*	P	C,J,K	**Moderate** – Sightings recorded within the locality. May forage across the Study Area at times.
Flesh-footed Shearwater	*Ardenna carneipes*	V, P	J,K	Low – Occasional records in the locality. Likely only to be a transient visitor within the Study Area.
Sooty Shearwater	*Ardenna grisea*	P	J	**High** – Sightings recorded within the locality and around the estuary entrance.
Wedge-tailed Shearwater	*Ardenna pacifica*	P	J	**High** – Sightings recorded within the locality and around the estuary entrance
Short-tailed Shearwater	*Ardenna tenuirostris*	P	C,J,K	Low – Occasional records in the locality. Likely only to be a transient visitor within the Study Area.
Australasian Bittern	*Botaurus poiciloptilus*	E, P	E	Low – Occasional records in the locality. Typically a wetland species occurring well inside the estuary.
Bush Stone-curlew	*Burhinus grallarius*	E, P		Low – Occasional records in the locality. Habitat within the Study Area is only very marginal for this species.
Sharp-tailed Sandpiper	*Calidris acuminata*		C,J,K,B	Low – No Sightings recorded in the locality. Habitat within the Study Area is only very marginal for this species.
Red Knot	*Calidris canutus*	P	E,C,J,K	Low – Occasional sightings recorded in the locality. Typically a wading species, with only very marginal habitat in the Study Area.
Red-necked Stint	*Calidris ruficollis*	P	C,J,K	Low – Sightings recorded in the locality, however habitat within the Study Area is only very marginal for this species.
Lesser Sand-plover	*Charadrius mongolus*	V, P	E,C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Antipoden Albatross	*Diomedea antipodensis*	V	V, B	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Wandering Albatross	*Diomedea exulans*	E,P	V, B	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Northern Royal Albatross	*Diomedea sanfordi*	E	E, B	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Black-necked Stork	*Ephippiorhynchus asiaticus*	E, P		Low – Sightings recorded in the locality, however typically a wading species, with only very marginal habitat in the Study Area.
White-bellied Storm-Petrel	*Fregetta grallaria grallaria*	V	V	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Latham's Snipe	*Gallinago hardwickii*	P	J,K	Low – Occasional records in the locality. Typically a wetland species with occurrences most likely well inside the estuary.
Gull-billed Tern	*Gelochelidon nilotica*	P	C	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Sooty Oystercatcher	*Haematopus fuliginosus*	V, P		**Known** – Observed foraging on the breakwater in the Study Area during site investigations.
Pied Oystercatcher	*Haematopus longirostris*	E, P		Low – Sightings recorded within the locality. Habitat within the Study Area is only marginal for this species.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V, P		Low – Regular sightings in the locality but any use of the Study Area is likely to be entirely aerial.
White-throated Needletail	*Hirundapus caudacutus*	P	V,C,J,K	Low –Sightings in the locality but any use of the Study Area is likely to be entirely aerial.

Common Name	Scientific Name	NSW status	Comm. Status	Likelihood of Occurrence
Caspian Tern	*Hydroprogne caspia*	P	J	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Bar-tailed Godwit	*Limosa lapponica*	P	C,J,K	Low – Sightings recorded in the locality. Habitat within the Study Area is only marginal for this species.
Square-tailed Kite	*Lophoictinia isura*	V, P		Low – Regular sightings in the locality but any use of the study area is likely to be entirely aerial.
Southern Giant Petrel	*Macronectes giganteus*	P	E	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Eastern Curlew	*Numenius madagascariensis*	P	CE,C,J,K	Low – Regular sightings in the locality but typically a wetland species with occurrences most likely well inside the estuary.
Whimbrel	*Numenius phaeopus*	P	C,J,K	Low – Regular sightings in the locality but habitat within the Study Area is only marginal for this species.
Sooty Tern	*Onychoprion fuscata*	V,P		Low – Occasional sightings recorded in the locality. Typically an oceanic species confined to offshore Islands and only seen on the coast during rare transient visits.
Eastern Osprey	*Pandion cristatus*	V,P		Low – Regular sightings in the locality but any use of the Study Area is likely to be entirely aerial
Pacific Golden Plover	*Pluvialis fulva*	P	C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Australian Painted Snipe	*Rostratula australis*	P,E	E	Low – No Sightings recorded in the locality. Typically a wetland species with occurrences most likely well inside the estuary.
Arctic Jaeger	*Stercorarius parasiticus*	P	C,J,K	Low – No sightings recorded in the locality. Typically, an oceanic species and any occurrences are likely to be exclusively aerial.
Common Tern	*Sterna hirundo*	P	C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Little Tern	*Sternula albifrons*	E,P	C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Buller's Albatross	*Thalassarche bulleri*	P	V,B	Low – No sightings recorded in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.
Shy Albatross	*Thalassarche cauta*	V,P	V,B	Low – Occasional records in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.
Chatham Albatross	*Thalassarche eremita*	P	E,B	Low – No sightings recorded in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.
Campbell Albatross	*Thalassarche impavida*	P	V,B	Low – No sightings recorded in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.
Black-browed Albatross	*Thalassarche melanophris*	V,P	V,B	Low – No sightings recorded in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.
White-capped Albatross	*Thalassarche steadi*	P	V,B	Low – No sightings recorded in the locality. Typically an oceanic species and any occurrences are likely to be exclusively aerial.
Crested Tern	*Thalasseus bergii*	P	J	**Known** – Observed during the site survey. Some marginal foraging habitat occurring within the Study Area.
Hooded Plover	*Thinornis rubricollis rubricollis*	V		Low – No sightings recorded in the locality. Typically a wading species, with only very marginal habitat in the Study Area.
Grey-tailed Tattler	*Tringa brevipes*	P	C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is only marginal for this species.
Common Greenshank	*Tringa nebularia*	P	C,J,K, B	Low – Occasional records in the locality. Habitat within the Study Area is very marginal for this wading species.
Terek Sandpiper	*Xenus cinereus*	V,P	C,J,K	Low – Occasional records in the locality. Habitat within the Study Area is very marginal for this wading species.
Marine mammals				
New Zealand Fur-seal	*Arctocephalus forsteri*	V,P		Low – No sightings recorded within the locality. Only marginal foraging and refuge habitat occuring within the Study Area.

Common Name	Scientific Name	NSW status	Comm. Status	Likelihood of Occurrence
Australian Fur-seal	*Arctocephalus pusillus doriferus*	V,P		Low – No sightings recorded within the locality. Only marginal foraging and refuge habitat occurring within the Study Area.
Bryde's Whale	*Balaenoptera edeni*	P	B	Low – No sightings recorded in the locality. Typically remains offshore and very unlikely to enter the estuary.
Blue Whale	*Balaenoptera musculus*	E, P	B	Low – No sightings recorded in the locality. Typically remains offshore and very unlikely to enter the estuary.
Dugong	*Dugong dugon*	E,P	E	Low – No recent sightings recorded in the locality. Rarely seen in NSW waters. Only likely to be a transient visitor to the Study Area.
Southern Right Whale	*Eubalaena australis*	E,P	E	Low – No sightings recorded in the locality. Typically remains offshore and very unlikely to enter the estuary.
Humpback Whale	*Megaptera novaeangliae*	V,P	E	Low – Regularly seen in coastal waters during migration period. Unlikely to enter the bar and estuary.
Killer Whale (Orca)	*Orcinus orca*	P	B	Low – No sightings recorded in the locality. Typically remains offshore and very unlikely to enter the estuary.
Indo-Pacific Humpback Dolphin	*Sousa chinensis*	P	B	Low – No recent sightings recorded in the locality. The lack of any seagrasses inside Coffs Harbour means there is only very marginal habitat for this species and it is only likely to be a transient visitor to the Study Area.
Marine reptiles				
Green Turtle	*Chelonia mydas*	V, P	V	**Moderate** – Occasional sightings within the locality. The species may use habitat to forage or for refuge within the Study Area at times.
Loggerhead Turtle	*Caretta caretta*	E, P	E	**Moderate** – Occasional sightings within the locality. The species may use habitat to forage or for refuge within the Study Area at times.
Leatherback Turtle	*Dermochelys coriacea*	E, P	E,B	Low – No sightings recorded in the locality. Typically remains offshore and rarely enters estuaries.
Flatback Turtle	*Natator depressus*	P	V,B	Low – No sightings recorded in the locality. Typically confined to more tropical waters, only likely to be a transient visitor to the Study Area.
Hawksbill Turtle	*Eretmochelys imbricata*	P	V	**Moderate** – Occasional sightings within the locality. The species may use habitat to forage or for refuge within the Study Area at times.
Fish, sharks, and rays.				
Oceanic Whitetip Shark	*Carcharhinus longimanus*		CE,B	Low – Occasionally recorded in coastal areas, but rarely known to enter estuaries. Only likely to be a transient visitor in the Study Area.
Grey nurse Shark	*Carcharias taurus*	CE, P	CE	Low – Occasionally recorded in coastal areas, but rarely known to enter estuaries. Only likely to be a transient visitor in the Study Area.
White Shark	*Carcharodon carcharias*	V,P	V	**Moderate** – Occasionally recorded within the locality. The Study Area includes some marginal habitat for foraging.
Black Rockcod	*Epinphelus daemelii*	E, P	V	**Moderate** – Occasionally recorded within the locality. The Study Area includes some marginal habitat for foraging and refuge.
White's Seahorse	*Hippocampus whitei*	E, P	E	**Low** – Has not been sighted in the Hasting River. Some potential habitat for this species is provided by seagrasses within the Study Area but tidal velocities and regular flooding make it unlikely the species would be able to establish and persist.
Mackeral Shark	*Lamna nasus*	P	B	Low – Rarely recorded in coastal areas. Typically remains offshore near the continental shelf edge and very unlikely to enter the estuary.
Coastal Reef Manta Ray	*Manta alfredi*	P	B	Low – Occasionally recorded within the locality, typically remains offshore and unlikely to enter the estuary.
Giant Manta Ray	*Manta birostris*	P	B	Low – Occasionally recorded within the locality, typically remains offshore and unlikely to enter the estuary.
Whale Shark	*Rhincodon typus*	P	V	Low – Occasionally recorded within the locality, typically remains offshore and unlikely to enter the estuary.

Common Name	Scientific Name	NSW status	Comm. Status	Likelihood of Occurrence
Scalloped Hammerhead Shark	*Sphyrna lewini*	E	E	Low – Occasionally recorded within the locality, typically remains offshore and unlikely to enter the estuary.
Greater Hammerhead Shark	*Sphyrna mokarran*	V		Low – Occasionally recorded in coastal areas, but rarely known to enter estuaries. Only likely to be a transient visitor in the Study Area.
Southern Bluefin Tuna	*Thunnus maccoyii*	E	E	Low – Occasionally recorded within the locality, typically remains offshore and unlikely to enter the estuary.
Other				
Marine Brown Alga	*Nereia lophocladia*	CE		Low – Typically confined to areas around Coffs Harbour. Habitat within the Study Area is very marginal for this species.
Soft Coral	*Dendronephthya australis*	E	E	Low – No records in the locality. Typically confined to more estuarine/harbour habitats then river systems.

CD = Conservation Dependent, P = Protected, V = Vulnerable, E Endangered, CE = Critically Endangered, M= Migratory species under Bonn Agreement

4.2 Existing Ecological Mapping

Mapping of estuarine macrophytes by NSW DPI Fisheries identified that *Zostera* seagrass beds are present at the western end of the breakwater within the Study Area, however they have not been mapped to extend into the Project Area. While some *Zostera* seagrass beds, saltmarsh and mangrove stands were also identified as being present nearby around Pelican Island, these occur outside the Study Area (NSW DPI 2022, Appendix 2). This mapping did not identify any of the endangered seagrass *Posidonia australis*.

The entirety of tidal areas inside the Study Area are identified as Key Fish Habitat (Appendix 2). In accordance with the definitions outlined by Fairfull (2013), Key Fish Habitat within the Study Area includes Highly Sensitive Key Fish Habitat based on the presence of seagrass beds covering an area of greater than 5 m^2 that occur to the west of the southern breakwater.

No Marine Protected Areas occur within or adjacent to the Study Area nor within the Hastings River (NSW DPI 2022).

No aquaculture areas exist within or nearby the Study Area, however some oyster leases occur upriver. The nearest oyster lease is identified to be approximately 1 km upriver of the Project Area (Appendix 2).

Mapping done as part of the Coastal Management SEPP identifies the Project Area to be mapped as part of the Coastal Environment Area under the SEPP (Appendix 2).

Review of the Biodiversity Values Map, which identifies land with high biodiversity value that is particularly sensitive to impacts from development and clearing, did not identify any areas of High Biodiversity Value within the Study Area (NSW DPIE 2022a).

4.3 Description of Habitat

4.3.1 Shoreline Habitat

The shoreline habitat along the southern breakwater at Port Macquarie is highly modified as a result of the presence of the breakwater. The crest of the breakwater consists of large rocks to minimise overtopping and a pedestrian walkway. Shoreline vegetation is very minimal and limited to Norfolk Island Pine (*Araucaria heterophylla*) plantings that are located on the landward (southern) side of the pedestrian walkway. Some notable stormwater drains were observed during the assessment, including a large drain from Port Macquarie Town Centre entering the estuary near the western end of the breakwater. The breakwater also adjoins Town Beach, which is small protected sandy beach located on the southern side of the breakwater head (Plate 1).

The breakwater and associated shoreline habitat (e.g. trees and artificial, built structures such as light poles and outdoor amenities) also provide resting locations for various marine birds including several gulls, terns and cormorants – many of which were observed during the Site Survey (Table 3). Some of the larger rocks closer to the waterline may also provide an opportunity for fur-seals (*Arctocephalus* spp.) to haul out to rest along the breakwater, as has been observed on other NSW breakwaters. Given that no sightings of fur-seals have been recorded in the Hastings River or the immediate locality, any use of the habitat within the area by fur-seals is considered to be rare.

The waters at the entrance to the Hastings River are used by a diverse range of marine birds including various birds of prey. For the majority of these species occurrences are likely to be exclusively aerial, being part of migratory movements along the coastline, or movements from offshore areas or foraging activities that may encompass vast areas of coastal waters. Some marine birds such as various terns and larger raptors, including some threatened and/or migratory species, may occur in the Study Area at times (Table 2). Occurrences of these species in the Study Area are likely limited to foraging activities, with some known to roost above the intertidal area on the nearby sandspit. These include several endangered and migratory species with a moderate or higher likelihood of occurrence within the Study Area (Table 2), and various other marine species (Appendix 3).

Isolated areas of shoreline in the vicinity of, but outside the Study Area may also provide habitat for nesting by Green Turtles (*Chelonia mydas*), with nesting known to occasionally occur along the northern NSW coast (DPIE 2022b).

4.3.2 Intertidal habitat

The intertidal habitat within the Study Area consists of:

- Some unvegetated marine sands associated with Town Beach;
- An exposed (south-easterly facing) section of intertidal habitat provided by rocks associated with the breakwater head along on the opposite side of the breakwater from the river mouth channel;
- Intertidal habitat provided by rocks associated with the breakwater along the river mouth channel; and
- Intertidal ballast rock used to stabilise the shoreline inside the estuary and western end of the breakwater.

The breakwater is constructed from large armour rock typically between 1 m^3 and 2 m^3 in size. The armour rocks provide intertidal surface habitat for colonisation by macroalgae and intertidal invertebrates. On the outside section of the breakwater head the intertidal habitat was noticeable different, with lesser biodiversity and diversity in habitats. These differences included an absence of larger brown macroalgae on the outside section, with typically only the green alga *Ulva lactuca* observed. On lower rocks in this area there was an abundance of common Tube Worms (*Galeolaria caespitosa*), along with Variable (*Amphibalanus variegatus*) and Rose (*Tesseropora rosea*) barnacles in the mid to lower intertidal areas (Plate 2).

Intertidal habitat along the majority of the length of the breakwater on the channel of the estuary entrance was characterised by a wide diversity of invertebrates, as well as macroalgae in lower intertidal areas. In the high intertidal zone, fauna was sparse and typically consisted of occasional patches of grazing Little Blue Periwinkles (*Austrolittorina unifasciata*) and the Pyramid Periwinkle (*Nodilittorina pyramidalis*). The mid intertidal zone was dominated by Purple Four-plated Barnacle (*Tetraclitella purpurascens*) and Sydney Rock Oysters (*Saccostrea glomerata*), with common occurrences of Gold-mouthed Conniwink (*Bembicium auratum*). Common species that extended from the middle to lower areas included barnacles (*A. variegatus* and *T. rosea*) and common limpets, the Variegated Limpet (*Cellana tramoserica*) and False Limpet (*Siphonaria denticulate*). In the lowest intertidal areas dense macroalgae mats consisting of brown macroalgae (*Petalonia binghamiae*, *Colpomenia sinuosa*), coralline red algae (*Coralina officinalis*) and the foliose green alga *U. lactuca* were dominant, with patchy occurrences of Cunjevoi (*Pyura stolonifera*) also noted (Plate 2). During the low tide shore crabs (*Paragrapsus laevis*) were also observed on the lower rocks of the breakwater.

The intertidal rock platform provided some potential foraging habitat amongst the oysters on the mid to lower rocks for birds at low tide. During the Site Survey various gulls, terns, and cormorants were observed resting on structures associated with the breakwater, while Australian Pelicans (*Pelecanus conspicillatus*) also frequented the adjacent waters. The Crested Tern (*Thalasseus bergii*) was also observed on the south-eastern sand spit of Pelican Island, which is located approximately 700 m west of the Project Area.

4.3.3 Subtidal habitat

The subtidal habitat within the Project Area included the toe of the breakwater, which extends 5–10 m out into the water from the breakwater at a 45–60-degree gradient. Lower (subtidal) sections of the breakwater were constructed of similar-sized large and haphazardly placed armour rock to that present in the intertidal area. Beyond the end of the toe of the breakwater the subtidal habitat consisted of a moderately sloping (15–30 degrees) soft sediment bottom. These sediments typically consisted of clean marine sands, although became siltier towards the western extent of the breakwater and to the west of the breakwater, where some seagrasses were found to occur. Some large rocks and patches of rubble occasionally occurred in those areas of soft sediment within 10 m of the breakwater toe. These rocks and rubble appear to have originated on the breakwater above, having been dislodged over time (Plates 3 and 4).

In shallow areas of hard substrate below the Low Water Mark a continuation of the lower intertidal assemblage, consisting of macroalgae and barnacles, extended into subtidal areas. In deeper areas near the tow of the breakwater where habitat formed a sandy rock interface the common brown macroalgae Gulfweed (*Sargassum* sp.), juvenile Kelp (*Ecklonia radiata*) and *Padina crassa* were more common. On the lower rocks, and typically in closer proximity to the breakwater head, dense beds of the ascidian *Ritterella pedunculata* occurred on the larger rocks. Turfing brown algae, encrusting sponges and occasionally anemones were also observed in association with this rocky habitat.

The haphazard positioning of armour rocks on the lower seawall was found to have created small artificial crevices, caves and overhangs that provide good fish refugee habitat. At the toe of the seawall the macroalgae beds and variable habitat provided by the mixture of scattered rocks, rubble and sand also provides for good fish habitat. On the north-western side of the breakwater these rubble patches supported macroalgae beds with long fronds of *Sargassum*, which also represents good fish habitat. The fish assemblage was dominated by Yellowfin Bream (*Acanthopagrus australis*), which was present in high numbers. Other common species included Luderick (*Girella tricuspidata*), Silver Batfish (*Monodactylus argenteus*), Mangrove Jack (*Lutjanus argentimaculatus*), Rock Cale (*Aplodactylus lophodont*), Tarwhine (*Rhabdosargus sarba*) and Dusky Flathead (*Platycephalus fuscus*).

Patchy *Zostera capricorni* seagrass beds were found in shallow areas (typically < 4 m) in the western part of the Study Area. These included high-density beds of *Z. capricorni* (Plate 4) that commence at the toe of the western section of the breakwater, as well as some smaller, low-density patches in deeper areas to the northwest of the breakwater (Figure 3).

Table 3: List of species observed during the site survey.

Common Name	*Species*	Seawall	Habitat
Fish			
Yellowfin Bream	*Acanthopagrus australis*	√	Rocky subtidal, soft sediment subtidal,
Eastern Blue Groper	*Achoerodus viridis*		Rocky subtidal
Rock Cale	*Aplodactylus lophodon*	√	Rocky subtidal

Common Name	*Species*	Seawall	Habitat
Stars-and-stripes Puffer	*Arothron hispidus*		Rocky subtidal
Red Morwong	*Cheilodactylus fuscus*		Rocky subtidal
Magpie Morwong	*Cheilodactylus vestitus*		Rocky subtidal
Yellowspotted Chromis	*Chromis flavomaculata*	√	Rocky subtidal
Longfin Pike	*Dinolestes lewini*		Soft sediment subtidal
Luderick	*Girella tricuspidata*	√	Rocky subtidal, soft sediment subtidal,
Southern Herring	*Herklotsichthys castelnaui*		Soft sediment subtidal
Mangrove Jack	*Lutjanus argentimaculatus*	√	Rocky subtidal, soft sediment subtidal,
Moses Perch	*Lutjanus russellii*	√	Rocky subtidal, soft sediment subtidal,
Stripey	*Microcanthus strigatus*	√	Rocky subtidal
Silver Batfish	*Monodactylus argenteus*	√	Rocky subtidal, soft sediment subtidal,
Sea Mullet	*Mugil cephalus*		Rocky subtidal
Blue Morwong	*Nemadactylus macropterus*		Soft sediment subtidal
Crimsonband Wrasse	*Notolabrus gymnogenis*		Rocky subtidal
Inscribed Wrasse	*Notolabrus inscriptus*	√	Rocky subtidal
Big-Scale Parma	*Parma oligolepis*	√	Rocky subtidal
Girdled Scalyfin	*Parma unifascata*	√	Rocky subtidal
Black-tipped Bullseye	*Pempheris affinis*	√	Rocky subtidal
Sand Flathead	*Platycephalus bassensis*		Soft sediment subtidal
Dusky Flathead	*Platycephalus fuscus*	√	Rocky subtidal, soft sediment subtidal,
Goldspot Sweetlip	*Plectorhinchus flavomaculatus*	√	Rocky subtidal, soft sediment subtidal,
Brown Sweetlip	*Plectorhinchus gibbosus*	√	Rocky subtidal, soft sediment subtidal,
Tailor	*pomatomus saltatrix*		Soft sediment subtidal
Silver Sweep	*Scorpis lineloata*		
Sand Whiting	*Sillago ciliata*		Soft sediment subtidal
Yellowtail Scad	*Trachurus novaezelandiae*		Soft sediment subtidal
Invertebrates			
Variable Barnacle	Amphibalanus variegatus	√	Rocky intertidal
Wavy Top Shell	*Austrocochlea concamerata*	√	Rocky intertidal
Zebra Top Snail	*Austrocochlea porcata*	√	Rocky intertidal
Barnacle	*Balanus trigonus*	√	Rocky intertidal
Gold-mouthed Conniwink	*Bembicium auratum*	√	Rocky intertidal
Colonial Ascidian	*Botrylloides leachi*		Rocky subtidal
Variegated Limpet	*Cellana tramoserica*	√	Rocky intertidal
Honeycomb Barnacle	*Chamaesipho tasmanica*	√	Rocky intertidal
Six-plated barnacle	*Chthamalus antennatus*	√	Rocky intertidal
Purple Bryozoan	*Disporella sp.*		Rocky subtidal
Tube worm	*Galeolaria caespitosa*	√	Rocky intertidal

Common Name	*Species*	Seawall	Habitat
Red Rock Crab	*Guinusia chabra*	√	Rocky intertidal
Purple Sea Urchin	*Heliocidaris erythrogramma*		Rocky subtidal
Red Sea Urchin	*Heliocidaris tuberculata*		Rocky subtidal
Short-spine Urchin	*Holopneustes purpurascens*		Rocky subtidal
Black Nerita	*Nerita atramentosa*	√	Rocky intertidal
Pyramid Periwinkle	*Nodilittorina pyramidalis*	√	Rocky intertidal
Little Blue Periwinkle	*Nodilittorina unifasciata*	√	Rocky intertidal
Limpet	*Notoacmea petterdi*	√	Rocky intertidal
Chiton	*Onithochiton quercinus*	√	Rocky intertidal
Sand Anemone	*Oulactis muscosa*		Soft sediment subtidal
Rock-pool Shrimp	*Palaemon serenus*	√	Rocky subtidal
Spotted Smooth Shore Crab	*Paragrapsus laevis*	√	Rocky intertidal
Oyster Limpet	*Patelloida mimula*	√	Rocky intertidal
Red Bait Crab	*Plagusia chabrus*	√	Rocky intertidal
Cunjevoi	*Pyura stolonifera*	√	Rocky intertidal
Ascidian	*Ritterella pedunculata*		Rocky subtidal
Sydney Rock Oyster	*Saccostrea glomerata*	√	Rocky intertidal
False Limpet	*Siphonaria denticulata*	√	Rocky intertidal
Sponge	*Spongia sp.*		Rocky subtidal
Encrusting Sponge	*Spongia sp.*		Rocky subtidal
Snake-skin Chiton	*Sypharochiton pelliserpentis*	√	Rocky intertidal
Mulberry Whelk	*Tenguella marginalba*	√	Rocky intertidal
Rose Barnacle	*Tesseropora rosea*	√	Rocky intertidal
Purple Four-plated Barnacle	*Tetraclitella purpurascens*	√	Rocky intertidal
Macroalgae			
Sinuous Ballweed	*Colpomenia sinuosa*	√	Rocky subtidal, soft sediment subtidal, rocky intertidal
Coralline Algae	*Corallina officinalis*	√	Rocky subtidal
Forkweed	*Dictyota dichotoma*	√	Rocky subtidal, rocky intertidal
Kelp	*Ecklonia radiata*		Soft sediment subtidal
Habonori	*Petalonia binghamiae*	√	Rocky Subtidal
Brown Macroalga	*Padina crassa*	√	Rocky subtidal, rocky intertidal
Red Alga	*Pterocladia lucida*		Rocky subtidal
Gulfweed	*Sargassum sp.*	√	Rocky subtidal
Sea Lettuce	*Ulva sp.*	√	Rocky intertidal
Birds			
Silver Gull	*Chroicocephalus novaehollandiae*		Soft sediment intertidal, aerial
Australian Pelican	*Pelecanus conspicillatus*		Soft sediment intertidal, in water, aerial
Great Cormorant	*Phalacrocorax carbo*	√	Rocky intertidal
Little Black Cormorant	*Phalacrocorax sulcirostris*		Soft sediment intertidal
Australian Pied Cormorant	*Phalacrocorax varius*	√	Rocky intertidal

Common Name	*Species*	Seawall	Habitat
Crested Tern	*Thalasseus bergii*		Soft sediment intertidal, aerial
Plants			
Eelgrass	*Zostera sp.*		Soft sediment subtidal

Figure 2: Bionet Sightings.

5 Impact Assessment

Coastal infrastructure such as seawalls and breakwaters can supplement natural marine habitats, attract and result in aggregations of marine species, and potentially provide diversity hotspots that may benefit rare and threatened species. Modifications or changes to these structures can smoother and/or encroach into adjacent habitats, or result in changes to the existing hydrology or coastal processes. While repair and maintenance works have potential for physical disturbance to the assemblages of marine species and habitats directly associated with the structures, other habitats adjacent to the structures may also be adversely affected by physical, chemical, biological and behavioural disturbances during construction works.

The Guidelines for Aquatic Ecology in Environmental Impact Assessment identifies that, in general, 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 (Lincoln Smith 2003). 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 artificial light emissions (Tidau *et al*. 2021). To recognise this, behavioural effects have been added as a fourth category of impacts summarised in Table 4.

Table 4: Identification of potential impacts from the proposal.

Impact	Likelihood	Description
Physical		
Removal of marine growth (sessile invertebrates and algae)	Likely	Marine fauna (typically sessile invertebrates) and flora (typically algae and macroalgae) associated with rock on the existing breakwater will likely be removed and lost as part of this proposal.
Removal of or direct impact on estuarine macrophytes (seagrass, mangroves or saltmarsh)	Unlikely	The proposal is not expected to require any removal of estuarine macrophytes. Some seagrasses occur in close proximity (approximately 7 m away); however these will not require removal and direct impacts should be able to be avoided.
Physical disturbance to marine fauna and flora	Known	The proposal will result in some physical disturbance to marine flora and fauna, particularly those associated with rock on the existing breakwater.
Removal of habitat	Likely	The proposal will likely require some removal of artificial intertidal and subtidal habitat associated with rock on the existing breakwater. This habitat will, however, likely be replaced by new, and in places additional, rock.
Modification or alteration of habitat	Known	The proposal will result in some modification to the existing artificial habitat provided by the breakwater. These modifications may likely reduce habitat complexity and remove areas of habitat provided by large gaps between rocks and undercutting under the breakwater toe.
Smothering or sedimentation of adjacent habitat	Known	The proposal will result in some smothering of rock, rubble and sand habitat by new rock placed to top up and repair the existing breakwater. For the most part these areas will be limited to areas where rock has previously been placed.
Barriers to fish passage	None	The proposal will not result in any temporary or permanent barriers to 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.
Potential for increased risk of vessel strike for marine fauna	Unlikely	The proposal is not expected to result in any notable or sustained increase in vessel movements in the Study Area that pose a risk to marine fauna that occupy waters at or near the surface. Furthermore, the majority of construction works will be done from shore.
Generation of noise resulting in injury	Unlikely	The proposal is not expected to require any piling works. Underwater noise will be limited to underwater noise associated with lifting, repositioning, removal and placement of rock by shore-based heavy machinery, which

Impact	Likelihood	Description
		does not have potential to generate noise of a level that could result in injury to marine fauna.
Loss of habitat as a result of changes in existing hydrology or coastal processes associated with the river entrance	Unlikely	It is unlikely that indirect impacts on habitat (e.g. seagrass beds) within the Study Area or adjacent areas will occur. The proposal is not expected to change the existing hydrology or coastal processes associated with the river entrance (TfNSW 2022).
Chemical		
Changes in water quality	Unlikely	The proposal will not result in any constant inputs or planned discharges into the adjacent waters. Potential for unplanned discharges can be adequately mitigated through adoption of suitable environmental controls during construction works.
Exposure to Acid Sulfate Soils (ASS)	Possible	ASS soils from subtidal areas are not expected to be exposed. Some indirect impacts of exposure of ASS from excavations above the wall is possible, which would be managed as part of the Acid Sulfate Management Plan (TfNSW 2022).
Mobilisation of sediments	Possible	There is potential that some construction works on land or in the water may mobilise sediments. Exposed sediments on the shore are the highest risk to water quality for this project. The marine sediments present in the Project Area are clean marine sands, so the proposal will result in minimal prolonged mobilisation of sediments associated with the seabed.
Nutrification	Unlikely	The proposal is not expected to result in any nutrient-enriched inputs or mobilisation of significant amounts of nutrient-enriched sediments.
Biological		
Invasion or spread of non-native or invasive species	Possible	Equipment brought to site during construction works has potential to introduce non-native or invasive species to the site from other areas.
Introduction of disease or pathogens	Possible	Transportable marine machinery with marine growth has potential to spread pathogens of shellfish to this estuary from other estuaries.
Behavioural		
Generation of shoreline construction noise	Possible	Shoreline construction noise may have a very localised deterrence of some shorebird species at times during construction works. Given the high levels of human activity that occur in this area, the use of the shoreline by marine fauna is likely limited to common species that tolerate human disturbances.
Generation of underwater noise	Unlikely	The proposal is not expected to require any piling works in subtidal areas. Given this, the potential to produce levels of underwater noise with potential to impact on marine fauna that may occur in the Study Area or adjacent waters in minimal.
Increased shoreline artificial light	Unlikely	No changes to the amount of artificial shoreline light as a result of this proposal are expected. Construction works are expected to be undertaken during daylight hours and as such the use of any additional lighting is not expected to be required.

5.1 Estuarine Fauna

5.1.1 Marine Birds and Shorebirds

Impacts on marine and shorebirds from the proposal are expected to be minimal and confined to disturbances during construction work. These disturbances are likely to affect small areas of foraging habitat associated with intertidal rocks. Marine birds that forage amongst intertidal rocks, such as the Sooty Oystercatcher (*Haematopus fuliginosus*), may be deterred from feeding in some areas at times during construction works. In contrast, marine birds such as gulls that are likely to be undaunted by construction works may be attracted to the area to forage amongst rocks removed from the water. The rocky intertidal areas where these disturbances may occur likely only represent a very small part of the very large foraging areas used by these species. The potential to impact on the Sooty Oystercatcher was considered further

through a Test of Significance. This assessment found that Sooty Oystercatchers that utilise habitat in the vicinity of the Study Area are unlikely to be significantly affected by the proposed activity. Impacts from the proposal on the Sooty Oystercatcher will be limited to disturbances during construction, as well as some minor habitat modifications that will not result in any net loss of artificial habitat for the species (Appendix 4).

Various species of shorebirds that roost above the high-water mark, and/or those that forage amongst intertidal sandflats at low tide or across adjacent coastal waters, may occur amongst intertidal sand flats in the locality. These foraging habitats provided by the sand flats are well outside the Study Area and not expected to be impacted by this proposal.

5.1.2 Marine Mammals

Some marine mammals such as dolphins and fur-seals may at times transiently occur within the Study Area. Occurrences of these species are likely to be the result of transient movements along the coastline, or to and from the estuarine waters of the Hastings River. Use of habitat within the Study Area during these movements would likely be restricted to opportunistic foraging activities associated with prey species attracted to the breakwater. Any foraging that may occur within the Study Area is unlikely to be impacted as a result of the proposal, so would likely be of minimal ecological significance in relation to the very large areas these marine mammals forage across. The Hastings River breakwater is not a known haul-out location and there are no records of fur-seals resting on the breakwater or other areas within the wider locality. Based on the recorded sightings, any occurrence of fur-seals in or around the locality is considered to be rare and confined to occasional transient visits while moving along the NSW coastline. The proposal is also not expected to result in any underwater noise, which is known to be a significant environmental concern for marine mammals (Erbe 2012). Given this, the proposal is not considered to have potential to impact on any threatened or migratory marine mammals that may occasionally occur in the Study Area or adjacent waters.

5.1.3 Marine Reptiles

Use of habitat around the breakwater by marine turtles is likely to be primarily transient passage between coastal waters and estuarine habitat associated with the lower Hastings River. The seagrass that occurs in the Study Area provide some marginal foraging habitat that may be visited by marine turtles at times, especially the Green Turtle, which seagrass is a preferred foraging habitat for, within NSW estuaries. Additional opportunistic foraging amongst habitat provided by the seawall may also occur at times.

