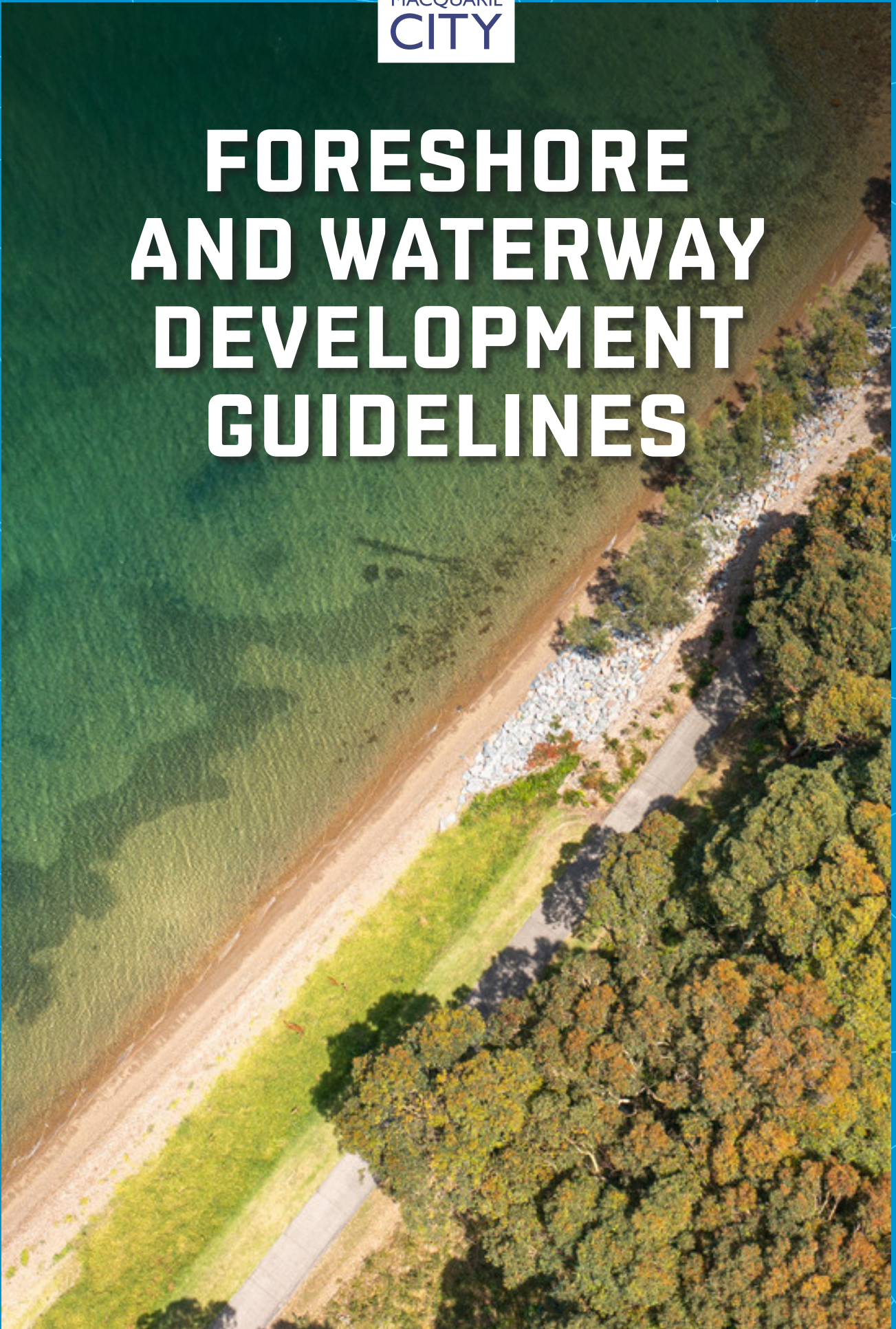


# FORESHORE AND WATERWAY DEVELOPMENT GUIDELINES



# ACKNOWLEDGEMENT OF COUNTRY

We remember and respect the Ancestors who cared for and nurtured this Country.

*Dhumaan ngayin ngarrakalu kirraanan barayidin.*

It is in their footsteps that we travel these lands and waters.

*Ngarrakalumba yuludaka bibayilin barayida baaduka.*

Lake Macquarie City Council acknowledges the Awabakal people and Elders past, present and future.  
*Lake Macquarie City Council dhumaan Awabakala ngarrakal yalawaa, yalawan, yalawanan.*

Wording by the Aboriginal Reference Group and translated by Miromaa Aboriginal Language and Technology Centre.

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# 1. INTRODUCTION



Lake Macquarie is a beautiful feature of our city that provides many people the opportunity to live on a waterfront property. About 40 per cent of Lake Macquarie's 174km of foreshore is privately owned. Foreshore properties offer direct access to the lake for recreation purposes but can also be at risk from erosion due to high tides, flooding and sea level rise.

When considering developing or improving their properties, waterfront property owners need to be aware that foreshore and waterway development is tightly regulated. Both local and state government have controls in place to ensure development in the foreshore area does not impact on natural processes, aquatic and intertidal ecology, or affect the significance and amenity of the area.

Consequently, a development application is required for all foreshore and waterway development. Owners should be prepared to liaise with multiple government agencies and invest in surveys, plans and other reports to support their application.

These guidelines provide owners on the foreshore of Lake Macquarie and its estuarine creeks with supporting information to help navigate submitting a development application for improvement works.

## These guidelines should be read in conjunction with;



- Lake Macquarie Local Environmental Plan 2014
- Lake Macquarie Development Control Plan 2014
- Coastal Management Program
- Landscape Design Guidelines
- Lake Macquarie Waterway Flooding and Tidal Inundation Policy
- Flora and Fauna Guidelines
- Scenic Management Guidelines

# 2. PLANNING DEVELOPMENT IN THE FORESHORE AND WATERWAY AREA



The planning controls that govern foreshore and waterway development are complex, with local and state government legislation that needs to be considered.

In addition to regular planning controls, your development may also need to be considered by other agencies such as NSW Department of Primary Industries – Fisheries, Transport for NSW and NSW Department of Planning, Housing and Infrastructure – Crown Lands.

In this section, we explain the basic planning principles that you need to understand when applying to develop a foreshore property.

## What is foreshore and waterway development?

Foreshore and waterway development includes boat sheds, wharves, slipways, jetties, waterway access stairs, swimming pools, fences, cycleways, walking trails, picnic facilities, recreation areas or water recreation structures. It also includes coastal protection works, such as beach nourishment or works to reduce the impact of coastal hazards, such as seawalls, revetments and groynes.

## What is the foreshore area?

The foreshore area is the land between the foreshore building line and the mean high water mark (MHWM).

## What is the foreshore building line?

The foreshore building line marks where development inland can occur, such as buildings or structures. The foreshore building line functions to minimise buildings and other works in the most environmentally sensitive area of the foreshore. This is shown on the foreshore building line map in the Lake Macquarie Local Environmental Plan 2014.