Nesting by Green Turtles (*C. mydas*) may also occur occasionally in isolated areas on the NSW north coast as far south as Port Macquarie (NSW DPIE 2022b). Within the Study Area only Town Beach would provide any potential habitat for nesting by marine turtles. With no known nesting by Green Turtles recorded at this location and the area unlikely to be desirable for nesting due to the very elevated levels of human disturbance, nesting at this location is considered to be very unlikely.

The potential for impact on marine turtles from this project was considered further through 7-Part test and the Impact Assessment Criteria. This assessment found that given the marginal foraging habitat within the Study Area, marine turtles that may utilise these habitats are unlikely to be significantly impacted by the proposed works. Impacts would be confined to short-term disturbances that may reduce habitat quality during construction, such as temporary modification of foraging habitat provided by the seawall, generation of underwater noise, construction vessel movements or reduced water quality. This habitat represents only a very small proportion of the area the species is likely to forage across and is not critical to their lifecycle.

The proposed works are unlikely to directly impact these species and do not pose any significant long-term effects to the survival of marine turtles within the locality (Appendix 4).

5.1.4 Fish, Sharks and Rays.

Impacts on sharks, fish and rays will be confined to habitat disturbance for species associated with the breakwater. Removal of rocks with extensive marine growth and replacement with new rocks without growth may have a short-term effect on habitat productivity. However, the replacement rock, and additional rock in places, is expected to be promptly colonised by marine biota (Mamo *et. al.* 2020). Physical habitat disturbance will be most significant for cryptic species of fish, sharks and rays that live amongst or within the rocks, with some individuals likely to be potentially displaced and most impacted by the proposal. Furthermore, the repair and rectification of gaps, and infilling of areas where toe scouring has occurred, may further reduce available habitat for such species. Species that may utilise such habitat include cods and groupers such as the threatened Black Rockcod (*E. daemelii*). Juvenile Black Rockcod are commonly found around rocky shores within estuaries along the NSW coast (NSW DPI 2015), with anecdotal reports juveniles may utilise habitat associated with seawalls inside estuaries. The potential to impact on Black Rockcod was considered further through a 7-Part Test and Impact Assessment Criteria. These assessments found potential Black Rockcod habitat inside the Study Area is marginal, suitable only to juveniles, and not expected to be ecologically significant to any or part of the local population. Impacts from the proposal are restricted to some potential disturbances during construction works that may have some localised and short-term influence on habitat quality for juvenile Black Rockcod. As such, the viability of the Black Rockcod population that may utilise habitat in the vicinity of the proposal is unlikely to be significantly affected by the proposed activity (Appendix 4).

Seagrass beds on the western side of the Study Area provide important Key Fish Habitat, especially in those areas where they occur in patches of higher density. They provide important estuarine habitat for juvenile fishes and protected syngnathid species that take refuge from larger predators within these habitats. The endangered White's Seahorse has not been sighted in estuarine waters of the lower Hastings River, although it is considered to be widely distributed within suitable estuarine habitats along the NSW and southern QLD coasts. Given the lower Hastings River has high tidal flow velocities and regularly floods, the establishment and persistence of this species within the estuarine waters of the Hastings River is considered unlikely.

The movements of the majority of larger fish are likely to be transient in nature, with some species likely attracted to the structure due to the presence of habitat that provides opportunity to prey on smaller fish and avoid larger predators. The proposed repairs and rectification works will likely remove some of the habitat complexity from the existing structure, while the lesser amounts of marine growth will reduce productivity. These effects can be expected to naturally reduce prey availability and the value of the habitat in terms of predator avoidance. As a result, the proposal may have some impact on overall diversity of fish assemblages attracted to the southern breakwater.

For large transient and predatory species such as sharks, including the threatened White Shark (*Carcharodon carcharias*), any minor change in diversity of the prey assemblage is likely to be of minimal ecological significance. These species typically forage over very large ranges of coastal habitat within and outside the estuary, including adjacent areas of the northern breakwater. Feeding activity that does occur in the Study Area is likely to be very seasonal (e.g. as part of seasonal movements following prey items), and/or opportunistic. The presence of the breakwater and its associated potential for prey items is

considered to be of minimal ecological significance to such species. Given this, impacts on the threatened White Shark from this proposal do not require further consideration.

5.1.5 Marine Invertebrates

The proposal will result in the removal and or repositioning of a large amount of rock with marine growth. This marine growth is dominated by oysters, barnacles and the colonial ascidian (*Ritterella pedunculata*), while other more cryptic species of mobile invertebrates such as isopods and arthropods are also likely to live amongst this marine growth. It is likely any mobile invertebrate fauna will retreat deeper into the rock armouring should the area be disturbed. Sessile invertebrates removed from the water will be lost, however these species typically settle and recolonise quickly once new structure is provided (Walker *et al*. 2007).

There is also potential for smothering of established subtidal habitat along the rock (reef) and sand interface in places where realignment of the breakwater toe is required. Some small areas of soft sediment containing invertebrate infauna is likely to be smothered in these areas. The potential for impacts on large epibenthic and mobile benthic invertebrate fauna is considered minimal. The threatened Cauliflower Soft Coral (*Dendronephthya australis*) is known to occupy sandy tidal channels within estuaries (NSW DPI 2021). Given Cauliflower Soft Coral was not found to occur at the time of the Site Survey and there are no reports of any previous occurrence of the Cauliflower Soft coral within the Hastings River, it is very unlikely that this species occurs in the Study Area.

5.2 Estuarine Flora

5.2.1 Seagrasses

Seagrass beds consisting of low- to high-density patches of *Z. capricorni* occur nearby the western end of the southern breakwater. These adjacent seagrass beds in close proximity to the breakwater and those in deeper areas further away have a highly temporally variable distribution. Based on mapping done in 2021, the seagrass beds are not expected to be directly impacted. However, given their close proximity to the Project Area, some potential for indirect disturbances from sedimentation during construction works on the nearby breakwater remains.

5.2.2 Mangroves

No mangroves occur in the Study Area.

5.2.3 Saltmarsh

Saltmarsh on the NSW North Coast is considered a TEC under both the BC and EPBC Acts. No saltmarsh occurs in the Study Area.

5.2.4 Macroalgae

Disturbance to common macroalgae species is unavoidable during removal, replacement and repositioning of rock associated with the structures. Disturbances to the macroalgae community will be greatest in areas around the V-Wall and training walls where macroalgae is most established and of greater density due to the lesser exposure to ocean swell. Along the majority of the southern face of the breakwater the macroalgae cover was minimal, with colonial ascidian cover dominating subtidal habitat to the sand line. Deeper habitat at the rock (reef) and sand interface around the breakwater head, particularly on the north-eastern side, provided some potential, albeit marginal habitat for the threatened Brown Marine Alga (*N. lophocladia*). Inspection of this habitat did not find this species to be present at the time of survey. Given

the Brown Marine Alga has not been recorded as far south as Port Macquarie (NSW DPI 2018), it is very unlikely that it occurs in the Study Area.

5.3 Sediment and Water Quality

Mobilisation of particulate terrestrial material and discharge of water via onshore construction activities and other unplanned spills and discharges may quickly enter waterways and disperse, resulting in impacts on water quality and indirect flow-on impacts on fauna that utilise adjacent habitats. Nearby habitats include some seagrasses, which are typically considered more susceptible to sedimentation and reduced water clarity (Kirkman and Kuo 2012). This proposal will require suitable measures to avoid, minimise and mitigate the risk of unplanned spills and discharges during construction works.

5.4 Key Threatening Processes

5.4.1 Debris and Harmful Substances

Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris is considered a Key Threatening Process under both the FM and EPBC Acts. 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 proposal area. For example, petroleum products destroy the insulating ability of fur-bearing mammals such as seals and the water repellence of bird feathers, while they can also have an effect on the health, fitness, condition, growth rates, and larval survival of fish and invertebrates (Clarke 2011). During construction works uncontained debris and contaminants from unplanned spills can enter the waterways. The implementation of management measures to manage wastes and minimise the likelihood of unplanned spills will be required to minimise this risk.

Figure 3: Habitat Map.

6 Recommendations and Conclusions

6.1 Recommendations

This section provides recommendations for multi-use and eco-features, as well as measures to avoid, minimise and mitigate ecological impacts on the marine environment. The recommendations have been provided to guide final design, and to avoid, minimise and mitigate potential impacts during the construction phases of the project.

6.1.1 Opportunities for multi-use and eco-features

Final design should allow for inclusion of additional multi-use and eco-features that enhance both ecological and community value. This should consider incorporation of habitat enhancements that can benefit marine fauna, especially threatened species, and can potentially improve Key Fish Habitat.

Increasing submerged habitat complexity offers improvements to subtidal habitat that may offset and replace habitat on the existing structure that is lost as a result of repairing the under-toe scouring and infilling areas of the seawall depleted of rock. During upgrade works for the Coffs Harbour breakwater the incorporation of rock scree and convoluted toe into the design provided improved habitat for the threatened Brown Marine Alga species that occurs in the area (Mamo *et al.* 2018). The use and placement of various large and irregular-shaped rock can provide for additional habitat complexity through creating crevices and cracks for a fish to shelter. This can provide benefits for some threatened species of fishes such as Black Rockcod, which may take up shelter in these crevices and cracks. The placement of some larger, 5-8 tonne rocks at the base of the structure to form a convoluted toe across areas of approximately 50 m^2 would provide additional opportunity to improve fish habitat. Such areas should consist of several haphazardly-placed large rocks on the toe and at the rock (reef) and sand interface. This rock could be sourced from additional materials that do meet the engineering specifications for inclusion into the wall. Suitable locations that do not pose navigational risks on the breakwater should be identified at the final design stage. It is recommended that final detail regarding rock size, spacing and placement involve consultation with NSW DPI Fisheries during the construction phase once the additional materials available to the project are identified.

Design should also consider improvements for recreational fishers, such as improved and safer access to the water's edge along the breakwater through the incorporation of inconspicuous rock safety stairs. Such structures should be considered approximately every 100m.

6.1.2 Prior to Construction

Sediment fencing should be put in place in any areas in close proximity to any drains or natural drainage lines above the HWM that have a high risk of erosion during construction works, particularly between any work sites along the breakwater and Towns Beach or the main stormwater drain that discharges to the west of the breakwater. The above erosion and sediment control measures should be implemented in accordance with the 'Blue Book' (Landcom 2004).

An exclusion zone should also be established around the seagrass beds on the western side of the Project Area before construction works commence.

6.1.3 During Construction

The following actions are recommended to be implemented during construction works. It is recommended that these be adopted into the Construction Environmental Management Plan (CEMP) for the works.

- No construction equipment should moor, anchor or operate in less than 1 m water depth within 2 m of seagrass habitat.
- Construction works should be confined to daylight hours with minimal lighting associated with plant and site compounds to be left on during night-time hours.
- Where practical, silt curtains should be put in place and maintained to minimise sedimentation and contain any unplanned spills.
- All equipment should be thoroughly cleaned before being brought to site to minimise the potential to spread weed seeds or soil-based pathogens.
- Procedures to adequately manage and store waste products and material in designated areas on the site should be established.
- All construction and work locations are to have designated litter disposal bins to avoid potential for marine debris.
- All machinery should be routinely checked for leaks, with an emergency spill kit to be kept on site at all times. All staff are to be made aware of the location of the spill kit and trained in its use.
- No stockpiling or storing of materials should occur within mangrove or saltmarsh habitat.
- All fuels and hydrocarbon-based products are to be stored in a bunded area away from the waters edge.
- No domestic animals are to be brought onto site during construction works to minimise potential for disturbance of any shorebirds.
- Should shorebirds be foraging in intertidal areas within 50 m of active construction works, reasonable care should be taken to ensure that the birds are not harmed in any way.
- If any marine or shorebirds are found to be nesting, or fur-seals resting within 100 m of the Project Area during construction works, the works should cease immediately and the local NPWS office notified.

6.1.4 Post-Construction

At the completion of construction works the following actions are recommended.

- All waste and construction materials are removed from the site.
- All environmental controls such as sediment fencing are removed from the site.

6.2 Conclusions

Direct impacts within the Study Area from this proposal will be restricted to disturbances to existing artificial habitat provided by the rock armouring of the breakwater. Habitat associated with rock armouring is used by some marine birds and fish, and at times this may include some migratory and/or threatened species. As a result, there remains some potential for some minor disturbances to habitat used by these species. The removal and replacement of rocks will also have a direct impact on marine growth present in the Project Area, including sessile invertebrates and macroalgae. These assemblages will, however, likely recover within 12-24 months following construction works. Sensitive habitats adjacent to the Project Area include seagrass beds that occur in close proximity to the western end of the Project Area. Care will be required during construction to ensure that these seagrass beds are not directly impacted as part of the proposal, particularly in terms of construction vessels beaching, mooring and anchoring.

The proposal is considered unlikely to have a significant impact on State and/or Commonwealth listed threatened biodiversity. As such, referral to the Department of the Environment under the EPBC Act is not required. Similarly, the preparation of a Species Impact Statement (SIS) based on the provisions of the BC and FM Act should not be required. The works are not expected to result in any obstruction of fish passage and a s.219 permit from NSW DPI Fisheries is not expected to be required. Given that the works will likely result in removal of some rocks with macroalgae (seaweeds), a Section 205 - permit to harm (cut, remove, damage, destroy, shade etc) marine vegetation (saltmarshes, mangroves, seagrass and seaweeds) may be required by NSW DPI Fisheries. In addition, under s199 of the FM Act, the Minister for Primary Industries is required to be consulted for any dredging or reclamation works carried out, or proposed to be authorised, by a public authority. Given dredging and reclamation works may include excavations within or removal of rocks from water land (Fairfull 2013), it is recommended that NSW DPI Fisheries is consulted further regarding this project.

Further recommendations to final design have been made to offer suggestions for potential in-water improvements to fish and threatened species habitat and improved access for recreational fishing. To manage the potential risks that this proposal may pose to marine habitat, flora and fauna, and the potential for impacts to adjacent habitat during construction, a series of recommendations have also been provided for pre-construction, during construction and post-construction phases of the project. A key component of these recommendations is the preparation and implementation of a CEMP to minimise impacts during construction works.

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Plates

Plate 1: Existing boat ramp, pontoons, seawalls and breakwater.

A: The southern breakwater, B: The breakwater head adjoining Town Beach, C: The breakwater crest and pedestrian path, and D: Stormwater drains to the west of Breakwater.

Plate 2: Intertidal habitat in the Study Area.

A: Intertidal habitat associated with the seaward side of the breakwater head, B: Typical higher intertidal habitat along the main part of the Breakwater, C: Typical lower intertidal habitat along the main part of the Breakwater, and D: Macroalgae stands near the LWM on the breakwater.

Plate 3: Subtidal habitat on the breakwater.

A: Dense algal mat dominated by Coralline and brown macroalgae in shallow areas, B: Ascidian beds dominating lower rocks, C crevices and overhangs amongst the rocks, and D: loose rocks with macroalgae at the breakwater toe.

Plate 4: Sub-tidal habitat in the Study Area.

A: Sand and rock interface at the breakwater toe with clean marine sands and rocks, B: Sand and rock interface at the breakwater toe with rubble and algae, C: Rubble and sargassum beds on the north western side of the breakwater , and D:Dense *Zostera* seagrass beds to the west of the breakwater.

Appendix 1: Design Drawings

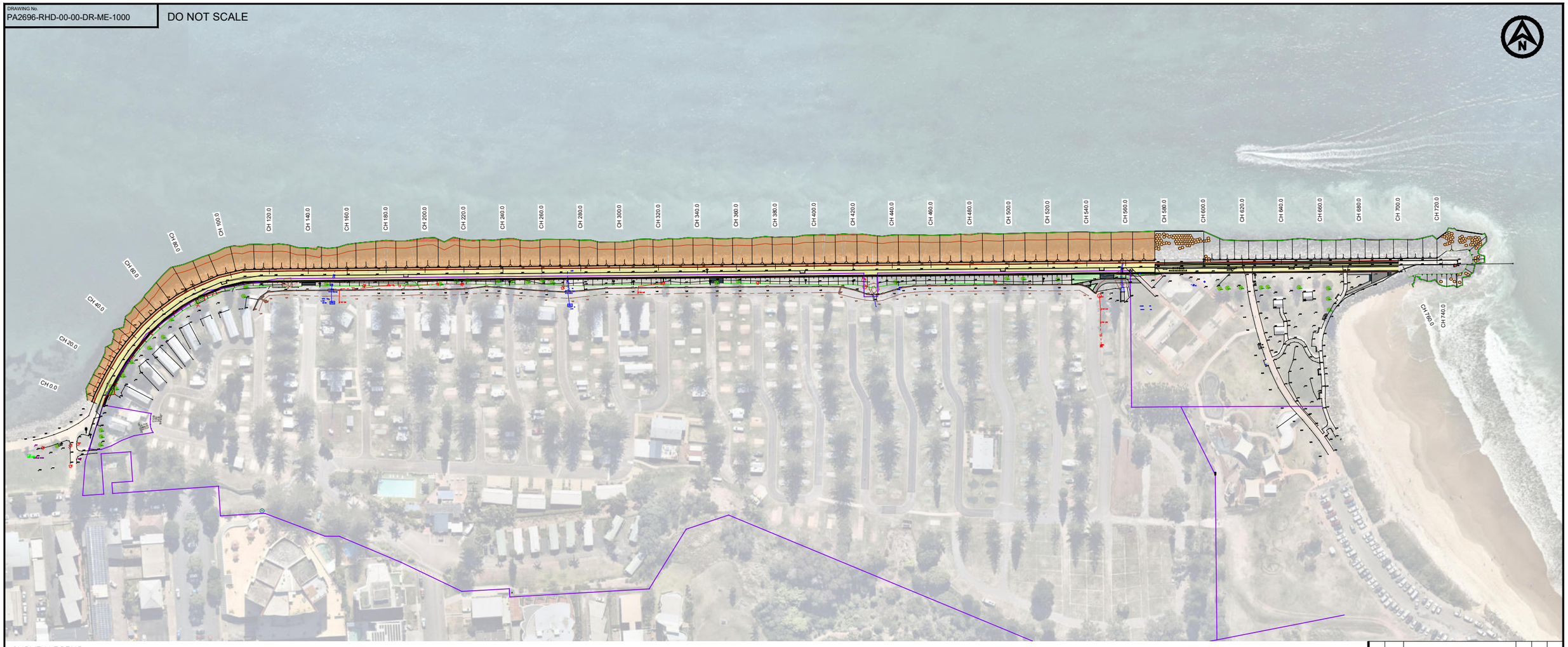
A1.1: Overview

A1.2: Inset 1

A1.3: Inset 2

DRAWING No.
PA2696-RHD-00-00-DR-ME-1000

DO NOT SCALE



SURVEY LEGEND

BM	BENCH MARK	TITLE BOUNDARY
CPIT	COMMS PIT	KERB
CPL	COMMS PILLAR	KERB INVERT
EPIL	ELECTRICAL PILLAR	ROAD CENTRELINE
EPIT	ELECTRICAL PIT	ROAD EDGE
FFL	FINISHED FLOOR LEVEL	BOTTOM BANK
FH	HYDRANT	TOP BANK
GLY	STORM WATER GRATE	FENCE
LP	LIGHT POLE	ELECTRICAL (U/G)
MH	MAN HOLE	DRAINAGE (U/G)
RDG	RIDGE HEIGHT	EDGE CONCRETE
SGN	SIGN	EDGE ROCK
SV	STOP VALVE	
SVR	STOP VALVE (RECYCLED)	
TAP	TAP	
WM	WATER METER	
BIN	BIN	
TR	TREE	

NOTES

1. COORDINATE SYSTEM: GDA94 MGA56
2. AERIAL PHOTOGRAPH SOURCED FROM NERAMAP, DATED 29/08/2021.
3. SURVEY BY NORTH COAST SURVEYS, DATED 29/07/2021.

LEGEND

- BATHYMETRIC SURVEY (MULTI-BEAM
  BATHYMETRY + DRONE PHOTOGRAMMETRY)
- TOPOGRAPHIC SURVEY
  (DETAIL TOPO SURVEY)
- BREAKWATER - INDIVIDUAL ROCKS
  TYPE B AND C (REFER DRG 1021)
- BREAKWATER - TYPE A
  (REFER DRG 1021)
- LANDSCAPE (REFER DRG 1022)
- FOOTPATH AND RETAINING WALL
  (REFER DRG 1022)
- CONCRETE STAIRS
- ACCESS RAMPS
- VIEWING PLATFORM

NOT FOR CONSTRUCTION | **S2 FOR INFORMATION** | **AUSTRALIAN HEIGHT DATUM**

20 0 20 40 60 80 100m

1:2000 (A3) 1:1000 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM		
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM		

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE BREAKWATER

TITLE

OVERVIEW PLAN

Royal HaskoningDHV
Enhancing Society Together
Level 15, 99 Mount Street
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Fax +61 2 99300960
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Website: www.royalhaskoningdhv.com

DRAWN BAM	COORD. SYSTEM GDA94 MGA56	DATUM AHD	DATE 23.11.2021
SCALE AS SHOWN	REF. PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1000	S2	P02

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DRAWING No.
PA2696-RHD-00-00-DR-ME-1001

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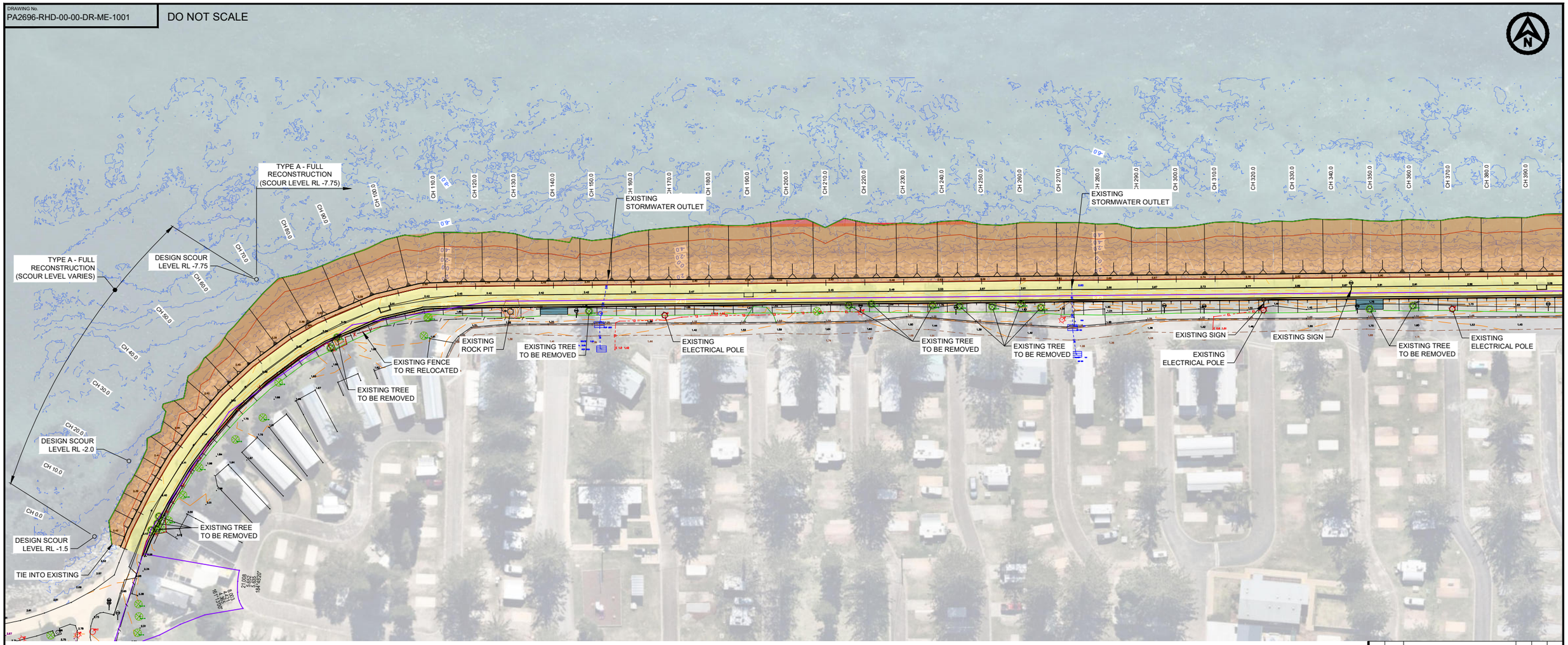

SURVEY LEGEND

BM	BENCH MARK
CPIT	COMMS PIT
CPL	COMMS PILLAR
EPIL	ELECTRICAL PILLAR
EPIT	ELECTRICAL PIT
FFL	FINISHED FLOOR LEVEL
FH	HYDRANT
GLY	STORM WATER GRATE
LP	LIGHT POLE
MH	MAN HOLE
RDG	RIDGE HEIGHT
SGN	SIGN
SV	STOP VALVE
SVR	STOP VALVE (RECYCLED)
TAP	TAP
WM	WATER METER
BIN	BIN
TR	TREE

- TITLE BOUNDARY
- KERB
- KERB INVERT
- ROAD CENTRELINE
- ROAD EDGE
- BOTTOM BANK
- TOP BANK
- FENCE
- ELECTRICAL (U/G)
- DRAINAGE (U/G)
- EDGE CONCRETE
- EDGE ROCK

NOTES

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LEGEND

- BATHYMETRIC SURVEY (MULTI-BEAM
- BATHYMETRY + DRONE PHOTOGRAMMETRY)
- TOPOGRAPHIC SURVEY (DETAIL TOPO SURVEY)
- BREAKWATER - INDIVIDUAL ROCKS TYPE B AND C (REFER DRG 1021)
- BREAKWATER - TYPE A (REFER DRG 1021)
- LANDSCAPE (REFER DRG 1022)
- FOOTPATH AND RETAINING WALL (REFER DRG 1022)
- CONCRETE STAIRS
- ACCESS RAMPS
- VIEWING PLATFORM

NOT FOR CONSTRUCTION | **S2 FOR INFORMATION** | **AUSTRALIAN HEIGHT DATUM**

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1:1000 (A3) 1:500 (A1)

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P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM		
P01	14.10.2021	CONCEPT ISSUED FOR INFORMATION	BAM		

REVISIONS

CLIENT

NSW GOVERNMENT | Transport for NSW

PROJECT

PORT MACQUARIE BREAKWATER

TITLE

INSET PLAN
SHEET 1

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Website: www.royalhaskoningdhv.com

DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	23.11.2021
SCALE	REF		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
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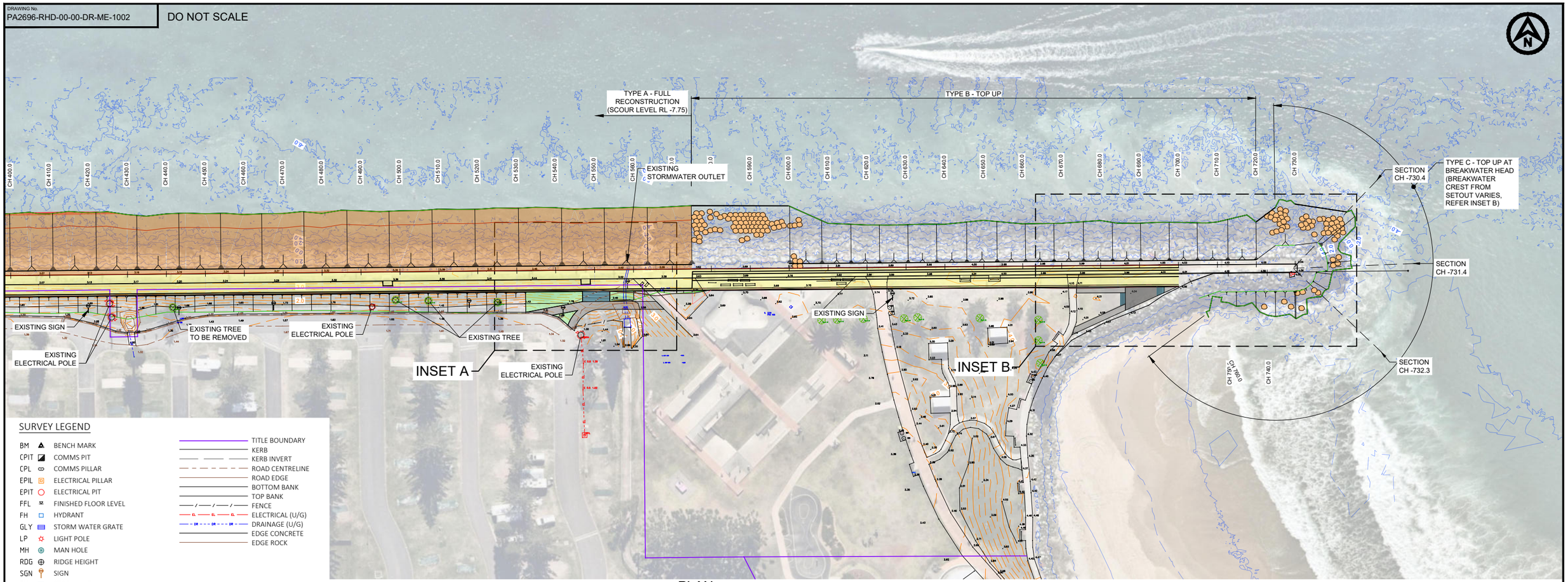

SURVEY LEGEND

- BM BENCH MARK
- CPIT COMMS PIT
- CPL COMMS PILLAR
- EPIL ELECTRICAL PILLAR
- EPIT ELECTRICAL PIT
- FFL FINISHED FLOOR LEVEL
- FH HYDRANT
- GLY STORM WATER GRATE
- LP LIGHT POLE
- MH MAN HOLE
- RDG RIDGE HEIGHT
- SGN SIGN
- SV STOP VALVE
- SVR STOP VALVE (RECYCLED)
- TAP TAP
- WM WATER METER
- BIN BIN
- TR TREE

- TITLE BOUNDARY
- KERB
- KERB INVERT
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- ROAD EDGE
- BOTTOM BANK
- TOP BANK
- FENCE
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- DRAINAGE (U/G)
- EDGE CONCRETE
- EDGE ROCK

NOTES

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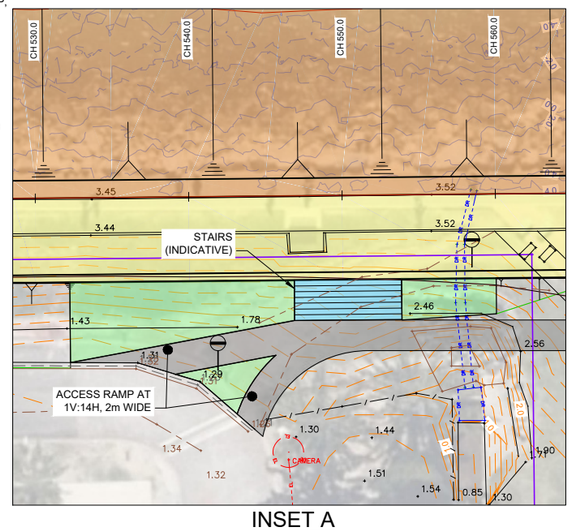
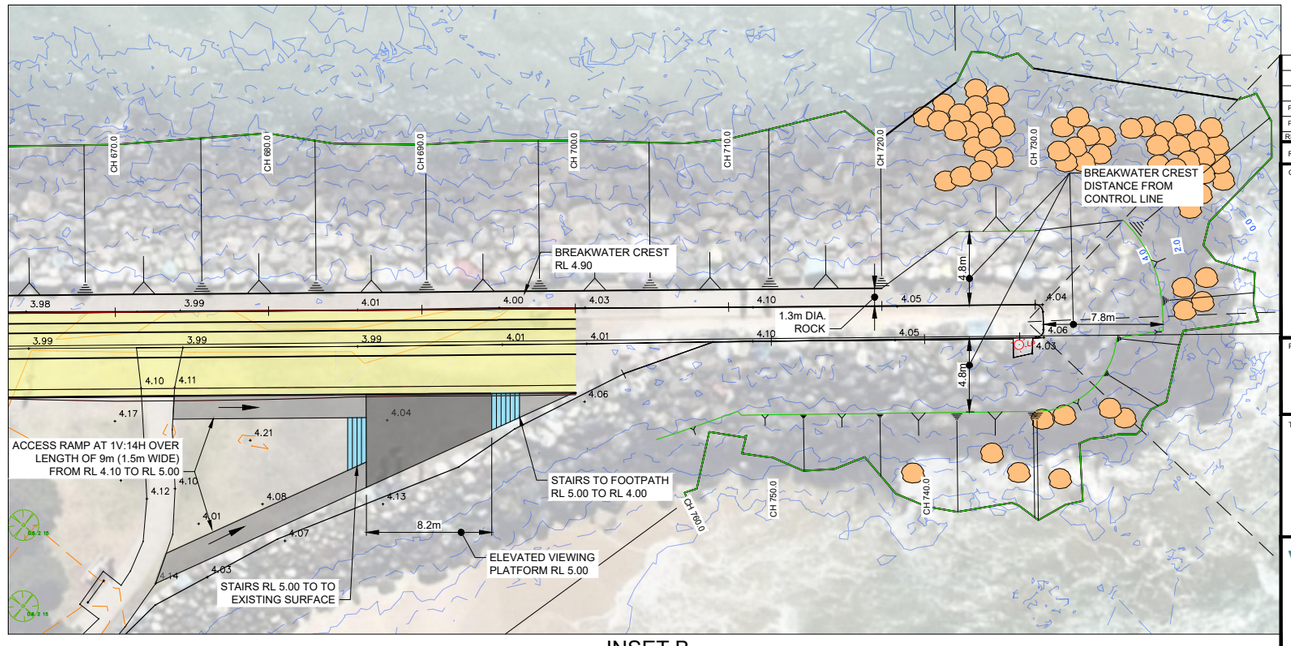
- CONCRETE STAIRS
- ACCESS RAMPS
- VIEWING PLATFORM

PLAN
1:500 (A1)



INSET A
1:200 (A1)



INSET B
1:200 (A1)

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

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1:1000 (A3) 1:500 (A1)

REV	DATE	DESCRIPTION	BY	CHK	APP
P02	02.11.2021	CONCEPT ISSUED FOR INFORMATION	BAM		
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PROJECT

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TITLE

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DRAWN	COORD. SYSTEM	DATUM	DATE
BAM	GDA94 MGA56	AHD	23.11.2021
SCALE	REF:		
AS SHOWN	PA2696-RHD-00-00-M3-CIVIL MODEL		

DRAWING No.	SUITABILITY	REVISION
PA2696-RHD-00-00-DR-ME-1002	S2	P02

NOT FOR CONSTRUCTION | **S2 FOR INFORMATION** | **AUSTRALIAN HEIGHT DATUM**

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Appendix 2: Existing Mapping of Ecological Constraints

A2:1: Estuarine macrophytes

A2.2: Key fish habitat map.