## What is the intent of the foreshore building line?

- To maintain and improve access along the foreshore area
- To improve the quality of urban run-off entering waterways
- To protect and enhance significant natural features and vegetation in the foreshore area
- To retain endemic vegetation along foreshore areas
- To restore and revegetate foreshore areas to improve estuarine flora and fauna habitat
- To complement the natural landscape by using design and materials that minimise the visual impact of development when viewed from adjacent land and waterways
- To maintain the natural landform of the foreshore area through integration of the development with the natural topography of the site
- To achieve a balance between private development and the public use of waterways
- To provide a buffer for sea level rise and climate change impacts
- To minimise the obstruction of water views from public land



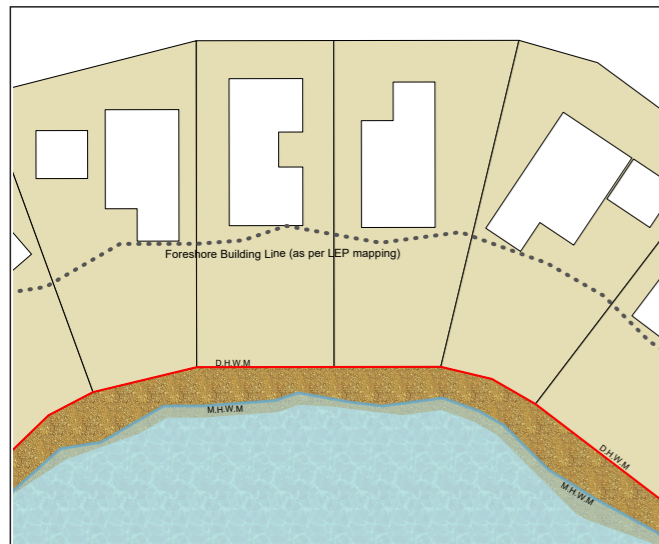
## How is the foreshore building line measured?

The position of the foreshore building line is measured perpendicular from the MHW as illustrated in the diagram below. Where the MHW is not a straight line, the foreshore building line will also not be a straight line. The foreshore building line is not measured parallel to the side boundary or any other property boundaries.

For lots where there is a reserve between the lot and the waterway, the foreshore building line is located parallel to any property boundary with the reserve, including side boundaries.

The foreshore building line does not change if the MHW shifts through natural processes, unless justified under the Modified Doctrine of Erosion and Accretion. Any request to change the building line requires an amendment to LMLEP 2014, which is a prolonged and legislative process that requires environmental assessment, approval by Council and NSW Government and community exhibition.

To determine your foreshore building line, please refer to the Foreshore Building Line Map in the LMLEP. Alternatively, contact Council.



Visual representation of foreshore building line from MHW measurement

## What is the mean high water mark?

The Lake Macquarie Development Control Plan defines the MHW as the position where the plane of the mean high-water level or all ordinary local high tides intersects the foreshore. The mean high water of Lake Macquarie has been determined as + 0.132 metres on the Australian Height Datum (AHD).

The MHW will have been marked on the deposited plan or deed for your property by a registered surveyor. This recorded line is known as the Deed High Water Mark (DHWM).

## Can the mean high water mark change?

It is common for natural processes such as erosion or accretion to affect the MHW. The current land title depicting the DHWM may not necessarily reflect the location of the boundary as it is today.

Traditionally, under the Doctrine of Erosion and Accretion the change in the MHW must be gradual, natural and imperceptible for the legal position of the boundary to be altered. Under the Modified Doctrine of Erosion and Accretion, contained under Section 28 of the *Coastal Management Act 2016*, any accretion must be able to be sustained by natural means and, as a result, any modification to a natural boundary must not either restrict or deny public access to the foreshore.

The methods for determining the position of the MHW are outlined in the Crown directions to surveyors, which are produced by the Surveyor General of NSW. To precisely locate the DHWM and MHW, you may need to undertake a current survey of your land.

In May 2022, Manly Hydraulics Laboratory completed a study on the water level trends in Lake Macquarie and calculated a new mean high water value for the Lake Macquarie foreshore of 0.132m AHD, based on tidal data from between 2001-2020.

## Is my property 'absolute waterfront'?

A property is defined as absolute waterfront when the property boundary directly adjoins Lake Macquarie. Where a reserve or land parcel lies between the property and the lake, the property is not classed as absolute waterfront.



Absolute waterfront property



Reserve between private property and the lake

## Who owns Lake Macquarie?

NSW Department of Planning, Housing and Infrastructure – Crown Lands has ownership, control and management of almost all of Lake Macquarie below the DHWM.

Any development below the DHWM (such as jetties and slipways) requires the consent of NSW Department of Planning, Housing and Infrastructure – Crown Lands and will likely be subject to lease fees.

## What development can I undertake on the lake side of the foreshore building line?

You may carry out the following development between the MHW and the foreshore building line if you have the necessary approvals:

- ✓ alterations to an existing dwelling
- ✓ domestic boat shed
- ✓ domestic slipway/boat ramp
- ✓ domestic jetty
- ✓ in-ground swimming pool (no higher than 300mm above ground level at any point)
- ✓ landscaping
- ✓ exempt development permissible in the foreshore area under the State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.

New dwellings should be located landward from the foreshore building line and must maintain and enhance natural vegetation and landforms visible from the waterways.

## What planning controls should I be aware of?

Control	How the control affects foreshore and waterway development	What you need to know
<b>Coastal Management Act 2016</b>	The <i>Coastal Management Act 2016</i> is administered by NSW Department of Planning, Housing and Infrastructure. When undertaking coastal protection works, a bond may be payable to Council to maintain the works.	Under Section 27 of the Act, consenting authorities must ensure that adequate funding is available to restore or maintain coastal protection works over the life of the works, or to restore any land affected by increased erosion as a result of the works. A bond or annual charge for coastal protection services may be payable by owners of land protected by the works.
<b>Marine Safety Act 1998</b>	The <i>Marine Safety Act 1998</i> is administered by Transport for NSW. Any works that occur on, in or over water requires agreement from Transport for NSW.	You are required to submit documentation including Statement of Environmental Effects (SEE), and/or Project Scope of Works, and/or Operational Plan to Transport for NSW. This documentation is assessed and a Safety to Navigation assessment is carried out by the local Boating Safety Officer. If approved, Transport for NSW will issue a Letter of Concurrence.
<b>Crown Lands Management Act 2016</b>	The <i>Crown Lands Management Act 2016</i> is administered by NSW Department of Planning, Housing and Infrastructure – Crown Lands. A current licence agreement from NSW Department of Planning, Housing and Infrastructure – Crown Lands is required for owners of waterfront properties that benefit from the private use of Crown Land.	Domestic waterfront licences are issued over Crown Land below the MHWL for a period of 20 years or the life of the structure. Please see <i>Domestic Waterfront Licences - Guidelines</i> available at <a href="http://www.crownland.nsw.gov.au">www.crownland.nsw.gov.au</a> for more information.
<b>Fisheries Management Act 1994</b>	The <i>Fisheries Management Act 1994</i> is administered by NSW Department of Primary Industries – Fisheries. Where landowners consent is sought from NSW Department of Planning, Industry and Environment - Crown Lands (i.e. works below MHWL), the Department will consult DPI Fisheries. Where works occur above the MHWL, but below the highest astronomical tidal mark, DPI Fisheries approval may still be required. A permit may also be required from the NSW Department of Primary Industries – Fisheries for jetties, boat ramps, foreshore stabilisation works or any development that may affect fish habitat or marine vegetation.	DPI Fisheries is responsible for ensuring that fish stocks are conserved and that there is no net loss of key fish habitats upon which they depend. To achieve this, DPI Fisheries ensures that developments comply with the requirements of <i>Fisheries Management Act 1994</i> (namely the aquatic habitat protection and threatened species conservation provisions in Parts 7 and 7A of the Act, respectively), and the associated Policy and Guidelines for Fish Habitat Conservation and Management (P&Gs) (2013).
<b>State Environmental Planning Policy (Resilience and Hazards) 2021</b>	The State Environmental Planning Policy (Resilience and Hazards) 2021 (SEPP) identifies development controls for consent authorities to apply to each coastal management area to achieve the objectives of the Coastal Management Act 2016. The SEPP also establishes the approval pathway for coastal protection works.	Lake Macquarie's entire waterway, foreshore and its estuarine tributaries have been mapped within the coastal management area Coastal Environment Area. All of the foreshore is included in Coastal Use Area and some parts are mapped as Coastal Wetlands Area and Littoral Rainforest Area. Council cannot approve your application unless it addresses all of the controls relating to the relevant coastal management area.
<b>Lake Macquarie Local Environmental Plan 2014 (LMLEP)</b>	The LMLEP specifies which developments are permitted with permission, without permission or prohibited in different land use zones. The LMLEP is a statutory document and it is illegal to develop land contrary to its directives.	Clause 7.6 of the LMLEP limits development permitted on foreshore area and ensures development on the foreshore area will not impact on natural foreshore processes or affect the significance and amenity of the area. It provides clear guidance on the types of development permitted in the foreshore area and parameters to consider as part of the assessment process. Coastal protection works are identified in this clause as permitted in the foreshore area. Landowners need to confirm the zoning of their property to confirm what development is permissible. The lake and its tributaries are zoned W1 Natural Waterways. There is no development in this zone that is permitted without Council's consent.
<b>Lake Macquarie Development Control Plan 2014 (LMDCP)</b>	The LMDCP is a non-statutory document that supports the LMLEP and provides more specific, guidelines for foreshore and waterway development	Landowners should consult Part 9 Section 7 Foreshore and Waterway Development of the LMDCP when preparing a development application. It includes a range of controls specific to domestic boat sheds, launching ramps, slipways, jetties, swimming pools, fencing and coastal protection works that your application should address.