A2.3: Aquaculture

A2.4: Coastal management mapping

Department of Primary Industries

Legend

NSW Estuarine Macrophytes

- Posidonia
- Posidonia - Sparse
- Posidonia/Zostera
- Posidonia/Zostera/Halophila
- Posidonia/Halophila
- Posidonia/Halophila/Ruppia
- Posidonia/Ruppia
- Zostera
- Zostera - Sparse
- Zostera/Halophila
- Zostera/Halophila/Ruppia
- Zostera/Ruppia
- Halophila
- Halophila/Ruppia
- Ruppia
- Mangrove
- Mangrove/Saltmarsh
- Saltmarsh

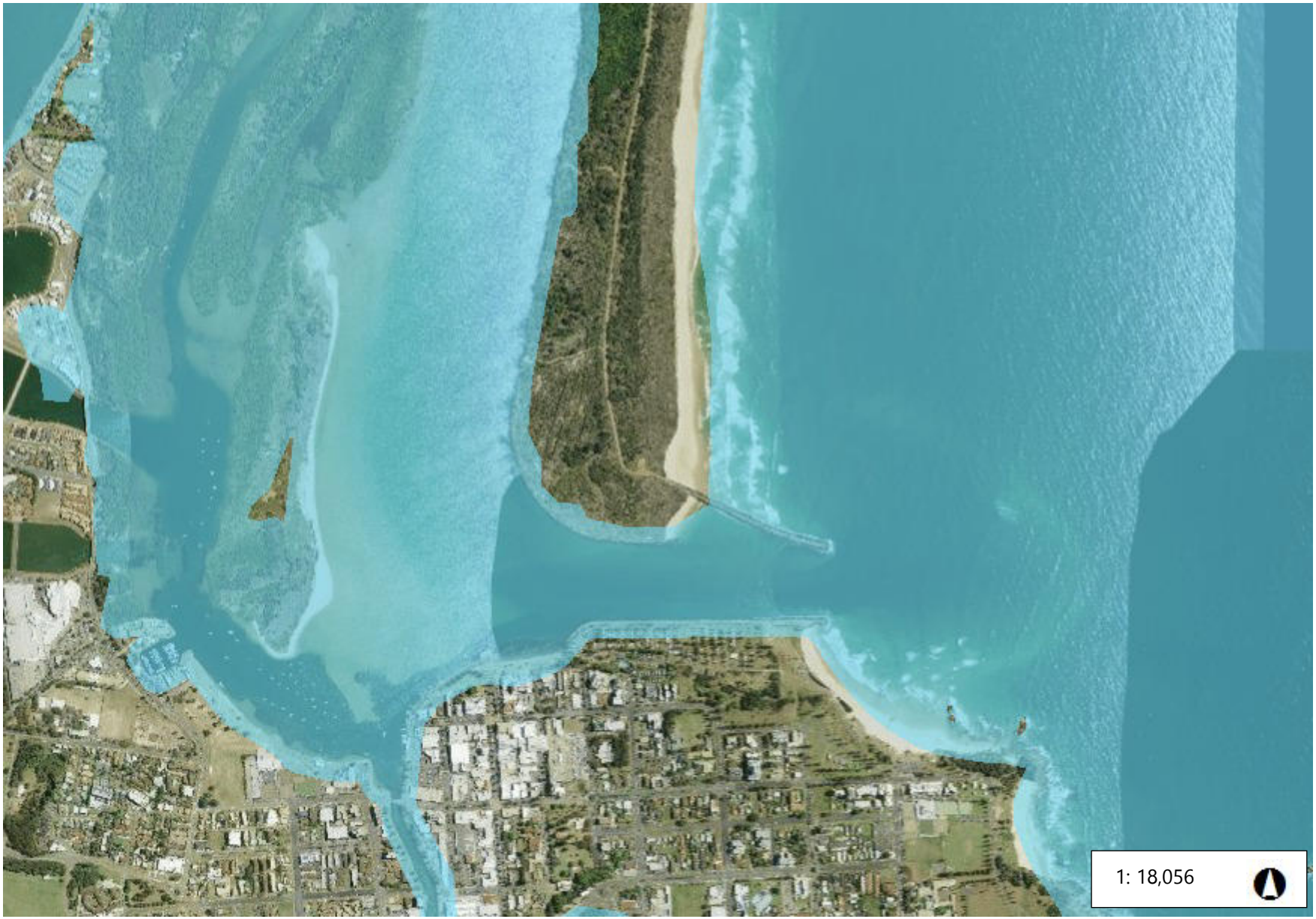
Notes

0.2 0 0.11 0.2 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

13-Sep-2021

Department of Primary Industries



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Legend

Key Fish Habitat - Northern Riv

Notes

0.9 0 0.46 0.9 Kilometers

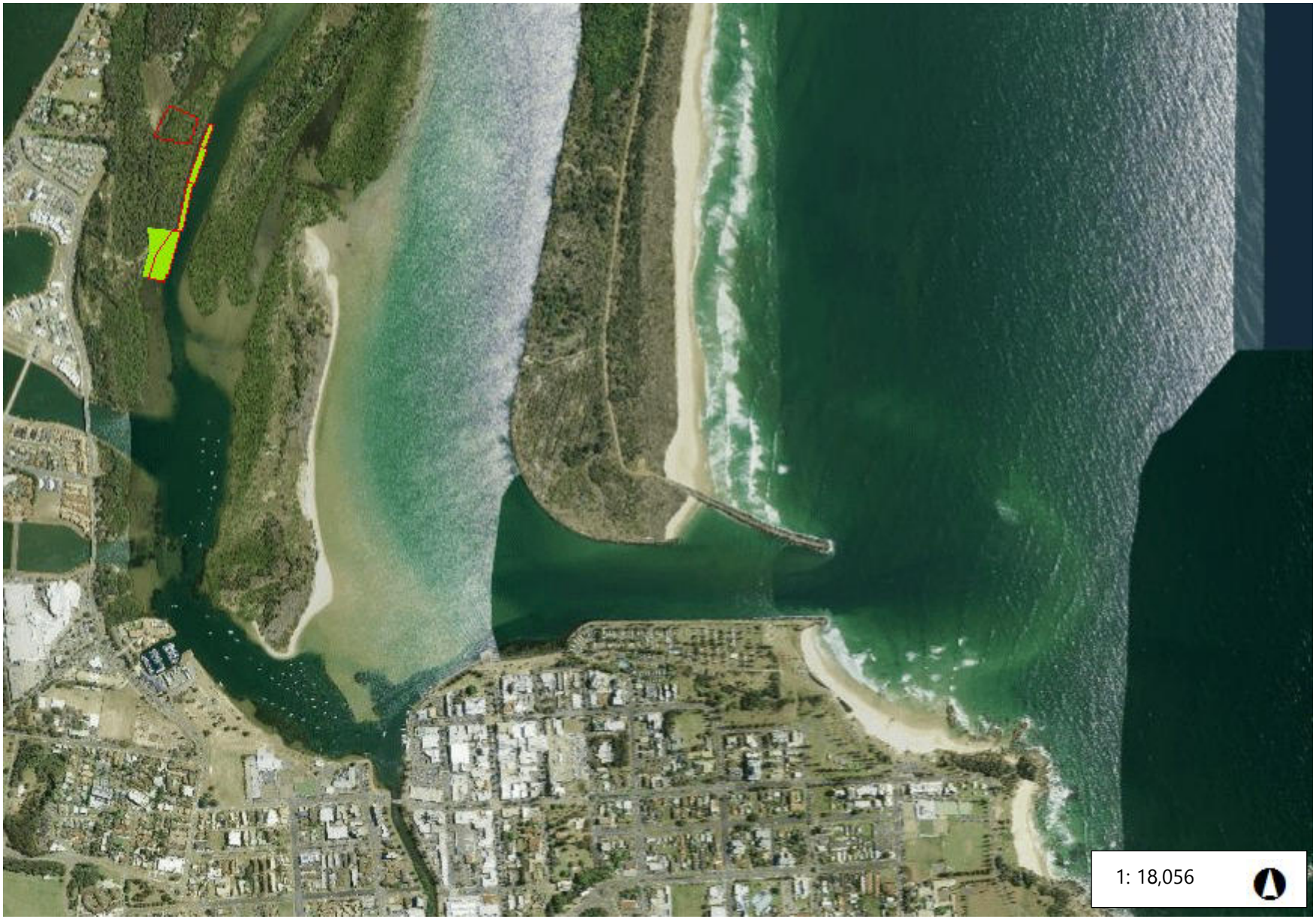
WGS_1984_Web_Mercator_Auxiliary_Sphere

13-Sep-2021

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Department of Primary Industries



Legend

- Aquaculture Leases
- Oyster Industry Sustainable Ac Strategy Areas
  - Current lease-Not to be renewed
  - Current leased area in Merimbula A
  - Current leased area in National Par
  - Priority Area

Notes

0.9 0 0.46 0.9 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

13-Sep-2021

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Department of Primary Industries

Legend

- Coastal Wetlands
- Proximity Area for Coastal Wet
- Littoral Rainforests
- Proximity Area for Littoral Rain
- Coastal Vulnerability Area Map this time
- Coastal Environment Area Map
- Coastal Use Area Map
- Land Application Map

Notes

0.5 0 0.23 0.5 Kilometers

WGS_1984_Web_Mercator_Auxiliary_Sphere

13-Sep-2021

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THIS MAP IS NOT TO BE USED FOR NAVIGATION

Appendix 3: Threatened Species Searches

Bionet Search (Marine Species only)

Kingdom	Class	Family	Species Code	Scientific Name	Exotic	Common Name	NSW status	Comm. status	Records
Animalia	Aves	Ardeidae	0197	*Botaurus poiciloptilus*		Australasian Bittern	E1,P	E	2
Animalia	Aves	Ciconiidae	0183	*Ephippiorhynchus asiaticus*		Black-necked Stork	E1,P		16
Animalia	Aves	Burhinidae	0174	*Burhinus grallarius*		Bush Stone-curlew	E1,P		2
Animalia	Aves	Laridae	0117	*Sternula albifrons*		Little Tern	E1,P	C,J,K	15
Animalia	Aves	Haematopodidae	0130	*Haematopus longirostris*		Pied Oystercatcher	E1,P		36
Animalia	Aves	Burhinidae	0175	*Esacus magnirostris*		Beach Stone-curlew	E4A,P		5
Animalia	Aves	Scolopacidae	0153	*Limosa lapponica*		Bar-tailed Godwit	P	C,J,K	106
Animalia	Aves	Laridae	0112	*Hydroprogne caspia*		Caspian Tern	P	J	2
Animalia	Aves	Scolopacidae	0158	*Tringa nebularia*		Common Greenshank	P	C,J,K	3
Animalia	Aves	Scolopacidae	0157	*Actitis hypoleucos*		Common Sandpiper	P	C,J,K	1
Animalia	Aves	Laridae	0953	*Sterna hirundo*		Common Tern	P	C,J,K	22
Animalia	Aves	Laridae	0115	*Thalasseus bergii*		Crested Tern	P	J	91
Animalia	Aves	Scolopacidae	0149	*Numenius madagascariensis*		Eastern Curlew	P	CE,C,J,K	32
Animalia	Aves	Apodidae	0335	*Apus pacificus*		Fork-tailed Swift	P	C,J,K	5
Animalia	Aves	Scolopacidae	0155	*Tringa brevipes*		Grey-tailed Tattler	P	C,J,K	53
Animalia	Aves	Laridae	0111	*Gelochelidon nilotica*		Gull-billed Tern	P	C	3
Animalia	Aves	Scolopacidae	0168	*Gallinago hardwickii*		Latham's Snipe	P	J,K	3
Animalia	Aves	Charadriidae	8006	*Pluvialis fulva*		Pacific Golden Plover	P	C,J,K	31
Animalia	Aves	Scolopacidae	0164	*Calidris canutus*		Red Knot	P	E,C,J,K	3
Animalia	Aves	Scolopacidae	0162	*Calidris ruficollis*		Red-necked Stint	P	C,J,K	46
Animalia	Aves	Procellariidae	0071	*Ardenna tenuirostris*		Short-tailed Shearwater	P	C,J,K	3
Animalia	Aves	Procellariidae	0070	*Ardenna grisea*		Sooty Shearwater	P	J	35
Animalia	Aves	Procellariidae	0069	*Ardenna pacifica*		Wedge-tailed Shearwater	P	J	9
Animalia	Aves	Scolopacidae	0150	*Numenius phaeopus*		Whimbrel	P	C,J,K	37
Animalia	Aves	Apodidae	0334	*Hirundapus caudacutus*		White-throated Needletail	P	V,C,J,K	35
Animalia	Aves	Procellariidae	0072	*Ardenna carneipes*		Flesh-footed Shearwater	V,P	J,K	1
Animalia	Aves	Charadriidae	0139	*Charadrius mongolus*		Lesser Sand-plover	V,P	E,C,J,K	56
Animalia	Aves	Diomedeidae	0091	*Thalassarche cauta*		Shy Albatross	V,P	V	1
Animalia	Aves	Haematopodidae	0131	*Haematopus fuliginosus*		Sooty Oystercatcher	V,P		53
Animalia	Aves	Laridae	0120	*Onychoprion fuscata*		Sooty Tern	V,P		1
Animalia	Aves	Scolopacidae	0160	*Xenus cinereus*		Terek Sandpiper	V,P	C,J,K	4
Animalia	Aves	Accipitridae	0226	*Haliaeetus leucogaster*		White-bellied Sea-Eagle	V,P		59
Animalia	Aves	Accipitridae	8739	*^^Pandion cristatus*		Eastern Osprey	V,P,3		80
Animalia	Aves	Accipitridae	0230	*^^Lophoictinia isura*		Square-tailed Kite	V,P,3		24
Animalia	Insecta	Petaluridae	I007	*Petalura gigantea*		Giant Dragonfly	E1		4
Animalia	Mammali	Dugongidae	1558	*Dugong dugon*		Dugong	E1,P		3
Animalia	Mammali	Balaenopteridae	1575	*Megaptera novaeangliae*		Humpback Whale	V,P	V	6
Animalia	Reptilia	Cheloniidae	2004	*Caretta caretta*		Loggerhead Turtle	E1,P	E	8
Animalia	Reptilia	Cheloniidae	2008	*Eretmochelys imbricata*		Hawksbill Turtle	P	V	3
Animalia	Reptilia	Cheloniidae	2007	*Chelonia mydas*		Green Turtle	V,P	V	1

Australian Government

Department of Agriculture, Water and the Environment

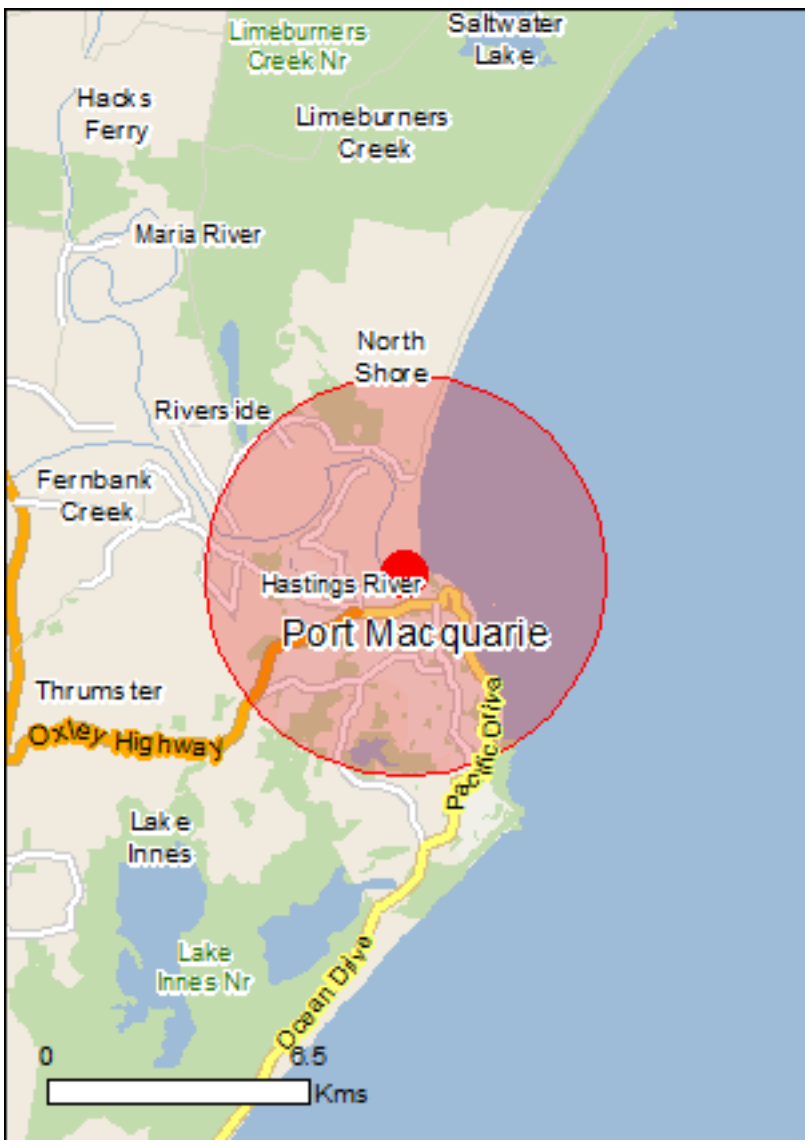
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

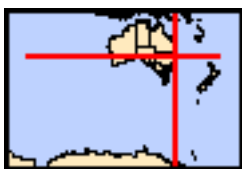
Report created: 13/09/21 08:57:20



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2015

Coordinates

Buffer: 5.0Km



Summary

Matters of National Environmental 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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	78
Listed Migratory Species:	68

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 http://www.environment.gov.au/heritage

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

Commonwealth Land:	5
Commonwealth Heritage Places:	None
Listed Marine Species:	89
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	5
Regional Forest Agreements:	1
Invasive Species:	36
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	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.

Name	Status	Type of Presence
Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community	Endangered	Community likely to occur within area
Littoral Rainforest and Coastal Vine Thickets of Eastern Australia	Critically Endangered	Community likely to occur within area
Lowland Rainforest of Subtropical Australia	Critically Endangered	Community likely to occur within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within 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
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis cucullatus cucullatus Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
Fish		
Epinephelus daemelii Black Rockcod, Black Cod, Saddled Rockcod [68449]	Vulnerable	Species or species habitat likely to occur within area
Hippocampus whitei White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area
Frogs		
Litoria aurea Green and Golden Bell Frog [1870]	Vulnerable	Species or species habitat known to occur within area
Mixophyes balbus Stuttering Frog, Southern Barred Frog (in Victoria) [1942]	Vulnerable	Species or species habitat may occur within area
Mixophyes iteratus Giant Barred Frog, Southern Barred Frog [1944]	Endangered	Species or species habitat may occur within area
Insects		
Argynnis hyperbius inconstans Australian Fritillary [88056]	Critically Endangered	Species or species habitat likely to occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
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

Name	Status	Type of Presence
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within 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]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE Mainland) [66645]	Vulnerable	Species or species habitat likely to occur within area
Pseudomys novaehollandiae New Holland Mouse, Pookila [96]	Vulnerable	Species or species habitat likely to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Roosting known to occur within area
Plants		
Acronychia littoralis Scented Acronychia [8582]	Endangered	Species or species habitat known to occur within area
Allocasuarina defungens Dwarf Heath Casuarina [21924]	Endangered	Species or species habitat known to occur within area
Allocasuarina thalassoscopica [21927]	Endangered	Species or species habitat known to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat may occur within area
Asperula asthenes Trailing Woodruff [14004]	Vulnerable	Species or species habitat may occur within area
Cryptostylis hunteriana Leafless Tongue-orchid [19533]	Vulnerable	Species or species habitat likely to occur within area
Cynanchum elegans White-flowered Wax Plant [12533]	Endangered	Species or species habitat known to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Macadamia integrifolia Macadamia Nut, Queensland Nut Tree, Smooth-shelled Macadamia, Bush Nut, Nut Oak [7326]	Vulnerable	Species or species habitat may occur within area
Marsdenia longiloba Clear Milkvine [2794]	Vulnerable	Species or species habitat may occur within area
Melaleuca biconvexa Biconvex Paperbark [5583]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Persicaria elatior Knotweed, Tall Knotweed [5831]	Vulnerable	Species or species habitat may occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Rhodamnia rubescens Scrub Turpentine, Brown Malletwood [15763]	Critically Endangered	Species or species habitat known to occur within area
Rhodomyrtus psidioides Native Guava [19162]	Critically Endangered	Species or species habitat known to occur within area
Syzygium paniculatum Magenta Lilly Pilly, Magenta Cherry, Daguba, Scrub Cherry, Creek Lilly Pilly, Brush Cherry [20307]	Vulnerable	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Tylophora woollsii [20503]	Endangered	Species or species habitat likely to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Coeranoscincus reticulatus Three-toed Snake-tooth Skink [59628]	Vulnerable	Species or species habitat may occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Sharks		
Carcharias taurus (east coast population) Grey Nurse Shark (east coast population) [68751]	Critically Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species	[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.	
Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Ardenna grisea Sooty Shearwater [82651]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area

Name	Threatened	Type of Presence
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Roosting known to occur within area
Charadrius bicinctus Double-banded Plover [895]		Roosting known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [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.

Name
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Postal Corporation
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Bank of Australia
Commonwealth Land - Defence Service Homes Corporation

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardea ibis](#) Cattle Egret [59542]		Species or species habitat may occur within area
[Arenaria interpres](#) Ruddy Turnstone [872]		Roosting known to occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Calidris ruficollis](#) Red-necked Stint [860]		Roosting known to occur within area
[Calonectris leucomelas](#) Streaked Shearwater [1077]		Species or species habitat may occur within area
[Catharacta skua](#) Great Skua [59472]		Species or species habitat may occur within area
[Charadrius bicinctus](#) Double-banded Plover [895]		Roosting known to occur within area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Roosting known to occur within area
[Charadrius ruficapillus](#) Red-capped Plover [881]		Roosting known to occur within area
[Diomedea antipodensis](#) Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea epomophora](#) Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea exulans](#) Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
[Diomedea gibsoni](#) Gibson's Albatross [64466]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
[Diomedea sanfordi](#) Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
[Fregata ariel](#) Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
[Fregata minor](#) Great Frigatebird, Greater Frigatebird [1013]		Species or species

Name	Threatened	Type of Presence
		habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Gallinago megala Swinhoe's Snipe [864]		Roosting likely to occur within area
Gallinago stenura Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Roosting known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus Whimbrel [849]		Roosting known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area

Name	Threatened	Type of Presence
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat may occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Roosting known to occur within area
Pluvialis squatarola Grey Plover [865]		Roosting known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Foraging, feeding or related behaviour likely to occur within area
Puffinus griseus Sooty Shearwater [1024]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche eremita Chatham Albatross [64457]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche sp. nov. Pacific Albatross [66511]	Vulnerable*	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis rubricollis Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Roosting known to occur within area

Name	Threatened	Type of Presence
Fish		
[Acentronura tentaculata](#) Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
[Festucalex cinctus](#) Girdled Pipefish [66214]		Species or species habitat may occur within area
[Filicampus tigris](#) Tiger Pipefish [66217]		Species or species habitat may occur within area
[Heraldia nocturna](#) Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
[Hippichthys heptagonus](#) Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
[Hippichthys penicillus](#) Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
[Hippocampus whitei](#) White's Seahorse, Crowned Seahorse, Sydney Seahorse [66240]	Endangered	Species or species habitat likely to occur within area
[Histiogamphelus briggsii](#) Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
[Lissocampus runa](#) Javelin Pipefish [66251]		Species or species habitat may occur within area
[Maroubra perserrata](#) Sawtooth Pipefish [66252]		Species or species habitat may occur within area
[Solegnathus dunckeri](#) Duncker's Pipehorse [66271]		Species or species habitat may occur within area
[Solegnathus spinosissimus](#) Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
[Solenostomus cyanopterus](#) Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
[Solenostomus paradoxus](#) Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
[Stigmatopora nigra](#) Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
[Syngnathoides biaculeatus](#) Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
[Trachyrhamphus bicoarctatus](#) Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
[Urocampus carinirostris](#) Hairy Pipefish [66282]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Vanacampus margaritifer		
Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri		
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus		
Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Dugong dugon		
Dugong [28]		Species or species habitat may occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis elegans		
Elegant Seasnake [1104]		Species or species habitat may occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Breeding likely to occur within area
Pelamis platurus		
Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat may occur within area
Delphinus delphis		
Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus		
Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area

Name	Status	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Lake Innes	NSW
Limeburners Creek	NSW
Macquarie	NSW
Sea Acres	NSW
Woregore	NSW

Regional Forest Agreements	[Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
North East NSW RFA	New South Wales

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Pycnonotus jocosus Red-whiskered Bulbul [631]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Alternanthera philoxeroides Alligator Weed [11620]		Species or species habitat likely to occur within area
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine,		Species or species

Name	Status	Type of Presence
Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643] Asparagus aethiopicus		habitat likely to occur within area
Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425] Asparagus plumosus		Species or species habitat likely to occur within area
Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana		
Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] Chrysanthemoides monilifera		Species or species habitat likely to occur within area
Bitou Bush, Boneseed [18983]		Species or species habitat likely to occur within area
Chrysanthemoides monilifera subsp. rotundata		
Bitou Bush [16332]		Species or species habitat likely to occur within area
Eichhornia crassipes		
Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana		
Broom [67538]		Species or species habitat may occur within area
Lantana camara		
Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Opuntia spp.		Species or species habitat likely to occur within area
Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata		
Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate		
Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla		
Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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.

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

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

Coordinates

-31.42704 152.91132

Acknowledgements

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

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

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

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

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Appendix 4: Threatened Species Assessments

Sooty Oystercatcher

Review of Species

Name /Species		Status BC Act	Status EPBC Act
Sooty Oystercatcher (Haematopus fuliginosus) –		Vulnerable	
Species	**Distribution**	**Habitat and Prey**	**Breeding**
H. fuliginosus	Found around the entire Australian coast, including offshore islands, being most common in Bass Strait. Small numbers of the species are evenly distributed along the NSW coast.	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries, where they forage on intertidal invertebrates such as limpets and mussels.	Breeds in spring and summer amongst pebbles and shells on rocky shores or cliffs located almost exclusively on offshore islands, but occasionally on isolated promontories.

Sources: NSW DPIE (2022)

Assessment of Significance – BC Act

Threatened Sooty Oystercatcher – BC Act
(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.
Sooty Oystercatchers are known to forage amongst intertidal habitat provided by the breakwater, within the proposal footprint. Breeding is unlikely to occur in the Study Area. Construction works will likely result in disturbance to a very small amount of habitat this species uses in the locality. These disturbances will likely include removal and modification of habitat, while increased noise during construction may reduce the availability and quality of foraging habitat during the construction period. These disturbances are unlikely to have any adverse effects on the lifecycle of any individuals that may use this location at times. It is likely that individuals will still forage when construction works are not being undertaken and will use nearby areas with similar habitat when construction works are occurring. Given this, it is unlikely that the proposed action has potential to adversely affect the life cycle of the species such that local populations are likely to be placed at risk of extinction.
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: (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

(c) in relation to the habitat of a threatened species or ecological community: (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
I. Modification to rocky intertidal habitat will occur as a result of this proposal. The works in most part will be limited to repair work that will require some replacement and or widening of the existing artificial rocky intertidal habitat. II. No habitat is expected to become fragmented or isolated as a result of the proposal. III. Modifications to the existing rocky intertidal habitat will result in a substantial net increase in habitat over the longer term. So there is minimal potential to impact the long-term survival of any Sooty Oystercatchers that use this habitat.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
No
(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 these shorebirds

Conclusion	Sooty Oystercatchers that utilise habitat in the vicinity of the Study Area are unlikely to be significantly affected by the proposed activity. Impacts from the proposal on the Sooty Oystercatcher will be limited to disturbances during construction, as well as some minor habitat modifications that will likely result in additional artificial habitat for the Sooty Oystercatcher once construction is complete.

Black Rockcod

Species Review

Name /Species		Status FM Act	Status EPBC Act
Black Rockcod (*Epinephelus daemelii*)		Vulnerable	Vulnerable
Species	**Distribution**	**Habitat and Prey**	**Breeding**
E. daemelii	Black Rockcod is now mostly found from southern Queensland to eastern Victoria, with the NSW coastline forming its main range. Adults are territorial and often occupy a particular cave for life.	Adult Black Rockcod are usually found in caves, gutters and beneath bommies on rocky reefs, from nearshore environments to depths of at least 50m. Small juveniles are often found in coastal rock pools, and larger juveniles around rocky shores in estuaries. Black Rockcod are opportunistic carnivores, eating mainly other fish and crustaceans.	The Black Rockcod is a protogynous hermaphrodite, first developing as a sexually mature female and then changing into a male later in life at a length of approximately 100–110 cm.

Source: NSW DPI (2015a).

7-Part Test – FM Act

Threatened Black Rockcod –FM Act
(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.
The Black Rockcod is common on coastal reefs along the northern NSW coast. Juveniles are also known to occur amongst rocks and cracks along the edges of break walls inside estuaries and harbours. Adults will typical frequent caves and overhangs on coastal reefs. Cracks and crevices associated with the seawall in the Study Area may provide potential habitat for juvenile Black Rockcod. Inspection of these areas during the survey did not find any Black Rockcod, and their use of these areas, if any, is likely to be sparsely distributed and potentially sporadic in frequency. Furthermore, any use would only be by a very small part of the local population. Given this, the proposal is unlikely to have an adverse effect on the life cycle of the Black Rockcod such that a viable local population of the species is likely to be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.
Not applicable

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: (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
(d) in relation to the habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the 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
i. The rocky subtidal habitat that will be disturbed as a result of this proposal includes the breakwater head and the inner river revetment. Repair and rectification works to the rock armouring may result in a reduction in the quality of habitat provided by larger gaps and under scouring. ii. No habitat is expected to become fragmented or isolated as a result of the proposal. iii. The habitat that will be modified represents only marginal habitat suitable for juveniles. Use, if any, would only be by a very small part of the local population of Black Rockcod, while the habitat is unlikely to be significant to the long-term survival of the species in the locality.
(e) Whether the proposed development or activity is likely to have an adverse effect on any critical habitat (either directly or indirectly)
This question is not applicable, as no critical habitat has been listed for Black Rockcod
(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.
A Black Rockcod Recovery Plan has been prepared by the NSW DPI Fisheries (NSW DPI, 2012). The objectives or actions of the recovery plan are: • Determine the distribution and abundance of Black Rockcod in NSW. • Initiate and support research into the biology and ecology of Black Rockcod. • Initiate and support research into the impacts of high and moderate risks to Black Rockcod. • Identify important areas of Black Rockcod habitat and implement appropriate actions to recover Black Rockcod. • Improve the collection of data on interactions between Black Rockcod and fishers. • Increase community awareness and support for Black Rockcod issues and recovery actions. • Ensure that management authorities carry out appropriate planning and impact assessment and make management decisions which minimise impacts on Black Rockcod habitats. • Mitigate the impacts of water pollution on Black Rockcod. Works during construction should be designed, implemented and managed to minimise potential for impacts on Black Rockcod. Impacts of disturbance to habitat and habitat quality from underwater noise and reduced water quality will require further consideration should Black Rockcod be found to be present at the subject site during construction works.

(g) Whether the proposed development constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	
KTPs with potential to be exacerbated by the proposed development do not have potential to impact on Black Rockcod.	
Conclusion	Black Rockcod habitat inside the Study Area is marginal habitat, suitable only to juveniles, and is not expected to be significant to any local population. Impacts from the proposal are restricted to some potential disturbances during construction works that may have some localised and short-term influence on habitat quality for juvenile Black Rockcod. Given the vicinity of the northern seawall to the Study Area, as well as the potential for use of adjacent areas along the southern seawall as alternative habitat for this species during construction, it is unlikely that any temporary changes to habitat will significantly impact Black Rockcod using the seawall as habitat. As such, the viability of the Black Rockcod population that utilise habitat in the vicinity of the proposal is unlikely to be significantly affected by the proposed activity.

Significant Impact Criteria: Black Rockcod

Significant Impact Criteria: Black Rockcod (EPBC Act)	Likelihood of Impact
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
1. lead to a long-term decrease in the size of an important population of a species	
The proposed action is limited to disturbances of marginal habitat associated with the breakwater that could be utilised occasionally by juveniles. Given the vicinity of the northern seawall to the Study Area, it is expected that juveniles, if any, would temporarily relocate and utilise potential habitat on the northern seawall, as well as adjacent habitat along the southern seawall during the construction phase, resulting in minimal disturbances to the population. Given the species was not found during the Site Survey and it has a high level of site fidelity, it is unlikely that the site has any significance or importance to the local population of Black Rockcod.	Unlikely
2. reduce the area of occupancy of an important population	
The proposal is not expected to reduce any area of occupancy important to the Black Rockcod population in the locality. Survey of the site as part of this assessment did not find any Black Rockcod in the Study Area at the time of survey. Any use of the site by Black Rockcod is likely to be sparsely distributed and potentially sporadic in frequency. Modification of the breakwater and seawall may result in a temporary reduction in available habitat on the southern seawall, however any disturbances are expected to subside at the completion of the construction phase.	Unlikely
3. fragment an existing important population into two or more populations	
No sightings of Black Rockcod were observed during the site surveys. The proposal is not expected to result in any habitat that Black Rockcod may use to become fragmented or isolated from other areas of habitat.	Unlikely
4. adversely affect habitat critical to the survival of a species	
The Study Area includes only marginal habitat that could potentially be used by juvenile Black Rockcod at times. This habitat is unlikely to be critical to the survival of the species in the locality, while any disturbances will be minimal and short-term.	Unlikely
5. disrupt the breeding cycle of an important population	

The types of habitat in the Study Area and adjacent areas are not identified to be of importance for spawning by the population.	Unlikely
6. modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	
Modification of potential habitat will be minimal, with the majority of impacts confined to some disturbances during construction. If disturbed, any individual black Rockcod will likely move to an adjacent area on the seawall or temporarily relocate to the northern breakwater. Following works, availability and quality of suitable habitat associated with the breakwater may reduce, however given no individuals were observed during the Site Survey and this is not a known critical habitat for the species, this is not expected to impact on the species to an extent that could cause a species decline.	Unlikely
7. result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable, endangered, or critically endangered habitat or habitat for migratory species'	
No known invasive species harmful to Black Rockcod are likely to be released or have their populations enhanced as a result of this proposal.	Unlikely
8. introduce disease that may cause the species to decline, or	
The proposed action is unlikely to result in the introduction of disease that may cause a decline in the local Black Rockcod population.	Unlikely
9. interfere substantially with the recovery of the species.	
The proposed action is unlikely to substantially interfere with the recovery of Black Rockcod.	Unlikely
Conclusion	
Habitat in the Study Area is not considered significant habitat for Black Rockcod or likely to be utilised by a significant part of the local population. Any impacts on Black Rockcod will be dependent on, if the species is present, and will typically be confined to short-term disturbances to habitat quality and some potential reduced availability at this locality.	