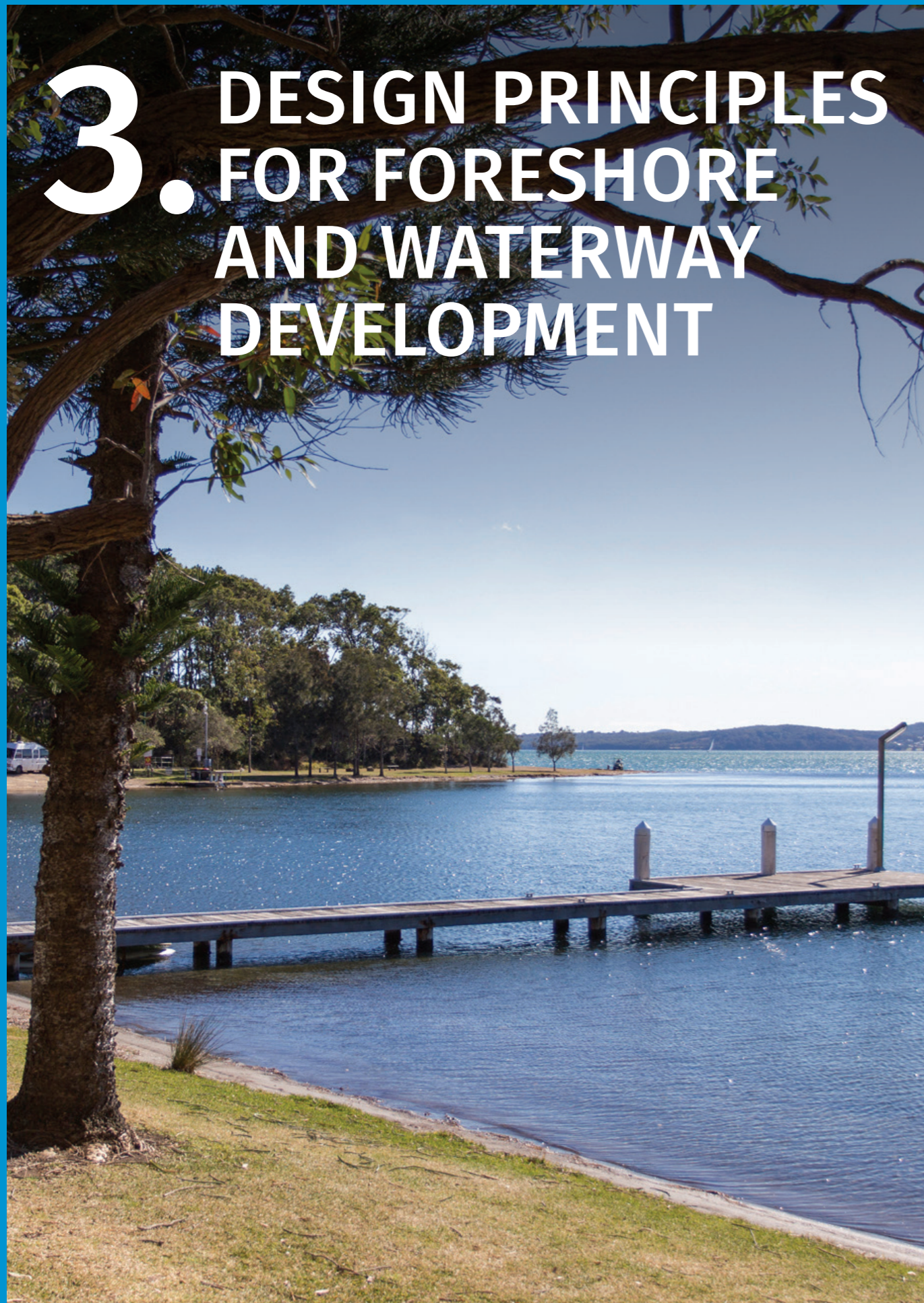
## What planning controls should I be aware of?

Control	How the control affects foreshore and waterway development	What you need to know
<b>Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 update)</b>	Document provides standard requirements for flora and fauna assessments accompanying applications to DPI Fisheries.	Any development activity that impacts upon aquatic habitat or species, including protected and threatened flora and fauna species, threatened and vulnerable ecological communities, endangered populations or their habitats. DPI Fisheries will assess whether these policies and guidelines have been satisfied when considering a development application.
<b>Flora and Fauna Survey Guidelines</b>	Document provides minimum standard requirements for flora and fauna assessments accompanying development applications.	Any development activity that impacts upon native vegetation and/or fauna habitat requires assessment of the effect on aquatic habitat, native vegetation communities, protected and threatened flora and fauna species, threatened and vulnerable ecological communities, endangered populations or their habitats. Council will assess whether these guidelines have been satisfied when considering a development application.
<b>Scenic Management Guidelines</b>	Provides a framework to protect the scenic and landscape values of the city.	The document provides scenic management recommendations for development within the foreshore area including the siting of buildings and structures, built form guidelines and treatment of the foreshore edge. Council will assess whether these guidelines have been satisfied when considering a development application.
<b>Environmentally-friendly seawalls: A guide to improving the environmental value of seawalls and seawall-lined foreshores in estuaries</b>	A state-issued document that informs readers of negative impacts associated with traditional vertical seawalls and ways to mitigate these impacts.	If your design includes a seawall, you should consider the advice and techniques outlined in this document to improve its environmental value.
<b>Domestic Waterfront Structures Landowner's Consent Strategy - Lake Macquarie estuary</b>	This strategy streamlines the process to obtain landowner's consent from NSW Department of Planning, Housing and Infrastructure – Crown Lands for domestic waterfront structures such as jetties, pontoons and boat ramps.	The strategy for Lake Macquarie is due to be completed by mid 2024. When released, the strategy will be available on the Domestic Waterfront Structures - Land Owner's Consent Strategies website. The strategy will map the Lake Macquarie estuary waterfront to show locations that are suitable or not suitable for land owner's consent, and why. A 'traffic light' system categorises locations for their suitability to obtain landowner's consent for a domestic waterfront structure.

Given the complexity of foreshore and waterway development, this list is not exhaustive. We recommend you seek professional advice to ensure your application addresses all relevant controls for your proposed development.



# 3. DESIGN PRINCIPLES FOR FORESHORE AND WATERWAY DEVELOPMENT



The following six principles inform and direct the design of foreshore and waterway development. These principles ensure development aligns with Council's long term strategies for the city including the Environmental Sustainability Strategy and Coastal Management Program and are enforced through the Lake Macquarie Local Environment Plan 2014.