Marine Turtles

Species Review

Name /Species	Status BC Act	Status EPBC Act
Green Turtle (*Chelonia mydas*)	Vulnerable	Vulnerable, Migratory
Hawksbill Turtle (*Eretmochelys imbricata*)		Vulnerable, Migratory
Loggerhead Turtle (*Caretta caretta*)	Endangered	Endangered, Migratory

Species	Distribution	Habitat and Prey	Breeding
C. mydas	Widely distributed throughout tropical and sub-tropical waters and will occur at times in temperate waters. In coastal waters of NSW it is generally seen on the north and central coasts. Can migrate more than 2600 km between feeding and nesting grounds.	Hatchlings spend their pelagic phase drifting in ocean current until reaching 30-40cm size, when they will settle in shallow benthic foraging habitats such as tropical tidal and sub-tidal coral and rocky reef habitat or inshore seagrass beds. Adults eat mainly seagrass and algae, although they will occasionally eat other items including mangroves, fish-egg cases, and sponges. Young turtles tend to be more carnivorous than adults. During their pelagic stage they feed on plankton.	Breeding and nesting can occur all year round in some areas of the tropics. Typically nest on isolated beaches or offshore coral cays in tropical regions. Some nesting occurs on beaches in northern NSW between November and May.
E. imbricata	Found in tropical, subtropical and temperate waters in all the oceans of the world. Occasionally found in northern NSW waters. Migrates up to 2400 km between foraging areas and nesting beaches.	Hatchlings spend their pelagic phase drifting in ocean currents until reaching 30-40cm size, when they will settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat. Less frequently utilise seagrass habitats of coastal waters. Adults feed on sponges and algae.	Breeding animals move from their feeding grounds to areas near nesting beaches for mating. Nesting occurs in the northern Great Barrier Reef and the Torres Strait between January and April.
C. caretta	In Australia, it occurs in areas of coral and rocky reefs, seagrass beds and muddy bays throughout eastern, northern and western Australia, including temperate waters of NSW where it is seen as far south as Jervis Bay	Small Loggerhead Turtles live at or near the surface of the ocean and move with the ocean currents. As they grow, they remain typically ocean-dwellers, foraging in deeper water for fish, jellyfish and bottom-dwelling animals, before recruiting to their chosen inshore or neritic feeding area at approximately 70cm or more in size. In their juvenile stage they feed on algae, pelagic crustaceans, molluscs, flotsam and anthropogenic debris. As they grow they become more carnivorous, feeding primarily on benthic invertebrates and smaller amounts of jellyfish, starfish, corals, crabs and fish.	Nests on open, sandy beaches in tropical areas. Low density and sporadic nesting also occurs southwards into northern NSW. Breeds from November to March with nesting possible through to May.

Sources: DPIE (2020) and DAWE (2022).

5-Part Test – BC Act

Threatened Marine Turtles– BC Act
(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.

Use of habitat by marine turtles within the Study Area is likely to be primarily transient passage between coastal waters and estuarine habitat associated within the lower Hastings River. The foraging grounds that marine turtles utilise in the locality are likely to be widely spread along the coastline and some within the lower Hastings River system. Within the Study Area, foraging may occur in subtidal habitats within and adjacent to the Project Area. Areas of reef associated with the seawalls and breakwater are likely to provide marginal foraging habitat for marine turtles, whilst seagrass to the west of the seawall may provide some opportunistic foraging habitat for Green Turtles. Occasional sightings of marine turtles have been recorded within the Study Area, however use of these areas is likely to be opportunistic. Modifications to the seawall during the construction phase may result in some temporary disturbances to available foraging habitat provided by the seawall, however these are likely to be short term and subside post construction. Although nesting has been recorded as far south as Port Macquarie, within the Study Area only Town Beach would provide any potential habitat for nesting by marine turtles. Given the elevated levels of human disturbance, nesting at this location is highly unlikely, with no known nesting of Green Turtles recorded at this location. Given the marginal foraging habitat and lack of suitable nesting sites within the Study Area, the proposal has minimal potential to affect the life cycle of any marine turtles in the locality.
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: (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
(c) in relation to the habitat of a threatened species or ecological community: (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
i) Habitat use within the Study Area is likely to be for transient passage as well as opportunistic foraging. The rocky subtidal habitat that will be disturbed as a result of this proposal includes the breakwater head and the inner river revetment. Repair and rectification works to the rock armouring will have a direct impact on marine growth present in the Project Area and may temporarily reduce available foraging habitat along the southern breakwater following construction works. These assemblages will, however, likely recover within 12-24 months following construction works. Sensitive seagrass habitat to the west of the breakwater is unlikely to be directly impacted by the proposed works. Other disturbances will be restricted to some potential short-term and localised impacts on habitat quality as a result of reduced water quality, vessel movements associated with construction, and underwater noise. ii) No habitat is expected to become fragmented or isolated as a result of the proposal. Reef habitats within the Study Area are considered only marginal for foraging by marine turtles. Modifications to the existing rocky subtidal habitat associated with the seawall and breakwater will result in minimal change, but there will be a substantial net increase in habitat over the longer term. Within the Study Area, Town Beach is the only location that would provide any potential habitat for nesting, however given the high potential for human and artificial disturbances, is highly unlikely and no known nesting of Green Turtles has occurred at this location. Given this, habitat within and adjacent to the Study Area is considered to be of minimal importance to the long-term survival of marine turtles that may utilise resources in the locality.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
No
(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 marine turtles
Conclusion — Marine turtles that may potentially utilise habitat in the vicinity of the proposal are unlikely to be significantly affected by the proposed works. Habitat use in the vicinity of the subject site is likely to be occasional and of a transient nature for passage between coastal and estuarine environments. Whilst the Study Area may provide some opportunistic foraging habitat, the proposal is unlikely to cause any significant disturbances to the long-term survival of marine turtles that may utilise resources within the locality.

Significant Impact Criteria: Threatened and Migratory Marine Turtles

Significant Impact Criteria: Migratory Marine Birds (EPBC Act)	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. lead to a long-term decrease in the size of a population.	
The action is not expected to lead to any long-term decrease in the size of a population of marine turtles as: • The foraging grounds that marine turtles utilise in the locality are likely to be widely spread along the coastline. Opportunistic foraging may occur along the seawall and adjacent seagrass beds associated with the western end of the seawall. The Study Area provides very marginal potential foraging grounds, which are not of a size of ecologically relevance to the areas that marine turtles forage across in northern NSW waters. • Nesting by marine turtles in northern NSW is sporadic and of low density. Town Beach is the only location that would provide any potential habitat for nesting within the Study Area. However, given the highly modified environment, high levels of potential human disturbance and no known recording of nesting within this location, it is considered highly unlikely within the Study Area.	Unlikely
2. 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 (e.g. underwater noise, construction vessel movements and water quality). Disturbances with potential to impact occupancy will likely be very short-term and limited to construction works that may impact on habitat quality. These short-term disturbances are not expected to impact the area of occupancy of marine turtles at any ecologically significant scales.	Unlikely
3. fragment an existing population into two or more populations	
The proposal is not expected to result in any habitat that marine turtles may use to become fragmented or isolated from other areas of habitat.	Unlikely
4. adversely affect habitat critical to the survival of a species	
The habitat is not considered to be critical to the survival of marine turtles.	Unlikely
5. disrupt the breeding cycle of a population of an endangered species or seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	
The habitat is not considered to be critical to the life cycles (including breeding and nesting) of marine turtles.	Unlikely
6. modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline or an area of important habitat for a migratory species	
Reef habitats within the Study Area are considered only marginal for foraging by marine turtles. Modifications to the existing rocky subtidal habitat associated with the seawall and breakwater will result in minimal change, but there will be a substantial net increase in habitat over the longer term. Short-term disturbances from construction and associated underwater noise, vessel movements and reduced water quality may impact on habitat quality over very short-periods. However, given the low density of marine turtles and likely occasional use of habitats within the Study Area, these indirect impacts on habitat quality have minimal potential to result in any species decline for marine turtles.	Unlikely
7. result in invasive species that are harmful to a critically endangered, endangered or migratory species becoming established in the critically endangered, endangered or migratory species' habitat	
No known invasive species harmful to the endangered and/or migratory marine turtles are likely to be released or have their populations enhanced as a result of this proposal.	Unlikely
8. introduce disease that may cause the species to decline, or	
The proposed action is unlikely to result in the introduction of disease that may cause a decline of marine turtles.	Unlikely
9. interfere with the recovery of the species.	
The proposed action is unlikely to substantially interfere with the recovery of marine turtles.	Unlikely
Conclusion	
The proposal is unlikely to result in a significant impact on marine turtles. Impacts will be confined to short- term disturbances that may reduce habitat quality during construction, such as disturbances to artificial habitat, generation of underwater noise, construction vessel movements or reduced water quality. This habitat represents only a very small area the species forages across and is not critical to their lifecycle.	

H2O Consulting Group Pty Ltd

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Appendix D
PACHCI

Transport
Roads & Maritime
Services

Date: 08/10/2021

Attention: David Hopper
Project Manager
Maritime Infrastructure Delivery Office,
Transport, NSW 2444.

Dear David,

Preliminary assessment results for the proposed Port Macquarie Break wall maintenance and refurbishment project.

Based on Stage 1 of the *Procedure for Aboriginal cultural heritage consultation and investigation* (PACHCI). Resource 3

The recommended works will be maintenance works that will be undertaken in the area and was assessed as being unlikely to have an impact on Aboriginal cultural heritage.

The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search **did** indicate known Aboriginal objects or places in the immediate project areas; however, there will be no direct impacts of the identified Aboriginal sites that have been highlighted in the area.
- The study area **does** contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's ***Due diligence Code of Practice for the Protection of Aboriginal objects in NSW*** and the Roads and Maritime Services' procedure.
- The cultural heritage potential of the study area appears to be reduced due to past disturbance.
- There is an absence of sandstone rock outcrops likely to contain Aboriginal art.

Safeguards: Please be vigilant for potential Aboriginal objects when work commences.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

If there are any changes, please contact me and your environmental team to reassess any potential impacts on Aboriginal cultural heritage.

If any potential Aboriginal objects (including skeletal remains) are discovered during the project, all works in the vicinity of the find must cease.

Follow the steps outlined in the Roads and Maritime Services ***Unexpected Heritage Items, Heritage Procedure 02, November 2015.***

Transport for NSW

76 Victoria Street, Grafton NSW 2460|
T 02 66443135 | M 0438 721 680 | **E** Lance.Randall@transport.nsw.gov.au **13 22 13**

Background

The Port Macquarie Southern Breakwater upgrade project area is managed by Maritime Infrastructure Delivery Office (MIDO) within Transport for NSW and requires remediation and potential upgrading to address issues of toe scour, movement/displacement of rock armour and consideration of climate change impacts (including sea level rise).

It is also proposed to widen the footpath along the crest of the breakwater and training wall structures, provide access ways, and consider numerous ancillary structures such as fishing platforms, lighting, shelters as proposed in the Breakwater Master Plan prepared by Port Macquarie-Hastings City Council (some extracts from the plan are provided below).

Figure 1: Cross Section – Existing Breakwater Path.

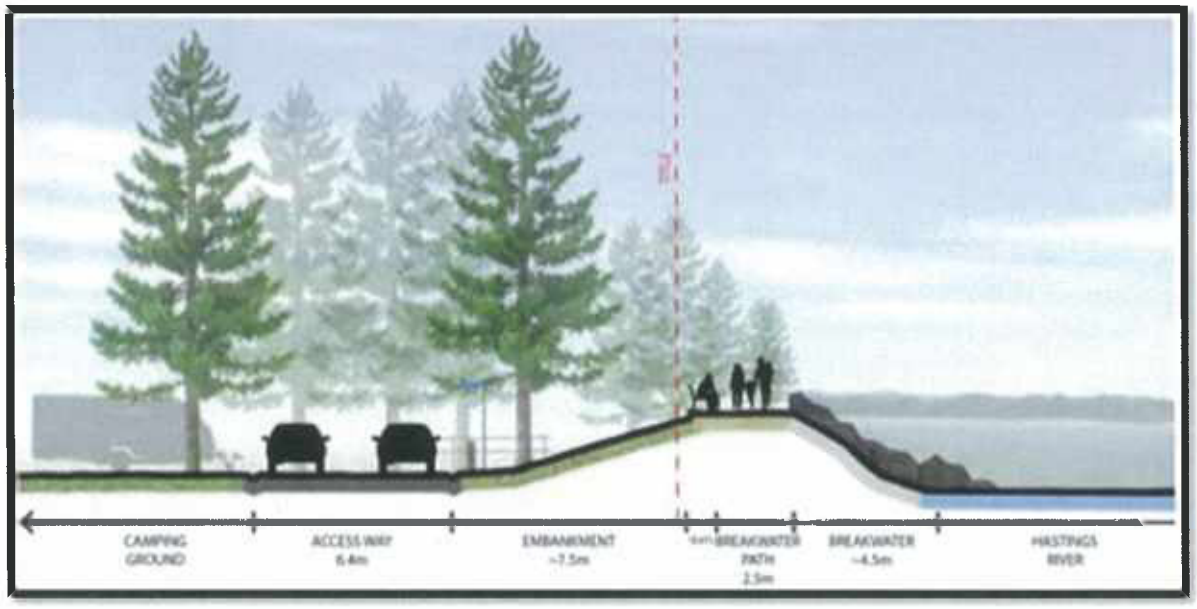


Figure 2: Cross Section – Proposed Breakwater Path.

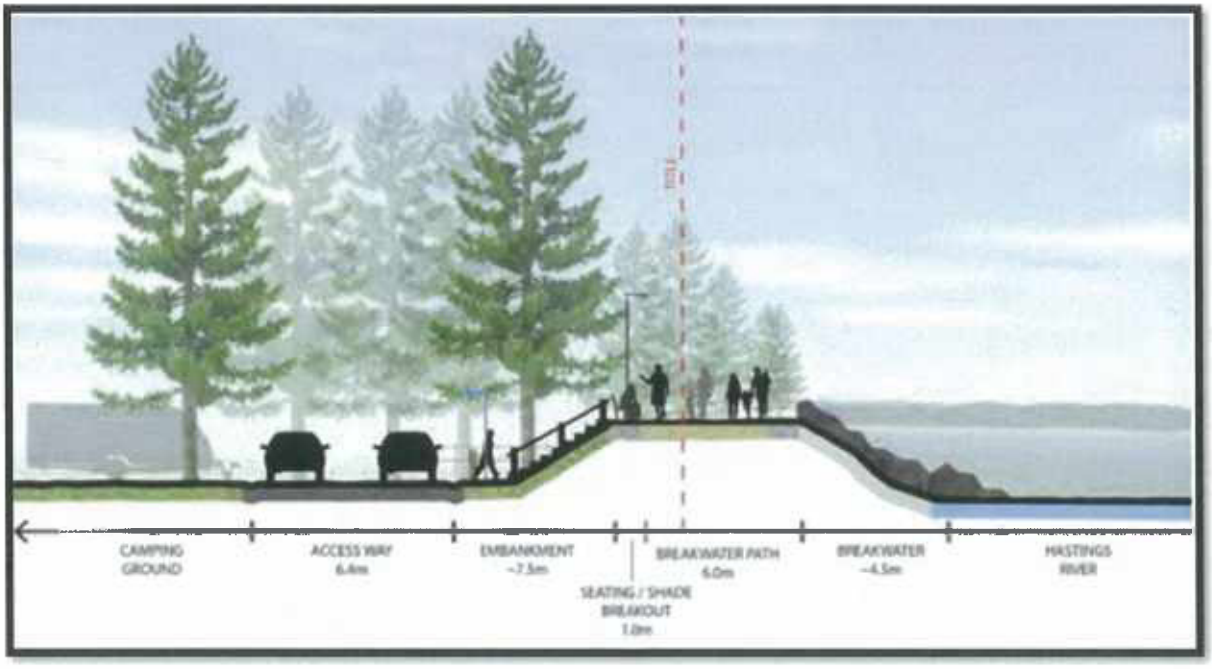


Figure 3: Proposed Breakwater Path.

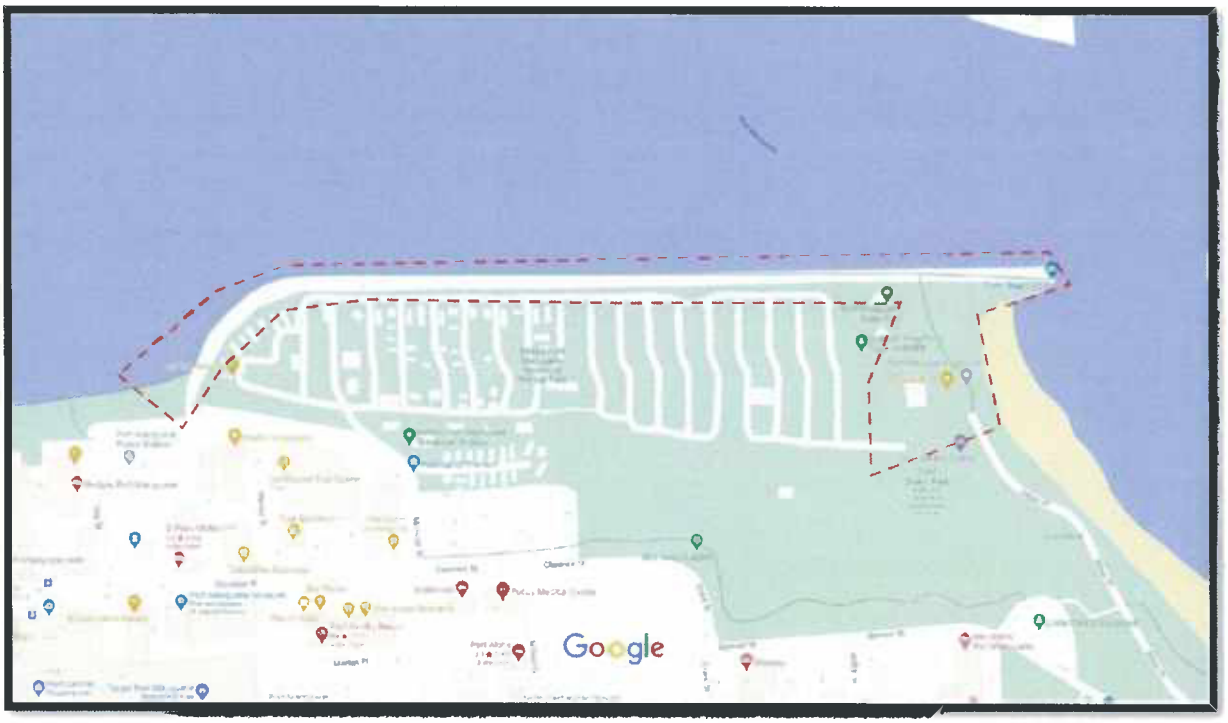
The proposed works include the breakwater head and the inner river revetment and crest path with a distance of approximately 700 metres in length as shown in Section 4 in ***Figure 4*** below.

Determining suitable access for construction will require consideration for adjoining parcels of land.

Figure 4: Section 4.

Royal Haskoning Australia (RHA) has been engaged by MIDO to undertake detailed assessment and to develop a detailed design for the proposed upgrade works. Information prepared by (RHA) should be used to inform the Review of Environmental Factors (REF).

Figure 5: Extent of works (red dotted outline)



See the attached AHIMS search.

The search indicates that there is an Aboriginal place or item, however it is situated approximately 250 metres from the western extent of the proposed works (S***ee Figures 5 & 6***) therefore, it is considered the project will not have any impact on the identified cultural item or site.

Figure 6: AHIMS search of the Port Breakwall.

AHIMS Web Services (AWS)
Search Result

Your Ref/PO Number : Port Breakwall
Client Service ID : 624538

transport nsw
21-23 central rd
port macquarie New South Wales 2444
Attention: Phil Rowan

Date: 22 September 2021

Email: phil.rowan@transport.nsw.gov.au

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lat, Long From : -31.43, 152.91 - Lat, Long To : -31.43, 152.92, conducted by Phil Rowan on 22 September 2021.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of Heritage NSW AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

1	Aboriginal sites are recorded in or near the above location.
0	Aboriginal places have been declared in or near the above location. *

A Native Title Vision website search indicated that there has not been any Native Title claims or determinations within the Birpai Local Aboriginal Land Council locality of Port Macquarie.

Consultation with the Birpai Local Aboriginal Land Council as the custodians of the surrounding country is a requirement of Transport fNSW.

Work to maintain, refurbish and upgrade the breakwall will occur on the existing formation and it is considered to have no impacts to the heritage items of both Aboriginal or non-indigenous people.

The work was assessed as being unlikely to have an impact on Aboriginal Cultural Heritage.

For further assistance regarding Aboriginal Cultural Heritage matters please contact me on (02) 66443135.

Yours sincerely

Lance Randall

Acting Aboriginal Cultural Heritage Officer
Aboriginal Engagement Team
Northern Region

Attachment A

Transport Roads & Maritime Services

Activity checklist
Procedure for Aboriginal cultural heritage consultation and investigation - Resource 1

1. Project details

Project name: Port Macquarie Break Wall maintenance and refurbishment.

Name of Project Manager: Dave Hopper.

Name of Environment Officer: Phil Rowan.

Name of Aboriginal Cultural Heritage Advisor: Lance Randall.

Project WBS#: P.0069828.01.001

2. Purpose of this assessment

This resource provides a checklist of actions associated with the four stages of the ***Procedure for Aboriginal cultural heritage consultation and investigation.***

It can be used to:

- Assist Roads and Maritime Services staff to ensure that the appropriate actions have been completed for a particular project.
- Demonstrate that the Roads and Maritime Services have been duly diligent in considering potential harm to Aboriginal cultural heritage prior to project implementation.

A copy of this checklist must be kept on the project file.

3. Project Works

The Port Macquarie Southern Breakwater upgrade project area is managed by Maritime Infrastructure Delivery Office (MIDO) within Transport for NSW and requires remediation and potential upgrading to address issues of toe scour, movement/displacement of rock armour and consideration of climate change impacts (including sea level rise).

It is also proposed to widen the footpath along the crest of the breakwater and training wall structures, provide access ways, and consider numerous ancillary structures such as fishing platforms, lighting, shelters as proposed in the Breakwater Master Plan prepared by Port Macquarie-Hastings City Council (some extracts from the plan are provided below).

The proposed works include the breakwater head and the inner river revetment and crest path with approximately 700 metres in length as shown in Section 4 in ***Figure 4*** below.

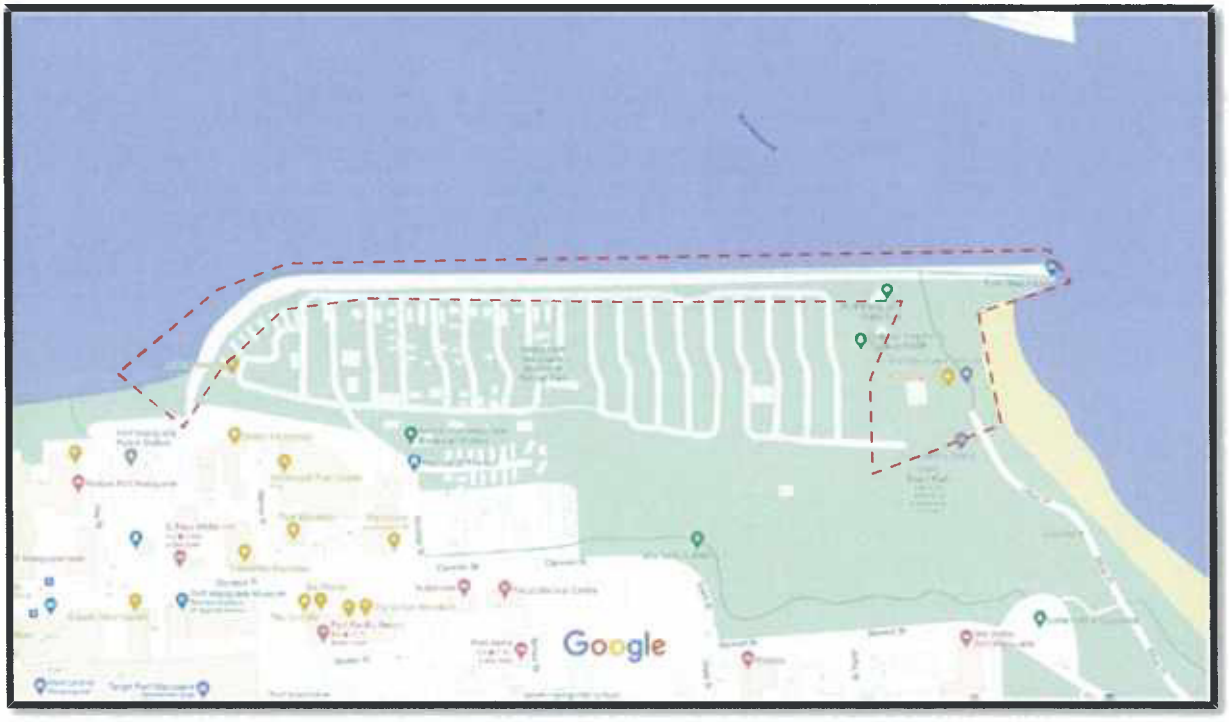
Determining suitable access for construction will require consideration for adjoining parcels of land.

Royal Haskoning Australia (RHA) has been engaged by MIDO to undertake detailed assessment and to develop a detailed design for the proposed upgrade works.

Information prepared by (RHA) should be used to inform the Review of Environmental Factors (REF).

Figure 4: Section 4.

Figure 5: Extent of works (red dotted outline)



Glossary

The following terms are used in this resource:

ACHA – Aboriginal cultural heritage advisor
AFG – Aboriginal focus group meeting
AHIMS – OEH's Aboriginal heritage information management system
CHAR – Cultural heritage assessment report
OEH – Office of Environment and Heritage
PM – Project manager
RES – Regional environmental staff
SES(H) – Senior Environmental Specialist (Heritage)

4. Action checklist

Stage	Action	Completed ☑	Date completed and signature
Stage 1	**Action 1:** Is the activity exempt development in accordance with the ***Environmental assessment procedure for routine and minor works*****?** If **yes**, the project may proceed in accordance with all other relevant approvals. If **no**, proceed to Action 2.	☐	
	Action 2: Undertake a Basic Search of AHIMS. Are sites located in the study area? If **yes**, undertake an Extensive Search.	☑	22/09/2021 Completed by Phil Rowan.
	Action 3: Provide project details and AHIMS results to ACHA and RES.	☐	
	Action 4: ACHA and RES to advise PM whether the project is likely to harm Aboriginal objects or places.	☐	
	Outcomes: Are known or potential impacts to objects or places likely? If **no**, proceed in accordance with all other relevant approvals and environmental impact assessment processes. If **yes**, proceed to Stage 2. Note: For large or complex projects, it may not be feasible to do a Stage 2 survey. Has a cultural heritage constraints mapping been suggested instead? If **yes**, engage an archaeologist and Aboriginal stakeholders to prepare this.	**No impacts – works to proceed.**	08/10/2021 Lance Randall

Appendix E

Archaeological Assessment

Port Macquarie Southern Breakwall

Statement of Heritage Impact

Prepared for Transport for NSW
May 2022

EMM Sydney
Ground floor, 20 Chandos Street
St Leonards NSW 2065

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E info@emmconsulting.com.au

www.emmconsulting.com.au

Port Macquarie Southern Breakwall

Statement of Heritage Impact

Report Number

E211120 RP#1

Client

Transport for NSW

Date

12 May 2022

Version

v2 Draft

Prepared by

Kerryn Armstrong
Senior Archaeologist
12 May 2022

Approved by

Pamela Kottaras
Associate, National Technical Leader - Historical Heritage
12 May 2022

Abbreviations

CEMP	construction environmental management plan
CHL	Commonwealth Heritage List
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Development Application
DP	Deposited Plan
EIS	Environmental Impact Statement
EPA	NSW Environmental Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPIs	environmental planning instruments
ha	hectares
Heritage Act	NSW *Heritage Act 1977*
km	kilometre
LCVIA	land character and visual impact assessment
LGA	local government area
LOS	level of service
m	metre
mm	millimetre
NHL	National Heritage List
SHR	State Heritage Register
SoHI	statement of heritage impact
SSD	State significant development
SSI	State significant infrastructure
TfNSW	Transport for New South Wales
VENM	virgin excavated natural material
WWI	World War I
WWII	World War II

Glossary

Term	Definition
Breakwall	A barrier that protects a shoreline or a harbour from wave action.
Breakwall	As 'breakwall' and used interchangeably by various sources. This report refers to the feature as 'breakwall' except in quoted text.
Catchment	the area from which a surface watercourse or a groundwater system derives its water.
Culvert	One or more adjacent enclosed channels for conveying a stream below formation level.
Cut	The material excavated from a cutting.
Cutting	formation resulting from the construction of the road below existing ground level – the material is cut out or excavated.
Earthworks	All works involving the loosening, excavating, placing, shaping and compacting of soil or rock
Embankment	that portion of a road located on an earthen structure where the subgrade level is above the natural surface.
Fill	the material placed in an embankment.
Pavement	The portion of a carriageway placed above the subgrade for the support of, and to form a running surface for vehicular traffic.
Training wall	Artificial wall or embankment built in an estuary or river to direct tidal stream or current. Usually constructed for navigational purposes.
Scour	The erosion of material by the action of flowing water.
Shared path	A pathway used for both cyclists and pedestrians, usually located on the side of the road.
Shoulder	The portion of the carriageway beyond the traffic lanes adjacent to and flush with the surface of the pavement.
The site	Land on which the Project is to be developed.
VENM	Virgin excavated natural material – natural material that has been excavated or quarried from areas that are not contaminated with manufactured chemicals or process residues, as a result of industrial, commercial, mining or agricultural activities, and that does not contain sulphidic ores or soils.

Executive Summary

ES1 Overview

Port Macquarie was established in 1821 by the colonial government as a convict settlement and is historically significant. The town's early establishment and purpose as a convict, then as a free settlement, indicates the potential for significant built and archaeological heritage across the modern settlement of Port Macquarie. The breakwall, being on the transition of land to water, and having been modified previously, was investigated as part of this report.

ES2 Site description

The Port Macquarie Southern Breakwall (southern breakall) is located at the mouth of the Hastings River, Port Macquarie, north of the town centre (Figure 1.1). The breakwall is zoned RE1 for public recreation on the *Port Macquarie-Hastings Local Environmental Plan* 2011 (Port Macquarie LEP).

ES3 Impact assessment and potential

The Port Macquarie breakwall group is recognised as a significant heritage item representative of government investment in improving coastal/riverine navigation on the North Coast and indicative of technologies of associated with navigation and harbour works (SHI A060 Training walls and breakwalls). The breakwall requires a full reconstruction which will in turn remove much of the original, external fabric. Additionally works at the south-western termination incurs low risk of impacting potential relics. These impacts however are able to be mitigated, as shown in Section 8.3

There is *low* potential for relics related to the Port Macquarie Penal settlement to occur where the southern breakwall meets the original coastline.

There is *nil* archaeological potential relating to the Port Macquarie Penal settlement in the project area away from the south-western connection to the original foreshore.

There is moderate potential for the survival of remnant tram tracks, installed for the southern breakwall construction. These items are 'works'.

ES4 Management and mitigation measures

To ensure the risk is managed appropriately for both the heritage significance and the project itself, appropriate management measures have been designed. These management measures are noted in Table 8.1, with descriptions on each measure found in Section 8.3.1.

Table ES1 Project area management measures

Site name	Site type	Significance / grading	Impact type	Project modifications	Management or mitigation options
Port Macquarie Southern Breakwall outer revetment	Training wall/ breakwall; archaeological site	Local contributory – Port Macquarie training walls and breakwalls (Port	Physical and visual: partial demolition and reconstruction; addition of new material	None possible	Archival photography Unexpected finds applies

Table ES1 Project area management measures

Site name	Site type	Significance / grading	Impact type	Project modifications	Management or mitigation options
		Macquarie-Hasting LEP 2011 A060) Local– not listed			Reconstruction methods Management of relics Interpretation if relics are found
Breakwall crest and inner breakwall	Training wall/ breakwall; public recreation area	Local contributory	Physical and visual – public amenities upgrade, tree removal	Not necessary	Archival photography
South west termination of breakwall crest and inner breakwall	Training wall/ breakwall; public recreation area; potential archaeological site	Local contributory	Physical and visual – public amenities upgrade, tree removal	To be determined	Avoid; OR Archival photography Management of relics Interpretation if relics are found
Cultural landscape	Landscape – modified and evolving; coastal leisure	Local contributory – not included in A060 listing	Physical and visual – public amenities upgrade, change in topography (introduction of fill); tree, fence etc. removal	None possible	Archival photography

Table of Contents

Tables

Figures

Plates

1 Introduction

1.1 Overview

EMM Consulting Pty Ltd (EMM) has been engaged by Transport for NSW (Transport), Maritime Infrastructure Delivery Office (MIDO; the client), to prepare this heritage assessment and statement of heritage impact (SoHI) for the activities associated with the proposed Port Macquarie Southern Breakwall remediation and upgrades (the project). Port Macquarie is situated on the Mid-North coast of New South Wales, approximately 390 km north of Sydney, in the Port Macquarie-Hastings local government area and parish and county of Macquarie. The Port Macquarie Southern Breakwall (or Breakwall) is part of a group that includes a training wall on the North Shore (Figure 1.2).

The primary aims of the report are to investigate the heritage significance of the project area and to assess impacts to relics (or potential relics), significant works, and the built environment in the project area. When impacts to heritage values are known, suitable management measures can be applied.

This report has been completed in accordance with current best practice and statutory requirements set out in Section 2.

1.2 Project Description

The project area encompasses a heritage item that is listed on the Port Macquarie LEP as an archaeological site, being item A060 *Training Walls and Breakwalls.* The 'training wall' or southern 'breakwall' protects the coast from wave action and will be referred to as the 'breakwall' or southern breakwall in this report as per the brief, but the listing for the group uses the word 'breakwall'; this is the term used to define the heritage item subject to this report.

Climate change and the rise in global sea levels are predicted to affect Australia's coastal infrastructure over the coming decades. MIDO has identified that the Port Macquarie Southern Breakwall is currently being affected by toe scour, that is, wave action, and that the associated movement of sediment is undermining the foundational toe of the wall. Moreover, movement/displacement of the rock armour has been observed on the outer revetment and breakwall. Toe scour and rock displacement pose a risk to the structural integrity of the breakwall and will be accelerated by the effects of climate change and rising sea levels if left untreated.

MIDO has recommended remediation works and upgrades to correct toe scour and rock amour movement/displacement affecting the Port Macquarie Southern Breakwall. The proposed works include:

- Full reconstruction of the outer revetment:
    - The outer revetment will be reconstructed and extended seaward. The reconstruction works will tie into the existing sea wall at the western termination of the breakwall. The reconstruction works will tie into the existing outer revetment c. 165 m east of the termination of the current path; and
- Top up with individual boulders:
    - Boulders will be added in strategic locations at the head of the breakwall and along the outer revetment area in the eastern 165 m of the breakwall.

Additionally, the Breakwall Concept Plan prepared by Port Macquarie-Hastings City Council (2021) has proposed further upgrades to public facilities along the crest of the breakwall to create a more accessible walk along the

waterfront. MIDO has considered the Concept Plan and funding availability and has included the following aspect of the Concept plan in this project:

- widening the existing pedestrian pathway (the crest path):
  - the public path will be extended to the south into the current embankment area increasing the combined width of the path and seating area from 2.5 m to 5 m;
- increasing the embankment slope:
  - the width of the current inner embankment slope will decrease from 7.5 m to 3.5 m and introduced fill will increase the angle of the slope to meet the pathway extension;
- construction of formed concrete access ways, including stairways and ramps in the easterly portion of the reclaimed land;
- removal and replacement of existing trees and fences along the inner embankment; and

Construction equipment and machinery will access the breakwall from the Alban Place public car park and pathway adjacent to Town Beach (Lot 7025 DP1060950, Lot 612 DP754434 and Lot 7324 DP1165988). The site compound and material stockpiles will be established in this area of reclaimed land.

1.3 Site Description

The southern breakwall is located at the mouth of the Hastings River, Port Macquarie, north of the town centre (Figure 1.1). The breakwall has no listed real property identifier but is north of Lot 2 DP1233513 (1 Munster Street), Lot 7324 DP1165988, and Lot 7025 DP1060950 (Town Beach) in the township of Port Macquarie, within the Port Macquarie- Hastings local government area (LGA). The breakwall is zoned RE1 for public recreation on the *Port Macquarie-Hastings Local Environmental Plan* 2011 (Port Macquarie LEP).

1.4 Terminology

The project area encompasses a heritage item that is listed on the Port Macquarie LEP as an archaeological site, being item A060 *Training Walls and Breakwalls.* While not described in detail in the listing, the definitions of 'training wall' and 'breakwall' have assisted with the identification of the elements of this listing: the 'training wall' is the item of interest, with the southern 'breakwall' traditionally being located to the east of the 'training wall' (Plate 4.4). There is also a northern 'breakwall' located to the north, and it directs current and flow through the estuary; this is not referenced further in this report.

The 'training wall' or southern 'breakwall' protects the coast from wave action and will be referred to as the 'breakwall' or southern breakwall in this report as per the brief, but the listing for the group uses the word 'breakwall'.

1.5 Project boundary

The southern breakwall begins north of Sunset Parade and stretches approximately 800 m east to the sea east of Town Beach (Figure 1.2). The project area includes the outer revetment, head and crest of the Port Macquarie breakwall. The project boundary also passes into the northern and western edges as well as the crest of the breakwall and land north and west of Lots 1 and 2 DP1233513 (1 Munster Street), Lot 677 DP 722594, Lot 7324 DP1165988, and Lot 7025 DP1060950 (Town Beach).

1.6 Assessment guidelines and requirements

This historical heritage assessment and SoHI has been prepared in accordance with the relevant government assessment requirements, guidelines and policies. The report and field survey were undertaken using the principles of *The Australian International Council on Monuments and Sites, Charter for Places of Cultural Significance* (also known as the *Burra Charter,* Australia ICOMOS 2013) and the New South Wales (NSW) *Heritage Manual* (Heritage Office 1996 with regular additions). Use of these documents satisfies the requirements of the review of environmental factors (REF).

The Burra Charter: The Australian ICOMOS charter for places of cultural significance (ICOMOS (Australia), 2013a) sets a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance including owners, managers and custodians. The *Burra Charter* defines the concept of cultural significance as 'aesthetic, historic, scientific, social or spiritual value for past, present or future generations' (Australia ICOMOS 2013, Article 1.2). It identifies that conservation of an item of cultural significance should be guided by the item's level of significance. The Charter provides specific guidance for physical and procedural actions that should occur in relation to significant places. A copy of the charter can be accessed online at http://icomos.org/australia.

The *Burra Charter* consists of 34 articles, arranged into five sections: definitions, conservation principles, processes and practice. The principal articles of the Burra Charter are:

- Conservation is based on significance;
- A cautious approach is required – changing as much as necessary, but as little as possible; and
- Maintenance is fundamental to conservation.

Further articles relate to preservation (maintaining fabric in its current state), restoration and reconstruction, adaptation and the introduction of new structures or extensions.

The *Heritage Manual* comprises the following guidance documents:

- *Statements of Heritage Impact Guidelines* (Heritage Office 2006);
- *Investigating Heritage Significance* (Heritage Office 2004);
- *Assessing Heritage* Significance (Heritage Office 2001); and
- *Assessing Significance for Historical Archaeological Sites and 'Relics'* (Heritage Branch Department of Planning 2009).

These documents have been used to guide this historical heritage assessment and SoHI.

Figure 1.1 Regional context

Figure 1.2 Local context and project detail

1.7 Assessment objectives

In accordance with the relevant Government assessment requirements, the objectives of the historical heritage assessment and SoHI are:

- to investigate the potential for items of historic heritage value, including relics, to exist within the development footprint;
- to assess the significance of historic heritage items in the property boundary, which encompasses the development footprint and its surrounds;
- to assess the potential impacts of the project on items of historic heritage in the development footprint; and
- to formulate management measures for the protection of historic heritage items in the development footprint.

1.8 Report assessment methods

1.8.1 Research sources

Research for this report was conducted using various sources including online archives, the State Library of NSW and the National Library. Included are the Historic Lands Records Viewer, Port Macquarie Historical Society/ Museum archive, Port Macquarie-Hastings Council, and the Heritage NSW website.

The list of references can be found at the end of this report.

1.9 Authorship

This report was authored by Amelia O'Donnell (Consultant Archaeologist) and Kerryn Armstrong (Senior Archaeologist) and quality assurance was given by Pamela Kottaras (National Technical Lead – Historic Heritage).

2 Statutory framework

2.1 Legislation

In NSW, heritage items and relics, that is archaeological sites assessed to be of local or State significance, are protected by two main pieces of legislation: the EP&A Act and the NSW *Heritage Act 1977*. An additional layer of protection is added, in certain circumstances, by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

2.1.1 Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

The EPBC Act provides a legal framework to protect the environment. The EPBC Act definition of environment includes places of natural, Indigenous and historic heritage value. Under the EPBC Act, heritage places can be listed on:

- World Heritage List (WHL) – places inscribed on the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage List;
- National Heritage List (NHL) -places of significance to the nation; and
- Commonwealth Heritage List (CHL) – items belonging to the Commonwealth or its agencies.

The EPBC Act requires actions on Commonwealth land (Section 26) and actions undertaken by a Commonwealth agency (Section 28) to be assessed to determine whether they are likely to have a significant impact on the environment. Heritage places may be listed on a statutory register, such as the WHL, NHL, CHL or State-based registers, or may be an unlisted item identified by a Commonwealth agency.

Additionally, actions that may impact on Matters of National Environmental Significance (MNES) must also be assessed for impacts. MNES that relate to heritage include identification on the WHL or NHL. Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. An action that may potentially have a significant impact on a MNES is to be referred to the Department of Agriculture, Water and the Environment (DAWE) for determination as to whether or not it is a controlled action. If deemed a controlled action the project is assessed under the EPBC Act for approval.

The project is unlikely to have a significant impact on any world heritage properties or places listed on the National Heritage Register, and the EPBC Act is not discussed further.

2.1.2 Heritage Act 1977 (NSW)

The *Heritage Act 1977* (Heritage Act) serves to conserve the heritage places, items and objects of NSW. The Heritage Council of NSW is constituted under the Heritage Act to advise the Minister with responsibility for heritage on matters relating to the conservation of the State's heritage. In practice, this power is largely delegated to Heritage NSW.

Under the Heritage Act, items of significance to the State can be recognised on the State Heritage Register (SHR). Items on the SHR cannot be demolished, damaged, developed, altered or excavation undertake without approval from the Heritage Council of NSW (or its delegate) under Section 59 of the Act.

Archaeological relics, defined as "any deposit, artefact, object or material evidence that relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and is of State or local significance",

are protected under Section 139 of the Heritage Act. A person cannot knowingly disturb or excavate land when they suspect a relic to be present without holding an excavation permit or an exemption. Section 139 applies to all land in NSW not listed on the SHR. Section 146 requires persons to notify the Heritage Council of NSW within a reasonable time if an unanticipated relic is discovered. The Heritage Act identifies the category of 'works', which refers to historical infrastructure, and is viewed as separate to that of archaeological 'relics' under the Heritage Act. 'Works' may be buried, and are therefore archaeological in nature, but exposing a 'work' does not trigger reporting obligations under the Heritage Act unless it is of demonstrable significance.

Section 170 of the Heritage Act requires State government agencies to establish and maintain a register of heritage items, to be known as a Heritage and Conservation Register. State agencies are required to undertake due diligence with regard to the care, control and management of items listed on their Section 170 Heritage and Conservation Register. Additionally, State agencies must notify the Heritage Council of NSW 14 days in advance if they intend to remove an item from their register, transfer ownership, cease occupation or demolish. Section 170 does not place statutory requirements on individuals or non-State government entities.

TfNSW is a state-owned corporation, and as such, the project will be assessed under Part 5, in the form of an REF (refer to Section 3.2). Consent from Council is not required however, consultation is. Port Macquarie-Hastings Council will be afforded 21 days to review the project documentation and comment on methods and assessed outcomes.

2.1.3 Environmental Planning and Assessment Act 1979 (NSW)

The EP&A Act establishes the framework for development assessment within NSW, with one of the objects of the Act being to promote the sustainable management of built and cultural heritage, including Aboriginal cultural heritage.

As the majority of development assessments and consents are managed by local government (council), the EP&A Act directs councils to prepare a local environmental plan (LEP) and development control plans (DCPs) for their local government area (LGA). LEPs are developed under the standard instrument template, to provide planning consistency across the State. Schedule 5 of the standard instrument provides a list of identified environmental heritage within the LGA, impacts to which are to be considered during the development assessment and approval process. DCPs provide policies that are specific to the local environment and character of the LGA or a subset of the LGA. The NSW department with responsibility for planning may also prepare state environmental planning policies (SEPPs) to guide planning across the State.

Government departments developing infrastructure such as roads and rail projects assess their proposed works through the preparation of a review of environmental factors (REF). This process is self-assessed and while council has the opportunity to comment, it does not have powers of approval. Other Acts, such as the Heritage Act, still apply in this instance.

Due to the size, economic value or impacts, some types of development are assessed as State Significant Development (SSD), State Significant Infrastructure (SSI) or Critical State Significant Infrastructure (CSSI). Where a project is identified as SSD, SSI, or CSSI, the NSW department with responsibility for planning is the consent authority and directs the proponent to prepare an application for the secretary's environmental assessment requirements (SEARs), which define the various studies and guidelines for the preparation of an environmental impact statement (EIS), and supporting technical reports.

The purpose of all assessment processes is to consider impacts to, among other things, cultural heritage items and places as well as archaeological sites and deposits associated with the proposal and to identify measures to avoid, mitigate or ameliorate impacts.

2.2 State Environmental Planning Policy (Transport and Infrastructure) 2021

The State Environmental Planning Policy (Transport and Infrastructure) 2021 (Transport and Infrastructure SEPP) consolidates and repeals the provisions of the four SEPPs listed below:

- *SEPP (Infrastructure) 2007* (Infrastructure SEPP);
- *SEPP (Educational Establishments and Childcare Facilities) 2017* (Education and Childcare SEPP);
- *SEPP (Major Infrastructure Corridors) 2020* (Corridor SEPP); and
- *SEPP (Three Ports) 2013* (Three Ports SEPP).

The consolidation of these four SEPPs has not resulted in any fundamental changes to how government infrastructure projects are authorised under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The public works proposed in the Breakwall Concept Plan trigger the consultation provisions pursuant to Section 2.11, Chapter 2 of the Transport and Infrastructure SEPP. Council will be given the opportunity to comment, and comments received will be taken into consideration. Refer to section 2.11 of the Transport and Infrastructure SEPP, reproduced below.

2.11 Consultation with councils—development with impacts on local heritage

1. This section applies to development carried out by or on behalf of a public authority if the development—

    a) is likely to affect the heritage significance of a local heritage item, or of a heritage conservation area, that is not also a State heritage item, in a way that is more than minor or inconsequential, and

    b) is development that this Chapter provides may be carried out without consent.

2. A public authority, or a person acting on behalf of a public authority, must not carry out development to which this section applies unless the authority or the person has—

    a) had an assessment of the impact prepared, and

    b) given written notice of the intention to carry out the development, with a copy of the assessment and a scope of works, to the council for the area in which the heritage item or heritage conservation area (or the relevant part of such an area) is located, and

    c) taken into consideration any response to the notice that is received from the council within 21 days after the notice is given.

2.3 Heritage Act 1977 (NSW)

The *Heritage Act 1977* (Heritage Act) serves to conserve the heritage places, items and objects of NSW. The Heritage Council of NSW is constituted under the Heritage Act to advise the Minister with responsibility for heritage on matters relating to the conservation of the State's heritage. In practice, this power is largely delegated to Heritage NSW.

Archaeological relics, defined as "any deposit, artefact, object or material evidence that relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and is of State or local significance",

are protected under Section 139 of the Heritage Act. A person cannot knowingly disturb or excavate land when they suspect a relic to be present without holding an excavation permit or an exception.

Section 139 applies to all land in NSW not listed on the SHR, therefore, where impacts to relics are predicted to be likely or certain, an excavation permit, also referred to as an s140 permit, is required except in certain circumstances. An exception from the need for an s140 permit may apply in certain circumstances. Exceptions are self-assessed and must be undertaken in strict accordance with Heritage NSW guidelines, published in the *NSW Government Gazette No.59* (2022).

Exceptions to the requirement for a s140 permit are as follows:

> The following disturbance or excavation of land does not require an excavation permit under subsections 139(1) or (2) of the Heritage Act 1977 provided that it falls within one or more of the exceptions described at clauses 2(a) to (f) below, and is undertaken in compliance with the General Conditions prescribed at clause 3 further below:
>
> a) Any disturbance or excavation of land that has limited archaeological research potential, as demonstrated by a heritage management document, such as an Archaeological Assessment, completed within the last five years.
>
> b) Any disturbance or excavation of land that constitutes minor works involving limited impact to relics of local heritage significance, in accordance with 'Relics of local heritage significance: a guide for minor works with limited impact' published by Heritage NSW.
>
> c) Any disturbance or excavation of land that constitutes minor works involving limited impact to relics of local heritage significance as demonstrated by a heritage management document, such as an Archaeological Assessment, completed within the last five years.
>
> d) Any disturbance or excavation of land for archaeological test excavation of relics of local heritage significance completed in accordance with the guideline 'Relics of local heritage significance: a guide for archaeological test excavation' published by Heritage NSW.
>
> e) Any disturbance or excavation of land for archaeological monitoring of relics of local heritage significance completed in accordance with the guideline 'Relics of local heritage significance: a guide for archaeological monitoring' published by Heritage NSW.
>
> f) Any disturbance or excavation of land:
>
> i) for the purpose of exposing underground utility services infrastructure which occurs within an existing service trench and will not affect any other relics;
>
> ii) to carry out inspections or emergency maintenance or repair on underground utility services with due care taken to avoid effects on any other relics;
>
> iii) to maintain, repair, or replace underground utility services to buildings which will not affect any other relics;
>
> iv) to maintain or repair the foundations of an existing building which will not affect any associated relics; or
>
> v) to expose survey marks for use in conducting a land survey.
>
> https://gazette.legislation.nsw.gov.au/so/download.w3p?id=Gazette_2022_2022-59.pdf

2.3.1 Port Macquarie-Hastings Local Environmental Plan 2011

Part 5, Section 5.10 addresses the conservation of heritage significance within the LGA. The objectives of the LEP in relation to heritage are:

a) to conserve the environmental heritage of Port Macquarie-Hastings;

b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views;

c) to conserve archaeological sites; and

d) to conserve Aboriginal objects and Aboriginal places of heritage significance.

To achieve these objectives, development consent is required to demolish, move, alter, disturb or excavate a heritage item, an Aboriginal object or a building, work, relic or tree within a heritage conservation area. Schedule 5 of the LEP provides a list of heritage items, conservation areas and archaeological sites within the LGA. The proposed works fall under clause 7 of section 5.10:

(7) **Archaeological sites** The consent authority must, before granting consent under this clause to the carrying out of development on an archaeological site (other than land listed on the State Heritage Register or to which an interim heritage order under the *Heritage Act 1977* applies)—

a) notify the Heritage Council of its intention to grant consent, and

b) take into consideration any response received from the Heritage Council within 28 days after the notice is sent.

2.4 Identifying listed heritage items

Listing on statutory registers provides a basis under which the item or place is protected, and change is managed through project approval. Statutory listings provide legal protection for heritage items under the legislation outlined above.

Statutory registers reviewed as a part of this assessment include:

- World Heritage List (WHL) – the register is managed under the EPBC Act;
- National Heritage List (NHL) - the register is made under the EPBC Act;
- Commonwealth Heritage List (CHL) - the register is made under the EPBC Act;
- State Heritage Register (SHR) - this register is made under Part 3A of the Heritage Act;
- s170 register - this register is made under Section 170 of the Heritage Act;
- Schedule 5 of the Port Macquarie-Hastings Local Environmental Plan 2011; and
- State Heritage Inventory (SHI), which was cross-checked with Schedule 5 of Port Macquarie-Hastings LEP and the s170 register. The SHI is not a single statutory register, but a central collection of locally listed statutory heritage items maintained by Heritage NSW.

Non-statutory listing is an acknowledgment of a site's, or place's, importance to sections of the community. Listings on such registers do not place legal requirements on development, but nevertheless influence the future of such listed items. Non-statutory registers reviewed as a part of this assessment include:

- National Trust of Australia, NSW (NT) - the NT is made up of autonomous state chapters. Each chapter is a community-based and non-government organisation, with a mandate to conserve and promote Australia's natural and cultural heritage. Classification by NT is a strong acknowledgment of heritage significance and while statutory constraints are not applicable, classification offers protection through visibility and community action.

- Register of the National Estate (RNE) - the RNE is an archived list of heritage items that were protected under the now repealed Commonwealth *Heritage Commission Act 1975*, which was replaced by the EPBC Act. While many items were transferred from the RNE to the NHL or CHL, those that were not remain on the RNE as an indication of their heritage value.

3 Environmental & Heritage Context

3.1 Introduction

The environmental characteristics of any area influenced the way people used the landscape. In the past, the availability of resources such as water, flora, fauna, stone material and topography played a substantial role in the choice of camping, transitory movement and ceremonial areas used by Aboriginal people.

Migrants to the early colony at Sydney looked for the same landscape characteristics but manipulated their environment in ways that left more obvious marks. Water, level or gently sloping ground, and suitable soils to grow crops and animals were sought after. Therefore, understanding environmental factors assists with predicting where archaeological sites are likely to occur. Additionally, natural and cultural (human-made) site formation processes that occur after the deposition of archaeological material influence the way archaeological material is distributed and preserved across a landscape.

3.2 Landscape overview

Port Macquarie is part of the North Coast bioregion, which covers an area of 5,924,130 ha. A little over 96% of the bioregion is in New South Wales, the rest extending over the Queensland border (NSW National Parks and Wildlife Service, 2003, pp. 172–175). The North Coast bioregion stretches from the coastal sand barrier through low foothills and ranges to the Great Escarpment. The bioregion sits atop diverse geology which includes Devonian and Permian bedrocks, small bodies of granite and granodiorite and three centres of Tertiary basalt eruption (NSW National Parks and Wildlife Service, 2003, pp. 172–175). The geomorphology of Port Macquarie is dominated by the Port Macquarie block, an igneous bedrock of early Cambrian serpentinite, chert and ocean ridge basalts. These are exposed in weathered rock formations by wind and wave action along the coast in outcroppings and cliffs where not covered by dunes, alluvial deposits or soil profiles (eSPADE 2022).

The area of the Port Macquarie township south of the breakwall is the location of the 1821 penal settlement, as such, 18 locally listed sites and nine archaeological sites are located within 1 km of the project area. Of the 27 items listed on the Port Macquarie LEP (2011) within 1 km of the project area, seven are listed on the SHR (refer to Table 3.1).The landscape abutting the southern breakwall is constructed and contains residential and public infrastructure. Land in the vicinity of the project area is dominated by coastal headland heath with the mouth of the Hastings River supporting seaweed beds and a variety of marine fish species (Bishop, 2016; Office of Environment and Heritage, 2021).

The project area also passes into the curtilage of the locally listed archaeological site A111 “Archaeology of early European settlement” and falls within the “Port Macquarie Historic Settlement Area” listed as an indicative place on the Register of the National Estate (RNE 100112).

The project area is primarily coastal recreation zone north of mixed urban and suburban township. The landscape of the project area is a low relief (<10m above sea level) with the coastal headlands of Flagstaff Lookout (20 m ASL) and Windmill Hill (40 m ASL) being the dominant topographical features.

The fresh water Kooloonbung Creek and Wrights Creek are present to the west and south of the project area. Early settlers to the region would have looked for areas close to permanent water to support settlement and the 1821 penal colony and later township is focused within the landscape bounded by the creeks.

3.3 Heritage listings

The Port Macquarie southern breakwall is part of a group listed *Training Walls and breakwalls* (ID A060) on the Port Macquarie LEP 2011 (Table 3.1, Figure 3.1). The listing locates the group on the North Shore and Port Macquarie and includes the structures of the southern breakwall and two northern breakwalls. The LEP classifies the item as an archaeological site.

The southern breakwall is one of two structures, originally proposed to be three, which control the flow of water and sediment between the Pacific Ocean and the mouth of the Hastings River.

Extending approximately 730 m long and between 0 m and 180 m from the original coastline, the wall is composed of a stone revetement, adjacent to a concrete walkway. Land directly south was reclaimed in the 1950s and therefore does not have heritage significance.

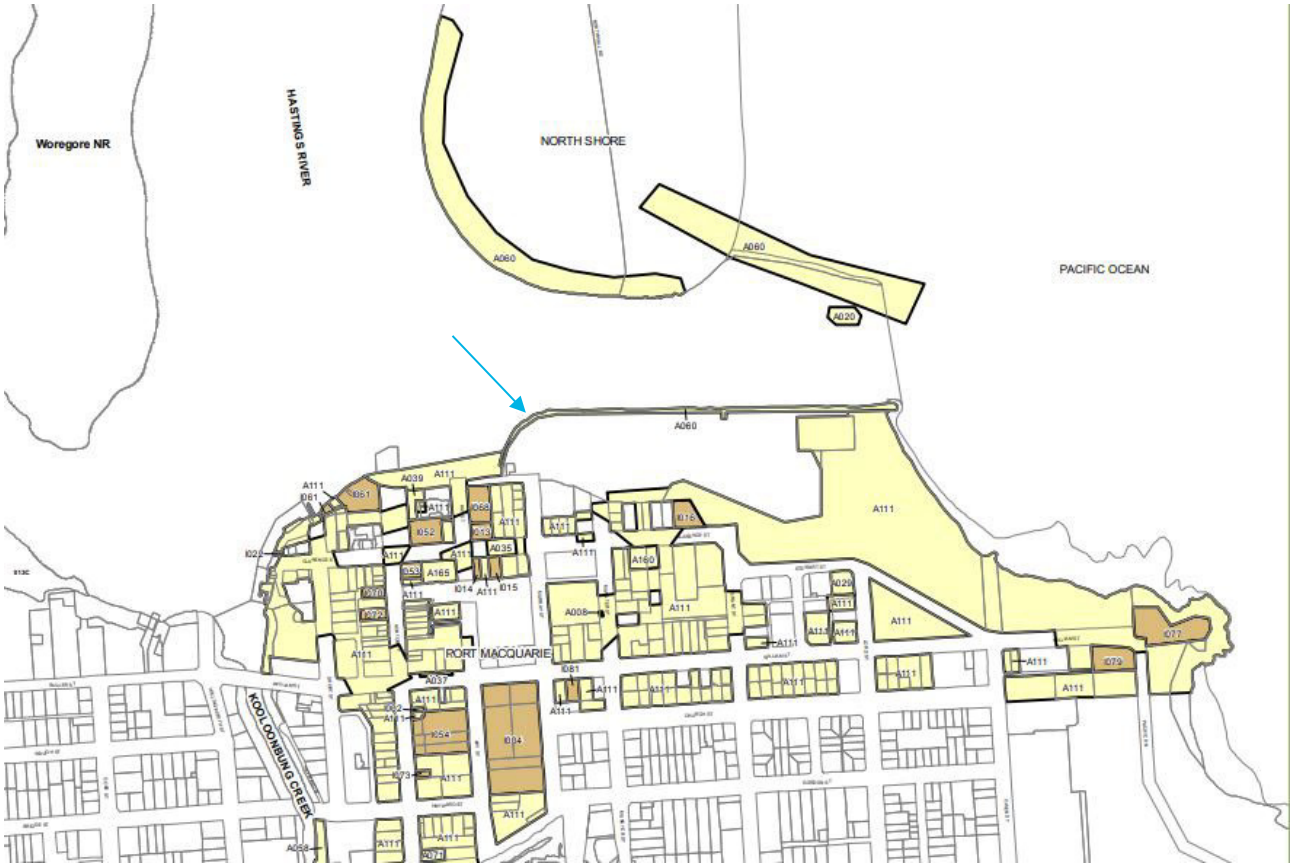

Plate 3.1 Excerpt from the LEP heritage map illustrating the heritage landscape. The southern breakwall is indicated by the blue arrow.

Source: Port Macquarie-Hastings Local Environmental Plan 2011 Heritage Map Sheet HER_013FA

Table 3.1 Identified heritage items within and in the vicinity of the project area

Item name	Register listing number								
	NHL	CHL	SHR	S170	LEP	NT	RNE	Other	Location
Training walls and breakwalls (Hastings River. Reserve No 56221; Lot 7005, DP 1074314; Crownland (46315)					A060				Within the project area
Archaeology of early European settlement (Parts of Town Centre and Town Beach precincts)					A111				Within the project area
Port Macquarie Historic Settlement Area, Port Macquarie							100112		Within the project area
Hayward House (102–104 Horton Street, Port Macquarie. Lot 1, DP 136866; Lot 1, DP 780589)					I002				Within 1 km of the project area
Port Macquarie Second Burying Ground (Gordon Street, Port Macquarie. Vol. 787-Fol. 730; Crownland)			01731		I003				Within 1 km of the project area
St Thomas The Apostle Anglican complex (Hay Street, Port Macquarie. Lots A and B, DP 420667; Lot 2, DP 507730; Lot 1,DP 662989; Lot 1, Section 7, DP 758852; Lot 1, Section 7A, DP 758852)			01653		I004		3497		Within 1 km of the project area
Former Courthouse building and mature Norfolk Island pine trees (31–35 Clarence Street (corner Hay Street), Port Macquarie. Lot 675, DP 722652)			00554		I013		3499		Within 1 km of the project area
"Garrison" building (26 Clarence Street (corner Hay Street), Port Macquarie. Lot 1, DP 630109)					I014				Within 1 km of the project area
Hastings Historical Society Museum (22 Clarence Street, Port Macquarie. Lot 1, DP 744652)			00326		I015				Within 1 km of the project area
First (Allman Hill) Burying Ground (Clarence Street, Port Macquarie. Reserve No 82916; Lot 7025, DP 1060950)			01730		I016				Within 1 km of the project area
Macquarie Hotel (8 Horton Street, Port Macquarie. Lot 1, DP 881805)					I052				Within 1 km of the project area
Ritz Theatre Complex (22–28 Horton Street, Port Macquarie. Lot 1, DP 631801; Lot 2, DP 631810)					I053				Within 1 km of the project area
St Agnes Roman Catholic Church building and grounds (Hay Street, with frontage also to Horton Street, Port Macquarie. Part Lot 2, DP 634711; Part Lots 9 and 10, Section 6, DP 758852)					I054				Within 1 km of the project area
War Memorial (Horton Street (Town Green), Port Macquarie. Lot 548, DP 754434; Reserve No 82306, Lot 7048, DP 1070509)					I061				Within 1 km of the project area
Former police station, lockup and residence (Hay Street, Port Macquarie. Lot 674, DP 722652)					I068				Within 1 km of the project area

Table 3.1 Identified heritage items within and in the vicinity of the project area

Item name	Register listing number								
	NHL	CHL	SHR	S170	LEP	NT	RNE	Other	Location
Westpac Bank building (35 Horton Street, Port Macquarie. Lot 2, DP 862632)					I070				Within 1 km of the project area
ANZ Bank building—original street façade (49 Horton Street, Port Macquarie. SP 36763)					I072				Within 1 km of the project area
Former single-storey Methodist Church building (Horton Street, Port Macquarie. Lot 10, DP 854235)					I073				Within 1 km of the project area
Pilots Memorial (William Street (Flagstaff Hill), Port Macquarie. Part Reserve No 82916; Lot 467, DP 754434)					I077				Within 1 km of the project area
3 dwelling houses (2–6 William Street, Port Macquarie. Lot 714, DP 823793)					I079				Within 1 km of the project area
Former dwelling house (98 William Street, Port Macquarie. Lot 2, DP 168128)					I081				Within 1 km of the project area
Well (Munster Street, Port Macquarie. Adjoining Lot 659, DP47332)					A008				Within 1 km of the project area
"Ballina"—paddle steamer wreck (Hastings River, North Shore. Between training walls at river mouth)					A020		14833		Within 1 km of the project area
Well (1 Stewart Street (corner Lord Street), Port Macquarie. Lot 2, DP 1107888)					A029				Within 1 km of the project area
Brick stormwater drain (Clarence Street (between Hay and Murray Streets), Port Macquarie)					A035				Within 1 km of the project area
Royal Hotel (2 Horton Street, Port Macquarie. Lot 3, DP 1040459)					A039				Within 1 km of the project area
Part of original Gordon Street Bridge abutments (Gordon Street (adjoining Kooloonbung Creek), Port Macquarie. Reserve No 87617—Lot 7006, DP 96366)					A058				Within 1 km of the project area
Convict well (158 Horton Street (corner Gordon Street), Port Macquarie. Lot 1, DP 705798)					A071				Within 1 km of the project area
Port Macquarie Government House site (2 Clarence Street (within School Street), Port Macquarie. Lot 1, DP 581307 and road)			01517		A160		102706		Within 1 km of the project area
Archaeological remains of overseers' cottages and barrel drain (30–42 Clarence Street, Port Macquarie. Lot 101, DP 1140251)			01813		A165				Within 1 km of the project area
Church Hill, Hay St, Port Macquarie							105768		Within 1 km of the project area
Lady Nelson Wharf, Horton St, Port Macquarie							101968		Within 1 km of the project area

Notes: ** NHL National Heritage List (statutory); CHL Commonwealth Heritage List (statutory); SHR State Heritage Register (statutory); S170 Section 170 of the Heritage Act (Government agency list of heritage assets) (statutory); LEP Local Environmental Plan (statutory); NT National Trust of Australia (NSW Branch) (non-statutory); RNE - Register of the National Estate (static and non-statutory); Landscape Identified significant cultural landscapes.*

Figure 3.1 Listed sites and items

4 Historical Summary

4.1 Historic themes

The Australian and NSW heritage systems employ a series of historic themes to guide the understanding of history and historical investigation in the nation and state. As part of any historic heritage assessment, it is important to review the historic themes when undertaking research on an area or place to provide proper context. The state and national themes are complementary to enable the historian to present a unified understanding of how an area fits into Australian history. The historic themes are also an important guide when assessing an item's heritage significance. They provide information on how an item may be historically significant at the local, state or national level.

Finally, historic themes help to develop interpretation and management strategies for items of heritage significance. A full list of these themes can be found on the Heritage NSW website. Historic themes in the study area were identified based on the historical background (as described below) and the results of the historical survey (Section 5.8). The Australian and NSW historic themes relevant to the project boundary that have been used in this report are listed in Table 4.1.

Table 4.1 Historic themes

Australian historic themes	NSW historic themes
2. Peopling Australia	Convict
3. Developing local, regional and national economies	Environment – cultural landscape
3. Developing local, regional and national economies	Technology
4. Building settlements, towns and cities	Towns, suburbs and villages
8. Developing Australia's cultural life	Leisure

4.2 Historical Context

4.3 Key phases

Historical analysis has allowed for the division of region's development into phases. These phases and the themes below provide a framework for understanding the site and therefore its significance.

Phase 1: Pre contact

Phase 2: Exploration

Phase 3: Establishment of the Port Macquarie penal settlement

Phase 4: Establishment of a free township

Phase 5: Construction of the southern breakwall

Phase 6: Breakwall upgrades and landscape changes

4.3.1 The environment of pre and early contact

The study area is within the traditional country of the Biripi people (also written and pronounced, Birrbay, Birpai, Biripi or Birippi) of the Gathang language group (also Gadjang or Worimi) (Solling, 2014, p.17). Tindale (1974)

records Biripi country extending from the Hastings River, west to Rollands Plains and south towards the Manning River. David Horton, however, maps Biripi country extending east-west from the coast to the Great Dividing Range and from north-south from Kempsey to Forster (Solling 2014, p.17). It must be remembered that our information about the boundaries of language groups are drawn from European ethnographic accounts collected after the social impacts caused by disease and displacement. As a result, this information is often contentious, particularly in relation to language group boundaries. Therefore, it is likely that language group boundaries were far more diffuse than the arbitrary demarcations drawn by colonial observers.