## 1. CONSERVE AND REHABILITATE BIODIVERSITY AND NATURAL PROCESSES OF THE LAKE AND ITS FORESHORE

Many natural processes take place in the foreshore and adjacent waterway, including aquatic habitat growth and seagrass wrack decay. Development must not interfere with these processes or impact the lakes water quality.



## 2. PROTECT THE FORESHORE AND FORESHORE PROPERTIES FROM RECESSION

The effects of foreshore recession occur during floods, windstorms and extreme high tides. The effects of this are expected to increase as climate change causes lake levels to rise. Foreshore and waterway development should include measures to reduce erosion and limit the risk of inundation.



## 3. CONSERVE AND ENHANCE FORESHORE PUBLIC ACCESS

Currently, public access to the lake can be from public reserves and below the MHWM adjoining private development. Development needs to consider existing and future access through design solutions that provide a continuous path of travel on even gradients, wherever practical.



## 4. CONSERVE THE SCENIC AND RECREATIONAL VALUES OF THE LAKE

The scenic quality of Lake Macquarie is highly valued by the city's residents as well as for a range of recreational and tourism-based activities. Designs must not reduce the scenic quality of the subject property and views from the lake and surrounding viewpoints.



## 5. ENSURE FORESHORE AND WATERWAY DEVELOPMENT IS SUSTAINABLE, ABLE TO BE IMPLEMENTED OVER TIME AND MODIFIED AS NEEDED

As the precise timing and severity of climate change effects are uncertain, designs need to be flexible in dealing with the projected impacts when they occur. Foreshore and waterway development works should be designed, staged and implemented to avoid over-construction and to encourage re-use of materials.



## 6. ENSURE FORESHORE AND WATERWAY DEVELOPMENT DOES NOT ADVERSELY AFFECT NEIGHBOURING PROPERTY OR INFRASTRUCTURE

Foreshore and waterway development works should not impede the functioning of existing infrastructure or natural or constructed features that minimise the impacts of flooding. Coastal protection works should form a continuous line of defence, so design solutions should be integrated with neighbouring properties as much as possible.

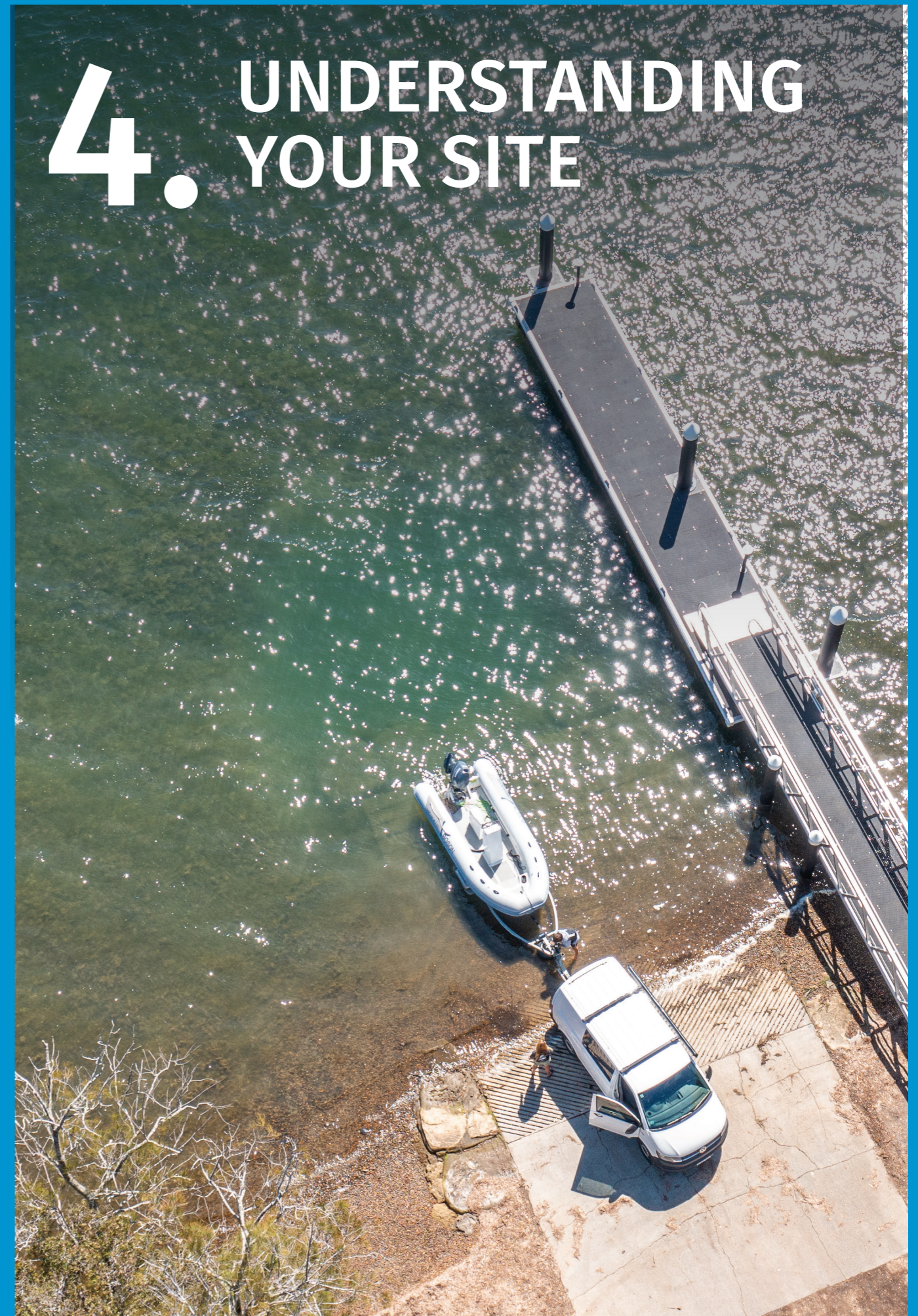


## What are Council's design principles protecting?

<b>Posidonia meadows</b>	Endangered in Lake Macquarie	Declining due to damage from boat mooring chains.
<b>Seagrass</b>	Evidence of loss and damage to integrity of sea grass beds	Damaged by propeller damage from vessels attempting to cross shallow seagrass beds while approaching shores or jetties. Loss of habitat due to shading from wooden and mesh jetties.
<b>Water quality</b>	Stormwater pollution can kill plants and animals that live in the nearshore.	Sediment in the water reduces light penetration and affects photosynthesis, the process that allows seagrass to use light as their source of energy. Soil makes waterways cloudy and can suffocate fish by clogging their gills. Litter clogs waterways and causes toxicity as it breaks down. It affects the health of birds, fish and other animals and plants that live in the waterways. High levels of nutrients in the water can lead to eutrophication causing algal blooms. When the excess algae eventually decompose, it uses up oxygen, taking vital oxygen away from plants, fish and other aquatic animals.
<b>Vegetation</b>	Vegetation provides important habitat to encourage biodiversity and helps reduce erosion.	Removing vegetation threatens important nesting areas for shorebirds (little tern, pied and sooty oystercatchers) and foraging areas for a range of state, national and internationally protected migratory bird species. Vegetated foreshores help to reduce erosion through soil stabilisation and through a reduction in the erosional energy of rainfall. Leaf litter and fallen branches/trees provide food and habitat for aquatic organisms including fish breeding.
<b>Intertidal habitat</b>	The narrow strip around the lake's foreshore which is impacted by tides is vital to the many species that rely on intertidal habitat.	The installation of vertical seawalls and other foreshore treatments reduces the area available for intertidal habitat (compared to gently sloping foreshore) and hard treatments such as concrete provides minimal habitat value as there are no places for plants to grow on, or animals to seek shelter within.
<b>Cultural heritage</b>	The landscape of the city has important traditional Awabakal spiritual and cultural meanings and values, which are respected by local Aboriginal people.	There is widespread and significant archaeological evidence around the shore of the lake and along its tributaries. Much of the evidence is shell midden. Other important site types close to the foreshore, include grinding grooves, rock shelters, scarred trees, ceremonial places and burials. The Lake Macquarie Aboriginal Heritage Management Strategy 2011 has mapped the entire foreshore of the lake as 'Sensitive Aboriginal Cultural Landscapes'.
<b>Scenic values</b>	The strong natural qualities of Lake Macquarie are widely recognised and valued.	The unique setting of Lake Macquarie is overwhelmingly created by its strong physical landscape. The views to the lake and from the lake are to be protected, to maintain a natural landscape and avoid having built structures dominating the sensitive scenic landscape.