Archaeological records suggest the New South Wales coastal plain was occupied from at least 30,000 years ago (Solling, 2014, p.14). But rising sea levels brought about by the end of the last glacial maximum c.10,000 years ago flooded much of the ancient landscape (Solling, 2014, p.14). Late Holocene (~8,000 years ago – present) midden assemblages were recovered from Swansea and Port Stephens in the 1970, but there have been few further studies of datable Aboriginal sites along much of the Newcastle-Forster-Port Macquarie coastline (Dyall 1971, 1972).

The Biripi people lived in clan groups of up to fifty individuals. The north coast provided an abundance of resources which meant Biripi clans occupied smaller territories than their inland neighbours (Solling 2014, p.21). Coastal groups are also believed to have travelled seasonally between the inland mountains and the sea(Solling, 2014, p.17). Groups also travelled for festivities and trade (Solling 2014, p.17).

The heathland, dunes, swamps, forest, estuaries and coastal waters of Port Macquarie offered a wide range of terrestrial and aquatic resources and supported high population densities (Moyes & Mant, 1986, p.74; Solling, 2014, p.14). The Biripi constructed stringybark gunyahs employed a large suite of stone, wooden and fibre tools and sewed possum skin cloaks for the colder months (Solling 2014, pp.21–22). Colonial observers also noted Biripi men wore a sash around their waist constructed of strips of possum and quoll fur as well as a fine string net across the forehead (Solling 2014, p.21). Moreover, women were noted to wear possum skin cloaks fastened at the shoulder by a pademelon leg bone known as a currapah, they wore their hair short and carried babies in a knitted bag on their back (Solling 2014, p.21). As Europeans moved into the region the traditional lifeways of the Biripi of Port Macquarie were permanently disrupted.

4.3.2 Exploration

The Port Macquarie region was first viewed from sea by James Cook in 1770 and later by Mathew Flinders in 1802 (Turner 1990, p.4). The first official European party to travel into the Hastings River valley was John Oxley's 1818 expedition into the New South Wales interior (Turner 1990, p.4).

Travelling from the Northern Tablelands to the coast, Oxley's party first observed the north coast from Mount Seaview on 24 September 1818 (Turner 1990, p.4). Oxley's party observed that the landscape:

> was broken into considerable forest hills and pleasing valleys, down the principal of which we could distinguish a small stream taking its course to the sea... Numerous smokes arising from the natives' fires announced a country well inhabited and gave the whole picture a cheerful aspect... (Turner 1990, p.4).

By the time Oxley was observing their fires, the Biripi way of life had already felt the effects of European invasion (Moyes & Mant 1986, p.83). Oxley recorded seeing individuals scarred from small pox and noted Biripi individuals near Port Macquarie had a fear of firearms (Moyes & Mant 1986, p.83). Nevertheless, Oxley described the Biripi as "…showing signs of good living…" (Moyes & Mant 1986, p.74).

Oxley's party followed the Hastings River to the coast coming to camp at the mouth of the river port "…upon a beautiful point of land, having plenty of good water and grass; and commanding a fine view of the interior of the port and surrounding country…" (Turner 1990, p.4). Oxley's description of the Hastings River Valley piqued Governor Macquarie's interest and in late 1818 Macquarie sent William Eckford to further inspect the region. Then, in May of 1819 Oxley, along with maritime explorer P.P. King and explorer-botanist Allan Cunningham, prepared an official report on the area for the Governor. Cunningham praised the agricultural potential of the Hastings River; however, Oxley and King noted the presence of a permanent sandbar would hinder the passage of ships over

100 tons through the mouth of the river (Turner 1990, p.4). Nevertheless, in 1820 Macquarie petitioned to establish a penal settlement at Port Macquarie as he believed it would be suitable for farming, provide a strong timber supply, and possibly cultivate sugar (Turner, 1990, p.1).

4.3.3 Establishment of a penal settlement

In 1821 Port Macquarie was established as a place of secondary punishment for convicts who transgressed the law after arrival in the colony (Edward Higginbotham & Associates et al., 1994a, p.4). Captain Francis Allman of the 48th Regiment led a party of military men and convicts to prepare the Port Macquarie settlement, which would replace Newcastle as the colony's place of secondary punishment (Turner 1990, p.4). The party quickly set about preparing the penal settlement, constructing temporary accommodations and clearing 100 acres (40.6 ha) for crop production (Turner, 1990, p.5). The early activities of the penal settlement focused on construction, timber-getting (both for settlement construction and to send to Sydney) and lime-making (Turner 1990, p.5).

In the early period of white settlement, the penal colony had a relatively peaceful relationship with the Aboriginal peoples who occupied the area around the mouth of the Hastings River (Moyes & Mant, 1986, p.83). By 1822 Allman had elected an Aboriginal man named Monungall "Chief of the Port Macquarie Tribe" (of which he had no authority to do), to reinforce the friendly relationship between the settlers and coastal groups. Aboriginal peoples from friendly Port Stephens tribes were also brought to the settlement (Moyes & Mant 1986, p.84). However, as convict timber getting parties moved further inland, violent conflicts occurred between the "mountain" Aboriginal groups and timber cutters (Turner, 1990, p.5).

The Port Macquarie penal settlement expanded quickly over the first half of the 1820s. By 1822 a steady stream of convicts were being processed through the settlement (Turner 1990, p.5). Permanent structures were constructed along picturesque lines, with prominent buildings situated at points of topographic interest (Plate 4.1, Plate 4.2). A number of administration buildings were constructed along the northern coastline of the township between 1822 and 1826 including the acting engineers store, commissariat store, main guard house, civil officers' quarters and lumber yard. Maritime traffic began servicing the settlement but the reduction in water depth to 1.8 m over the sandbar at the entrance of the Hastings River continually caused trouble for even the smallest ships of the period (Higginbotham et al., 1995, p.22).

Changes to the convict system from 1825 slowly reduced the convict population at Port Macquarie. By the end of 1828 Governor Darling determined the settlement was no longer viable and requested permission to decommission the penal colony and open the area for free settlement (Turner 1990, p.5). The penal settlement was closed in 1830.

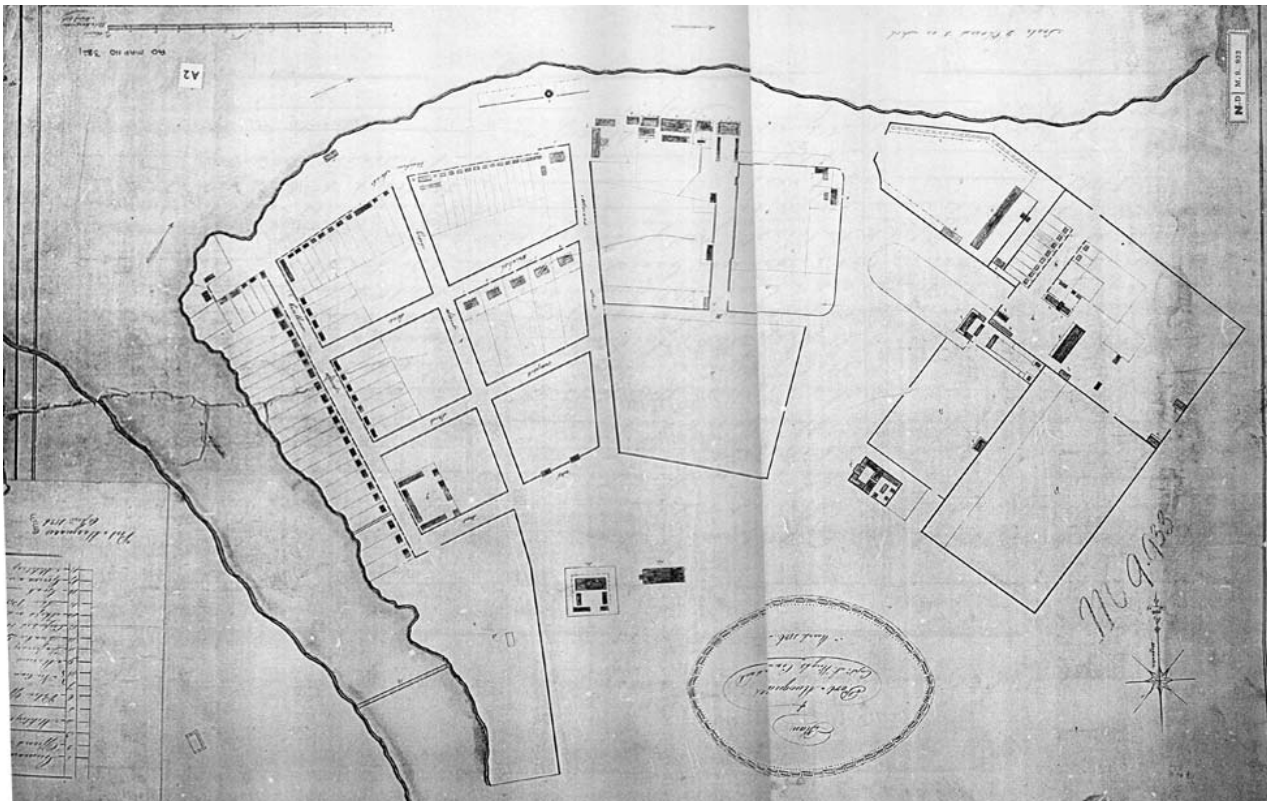

Plate 4.1 1826 plan of the Port Macquarie penal settlement. Source: Annable et al., 2003, p.4.

Plate 4.2 Detail. 1831 Plan of Port Macquarie. The dashed line has been added to show the approximate location of the breakwall. Source: NLA MAP G8974.P6G46 1831.

4.3.4 Free township

The free town of Port Macquarie was surveyed by government surveyors Ralfe and D'Arcy in March of 1830 (Plate 4.2), (Turner, 1990, p.7). Crown land was subdivided and the township area was reserved at the head of Hastings and Wilson Rivers (Turner, 1990, p.7). Many of the penal settlement buildings were demolished, including those structures on the north coastline which were removed in the 1840s (Higginbotham et al., 1995, p.4). Land applications were opened in August of 1830 (Turner, 1990, p.7).

Agricultural estates were established over the 1830s with the help of convict labourers. Even so, the wet climate of Port Macquarie, which was considered unsuitable for sheep, and the fact that potential land holders needed to purchase land at auction meant occupation of the region and township was slow to develop (Turner 1990, p.7). Additionally, shipping routes began to bypass Port Macquarie as more easily accessible ports were established on the northern New South Wales coastline (Higginbotham et al., 1995, p.22). Despite the difficulty of the river port, entrepreneur settlers A.C. Innes, Benjamin Sullivan, Captain Geary and Jeremiah Warlters formed boat building company, the Port Macquarie Stem Navigation Company. A public wharf was constructed at the end of Horton and Clarence streets and boatshed, repair yards and warehouses were built around the wharf. The *Port Macquarie Stem Navigation Company*, however, was soon dissolved after the *Port Macquarie Packet*, a vessel commissioned by the company, was lost off the harbour (Higginbotham et al., 1995, p.23).

Aboriginal-settler violence continued with free settlement. Historical records describe outbursts on both sides continuing in the region west of the Port Macquarie township ("The Aborigines at Port Macquarie," 1838, p.224), but an article from 1838 also reports "a series of cold-blooded atrocities" perpetrated against the "friendly" Aboriginal groups close to the Port Macquarie settlement. The article suggests the atrocities were in retaliation for the murder of four servants of Mr McLeod and incited by Mr Gray and local constables (*Asiatic Journal* 1838, p.224). A massacre site is recorded (30-3-0235) some 6 km north-west of the Westport campus where the Maria River enters the Hastings River. The perspective of hostile Aboriginal groups outside the settlement and friendly within continued over the nineteenth century (Moyes & Mant, 1986, p.84).

The deconstruction of the convict system over the 1840s and cessation of transportation in 1852 severely affected the colonial economy. Beginning in the 1840s the economic depression also affected the growth of Port Macquarie, due partially to the fact that similar produce was available closer to Sydney, preventing Port Macquarie from getting a foothold in the market (Turner 1990, p.10). Sediment build up at the mouth of the Hastings River also meant the sandbar became nearly impassable in this decade (Higginbotham et al., 1995, p.23).

By the 1860s, the sandbar had reduced and maritime access to Port Macquarie had improved. Steam ships began to service the town, which began to make notable economic progress through the timber trade in the 1870s (Higginbotham et al., 1995, p.25; Turner, 1990, p.1). Dairy cattle became the key agricultural economy in Port Macquarie, producing dairy products for the local region. Beef cattle was also notable in the area, and *Douglas Vale* winery produced its first wine in 1867 (Turner 1990, p.7). The Port Macquarie-Hastings municipality was formed in 1887 during a period of growth for the area; however, the depression in the 1890s stunted further expansion. The town was further affected by the North Coast Railway bypassing Port Macquarie and passing through Wauchope instead (20 km west of Port Macquarie) (Turner, 1990, pp.10–11).

Town growth started up again in the early twentieth century when it became a tourist destination accessible by increased car ownership and usage. In 1952 the road between Sydney and Port Macquarie was bituminised (Higginbotham et al., 1994a, p.10).

4.3.5 Southern Breakwall

i Construction

In 1880 Port Macquarie aldermen petitioned the NSW Legislative assembly for the construction of a breakwall to facilitate navigation through the mouth of the Hastings River (*The Sydney Morning Herald* 1880, p.3). The petitioners

argued that steamers could only enter and exit the port half-laden, and vessels often had to wait outside the harbour for days when tides made it too shallow to pass the bar, which a Mr Sadler noted extended over 30 feet (9 m) in length (*The Sydney Daily Telegraph* 1880, p.6). Moreover, the entrance had been obstructed by the wreck of the *Ballina* since 1879 (*The Sydney Morning Herald*, 1881, p.2). Messrs. Booth and Young argued that a training wall would increase the depth of the scour from 8 feet to 16 feet (2.4 m to 4.9 m) (*The Sydney Daily Telegraph* 1880, p.6).

The original harbour works scheme was also entangled with a request to re-open the Port Macquarie goal, which was closed in 1847 (Higginbotham et al., 1995, p.22; *The Sydney Morning Herald* 1880, p.3). The petitioners suggested if the goal was re-established than the c.100 prisoner population could be used as a labour force to construct the proposed breakwall *(The Sydney Morning Herald* 1880, p. 3, 1886, p.3). The Legislative Assembly objected to the reopening of the goal— it was not physically, nor economically viable— as well as employing prison labour to construct the work (T*he Sydney Morning Herald* 1880, p.3). The matter of the breakwall was more positive; Sir Henry Parks agreed that improvements to the port would easily improve the entrance but as the bar was the "the least dangerous on the coast" it seemed the Legislative Assembly was in no rush to finance the works (*The Sydney Morning Herald* 1880, p. 3, 1886, p.3).

The NSW Public Works Department (Harbours & Rivers Branch) commenced the construction of a breakwall training wall on the south side of the Hastings River entrance in 1897, under the supervision of contactor George P. Cook (Higginbotham et al., 1995, p.25). The breakwall was constructed primarily of local stone, but concrete blocks were also employed to reinforce the eastern end of the structure (SHI A060 *Training walls and breakwalls*).

The large bluestone basalt boulders used in the breakwall construction were quarried from Aston Hill, west of Kooloonbung Creek, and transported to the breakwall site via horse-drawn tram (SHI A060 *Training walls and breakwalls*). The tramway ran along Warlters Street though Westport Park, crossed Kooloonbung Creek near Buller Street, and continued on along Short Street travelling north of the Post Office and Royal Hotel coming to the beginning of the wall at the end of Murray Street (Higginbotham et al., 1995, p.25).

By May of 1898 approximately 183 m of the breakwall had been constructed and the positive effects of the structure were already visible on the Port Macquarie bar scour (*The Manning River Times and Advocate for the Northern Coast Districts of New South Wales*, 1898, p.6*)*. Even so, a review of the works from 1898 presented mix opinions regarding the works. Captain Kingland stated the entrance had become even more difficult to pass due to the shifting bar and civil engineer J. L. Ruthven suggested the southern training wall was unnecessary and would be ineffective as it had been constructed on rocks. Debates also raged over the placement of further breakwalls to the north and west (*The Manning River Times and Advocate*, 1898c, p.6). Nevertheless, the breakwalls were deemed necessary to ensure the economic growth of the Port Macquarie township (*The Manning River Times and Advocate*, 1898c, p.6).

The breakwall works stalled in 1898. The schedule of works had been affected by bad weather and rough seas causing periods of stop work , 1898b, p.5). Moreover, there appear to have been issues with the distribution of wages, leading to unrest among workers and further delays (Telford, 2019; *The Manning River Times and Advocate,* 1898a, p. 2, 1898d, p.2) leading to contractors Cook and Curl taking over construction in 1900 (Telford, 2019). The training wall was completed in 1901 to a length of 800 m at a cost of £26,260 (SHI A060 *Training walls and breakwalls*) (Plate 4.4). By 1901 the depth of the scour had increased by c.3 m at high tide and navigational beacons were installed on the wall as the bar shifted north (*Evening News* 1901, p.3).

The movement of the sand bar and deepening scour also effected the movement of water and sediment around the southern breakwall. The sandbar of Town Beach extended to the tip of the breakwall wall and the area between the training wall and the original coastline became a shallow tidal pool (Plate 4.3).

Plate 4.3 **Aerial view of Port Macquarie, New South Wales 27 July 1933 (south-east). Source: NLA, call no. PIC/15611/11533 LOC Cold store PIC/15611 Fairfax archive of glass plate negatives.**

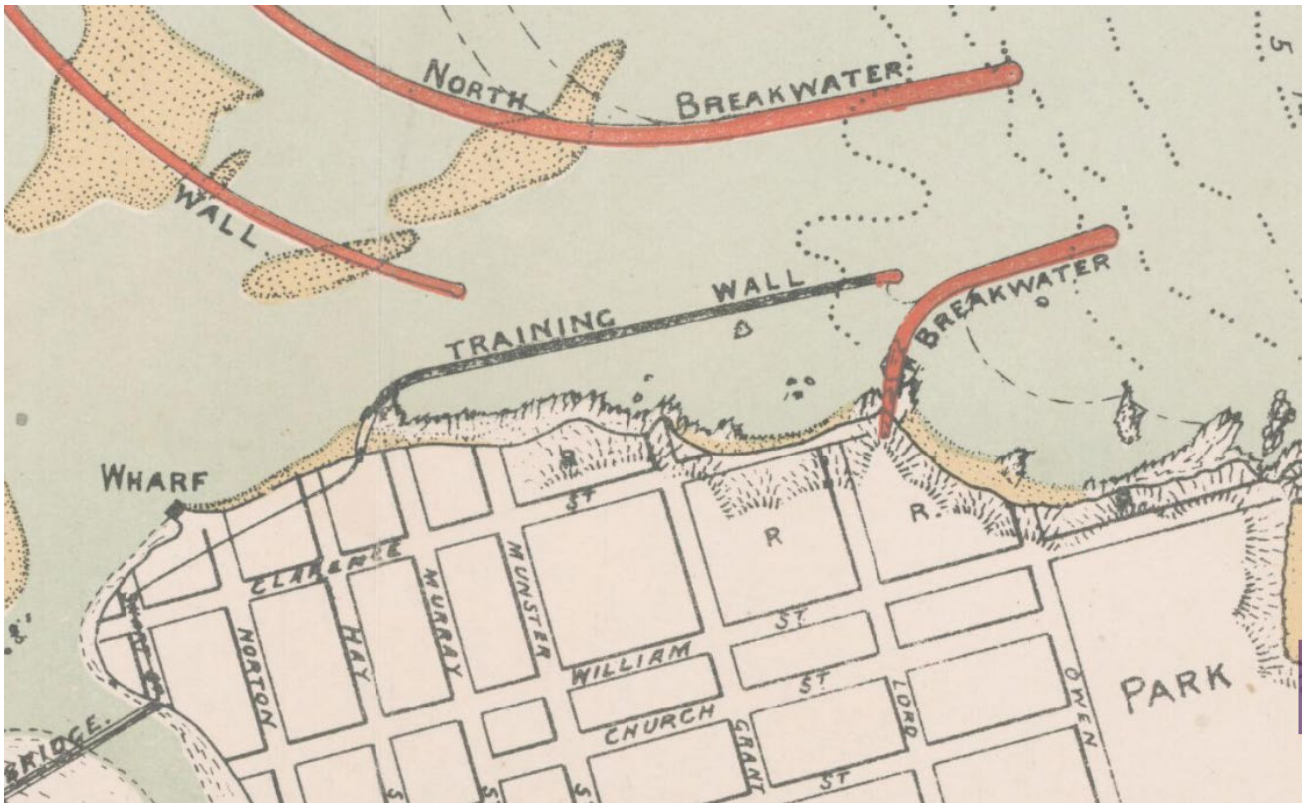

Plate 4.4 1901, New South Wales harbours: Hastings River entrance. Source: NLA MAP RM 5096.

Plate 4.4 shows the extent of the completed southern breakwall training wall in black. The red structures were proposed breakwalls that were not built. The tramline can be seen as a single line leading from the training wall over Kooloonbung Creek to the west.

ii Upgrades

As Port Macquarie's economy became focused on tourism over the twentieth century, upgrades to the southern breakwall and the surrounding landscape focused on leisure (Higginbotham et al., 1994a, p.10). The area between the breakwall and the original coastline was gazetted for public recreation in 1931 (No. 62,882) (*The Port Macquarie News and Hastings River Advocate*, 1931, p.4). Around this time a concrete cap was installed on top of the stone southern training wall to create a footpath (*The Walcha News*, 1934, p.1). Additionally, campgrounds were established along the original coastline southwest of the breakwall. Advertisements for camp grounds over the 1930s encouraged fishing and swimming from the breakwall (*The Walcha News*, 1934, p.1). Moreover, the southern breakwall featured on Port Macquarie souvenirs over the twentieth century and remains linked to tourism to this day. Today, the breakwall stones have been appropriated for public art, graffiti and memorials.

The post WWII leisure boom drove the desire for further leisure spaces in Port Macquarie. In 1950 Port Macquarie aldermen proposed the reclamation of land between the original coastline and southern breakwall to extend camping areas *(The Port Macquarie News and Hastings River Advocate,* 1950, p.1). It was proposed to fill the area with sand and mud dredged from the Hastings River channel and dress to top of the reclaimed area with clay *(The Port Macquarie News and Hastings River Advocate*, 1950, p.1). The reclamation and drainage works were completed between 1956 and 1960 (Plate 4.5, Plate 4.6).

Plate 4.5 **Detail. 1956 Aerial Photograph of the southern breakwall. Source: NSW Government Historic Imagery 279_3P_002.**

Plate 4.6 **Detail. 1979 Aerial Photograph of the southern breakwall. Source: NSW Government Historic Imagery 3676_11_019.**

The eastern end of the reclaimed area was gazetted as public reserve over the 1960s and South Pacific Accommodation Limited was granted a special lease for 24 acre 6 ¾ perches of the reclaimed land in 1960 (Plate 4.7). A campground over the reclaimed land was built and the area continues to function as a place for tourist accommodation.

The public reserve east of the campground took a longer time to be completely infilled and served various functions over the latter half of the twentieth century. Until at least the mid-1970s, channels were periodically dug from the sea to flood the lower lying land behind the Town Back dunes to create a tidal pool (Plate 4.8). Between 1975 and 1986 the eastern reserve was permanently filled, Norfolk Island pines and casuarinas were planted, and a public pool was constructed in this area— the pool was removed in the 1990s and a skate park is currently located in this area.

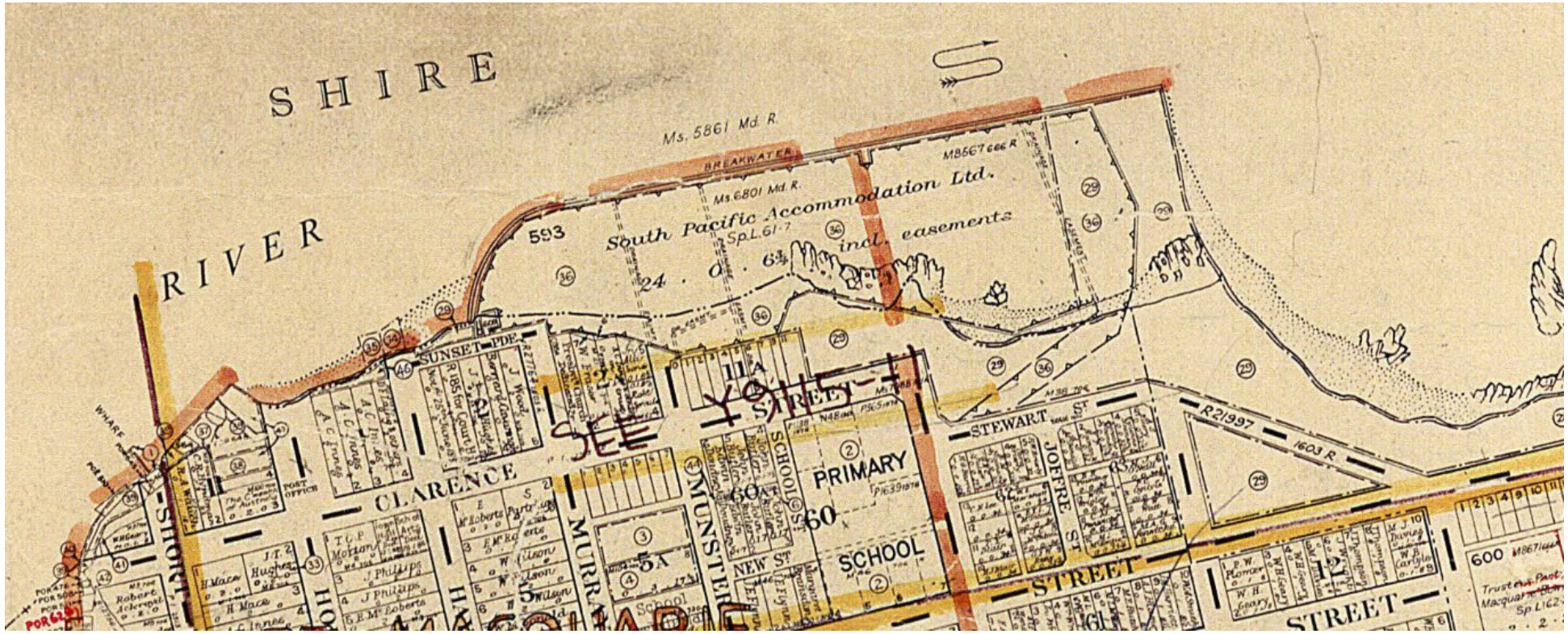

Plate 4.7 1969 Town of Port Macquarie East and West and adjoining Lands plan (detail). Source: HLRV.

Plate 4.8 **1975 View of southern breakwall and tidal pool inside the training wall and camping ground, with Allman Hill in the background. Source: Port Macquarie Historical Society Photographs No. 612.**

5 Evaluation of the project area

5.1 Key findings

Archival research, field survey and analysis of these data suggest the following:

- the southern breakwall was constructed between 1897 and 1901;
- the majority of land within the project area was reclaimed in the late 1950 and no archaeological sites are expected to exist in this area;
- the western end of the breakwall where it meets land (referred to as the south-western termination), has the highest potential to reveal archaeological sites;
- no sites were recorded during field survey;
- the southern breakwall and training wall have been assessed to be of local contributory significance.

5.2 Background

The historical heritage landscape was recorded during field survey (refer section 1.7), the following archaeological features were recorded in the below.

5.3 Land use summary

The landscape of the project area was originally coastal heathland, rocky coastline and coastal waters supporting seagrass beds. The land is within the country of the Biripi people. Between 1821 and 1830 the project area was part of the Port Macquarie penal settlement. Government constructions in the vicinity of the project area include acting engineer's store, commissariat store, officers' quarters, main guard house, lumber yard (Higginbotham et al., 1994b, p. 180). Buildings were converted and demolished after Port Macquarie was declared a free settlement in 1830. The lumber yard, commissariat store, and civil officers' quarters - later old Government house - were demolished over the 1840s (Higginbotham et al., 1994b). It is possible maritime-based labour may have also occurred in the vicinity of the project area during the free settlement period.

The southern breakwall was constructed between 1897 and 1901. Around 1930 a concrete footpath was constructed on top of the breakwall training wall and the land between the training wall and original coastline was gazetted as public reserve. The land between the breakwall was reclaimed from 1956 and continues to function as a campground and public leisure area.

5.4 Significant cultural landscapes

Cultural landscapes come in different forms, from having the appearance of wilderness to countryside to urban areas. The common factor that all cultural landscapes possess is they are a moment in time in a continuum of change created by human action (Meinig, 1979). Cultural landscapes can be broadly defined as designed, evolved or associative (ICOMOS (Australia), 2013a), with designed landscapes being largely represented by gardens; evolved landscapes by development; and associative landscapes being more indebted to the intangible, the religious or sacred. Cultural landscapes are also dynamic (Stuart, 1997, p.28), regardless of the pace of change.

The significance of a landscape is dependent on how it reflects values of the heritage standards in Australia and the *Burra Charter*, which was developed to reflect the values of the community. Interpretability, that is, the ability of a

landscape to tell a story is a socially and scientifically valuable attribute. So, while all human interactions with nature result in the formation of cultural landscapes, significance varies depending on what values can be identified and interpreted.

The landscape of the project area is the result of human construction. While the original coastline would have played an important role in the lives of the Biripi people and early settlers, the landscape now reflects Port Macquarie's relationship with maritime industry. More recently the landscape has evolved to suit Port Macquarie's function as a tourist destination and place of leisure. The breakwall forms an important part of the leisure landscape of Port Macquarie and travellers and locals have left their mark and established memorials on the stones.

5.5 Previous Studies

The southern breakwall and surrounds was included in Edward Higginbotham & Associates et al.'s (1994b, p. 180) archaeological assesment of Port Macquarie. The southern breakwall structure was noted to be largly intact with partial disturbance. Edward Higginbotham & Associates et al. (1994a) classed the northern coastline of the township, including the breakwall and much of the reclaimed land, as State significant (Plate 5.1).The state significance classification is based on the high potential for penal settlment archaeological resources and minor disturbance in this area.

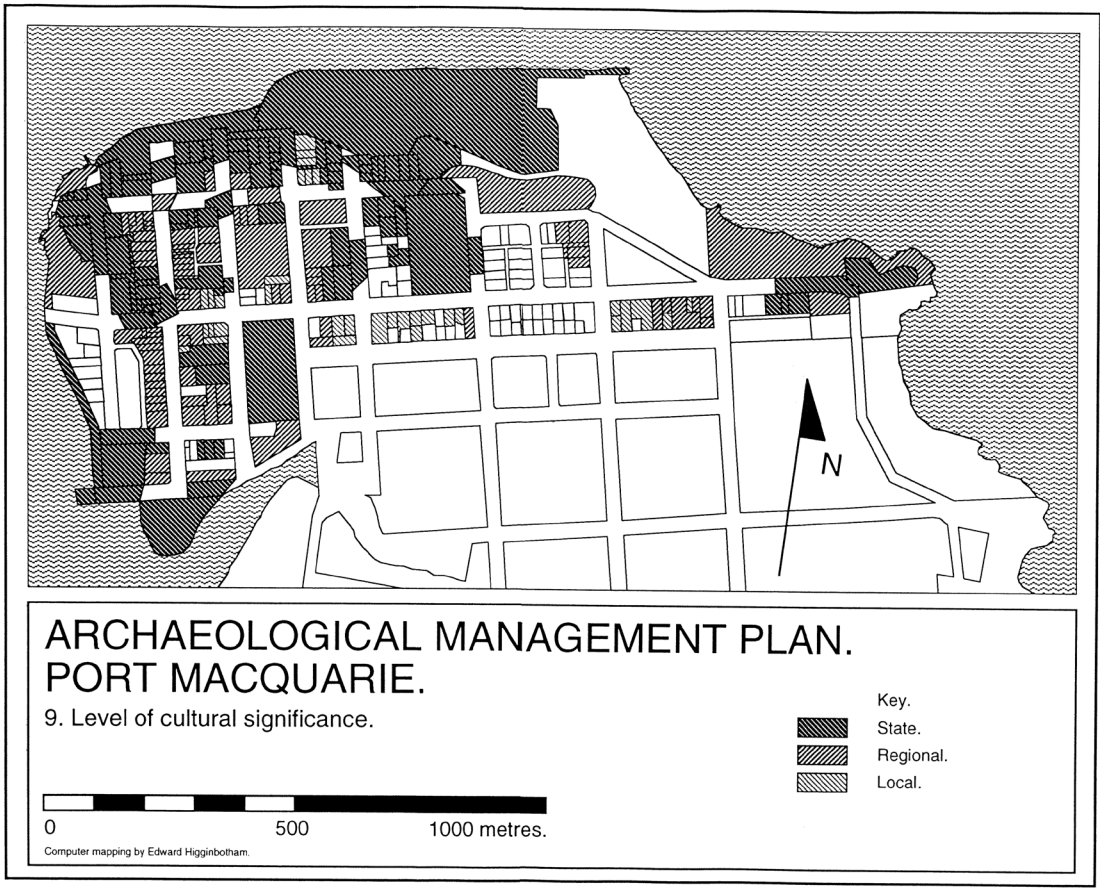

Plate 5.1 Edward Higginbotham & Associates et al. (1994a) Port Macquarie Level of Cultural Significance map.

Two minor archaeological excavations have also been completed in the vicinity of the project area within the curtilage of the locally listed Archaeology of early European settlement site (A111 Port Macquarie LEP 2011). No archaeological relics or works were uncovered.

- A 300 mm wide conduit test trench was excavated to a depth of 700 mm near Lady Nelson Wharf, west of the breakwall (John Appleton archaeological surveys & reports pty ltd, 2001). No archaeological material was recovered possibly due to the shallow depth of the trench (john appleton archaeological surveys & reports pty ltd, 2001).

- A 400 mm by 200 mm trench was excavated to a depth of 500 mm on Sunset Parade (2PTM-22 FNO-11). No archaeological resources were uncovered, possibly due to the small size and shallow depth of the trench (RPS Australia East Pty Ltd, 2018).

It should be noted that although Higginbotham & Associates have deemed the area between the breakwall and land as State significant, this area did not exist until after the 1960s. The area between the breakwall and land was part of the water way that has been filled in over time. EMM's background research shown there is no evidence to suggest State (or local) significant archaeological potential in this section.

5.6 Predictive model

Development of a predictive model for the survey has been ongoing and is based on background research, which includes documentary sources, maps and plans, and observations recorded during the field assessments.

A number of penal settlement administrative buildings were present on the northern coastline of Port Macquarie between c.1822 and the 1840s and so it is possible that maritime structures were also built along the original northern coastline. If this was the case when the breakwall was built between 1897 and 1901, the activity may have buried remnants of former structures at the western end where it meets land, or on the original coastline as shown in Plate 4.7. Further, when the bay that formed between the breakwall and the original coast was filled in the 1950s, the reclamation may have buried structures such as jetties and platforms.

The south-western end of the southern breakwall, within the boundaries of the area that was Port Macquarie penal settlement, the entire breakwall and reclaimed land, were identified as being of State significance (Higginbotham 1994; refer to Plate 5.1). It is clear that the State-level of significance relates to the colonial/penal period of Port Macquarie's development, which is close to where the breakwall connects to the original coastline to the west. The rest of the structure is very unlikely to contain relics of State significance that relate to the colonial penal settlement.

The majority of the project area is in the vicinity of reclaimed land, and it is not anticipated that significant archaeological sites (i.e relics) exist in the project activity boundary. The south-western termination of the breakwall, i.e south west section of the project area, connects to the original Port Macquarie coastline and abuts the curtilage of the locally listed 'Archaeology of early European settlement' site (A111 Port Macquarie LEP 2011) (Plate 3.1). It should be noted that the land south-east of the training wall is also included in the curtilage of the A111 archaeological site but is reclaimed land and is therefore not sensitive for colonial-period relics, except along the original northern coastline.

The southern breakwall is a part of a larger listing that includes training walls on the North Shore locally listed heritage item reflecting Port Macquarie's participation in, and concerns with, maritime economies. As such, features and items relating to the construction of the wall and other maritime activities may be present.

The south-western section of the project area has the potential to reveal items and features associated with the tramway, and to a lesser extent, the original coast line.

5.7 Field assessment methods

5.7.1 Introduction

EMM Senior Archaeologist Kerryn Armstrong conducted an archaeological field survey of the project of 6 January 2022. The primary aims of the survey were to:

- identify historical built or archaeological sites;
- characterise the landscape to aid predictions of archaeological potential;
- identify culturally significant landscapes;
- identify sites or areas that would require further investigation if planned for development as part of the project;
- identify sites or areas to be avoided by development, where possible; and
- identify areas with minor or negligible historical significance that are most suitable for development.

5.7.2 Survey limitations

Archaeological survey was conducted from public land. All efforts were made to cover the landforms and areas that would provide the greatest amount of information to supplement this report, but some elements of the southern breakwall in need of remediation are submerged and were not visible.

5.7.3 Data collection methods

Information was collected using a handheld Garmin GPS and notebook, DSLR Canon camera, along with ArcGIS 123 survey forms.

5.7.4 Survey method

The field survey was undertaken over a single day and was designed to cover as much of the proposed project area as possible. Walkover survey was conducted over the length of the southern breakwall and surrounding publicly accessible land. Photographs were taken at waypoints along the length of the breakwall.

5.8 Results of the field assessment

A field survey was conducted of the breakwall where it was noted that the item is currently intact (at least visibly, above sea-level). The site buffers the popular, local caravan park and has been utilised as memorial and public art strip (Plate 5.2 and Plate 5.3). It should be noted that although this is street graffiti, very little of the artwork (or graffiti) appears to have been vandalised. It appears a mutual understanding between 'artists' exists along the breakwall. This trend appears to be common along the east coast of Australia, with the Nambucca breakwall also becoming a canvas for the public (Plate 5.4). The breakwall itself is topped with a concrete footpath, which is well utilised by the public, and the clients of the caravan park (Plate 5.5).

The field survey was limited to land; no visible archaeological resources were observed during survey.

Plate 5.2 **Examples of public art**

Plate 5.3 **Examples of public art**

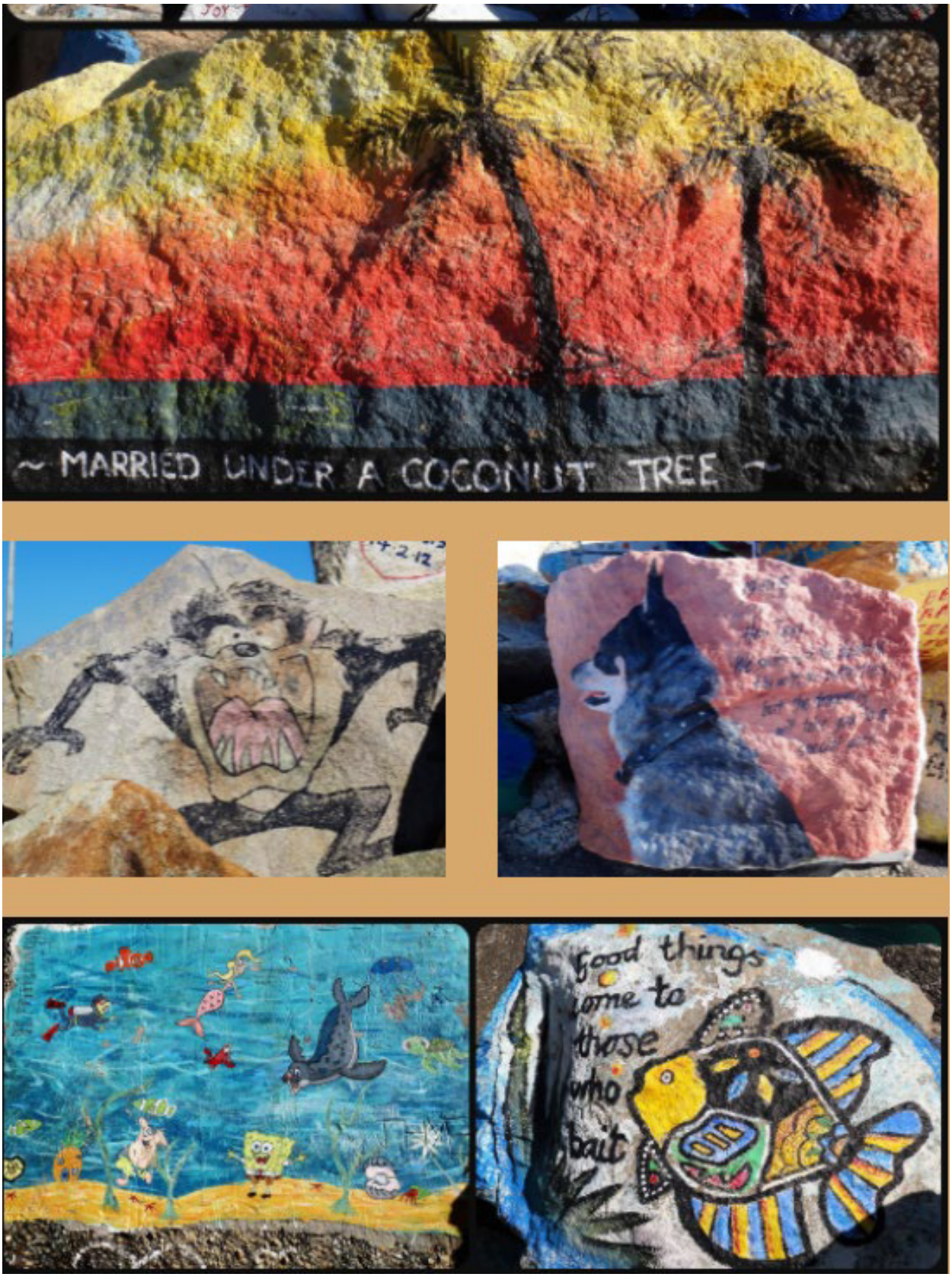

Plate 5.4 **Breakwall art at Nambucca Heads, NSW. Source: Michael Wiebe, 2021**

Plate 5.5 **The breakwall along the left, with the footpath and caravan park to the right.**

5.9 Comparative analysis

5.9.1 Review of similar sites

There are four breakwalls/training walls listed on the NSW State heritage inventory. The Trial Bay group is of State significance and the Urunga, Shellharbour and Mossy Point breakwalls are of local significance.

i Trial Bay Gaol, Breakwall and Environs (State Heritage Register SHI 01825, Cardwell Street, Arakoon NSW)

Trial Bay Gaol, breakwall and environs is located on the north Coast of NSW, approximately 62 km north of the project area. The construction of the breakwall off Laggers Point began in 1889 but the Public Works Department (Harbours & Rivers Branch) abandoned the project in 1903 due to improvements in overland and sea transportation to the area. The breakwall and associated quarrying works were performed by prisoners of the Trial Bay Gaol.

The Trial Bay Gaol, Breakwall and Environs, which includes the local prison/breakwall quarry, is of State significance as it embodies the evolution of the Penal System in New South Wales, specifically the ideals of prison reformer Harold Maclean (c.1877 and 1900). Additionally, the item represents the development of maritime infrastructure along the New South Wales North Coast and is significant as one of the five WW1 internment camps for Germans in NSW.

The breakwall, though only completed to one third of its intended length, is considered a rare example of a public work carried out by prisoners of the Trial Bay Gaol (SHR Criteria a and f). Further the breakwall is representative of coastal shipping routes and maritime infrastructure development along the New South Wales North Coast during the late nineteenth to early twentieth century (SHR Criterion a). The breakwall also forms part of the leisure and tourist landscape of Trial Bay (SHR Criterion d), may provide insights into Victorian engineering works and construction as well as the effects of human intervention on the landscape (SHR Criterion e), and is a good representation of a nineteenth century breakwall designed by the Harbours and Rivers Navigation Branch of the NSW Department of Public Works (SHR Criterion g).

ii Urunga Breakwall and Training Walls (Bellingen Local Environmental Plan 2010 A75, Morgo Street, Bellinger and Kalang Rivers west of the river mouth, Urunga NSW)

The Urunga breakwall is located on the mouth of the Bellinger and Kalang rivers on the North Coast of NSW, approximately 104 km north of the project area. Constructed from local stone quarried at Lower South Arm between 1895 and 1904, the purpose of the breakwall was to secure the river mouth by removing the bar, stopping sand movement and assist in the movement of cedar and goods between Urunga and Sydney. Later additions were completed after damage and the walls were also capped. The breakwall is included in the Urunga boardwalk tourist walk.

The Urunga Breakwall is representative of the difficulties and importance of maritime trade in the economic and social development of the area and is part of the group of breakwalls and training walls developed along the New South Wales North Coast during the late nineteenth (SHR Criteria a, c, g).

iii Breakwall and boat haven (Shellharbour Local Environmental Plan 2013 I051, Shellharbour Foreshore, Shellharbour NSW)

The Shellharbour Foreshore breakwall and boat haven is located on the South Coast of NSW, approximately 400 km south of the project area. The breakwall was constructed between 1877 and 1879 from dressed stone creating a walled masonry harbour reminiscent of English harbours. The harbour contributed to the commercial development of the area until the railway was completed in the late 1880s.

The Shellharbour Foreshore breakwall and boat haven is a historically significant port in south coast maritime trade contributing to the commercial and agricultural development of Shellharbour and later to the evolution of local tourism (SHR Criterion a). The breakwall has strong associations with Shellharbour village and is a visually prominent landmark of the village's historic cultural landscape (SHR Criteria b, c). The breakwall is considered a rare and excellent example of its type and has the possibility to provide information regarding nineteenth century civic engineering and the importance of a maritime industry in Shellharbour (SHR Criteria d, e, f, g).

iv Breakwall (Eurobodalla Local Environmental Plan 2012 I172, Annetts Parade, Mossy Point NSW)

The Mossy Point breakwall is located on the South Coast of NSW, approximately 550 km south of the project area. The breakwall was constructed from ship ballast stone brought from in barges Sydney between 1850 and 1859. Rails were installed along the item, during construction, to load timber on ships heading north to Sydney. Mossy Point is believed to have been named after the large moss-covered boulder at the termination of the breakwall.

Timber getting was the major industry of the Tomaga River region over the mid to late nineteenth century and the Mossy Point breakwall was constructed to support the transportation of timber by sea (SHR Criterion a). Moreover, the use of ship ballast in construction has the potential to offer information regarding sources of ballast and ballasting techniques as well as breakwall construction in NSW over the second half of the nineteenth century (SHR Criterion e).

5.9.2 Analysis

Comparison of the Trial Bay, Urunga, Shellharbour and Mossy Point breakwalls confirms that all were constructed to improve each place's access to maritime trade economies along the New South Wales coast, over the second half of the nineteenth century. By allowing greater access to townships by sea, breakwalls contributed to the growth of local economies until other methods of transportation were developed. Despite the decrease in sea-based transportation over the twentieth century, the breakwalls remain important tourist places for local townships and contribute to the historical cultural landscapes of their localities. The construction methods and materials of the breakwall walls vary, but both of the north coast breakwalls were constructed in a manner similar to the Port Macquarie southern training wall, with the use of boulders quarried from local stone. Minor works including remediation and additions have occurred at the breakwall sites but do not appear to have detracted from their significance.

5.10 Archaeological potential

5.10.1 Discussion

The archaeological potential in the project area is generally *low* with the potential for archaeological resources to meet the threshold for relics, also being *low*. The southern breakwall is intact but has been subject to minor upgrades over its history, the most significant being the concrete paving laid in the 1930s.

Edward Higginbotham & Associates *et al*. (1994b, p. 180; refer also to Plate 5.1) previously determined the northern coastline of the Port Macquarie township, including the breakwall and much of the reclaimed land, were areas of high archaeological potential. The designation of high archaeologial potential/sensitivity in this area was based on historical plans which show now demolished convict-era buildings/structures along Port Macquaire's northern coastline and the belief that only minor levels of disturbace have occurred in this area. While this may be true, the southern breakwall is in an area that was once in the estuary and away from the original coastline; therefore intact penal settlement archaeological resources will not be located on or near the majority of the breakwall as the area of land between the original coastline and the southern breakwall was reclaimed in the 1950s. If artefacts and building fabric exist in this area and relate to the early colonial period of Port Macquarie they would have been redistributed in the reclaimed area as fill and have therefore lost context.

Higginbotham's (1994b, p. 180) analysis of the southern breakwall classes the training wall structure as "visible archaeological remains" and notes the "existing structure" of the reclaimed land excludes the southern boundary of the breakwall reserve. Moreover, the southern breakwall and reserve were believed to reveal evidence relating to the following themes:

- The penal settlement (Rare, State/National);
- The early nineteenth century development of the town (Rare, Regional);
- The late nineteenth or twentieth century development of the town (Representative, Regional);
- The nature of convict labour or public works undertaken by convict labour (Rare, State); and
- The government administration or improvement of maritime trade & communications (Rare; Regional).

The southern breakwall contributed to the late nineteenth and twentieth century development of the Port Macquarie Township, but the potential for evidence relating to the remaining above themes is unlikely. Plans show that the penal settlement structures were located at least 20 m inland from the coastline (c. 30 m from the mapped edge of the sand) (Plate 5.6), which is at least 110 m from the parallel section of the southern breakwall and approximately 25 m from the edge of the colonial streets and structures. Evidence of early structures may survive close by, but they would be beneath twentieth century buildings and outside of the project area.

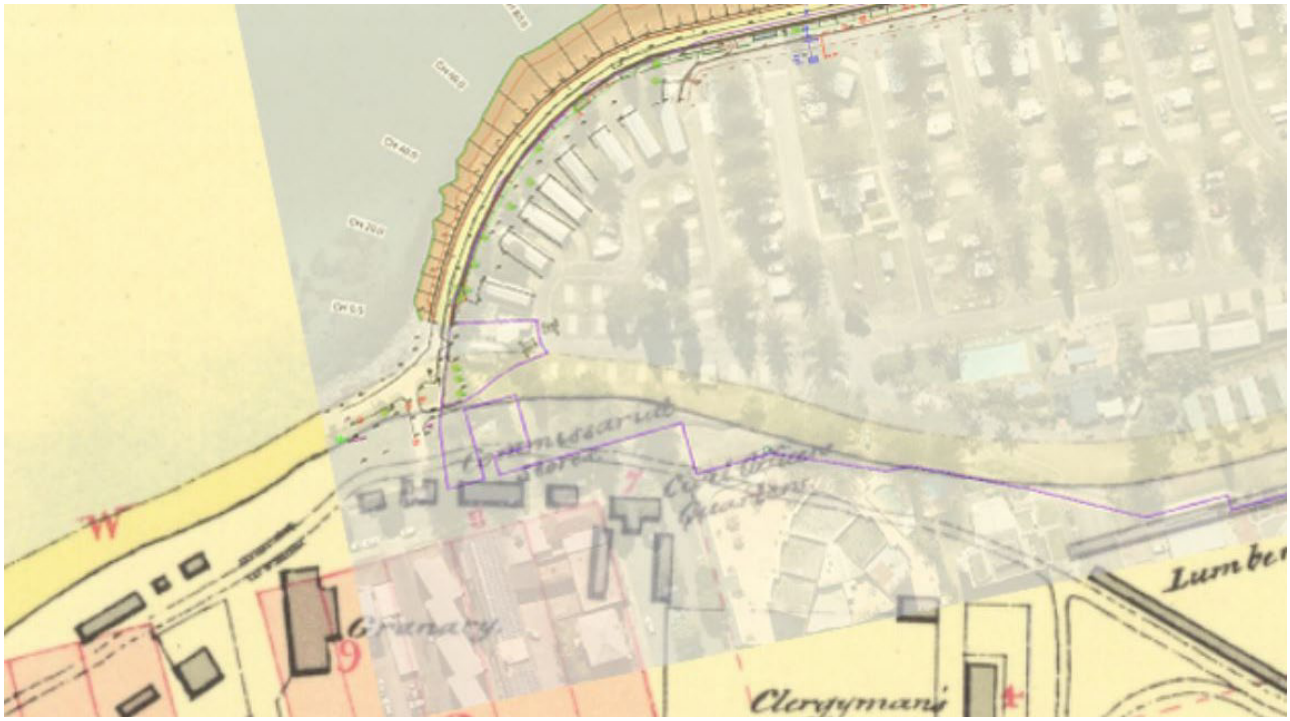

Plate 5.6 Overlay of current proposal on the 1831 'Plan of Port Macquarie'.

The proposed southern breakwall remediation and upgrade works will primarily occur on reclaimed land composed of introduced fill deposited after 1956. As such, the inner revetment of the breakwall reserve holds *nil* archaeological potential for intact relics is also *nil*.

There is *nil* archaeological potential relating to the Port Macquarie Penal settlement in the project area away from the south-western connection to the original foreshore.

Historical plans of the project area, however, place the south-western termination of the breakwall, over the original Port Macquarie coastline and in proximity to colonial structures. Colonial buildings may be preserved in archaeological form, but based on the analysis in this report, that evidence is unlikely to fall within the boundary of the project.

Further, the level of excavation completed in the area where the breakwall connects to the mainland, during construction, is not understood and therefore, the cautious approach is to assume that evidence of the early shoreline has been preserved. The assessment must conclude that potential exists for remnants of the coastline to remain intact beneath the southern breakwall and introduced fill, but this evidence will be beyond the depth of the project activities.

There is *low* potential for relics related to the Port Macquarie Penal settlement to occur where the southern breakwall meets the original coastline.

There is *low potential for evidence of the original shoreline to exist in the project area.*

The 1901 plan of the Port Macquarie breakwall schemes places the tramway used in its construction in the vicinity of the project area in this location (Plate 4.4). If the tramline was left *in situ* after the completion of the southern breakwall it is likely to have been covered over by later development, such as the construction of the path in the 1930s and survive at least partially intact. Given the possibility of sub-surface evidence of the tramway, the south-western termination of the breakwall has moderate to high archaeological sensitivity until demonstrated otherwise.

If evidence of the tramline were to survive it would be classified as a work, not a relic.

There is moderate potential for the survival of remnant tram tracks, installed for the southern breakwall construction. These items are 'works'.

6 Assessment of significance

6.1 The significance framework

In NSW, historical value is ascribed to buildings, places, archaeological sites and landscapes modified in the Australian historical period for purposes other than traditional Aboriginal use. The assessment of heritage significance is based on the *Burra Charter* (Australia ICOMOS 2013) and further expanded upon in *Assessing Heritage Significance* (NSW Heritage Manual Heritage Office 2001). The heritage manual lists seven criteria to identify and assess heritage values that apply when considering if an item is of state or local heritage significance, which are set out in Table 6.1. It also identifies the heritage gradings for which items (or features or components) that were recorded on site have been assessed against, which are set out in Table 6.2, and which provide context for each individual item's contribution to the cultural landscape. The result of the assessments of significance may determine that an individual component does not meet the threshold for local or State significance as an individual item, but that it does contribute to the significance of the cultural landscape.

The criteria against which heritage significance have been assessed are reproduced in Table 6.1. Gradings of significance are reproduced in Table 6.2. The assessment of relics is hypothetical as their existence as intact and substantial sites is predicted.

Table 6.1 NSW heritage assessment criteria

Criterion	Explanation
a)	An item is important in the course or pattern of NSW's (or the local area's) cultural or natural history (Historical Significance).
b)	An item has strong or special association with the life or works of a person, or group of persons of importance in NSW's (or the local area's) cultural or natural history (Associative Significance).
c)	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area) (Aesthetic Significance).
d)	An item has a strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons (Social Significance).
e)	An item has the potential to yield information that will contribute to an understanding of NSW's (or the local area's) cultural or natural history (Research Significance).
f)	An item possesses uncommon, rare or endangered aspects of NSW's (or the local area's) cultural or natural history (Rarity).
g)	An item is important in demonstrating the principal characteristics of a class of NSW's (or the local area's) cultural or natural places or environments (Representativeness).

Source: *Assessing heritage significance* (NSW Heritage Office 2001, p.9).

Table 6.2 NSW heritage assessment gradings

Grading	Justification	Status
Exceptional	Rare or outstanding element directly contributing to an item's local or state significance.	Fulfils criteria for local or State listing.
High	High degree of original fabric. Demonstrates a key element of the item's significance. Alterations to not detract from significance.	Fulfils criteria for local or State listing.

Table 6.2 NSW heritage assessment gradings

Grading	Justification	Status
Moderate	Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance of the item.	Fulfils criteria for local or State listing.
Little	Alterations detract from significance. Difficult to interpret.	Does not fulfil criteria for local or State listing.
Intrusive	Damaging to the item's heritage significance.	Does not fulfil criteria for local or State listing.

Source: *Assessing heritage significance* (NSW Heritage Office 2001, p.11).

6.2 Assessment of the southern breakwall

The southern breakwall forms part of locally listed Port Macquarie training walls and breakwalls group (Port Macquarie LEP 2011 archaeological site A060). The SHI listing for this item does not provide a detailed assessment of significance but notes the site is "historically significant regionally" against criteria a) Historical, d) Social, and g) Representativeness. The current statement of significance for the Port Macquarie training walls and breakwalls is as follows:

> These training walls are representative of the large government investment in improving coastal and riverine navigation on most of the major Northern Rivers, and indicate the technological difficulties of navigation as well as massive harbour works (SHI A060 *Training walls and breakwalls*).

Table 6.3 assesses the significance of the southern breakwall as an individual item and does not consider the significance of the other sites in the breakwall group. Moreover, the assessment considers the significance of potential relics. This table will be employed to present an updated statement of significance for the Port Macquarie southern breakwall in Section 6.2 (i)

Table 6.3 Assessment of significance

Criterion	Assessment
a) Historical	The construction of the southern breakwall is evidence of the importance of maritime-based communication and trade to the settlements along the North Coast of NSW over the nineteenth and early twentieth centuries. The southern breakwall was one of several north coast breakwalls designed by the Public Works Department Harbours & Rivers Branch over the late nineteenth and early twentieth centuries. The New South Wales economy was dependant on sea transportation throughout the nineteenth century and coastal townships needed safe, easy access ports to export local goods to and from Sydney. Port Macquarie's Hastings River bar had long been the bane of ships travelling the North Coast routes. As the Port Macquarie township began to make notable economic progression through the timber trade in the 1870s the need for a breakwall to move the bar and deepen the estuary entrance became essential. Construction on the southern breakwall was completed between 1897 and 1901. Local bluestone basalt boulders quarried and transported from the local Aston Hill via tramway were used to construct the training wall. After the First World War, Port Macquarie's economy shifted focus to tourism and the breakwall became a place of public recreation. The southern breakwall is intact and has undergone minor alterations. The site holds potential to inform on breakwall construction techniques and may hold evidence of local maritime activities at its lower levels its 120-year history. **The site meets the threshold for local significance.**

Table 6.3 Assessment of significance

Criterion	Assessment
b) Associative	Although the southern breakwall has an association with the Port Macquarie tourism landscape since the 1930s, the association does not meet the threshold for associative significance. **The site does not meet this criterion.**
c) Aesthetic	This site forms a well-known landmark within Port Macquarie as it is visible and recognisable from the ocean, sky and surrounding land. The design is technological progressive, offering protection of the shoreline from the wave breaks, preventing erosion through the years. Additionally, the associated graffiti is a visual representation of the coming and goings of tourist in the area, over time and their social ownership of the place. **The site meets the threshold for local significance.**
d) Social	The southern breakwall has special associations with the residents of Port Macquarie as well as visitors, who holiday there. The graffiti and memorials marking the stone boulders of the training wall are tangible examples of the importance the breakwall has in the cultural connection to Port Macquarie. **The site meets the threshold for local significance.**
e) Research	The southern breakwall is intact and has had minor alterations. The structure, as well as land to the south-west of the breakwall, has the potential to yield archaeological resources which may contribute to information regarding late nineteenth century maritime engineering in New South Wales and local construction techniques, which not readily available from other sources. The southern breakwall forms part of a group of late nineteenth century Public Works Department Harbours & Rivers Branch designed breakwalls on the North Coast of NSW. There is little to no current research which considers the North Coast breakwalls and training walls as a group and analyses of these items as a group may contribute to understandings of coastal economies over a wide area of NSW and the plans versus physical realities of later nineteenth century government designed public works. **The site meets the threshold for local significance.**
f) Rarity	The comparative analysis places the southern breakwall in a class of similar coastal infrastructure on the north coast of NSW. **The site does not meet this criterion.**
g) Representativeness	The southern breakwall is representative of coastal developments made by NSW coastal towns over the nineteenth century. The southern training wall is also a fine example of a late nineteenth century North Coast breakwall designed by the Public Works Department Harbours & Rivers Branch. **The site meets the threshold for local significance.**

i Statement of significance

The southern breakwall is a locally significant structure with connections to Port Macquarie's maritime history and more recent history as a place of tourism and leisure. The southern breakwall was constructed between 1897 and 1901 to improve Port Macquarie's access to, and participation in, the NSW North Coast maritime trade economy. The southern breakwall has also been part of the Port Macquarie tourism landscape from the 1930s and continues to serve as an important landmark in the cultural identity of Port Macquarie.

The site is intact and has the potential yield archaeological resources and reveal archaeological works which may contribute to our understandings of late nineteenth century maritime engineering and construction techniques. Further, potential archaeological resources relating to 120-years of maritime and tourism activities around the breakwall may be present within the training wall structure. The southern breakwall has also had impacts on the physical and cultural landscape of Port Macquarie and these impacts may be revealed though community-based research.

The training walls are representative of the North Coast breakwalls designed by the Public Works Department Harbours & Rivers Branch over the late nineteenth century. In future, the site may also offer contributary State significance to the late nineteenth century breakwall scheme along the North Coast of New South Wales.

7 Heritage impact assessment

7.1 Background to assessing impacts

7.1.1 Introduction

The assessment of a project's impacts to the heritage significance of a place or an item is to understand change, if it is beneficial to the place or item, and how changes can be managed to best retain significance. The historical landscape in Australia, be it rural or urban, is by social agreement, a significant aspect of our identity (refer to Section 7.1.2). That agreement is codified in legislation, the intent of which is to encourage the conservation of cultural heritage by incorporating it into development where feasible. In many situations avoiding impacts is impossible, but the aim is to reduce those impacts by either project re-design or managing the loss of information through methods that reduce and/or record significance before it is removed.

The framework around assessing significance and therefore suitable levels of impact is to understand how the place or item came to be, how important it was (and may be still) in the development of the local area or the state (the colony at the time) and providing guidance on its management. This is what this report aims to do.

Table 7.1 Summary of the nature of impacts

Major negative impacts (substantially affects fabric or values of state significance)
Moderate negative impacts (irreversible loss of fabric or values of local significance; minor impacts on State significance)
Minor negative impacts (reversible loss of local significant fabric or where mitigation retrieves some value of significance; loss of fabric not of significance but which supports or buffers local significance values)
Negligible or no impacts (does not affect heritage values either negatively or positively)
Minor positive impacts (enhances access to, understanding or conservation of fabric or values of local significance)
Major positive impacts (enhances access to, understanding or conservation of fabric or values of state significance)

7.1.2 Inter-generational equity

Aboriginal cultural heritage management is based on the principle of inter-generational equity, the intent of which is to ensure present generations consider future generations when making management decisions about culture. This principle is possibly the most relevant part of the notion of ecologically sustainable development (ESD) when considering Aboriginal cultural heritage management.

The same philosophy is applied to historical heritage management and is covered under the ICOMOS *Burra Charter:*

> Article 1.2 Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present and future generations (Australia ICOMOS 2013, p.2).

The Burra Charter continues:

> Places of cultural significance enrich people's lives, often providing a deep and inspirational sense of connection to community and landscape, to the past and to lived experiences. They are historical records, [sic] that are important expressions of Australian identity and experience. Places of cultural significance reflect the diversity of our communities, telling us about who we are and the past that has formed us and the Australian landscape. They are irreplaceable and precious.
>
> These places of cultural significance must be conserved for present and future generations in accordance with the principle of inter-generational equity.
>
> The Burra Charter advocates a cautious approach to change: do as much as necessary to care for the place and to make it useable, but otherwise change it as little as possible so that its cultural significance is retained.
>
> (Australia ICOMOS 2013, p.1)

7.2 The proposal

The purpose of the proposed work is to address issues of toe scour and the movement/displacement of rock armour on the sea-side of the breakwall. The effects of climate change have also been considered in the development of the project scope.

In addition, the footpath will be widened along the crest of the breakwall , access will be provided and ancillary items such as lighting will be added. The work will be in accordance with *Breakwall Concept Plan* prepared by the Port Macquarie-Hastings City Council.

Refer to excerpts in Plate 7.5 to Plate 7.8.

7.3 Sources of impact

The proposed southern breakwall remediation works and upgrades have been designed to improve the structural integrity of the training wall and public accessibility to the waterfront. The proposed works will occur within the curtilage of the locally listed Port Macquarie training walls and breakwalls (Port Macquarie LEP 2011 A060). Impacts are expected to occur as a result of the works including:

- physical impacts are those impacts that will materially affect the features and sites that are present within the project area whether they were found or if they are unanticipated; and
- visual impacts are those impacts that will affect the views and the setting of the cultural landscape and nearby built items within the project area and surrounds.

"Full Reconstruction" of the breakwall: The western three-quarters of the southern breakwall outer revetment, CH0.0 to CH565.0, will be subject to "full reconstruction" (Plate 7.1, Plate 7.2). The boulders of the breakwall will be removed above the -2.0 AHD mark and replaced below -2.0 AHD to form the new 5 m wide (seaward) breakwall toe, increasing the width of the foundation to increase the scour level. The exposed foundation of the breakall above -2.0 AHD will be levelled where necessary and covered with geofabric. The fabric will be covered with a gravel underlayer before the new armour rock, each approximately 1.35 m in diameter, is added.

"Top Up": Boulders will be added in the eastern c.165 m of the breakwall outer revetment and breakwall head (Plate 7.2, Plate 7.3). Boulders will be added in areas: CH565.0 to CH605.0 and CH720.0 to CH740.0 (the breakwall head).

Crest Path: The existing breakwall pedestrian path will be extended south into the current embankment area (Plate 7.5, Plate 7.6, Plate 7.7). The width of the public path will increase in width from 2.5 m to 5 m. As a result, the current inner embankment will decrease in width from 7.5 m to 3.5 m. The original path will be removed along the "full reconstruction" area and formed concrete retaining walls will be installed abutting the outer revetment armour and along the inner crest. Compacted sterile fill will be added to level the path area between the retaining walls which will be topped with the poured concrete walkway reinforced with steel mesh.

Sterile fill will be deposited along the current embankment and compacted every 300 mm in depth to level the area prior to the path widening works. Fill will also be introduced to increase the angle of the slope of the inner embankment to meet the pathway extension.

Additional public facility upgrades: Two sets of formed, reinforced concrete stairways, ascending to the north, will be set into the inner embankment fill. Current plans locate these stairs at CH140.0 and CH345.0. The stairs at CH140.0 will measure 12 m in width with the stairs at CH345.0 measuring 7 m in width.

Formed, reinforced concrete access ramps will be installed between at CH525.0 to CH565.0. The access ramps will be installed on reclaimed land which will be levelled with compacted fill. The primary access ramp (yellow) at CH525.0 to CH565.0 will travel east/west and connect the access road to the current skate park pathway. A second ramp to the south will travel north from the road to the primary ramp via a set of proposed stairs (blue) at CH545.0, which will be flanked by landscaping (green) (Plate 7.4**Error! Reference source not found.**).

Foundations for steel handrail poles will be excavated into the fill.

Removal of existing trees and infrastructure: Approximately thirteen (13) mature trees, primarily casuarinas, will be removed along the inner embankment to make space for the path extension works. The majority of Norfolk Island Pines will be retained. A standing fence located at CH90.0, bins and signs will be relocated. Five benches along the public path are scheduled for removal.