Please refer to the Lake Macquarie Coastal Management Program for more information about the specific geographical and ecological features of Lake Macquarie and its foreshore.

# 4. UNDERSTANDING YOUR SITE



The specific location and conditions of your site will be closely considered as part of your application assessment. Ensuring your design is suitable for the context will save time, cost and frustration through the application process.

Before deciding on an appropriate foreshore design, a thorough site assessment needs to be carried out. It is recommended that you engage a qualified engineer or designer to help you work through the aspects of your site's natural features, its history and social values that have direct bearing on appropriate design.

### Natural context

To meet design principles 1 'Conserve and rehabilitate biodiversity and natural processes of the lake and its foreshore', and 2 'Protect the foreshore and foreshore properties from recession', foreshore and waterway development needs to consider the site geography and ecology.

#### Factors that need to be addressed include:

- **Aspect, orientation and exposure:** these factors determine the wave climate of an area that then affects a sites susceptibility to erosion. Wave height is dependent on wind speed, duration, fetch length, water depth and wind direction.
- **Geology of the foreshore and sediment type:** these factors determine how erosion prone the foreshore may be and the extent of intervention required to stabilise the foreshore and protect property.
- **Gradient of the foreshore:** for coastal protection, this is a critical factor in determining the best treatment. For example, shallow profiles may best suit beach or vegetative treatments, while steeper gradients may require more substantial responses such as revetments or seawalls.
- **Existing vegetation or natural features:** undisturbed native vegetation and geological features help to stabilise foreshores and should be conserved or integrated into designs.

### Cultural, scenic and recreation context

*To meet design principles 3 'Conserve and enhance foreshore public access' and 4 'Conserve the scenic values of the lake', designs need to:*

- avoid excavation or alteration of natural landforms
- avoid excavation, disturbance or construction adjoining significant heritage items
- retain significant views to and from the lake
- maintain easy and safe access to the water or shoreline (i.e. access to jetties, places to fish, swim or launch small craft).

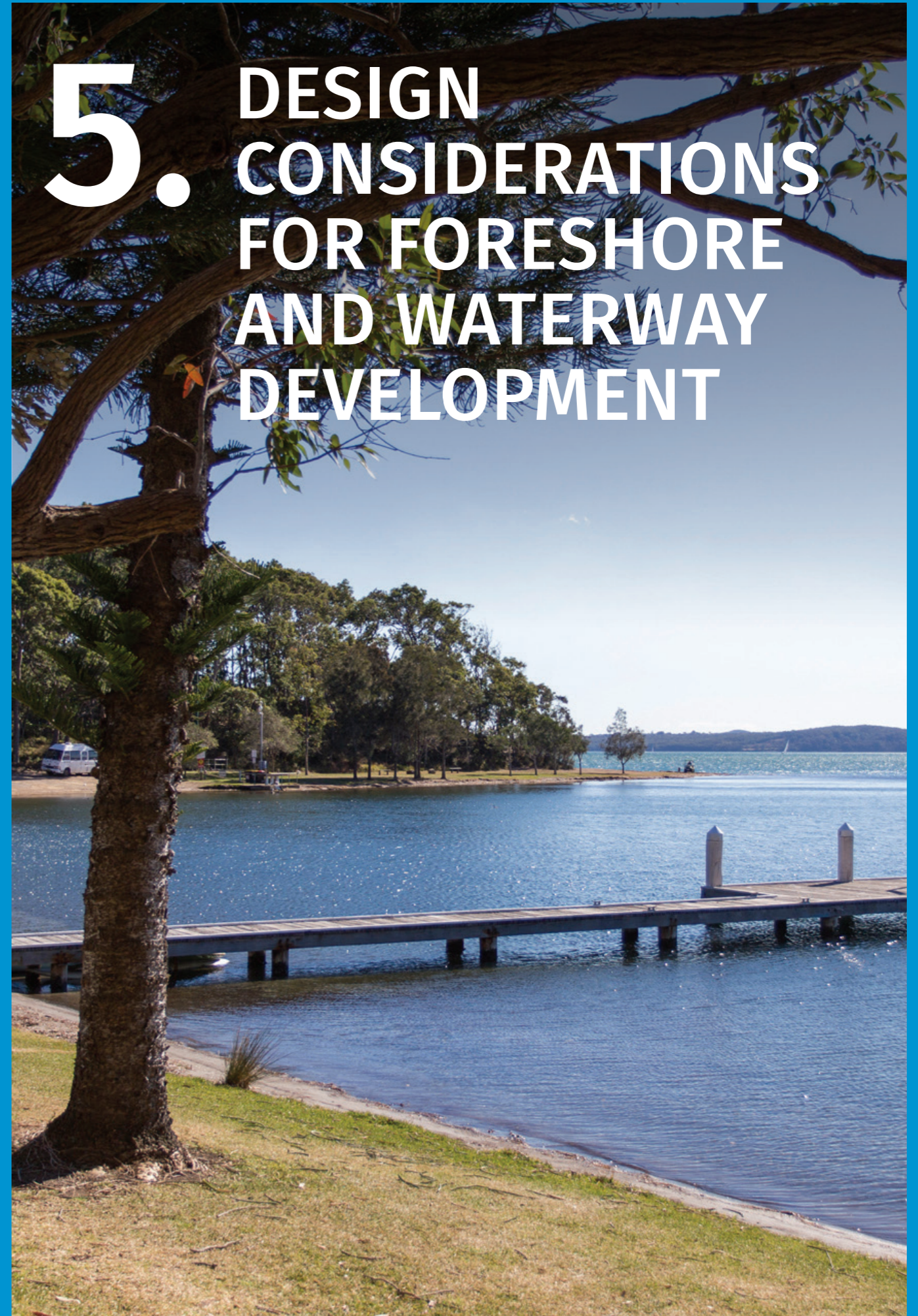
In most cases, treatments that use natural materials and involve minimal site disturbance will best conserve these values.

### Development context

To meet design principles 5 'Ensure foreshore and waterway development is sustainable, able to be implemented over time and modified as needed' and 6 'Ensure foreshore and waterway development does not adversely affect neighbouring property or infrastructure', your design will need to address the relative natural context of the site.

Urban centres with significant foreshore infrastructure and high levels of public use (such as Toronto or Warners Bay) or adjoining areas of major tidal flow (such as Swansea Channel) will have different design considerations to relatively undeveloped and protected foreshore areas.

# 5. DESIGN CONSIDERATIONS FOR FORESHORE AND WATERWAY DEVELOPMENT



Whether you are looking to build a jetty or boat shed, or do work to protect your property from erosion or tidal inundation, your design should consider the site context and the principles outlined in these guidelines.

### Foreshore stabilisation considerations

Foreshore and streambank erosion, and resulting impacts on the lake, are a major concern for the community. Council has trialled a number of 'soft' and 'hard' engineering and landscape treatments in an attempt to combat this problem. The information around foreshore stabilisation outlined in this guide is based on the results of these trials.

Council's general aim is to re-establish a stable, preferably natural, foreshore around the lake and along its tributaries. 'Softer' green engineering is the preferred treatment wherever this meets design and performance requirements and available space.

Council encourages you to consider your property in relation to adjoining properties. Uncoordinated and isolated designs across neighbouring properties can make it more expensive to protect property boundaries, where different foreshore treatments meet. Wave action at this intersection can cause increased erosion and, where planting is not continuous, habitat can become fragmented.

It is recommended that individual foreshore treatments constructed over 20-30 years combine, where possible, to provide a consistent and effective treatment across a number of properties. For example, the progressive replacement of seawalls with combinations of revetment, beach and vegetation treatments will allow more flexibility to coordinate treatments installed at different times.

### Long-term design considerations

The guidelines for treatments for foreshore stabilisation allow for sea level rise to 0.3m AHD, but also outline strategies for sea level rise up to 0.9m in total. There is merit in private landowners considering the potential for long-term sea level rise – even as they are addressing the shorter timeframe of a future 0.3m AHD lake level.

#### *Long-term design considerations should include options to:*

- select materials and implement designs that permit ease of reuse and relocation to the new shoreline as sea level rise progresses.
- integrate protective measures for properties into garden and landscape designs (for example by creating a garden terrace wall close to buildings that may act as a future seawall).

#### *The benefits of this longer-term approach include:*

- reduced long-term costs
- higher sustainability values
- reduced requirements for planning applications
- reduced disruption to properties.

### Recreational infrastructure considerations

A large majority of waterfront properties own licenced recreation vessels or passive watercraft and need infrastructure to launch, access and store their vessels. These can include boat ramps, slipways, jetties, pontoons and boat sheds.

Council provides public boat ramps so people can launch private trailable vessels. Lake access for boats is also available through smaller sailing, rowing or similar clubs. Smaller vessels, such as dinghies, runabouts and passive craft, can be launched from public foreshore reserves and beaches. In addition to boat ramps, there are about 50 public access points in the Lake Macquarie region including wharves, jetties, pontoons and landings.

#### *Before deciding to design and construct private infrastructure for recreational boating, some of the things to consider are:*

- How frequently will you need to launch your boat? If it is only a few times each year, do you need your own private boat ramp or slipway or are there public launching facilities close by?
- Do you have sufficient water depth?
- What is the length and draft of your boat?
- Can you share your neighbour's jetty?
- Where will you store your boat? (Note: Jetties are only permitted to be used for loading and unloading, permanent mooring on jetties is not permitted).

# 6. DESIGN OPTIONS FOR FORESHORE AND WATERWAY DEVELOPMENT



The following section examines options that are permissible within the foreshore area of Lake Macquarie, subject to development approval. Owners can select from these options if they are appropriate for the site context. Importantly, foreshore treatments can and should be used in combination, where appropriate. Foreshore treatment combinations may be used and applied in immediate conjunction (for example a cobble beach fronting a revetment) or in sequence as sea level rises, (such as vegetation on a shallow slope with a revetment closer to the building to protect against future sea level rise).

## Coastal protection works

The following coastal protection works are described in order from 'softest' to 'hardest' construction. The guidelines recommend that 'softer' green engineering is the preferred treatment wherever this meets the design and performance parameters and available space.

### Landscaping and vegetation

Landscaping on private foreshore land should aim to retain and enhance native vegetation and provide landscaping that considers and compliments the scenic amenity and natural foreshore of Lake Macquarie.

Native foreshore and streambank vegetation effectively protects against erosion while providing a habitat corridor by reducing the erosive forces of water, reinforcing the soil with plant roots, reducing the speed of surface runoff, and catching dislodged soil particles before they move from the eroded site.

Vegetation can provide long-term benefits including reduced maintenance costs, energy savings and increased areas of foreshore habitat. However, returning the foreshore to a more natural state takes time to properly establish and can initially be a more expensive option.

### Application

Vegetation can and should be included in all designs wherever practical. Revegetation with fully structured native plants and trees is encouraged to assist in both streambank stabilisation and biodiversity.

Establishing a naturalised foreshore can be achieved by passive or active means. Passive naturalisation occurs when the area is allowed to naturally regenerate. The process works best where there is an existing source of native seed. Some limited intervention may be required to control excessive weed growth until a native understorey establishes. Active naturalisation is required where there is no native species present. The area to be naturalised needs to be prepared, planted, mulched and maintained until native species establish themselves.

### Design guidelines

- **Species:** employ a variety of species to create a diverse vegetation community (refer to Appendix 1 for a list of suitable species).
- **Planting:** clump planting into groups to present a natural planting style and allow intermittent water access. Plant at densities to encourage root spread and minimise erosion.
- **Site preparation:** dependent on the sites natural slope and soil type. Provide protection to plants while they establish in areas of moving water.
- **Foreshore access:** provide defined access routes through planting to the foreshore to prevent trampling damage.
- **Views and aesthetics:** locate trees and tall shrubs to frame views to prevent later lopping or removal.
- **Establishment:** temporary irrigation may be needed once plants are in the ground. New planting should also be mulched with an organic mulch. In areas where mulch may be washed away, jute matting is recommended.
- **Maintenance:** provide a clear edge definition to planting to minimise weed invasion and control adjoining grass mowing.

### Wrack management

Wrack is the build-up of debris, including seagrasses and other material, on the foreshore. Organic wrack build-up is an important first line of defence against wave energy. It also provides habitat for invertebrates, crustaceans and small fish and forms an integral part of the ecology of the lake.

Due to the importance of wrack to the biological and physical processes of the lake, it should not be removed unless it is causing severe odour or use concerns.

### Beaches

Beaches are common around the lake, providing habitat to support a range of invertebrate species as well as natural foreshore processes such as seagrass wrack bio-degradation. Beaches have little environmental impact during construction, minimally alter the visual appearance of the natural shoreline, and dissipate wave energy, thereby reducing erosion.

Beaches are a cost effective, low maintenance option to achieve easy access to the water. Gently sloping foreshores allow for smaller craft such as kayaks, tenders, small sail boats and 'tinnies' to be successfully launched without the need for hard construction.

Beaches do not require approval from Council, provided that no earthworks are required.

Beaches typically do not require a licence from NSW Department of Planning, Housing and Infrastructure – Crown Lands.

### Application

Sand beach and vegetation treatments integrate a simple sand beach – a common, naturally occurring shoreline on shallow foreshore areas around the lake – with native vegetation on the landward side. The optimum application of a sand beach is on shallow shorelines with limited wave exposure, principally to shallower gradient shorelines of 1:8 or less. (See Design 1 - Typical Sandy Beach Treatment)

Cobbled beach treatments comprise small loosely compacted stone laid to an existing shoreline gradient, which prevents erosion and restores natural foreshore slopes. The cobbled beach will transition to native vegetation on the shoreline. (See Design 2- Typical Cobble Beach Treatment)

Cobbled beaches suit shallow gradient shorelines of 1:20 or less up to 1:8 (although with larger cobble sizes some steeper shorelines can also be treated this way) on foreshores without obstacles such as building and infrastructure. Cobbled beaches are also suitable for low to high wave energy environments to reduce erosion and when there is minimal scarp height with gentle batters to the water.

### General design guidelines for beaches

If your design incorporates a beach, you should be aware wave action will modify the designed grade. Consequently, overfilling the beach during construction allows natural processes to establish the beach and reduces the need for early maintenance. Steeper beaches will require coarser material, with grades of naturally formed beaches around the lake generally being the ratio of vertical height (V) to horizontal distance (H) of between 1V:6H and 1V:12H.

You are encouraged to combine beaches with vegetation rehabilitation work to restore habitat and control erosion.

### Design guidelines – sand beach

- Maintenance: nourish the beach sand as required over time by topping up to a shallow profile
- Provide a clear edge definition to planting to minimise weed invasion and control adjoining grass mowing.