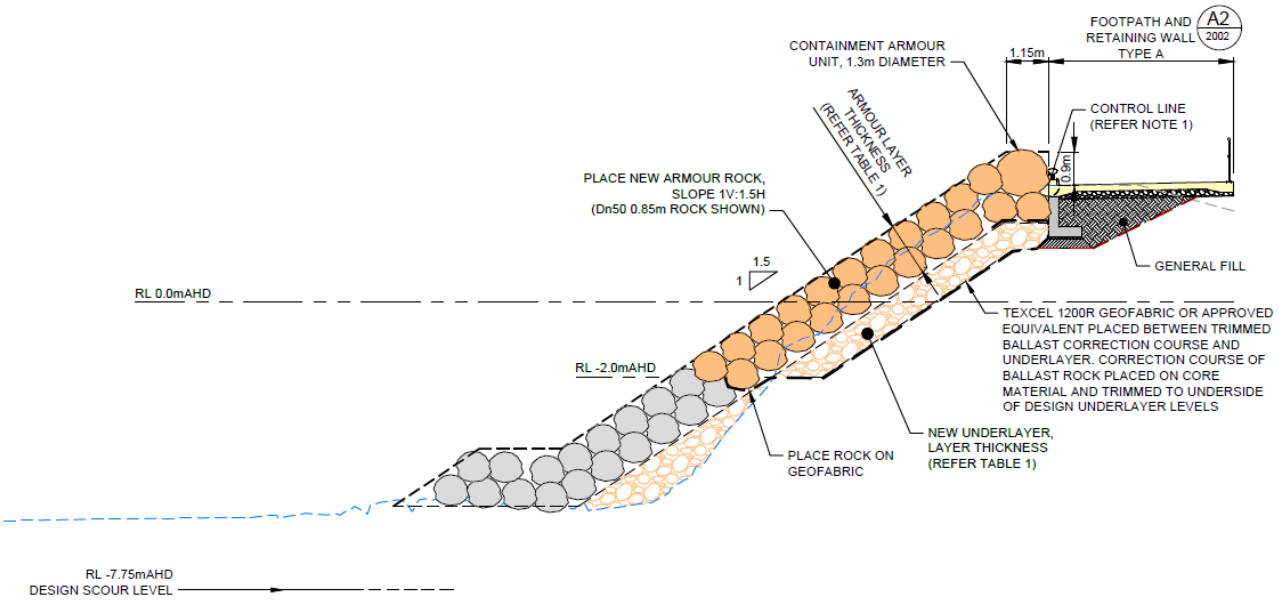

Plate 7.1 Detail of the southern breakwall remediation works "full reconstruction" of the breakwall. Royal Haskoning DHV 2022 (22 Feb), Drawing No. PA2696-RHD-CI-00-DR-ME-2001

Plate 7.1 shows the breakwall reconstruction in section. The grey circles show the reused original breakwall boulders and the new armour is shown as orange circles. The retaining wall is illustrated as a grey "L" shape and the widening of the crest pathway is marked in yellow.

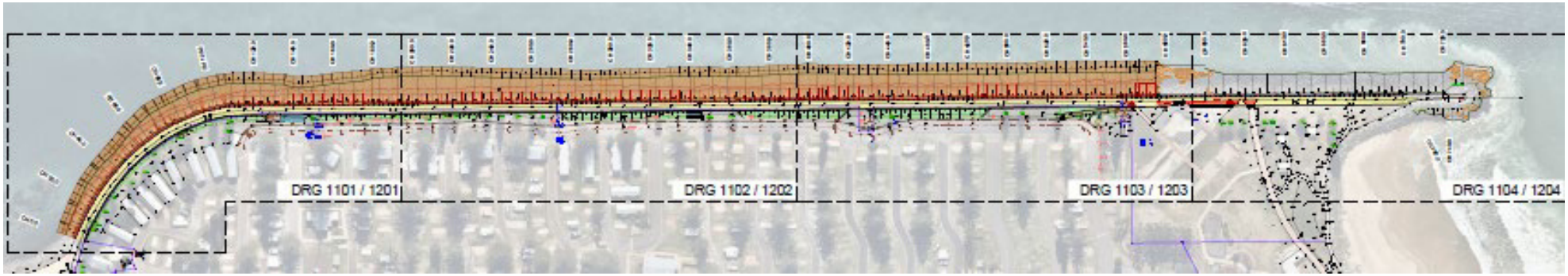

Plate 7.2 Overview of the southern breakwall remediation works and public facility upgrades. Royal Haskoning DHV 2022 (22 Feb), Drawing No PA2696-RHD-00-00-DR-ME-1000.

Plate 7.2 shows the section of the breakwall outer revetment subject to the proposed full reconstruction in solid orange. The boulder “top up” is shown as orange circles. The widening of the crest pathway is marked in yellow.

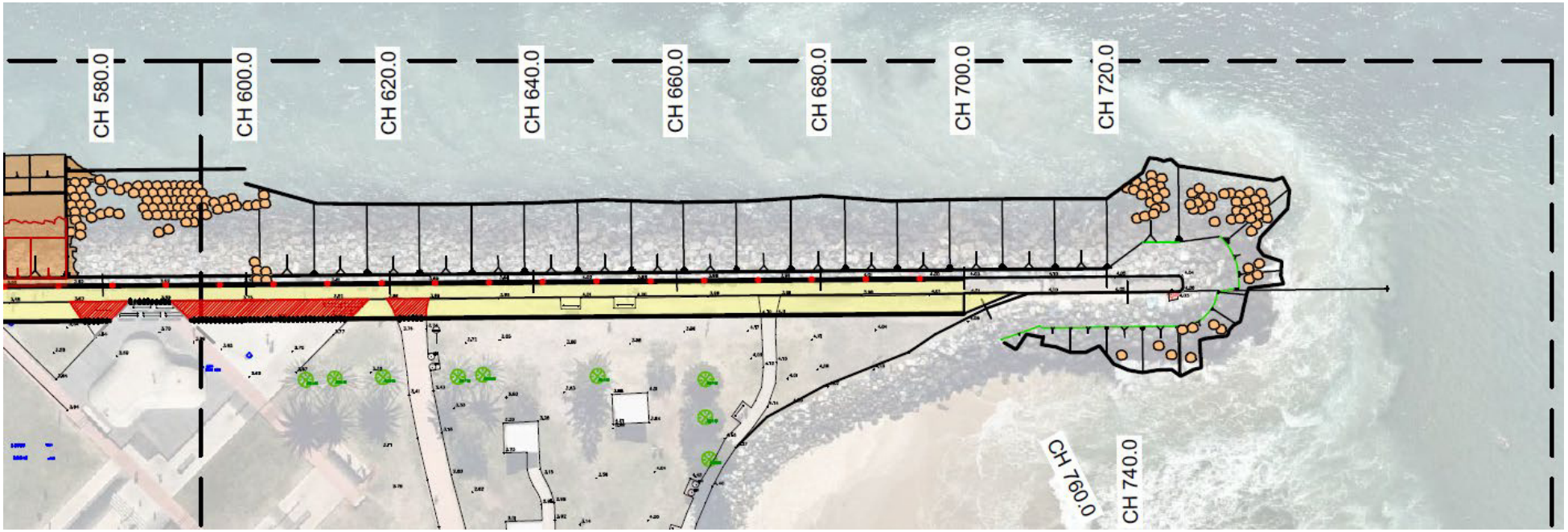

Plate 7.3 **Detail of the southern breakwall remediation works and public facility upgrades. Royal Haskoning DHV 2022 (22 Feb), Drawing No PA2696-RHD-00-00-DR-ME-1000.**

Plate 7.3 shows the addition of boulders (orange circles).

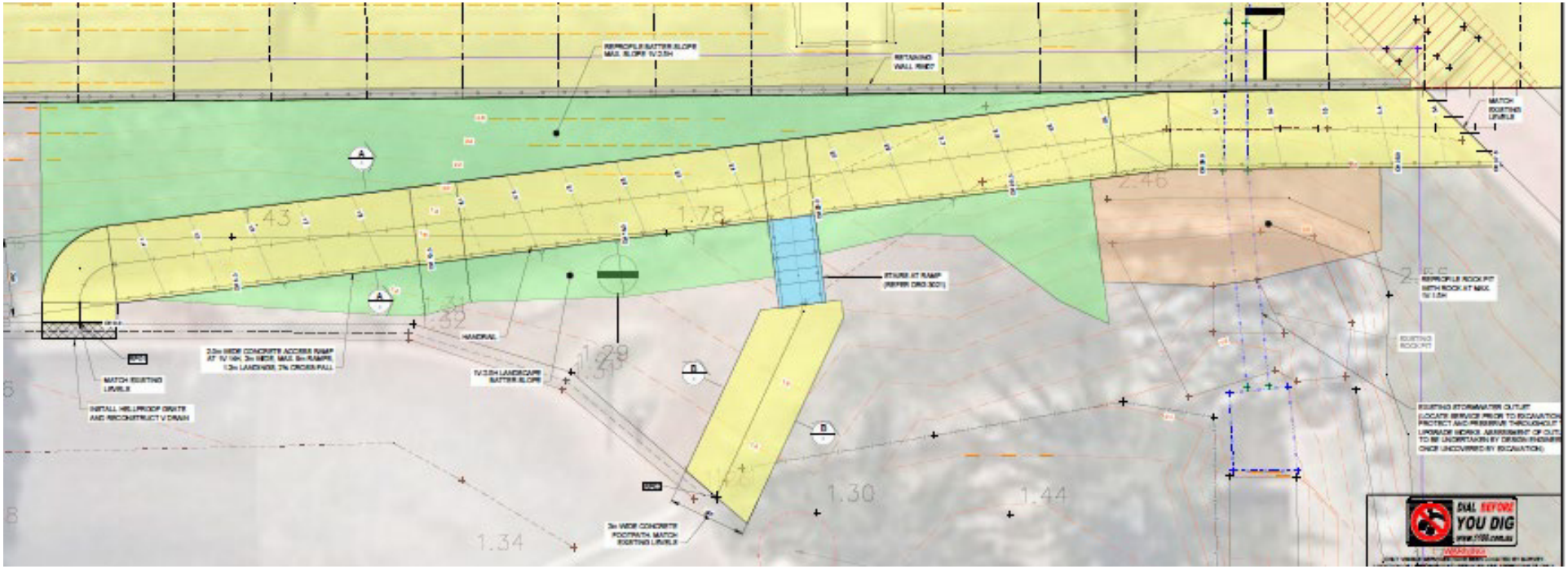

Plate 7.4 Detail of the southern breakwall remediation works access ramps. Royal Haskoning DHV Drawing No. PA2696-RHD-CI-00-DR-ME-2301.

Plate 7.4 shows the access ramps and path extension in yellow, stairs are marked in blue and the green fill represents landscaping. The orange filled area in the east of the image is an extant stormwater rock pit.

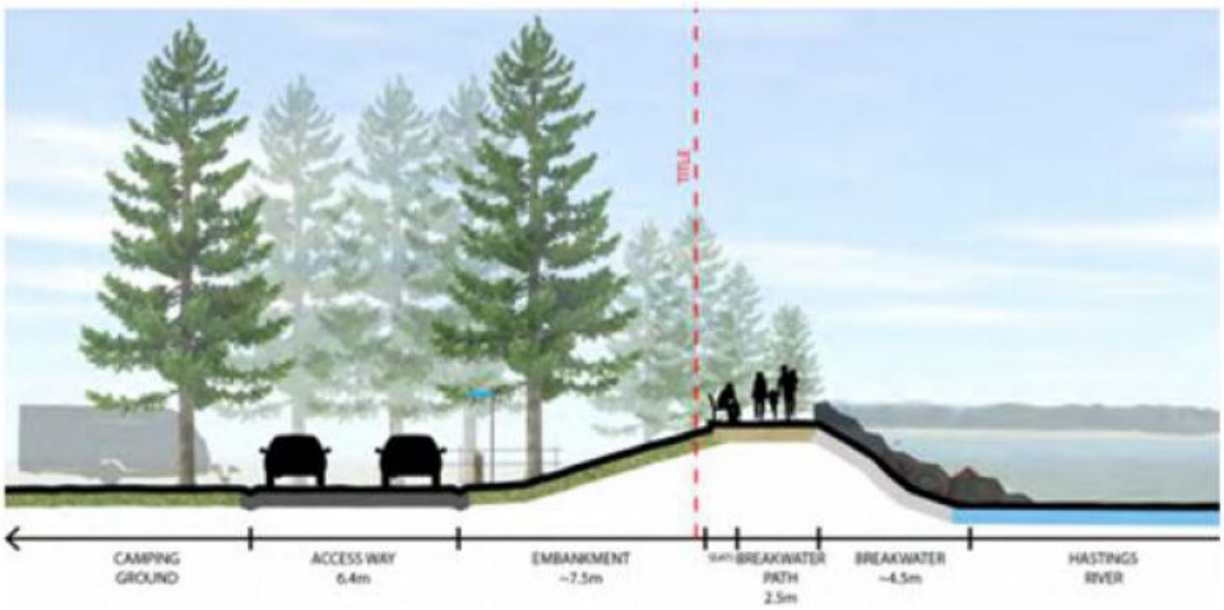

Plate 7.5 Cross section of existing breakwall path (Haskoning Australia Pty Ltd, 2021, p.6)

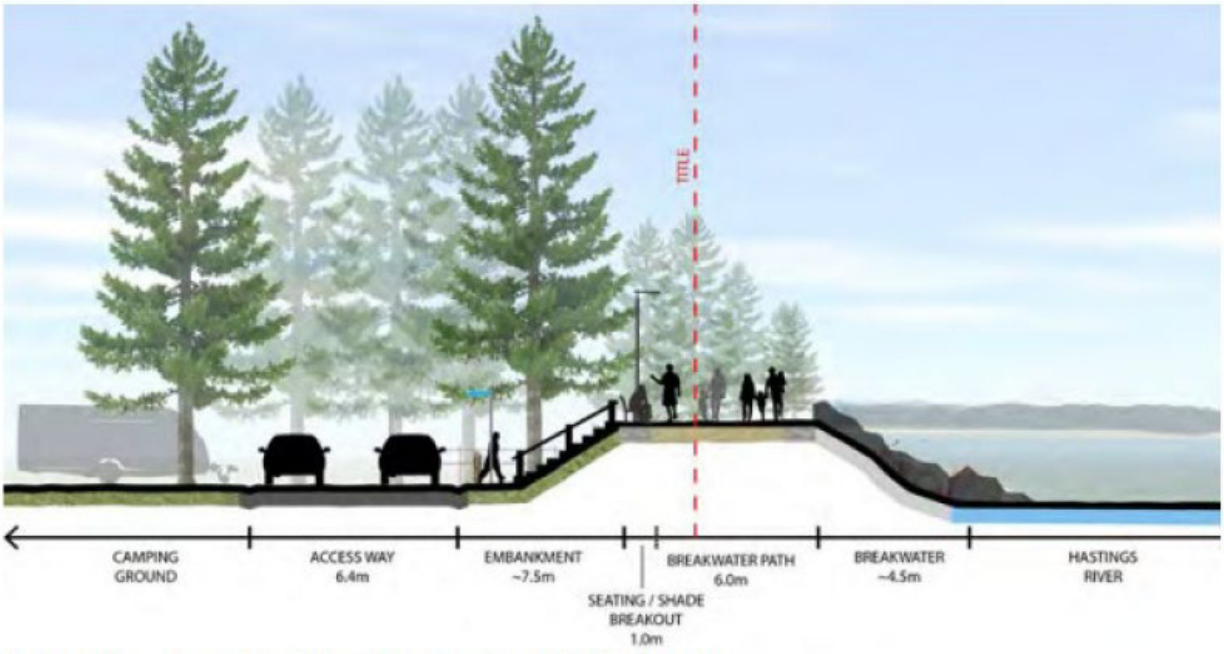

Plate 7.6 Cross section of the concept. The drawing is not to scale (Haskoning Australia Pty Ltd, 2021, p.7)

Plate 7.7 **Mock-up plan of proposed crest path upgrade works within the current landscape. From Breakwall Master Plan extract in proposal (Haskoning Australia Pty Ltd, 2021, p.7)**

7.4 Assessment of impacts

7.4.1 Impacts to listed heritage items

i Proposed activities

The southern breakwall forms part of locally listed Port Macquarie training walls and breakwalls group (Port Macquarie LEP 2011 archaeological site A060). The Port Macquarie breakwall group is recognised as a significant heritage item representative of government investment in improving coastal/riverine navigation on the North Coast and indicative of technologies of associated with navigation and harbour works (SHI A060 Training walls and breakwalls). As a stand-alone site, the southern breakwall fulfils the criteria for local significance due to its connections to Port Macquarie's maritime history and more recent history as a place of tourism and leisure.

The full reconstruction of approximately three-quarters of the southern training wall will remove the majority of the exposed 1897-1901 breakwall outer revetment and result in the loss of historical, research and representative heritage significance and negatively impact social heritage significance to a lesser degree.

The addition of boulders at the eastern c.165 m of the breakwall outer revetment will not have a detrimental impact on the significance of the southern breakwall.

ii Consideration of alternatives

The southern breakwall remediation works are necessary to correct the toe scour and rock displacement which pose a risk to the future structural integrity of the breakwall structure and the Port Macquarie coastline. Management measures to mitigate the loss of heritage significance are presented in Section 7.4.2.

7.4.2 Impacts to relics and archaeological resources

i Proposed activities

The outer revetment is likely to retain evidence associated with the construction of the breakwall and use of the structure as a place of leisure through the twentieth century. The full reconstruction of three quarters of the outer revetment will impact the training wall structure.

Reconstruction work will reach the south-wester west termination of the breakwall (Plate 7.8). The south-western termination has *moderate* archaeological potential for evidence of the tramline that was installed for the breakwall construction program; the tramline, however, would not be classified as a relic, but as a work.

The removal of a stand of six mature Casuarina trees in this area will cause sub-surface disturbance (Plate 7.8). Casuarinas and Norfolk Island Pines were planted on the embankment during the final stages of reclamation work in the late 1980s. Casuarina species tend to create wide, shallow root mats but may send out deep taproots if in need of water (Sanchez, 2019). It appears the trees have been planted high on the current embankment slope, thus unless the depth of the roots is substantial, their removal is unlikely to have an impact on archaeological resources, or the now buried original coastline.

There is a *low* potential for evidence of the colonial period penal settlement to exist in the project area. The proposed works are in an area of largely reclaimed land and the location where the breakwall meets the mainland has been modified from a coastline. Buildings and infrastructure related to the early historical period did not extend as close to the coast as the project area.

The proposed breakwall remediation and upgrades works on the breakwall crest and inner embankment are not expected to impact archaeological resources and/or relics beyond the south-western terminus.

ii Consideration of alternatives

The size, location and environmental factors that have led to the project's necessity do not allow scope for alternatives.

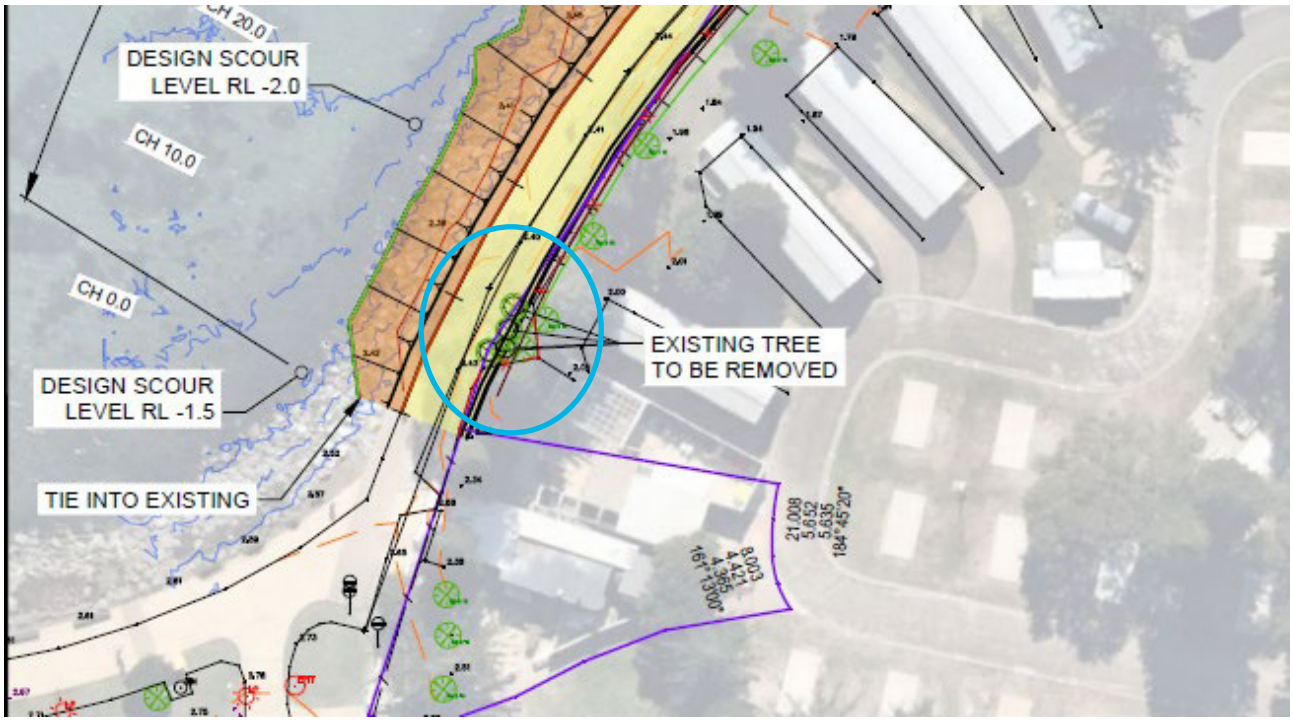

Plate 7.8 **Proposed plan of southern breakwall remediation works and upgrades. Source: Royal Haskoning DHV drawing number PA2696-RHD-00-00-DR-ME-1001**

Plate 7.8 is a detail of the proposed remediation and upgrade works. The blue circle shows the location of trees to be removed in an area of moderate archaeological potential.

7.4.3 Impacts to landscape

i Proposed activities

Access to the cultural landscape of the southern breakwall will be improved following the completion of the remediation woks and public facility upgrades.

The removal of trees along the breakwall crest public pathway will change the views of the Port Macquarie coastline and the ambience of the public path.

The full reconstruction of three quarters of the breakwall has the potential to impact community connection to the site if the structure comes to be considered “new” and “unspoilt”. If the breakwall is replaced as new, it may discourage the tangible expressions of connection to the cultural landscape of Port Macquarie through the installation of graffiti and memorials. The removal of the graffiti rocks will have an impact on the social values of the breakwall; however, Council has consulted with the community, which has been invited to record the paintings and remove memorial plaques.

The cultural landscape inside the project area contributes to the local significance of the southern breakwall and should be considered in the final designs for remediation works and public amenities upgrades. The minor negative impacts to the cultural landscape of the southern breakwall will not result in the reduction of associative and social heritage significance.

ii Consideration of alternatives

The removal of the trees is necessary to widen the public path and improve access to the southern breakwall. Plans do not currently state if appropriate vegetation will be reintroduced to the area beyond the landscaping around the access ramp.

Changes to the structure and landscape of the southern breakwall are unavoidable due to the necessity of the remediation works. Management measures to mitigate the loss of heritage significance are presented in 8.1.

7.5 Statement of heritage impact

The proposed southern breakwall remediation works and public facilities upgrades will occur on public reserve land held by Transport for New South Wales, within the curtilage of the locally listed *Port Macquarie training walls and breakwalls* (Port Macquarie LEP archaeological site A060).

The site has a history of minor upgrades and minor remediation works and upgrades are noted to have occurred at comparative breakwall sites, which have not affected the heritage values of the structures. As such, it is not predicted that the introduction of boulders along the eastern c.165 m of the break wall will impact the significance of the southern breakwall.

The reconstruction of approximately three quarters of the southern breakwall outer revetment, however, will result in minor negative heritage impacts and some loss of heritage significance through the loss of original fabric in the form of the public graffiti and memorials.

The upgrades to public facilities are expected to have an overall positive impact to the southern breakwall enhancing public access and use of the site. The change in the landscape of the breakwall as a result of the widening of the pathway will be absorbed into the current visual landscape readily.

The south-western termination of the breakwall has *low* to *moderate* sensitivity. The removal of six mature trees in this area will cause sub-surface disturbance but it is not anticipated that relics exist in this area; however, tramline elements may be exposed. It is unlikely that the earlier coastline will be unearthed but there is a small possibility that this will be the case.

The upgrades to public facilities along the breakwall crest and inner embankment are not expected to expose relics or to negatively impact the significance of the southern breakwall.

8 Recommendations and management

8.1 Heritage management objectives

The overriding objective in managing heritage significance is the avoidance of impacts. Avoidance removes the need for mitigation or amelioration and is in keeping with the philosophy of the *Burra Charter 2013* (Australia ICOMOS 2013).

In all cases where significant heritage values may be affected by a project, it is prudent to take a precautionary approach by excising the construction disturbance footprint where it intersects with heritage items or with areas that have been identified as having potential to contain relics.

An overarching strategy to protect the significance of heritage items within the development footprint has been followed to date and will continue as needed through adoption of a precautionary approach. This will continue to be applied for all activities that could impact on heritage items or potential heritage items. That is, the items will either be completely excluded from the development footprint or its heritage values will be investigated and recorded prior to the works if its removal is appropriate.

The southern breakwall is managed by the Maritime Infrastructure Delivery Office (MIDO), which a state-owned corporation classified as a public authority under Section 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and a determining authority under Part 5 of the Act. Under Section 5.6 of the EP&A Act and Clause 171 of the *Environmental Planning & Assessment Regulation* 2021 (EP&A Regulation), TfNSW is responsible for assessing the impacts of its activities.

The "Port Macquarie training walls and breakwalls" are listed as a locally significant archaeological site (A060) under Schedule 5 of the *Port Macquarie-Hasting LEP 2011* (LEP). As an identified relic, or collection of relics, the subject site is protected under Section 139 of the *Heritage Act 1977* (Heritage Act).

8.2 Recommendations

The general management measures for the *Port Macquarie training walls and breakwalls* outlined in the *Archaeological Management Plan, Port Macquarie* (AMP, Inventory No 146) (Edward Higginbotham & Associates et al., 1994b, p. 180) are for an excavation permit to be obtained prior to disturbance (conserved (Edward Higginbotham & Associates et al., 1994b, p. 180) it is considered unnecessary to do so for the current scope of works.

Although the level of potential for relics has been assessed to be *low*, it would be prudent to engage an archaeologist to monitor the removal of trees and excavation in the south-western section of the project area. The inclusion of archaeological monitoring can be undertaken through an exception to the requirement for an excavation permit under subsections 139(1) and (2) of the Heritage Act. This exception (known as an 'archaeological work method statement') should be kept on record, along with this report and any other relevant material for the recommend five to ten years.

The recommendations to facilitate the project are as follows:

1. Adopt the management measures below; and

2. Keep a copy of this report, and other relevant material on record for Heritage NSW.

8.3 Management measures and mitigation options

The southern breakwall remediation works and upgrades are necessary to correct the toe scour and rock displacement which pose a risk to the future structural integrity of the breakwall and coastline. As a result, many of the impacts associated with the project cannot be avoided but where possible management measures to reduce the severity of impacts and loss of heritage significance should be employed. A summary of management measures are listed in Table 8.1. Further instructions on how to undertake the specific management measures can be found in Section 8.3.

Table 8.1 Project area management measures

Site component	Site type	Significance / grading	Impact type	Project modifications	Management or mitigation options
Port Macquarie Southern Breakwall outer revetment	Training wall/ breakwall; archaeological site	Local contributory – Port Macquarie training walls and breakwalls" (Port Macquarie-Hasting LEP 2011 A060) Local– not listed	Physical and visual: partial demolition and reconstruction; addition of new material	None possible	• Archival photography (Section 8.3.6i) • Reconstruction methods (Section 8.3.1) Apply if necessary; • Unexpected finds (Section 8.3.3) • Management of relics (Section 8.3.6ii) • Interpretation if relics are found (Section 8.3.6iv)
Breakwall crest and inner breakwall	Training wall/ breakwall; public recreation area	Local contributory	Physical and visual – public amenities upgrade, tree removal	Not necessary	• Archival photography (Section 8.3.6i)
South-western termination of breakwall crest and inner breakwall	Training wall/ breakwall; public recreation area; potential archaeological site	Local	Physical and visual – public amenities upgrade, tree removal Relics are not expected along the breakwall crest nor inner embankment. The south-western termination of the breakwall has been assessed to possess *low* potential for relics. There is moderate potential for the survival of remnant tram tracks, installed for the southern breakwall construction. These items are 'works'.	To be determined	Avoid; OR Archival photography (Section 8.3.6i) Apply if necessary; • Management of relics (Section 8.3.6ii) • Interpretation if relics are found (Section 8.3.6iv)

Table 8.1 Project area management measures

Site component	Site type	Significance / grading	Impact type	Project modifications	Management or mitigation options
Cultural landscape	Landscape – modified and evolving; coastal leisure	Local contributory – not included in A060 listing	Physical and visual – public amenities upgrade, change in topography (introduction of fill); tree, fence etc. removal	None possible	• Archival photography (Section 8.3.6i)

8.3.1 Reconstruction methods

To minimise the impact of the remediation works the following measures should be applied:

1. Boulders and materials used in the remediation should be in keeping with the original materials used in the construction of the breakwall, ie local bluestone and concrete. If not possible the introduced material should complement the size, shape and colour of the original materials.

2. Original breakwall materials should be kept and reused during the reconstruction process. Ideally, the original stones would be relocated in the upper, visible sections of the breakwall, however, current plans propose to reuse the stones to form the foundation of the new breakwall structure. If original breakwall stones are not suitable to be replaced than they should remain within the project area, ie used for landscaping.

3. If possible original construction techniques should be used in the reconstruction.

4. Stones with memorials and socially significant graffiti should be retained and re-laid in locations visible to the public. If this is not possible the project should fund a public art scheme for the breakwall and a public memorial garden with space for current and future memorials is also recommended.

5. The archaeological research potential of the breakwall structure is *low.* An exception and unexpected finds protocol will govern the remediation and upgrade works, but a Section 140 Excavation permit may be required if significant and intact relics with research potential are uncovered during works.

There is potential for evidence of the breakwall tramline to be uncovered during the proposed remediation and upgrade work. If found to be an *in situ* feature, the tramline should be archivally recorded and incorporated into the breakwall design. The tramline is a work and a Section 140 will not be needed if exposed.

8.3.2 Management of Relics

There is moderate potential for the survival of remnant tram tracks, installed for the southern breakwall construction. These items are 'works'.

The project can proceed with an archaeologist monitoring the south-western extent of the project area where the breakwall meets the original coastline.

This work can proceed under exception (a);

> Any disturbance or excavation of land that has limited archaeological research potential, as demonstrated by a heritage management document, such as an Archaeological Assessment, completed in the last five years (Government Gazette Number 59–Planning and Heritage, 18 February 2022; 2(a).

A copy of this report must be kept for a reasonable time in the case of auditing by the Heritage Council (Government Gazette no.59 Item 3 (f) (Appendix A).

If relics are uncovered (refer to unexpected finds protocol), interpretation of those finds should be considered.

8.3.3 Unexpected finds protocol

If unexpected finds of historical nature are discovered during any work, work within 5 m of the find must cease and the following steps taken:

- stop work;

- secure the area so as to avoid further harm to the relic; and
- contact an archaeologist for further information.

8.3.4 Suspected human remains

In the event that known or suspected human remains (generally in skeletal form) are encountered during the activity, the following procedure will be followed immediately upon discovery:

- all work in the immediate vicinity will cease and the find will be immediately reported to the work supervisor who will advise the Environment Manager or other nominated senior staff member;
- the Environment Manager or other nominated senior staff member will promptly notify the police (as required for all human remains discoveries);
- the Environment Manager or other nominated senior staff member will contact OEH for advice on identification of the human remains;
- if it is determined that the human remains are Aboriginal ancestral remains, the Local Aboriginal Land Council will be contacted, and consultative arrangements will be made to discuss ongoing care of the remains; and
- if it is determined that the human remains are not Aboriginal ancestral remains, further investigation will be conducted to determine if the remains represent a historical grave or if police involvement is required.

8.3.5 Cultural landscape management

The trees that will be removed along the breakwall crest, should be replaced with plantings in keeping with the area or natives to the Port Macquarie region.

8.3.6 Government guidelines

i Archival photography - digital archival photographic recording

A digital archival photographic record will be prepared prior to any changes to the landscape and heritage items in the project area. Photographic archival recording is important in recording change, for posterity and future research, and in keeping a record of the place's state before that change. A record of the works, and at completion will also be undertaken to complete the record.

The digital photographic record will be prepared in accordance with the Heritage Manual guidelines, *Photographic Recording Of Heritage Items Using Film or Digital Capture* (Heritage Office 2006) and *How to prepare archival records of heritage items* (NSW Heritage Office 1998).

Photographic archival recording will be undertaken by a project archaeologist and will include the entirety of the southern breakwall and surrounding landscape. This will include photographs from both the land and water, and will capture the public graffiti, east and west termination and contextual photographs to and from the holiday park.

Photographs will be taken from ground level and, if necessary, will also incorporate drone photography to capture discrete sites with more detail than current ground photography allows.

ii Archaeological excavation

Should excavation become necessary an archaeological research design (ARD) will be prepared. ARD is a theoretical framework to support archaeological field investigations with the aim of extracting information that is relevant to the development and function of the site. It will also form the most appropriate excavation methods to be used within the site.

The research design is based on the outcomes of the archival and documentary research and the existing environment and seeks to develop questions that will contribute to current knowledge about a place, a theme or perhaps individuals that documentary sources cannot contribute to. These questions should be compatible with the nature of the predicted archaeological resource and realistic in terms of the sites ability to produce answers.

iii Archaeological monitoring

As per our previous advice, work at the south-west termination of the southern breakwall is considered to have low risk of harming archaeological resources where they remain. Given the sensitivity of the site, we recommended that archaeological monitoring of these areas is undertaken to ensure inadvertent impacts are avoided in the event that cultural material is identified. Please note that in the event that cultural material is observed through these works, the development would be required to cease – or be redesigned – until the resource's significance is determined.

iv Heritage interpretation

Should relics be identified during excavation, heritage interpretation may become necessary. Best-practice heritage management in Australia is guided by *The Burra Charter* (ICOMOS (Australia), 2013b). The Burra Charter defines interpretation as "all the ways of presenting the cultural significance of a place", which may occur through a "combination of the treatment of the fabric (e.g. maintenance, restoration, reconstruction); the use of and activities at the place; and the use of introduced explanatory material" (ICOMOS (Australia), 2013b).

With this in mind, the aims of the Interpretation Strategy are to:

- interpret the heritage significance of the uncovered relics;
- enhance the understanding of the relics through publicly available interpretation;
- identify opportunities to increase collaboration and engagement with key community and stakeholders; and
- enact best practice interpretation, consistent with State, National and internationals standards and guidelines.

9 Conclusion

The southern breakwall is a locally significant structure with connections to Port Macquarie's maritime history and more recent history as a place of tourism and leisure. It is a historical landmark that is easily recognisable from both the land, air and water surrounding Port Macquarie. The social aspect of the area is evident in both the throes of pedestrians utilising the space, as well as the public graffiti present across the breakwall. The archaeological potential of the area has been previously (innocently) mis-represented by Higginbotham & Associates, who did not account for the fact that water previously lay between the land and breakwall. It was not until the mid-twentieth century that the void was filled.

Although the proposed works are necessary for continual safe, public use, it is also necessary to ensure that mitigation measures are put in place to reduce the overall risk of the project on the local heritage. These mitigation measures range from archival photography to excavation and interpretation.

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Appendix A

Government Gazette No. 59

A.1 Appendix Heading

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