### Adaptation

If and when sea level rises beyond the 0.3m AHD level, this treatment would best be extended by beach sand nourishment and progressive revegetation in line with the high water mark regression. If buildings are threatened in the longer term, a revetment or seawall may need to be constructed closer to the building.

## Design guidelines – cobble beach

- **Slope:** as a general guide, the ratio of vertical height (V) to horizontal distance (H) of a beach using coarse sand is 1V:20H. Flatter cobbles of 20-45mm are recommended if the ratio is 1V:8H or flatter.
- **Construction:** cobbles laid typically to a depth of 700mm, tapering to the lake edge.
- **Imported material for beach nourishment:** to match the existing site material (i.e. similar colour range, surface texture, particle shape and particle size range).
- A bias towards the larger size range is preferred.
- **Foreshore access:** provide defined access routes to the foreshore.
- **Maintenance:** a properly designed cobble beach should require little or no maintenance.

## Adaptation

If and when sea level rises beyond the 0.3m AHD level, the adaptation of this treatment would generally best be achieved by continuing the laying progressively up-slope to match the new shoreline created by the corresponding rise.

This adaptation can be achieved cost effectively by reusing the beach treatment material and relocating it to the new shoreline location. Where the foreshore gradient progressively increases with distance from the high water mark, this treatment can be used in combination with stone revetments.



## Revetments

Sloped rock rubble revetments are an effective way of absorbing and dissipating wave energy, reducing wave run-up, over-topping, reflections and scour. These rough and flexible treatments can tolerate some movement without failing, protecting the foreshore from currents and smaller wave conditions as well as providing valuable foreshore habitat.

Council has constructed revetment treatments over considerable lengths of public foreshore around the lake over recent years and this treatment is equally applicable to private foreshores in response to sea level rise.

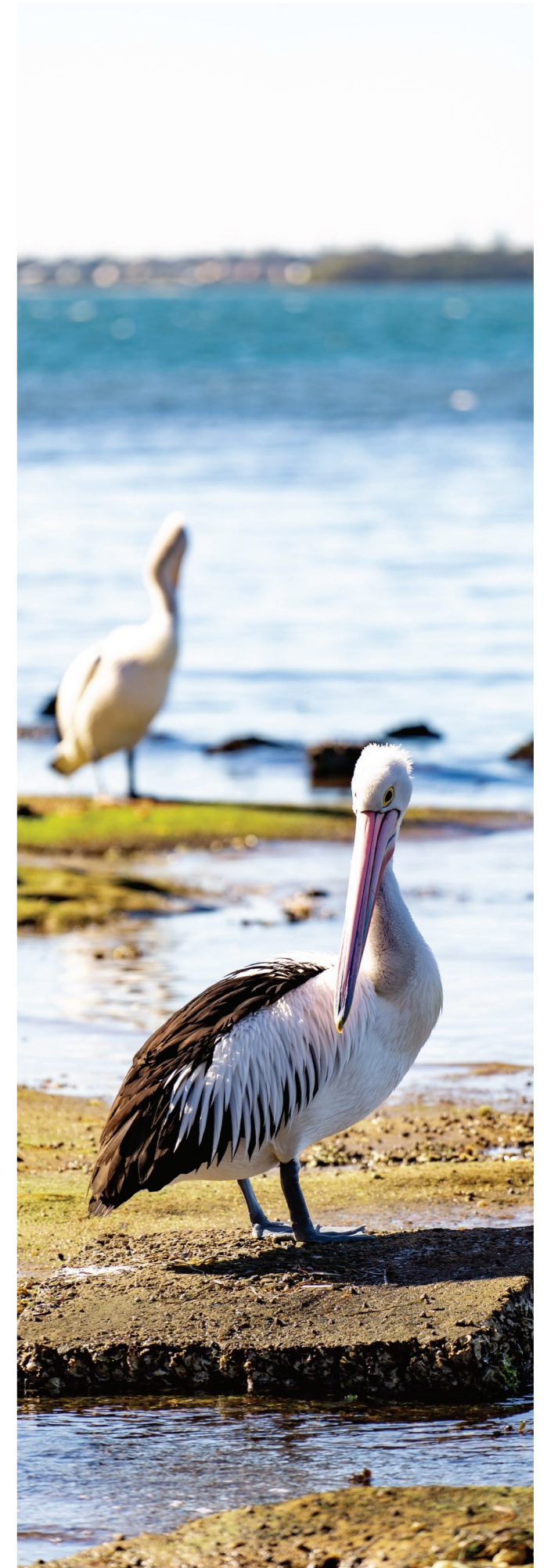
## Design guidelines

- **Materials:** rock that is sound, durable and hard, free from lamination and weak cleavages and does not disintegrate under the action of water, air exposure or handling and placing. Angular in shape with the greatest dimension not more than three times the smallest dimension. Due to these requirements igneous rock is preferred.
- **Rock sizes:** A thickness of more than one rock is required to allow for wave energy dissipation and to reduce damage. Rock sizes of between 200mm and 400mm are effective in most situations.
- **Construction:** Revetments can be constructed as either 'rigid' or 'flexible'. Flexible revetments treatments can tolerate settlement or movements without failing. A layer of geotextile, and a 150mm course gravel drainage layer (75-150mm diameter), is required between the natural ground and the rocks to prevent leaching of fine particles, and the subsequent undermining of the structure.

- The lakeside face should be a ratio of vertical height (V) to horizontal distance (H) of 1V:2H.
- **Backfill:** in areas of shallow gradients, backfilling to the landward side of the revetment may be required to maintain stormwater run-off to the lake.
- **Maintenance:** provide a clear edge definition to planting or grass adjoining the revetment to minimise weed invasion and control mowing.
- **Foreshore access:** provide defined access routes through revetment areas.

## Adaptation

If and when sea level rises beyond the 0.3m AHD level, the adaptation of this treatment would generally best be extended by progressive relocation of the revetment in line with the high water mark regression. Where buildings may be threatened, in the longer term, a revetment or seawall may need to be placed closer to the building.



## Seawalls

Seawalls are usually vertical walls constructed of reinforced concrete or hard rock rubble designed to dissipate or reflect wave energy. Seawalls are not a preferred option for general foreshore stabilisation on the lake foreshore or on the banks of estuarine creeks.

Seawalls are generally designed to withstand large waves, oceanic tidal ranges and/or strong tidal and flood currents. Given that these conditions are not experienced on most of the lake foreshore, seawalls are unnecessary.

Vertical or near vertical faces are generally less effective against wave attack as turbulence can cause severe scour at the base of the wall. Vertical surfaces also reflect wave energy offshore causing increased wave turbulence that can cause sea bed profile changes.

Many of the existing seawalls fronting private properties around the lake are of limited design life (with the majority not much higher than high water mark). They are likely to be overtopped when mean lake levels reach 0.3m AHD.

Where approved seawalls exist and they are degraded or structurally undermined from rising sea levels, extending the wall height is not a preferred option. Rather, they should be modified using revetment and beach treatments on the shoreline in front of and behind the wall.

Methods of modifying seawalls to improve the environmental values and the role of the existing seawall as habitat should be pursued. A number of ideas are outlined in the publication 'How to make your seawall more environmentally friendly' (Sydney CMA, June 2009).

### Seawalls are also a poor replacement for natural foreshores because:

- the types of habitat and area available to plant and animal life are reduced dramatically
- the ability to filter pollutants from runoff is lost leading to poorer water quality
- they can change flow and wave patterns, resulting in deepening in front of the seawall and erosion further along the shore.

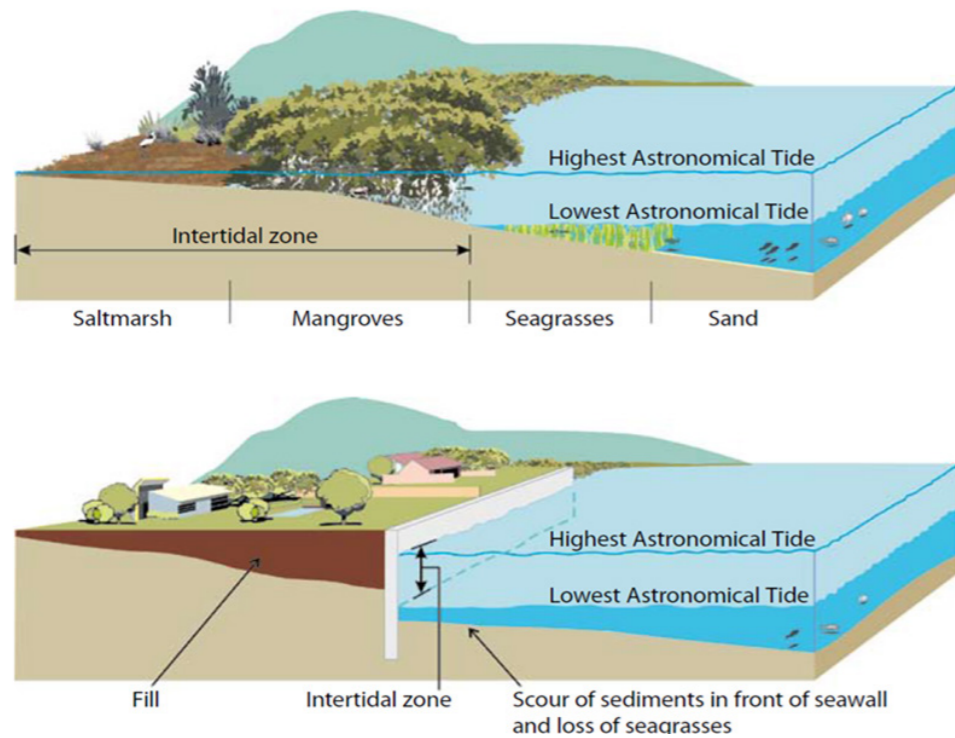


Figure 1: Comparison of a common low-sloping, estuarine shoreline (top) with a traditional vertical seawall, showing the substantial loss of intertidal area and important habitats such as saltmarsh, mangroves and seagrasses (bottom) (Source: NSW Department of Environment and Climate Change, 2009)

## Application

- Where an existing approved seawall is failing or frequently overtopping.
- Where an existing unlicensed or unapproved seawall is seeking Council approval.
- Where other treatments are not sufficient to treat an immediate recession risk (to a habitable building or essential infrastructure) and where a rock revetment cannot be constructed due to engineering requirements (space restrictions, limits to foreshore access etc).

### Design guidelines – modification to existing seawall

- Consolidation of the toe and rear of the wall using rocks and revetment. The addition of these materials provides habitat to organisms and small fish and helps to control scour. The addition of any materials where seagrass exists in front of seawalls should be avoided.
- Geotextile and a coarse gravel filter may be required beneath the rock revetment at rear of wall to prevent early failure of the revetment or wall during overtopping.
- Vegetation treatment in association with revetment to the rear of the wall prevents erosion and early undermining of the wall and revetment.
- Modifications to existing seawalls to increase habitat value (see Designs 7-12 - Modifications to Seawalls).

### Design guidelines – new seawalls

- Where a hard treatment is required, rock revetments will be preferred unless site conditions do not allow for their construction.
- **Heights:** to be constructed to the minimum height necessary to prevent permanent inundation of a habitable building or damage to infrastructure.
- **Design:** to achieve the maximum slope allowed by site conditions and engineering requirements.
- Increase roughness and texture of surface by creating cavities or attaching objects such as concrete knobs or habitat tiles.

## Adaptation

If and when lake levels rise beyond 0.3m AHD, the adaptation of this treatment could be extended by progressive relocation, using the appropriate treatment from the range presented in these guidelines. The first option is to maintain the approved seawall in situ by adding rock to increase the height of the wall and/or moving the crest of the protective rock revetment landward.

If the in-situ treatment is overtopped or fails, a new protective structure such as cobble beach or rock revetment could be built further landward.

The choice of treatment will depend on the risk, the limitations of the site and adjoining treatments. A new vertical seawall, or extending the height of an existing wall, is only suitable where there is an immediate threat to a building and there is no room to establish a new line of protection.

Where buildings may be threatened in the longer term, a revetment or seawall may need to be placed closer to the building. These might be in the form of a garden terrace structure close to the building and constructed well in advance of the sea level rise.

## Domestic slipways

Slipways are used to launch vessels that are stored in a boatshed. They consist of two parallel rails upon which a boat cradle runs. Slipways extend into the lake to a depth at which the boat may be launched without damaging the lakebed or aquatic fauna. They are generally a cost effective, low maintenance solution for launching larger vessels, particularly if a mechanical winch is used.

Due to their low environmental impact, especially to seagrass beds, sliprails are a preferred alternative to most boat ramp designs. However, in combination with a boatshed, they can have greater visual impact and can make it difficult for some users to climb in and out the vessel.

## Design guidelines

- Slipway rails must be recessed to ground level to mitigate trip hazards and protruding components.
- No timber or concrete infills should be used between the sliprails, but other permeable surfaces can be used such as turf, pebble or gravel to promote an even surface and reduce maintenance.
- Sliprails may not be used to store vessels on Crown Land or within 1.5 metres landward of the DHWM.

## Domestic jetties

To maintain the visual character and natural landscape of the lake and to reduce ecological impacts, Council aims to minimise the number of jetties within the lake. Residents are encouraged to share jetties where possible. Residents will be required to demonstrate, in writing, why sharing an existing, or proposed jetty is not achievable.

Jetties are intended only to be used for short stay embarking and disembarking. They are not intended to be used to permanently moor or park a vessel.

### Design guidelines

- Sufficient depth of water must be available to ensure the lakebed is protected from damage.
- Decks must be mesh, grids, or grates to allow light penetration.
- High jetties are preferred to allow for more light penetration.
- Residents are encouraged to share jetties where possible

## Floating pontoons

Unlike a jetty, which is set at a fixed height, a pontoon is a floating dock that can rise and fall with the tide. Adaptable to long and short-term variations in lake water levels, including sea level rise, it is easier to access a vessel from a pontoon than a jetty.

However, as pontoons float, the decking surface cannot be made from meshed decking which reduces light penetration, causing direct habitat modification or loss due to severe shading.

## Design guidelines

- Pontoons will only be permitted in tidal creeks of Lake Macquarie such as Sheppards Creek, LT Creek, Mudd Creek, and Stony Creek.
- Pontoons can only be located where impacts to seagrasses will be minimal.
- There must be sufficient water depth.
- There must be no navigational impacts.

## Boat sheds

Boat sheds protect boats from weather damage and keep the waterfront looking tidy by allowing owners to store their vessels securely out of sight.

### Design guidelines

- Boat sheds should be designed purely to store recreation boats and other personal watercraft such as kayaks or jet skis.
- Please refer to Council's DCP, which sets out specific guidelines around the allowable location and dimensions of a boat shed.
- All boat sheds should be designed and built to maintain the visual amenity and character of the lake's foreshore and to ensure public access and safety is not adversely affected.

## Domestic boat ramps

Domestic boat ramps can be used to launch a range of watercrafts. However, concrete surfaces provide limited habitat for intertidal organisms and, especially where water depth is insufficient, seagrass habitat can be lost due to scouring at the end of the boat ramp.

Given these environmental impacts, and the public safety risk if a concrete boat ramp becomes slippery from algae build-up, any application will need to address the need for a concrete boat ramp over the natural surface of the foreshore or an existing slipway.

## Design guidelines

Boat ramps are generally constructed using concrete that extends in a gentle slope from the land into the water.

Sufficient water depth must be available to prevent impacts to seagrass or native vegetation.

## Swimming pools

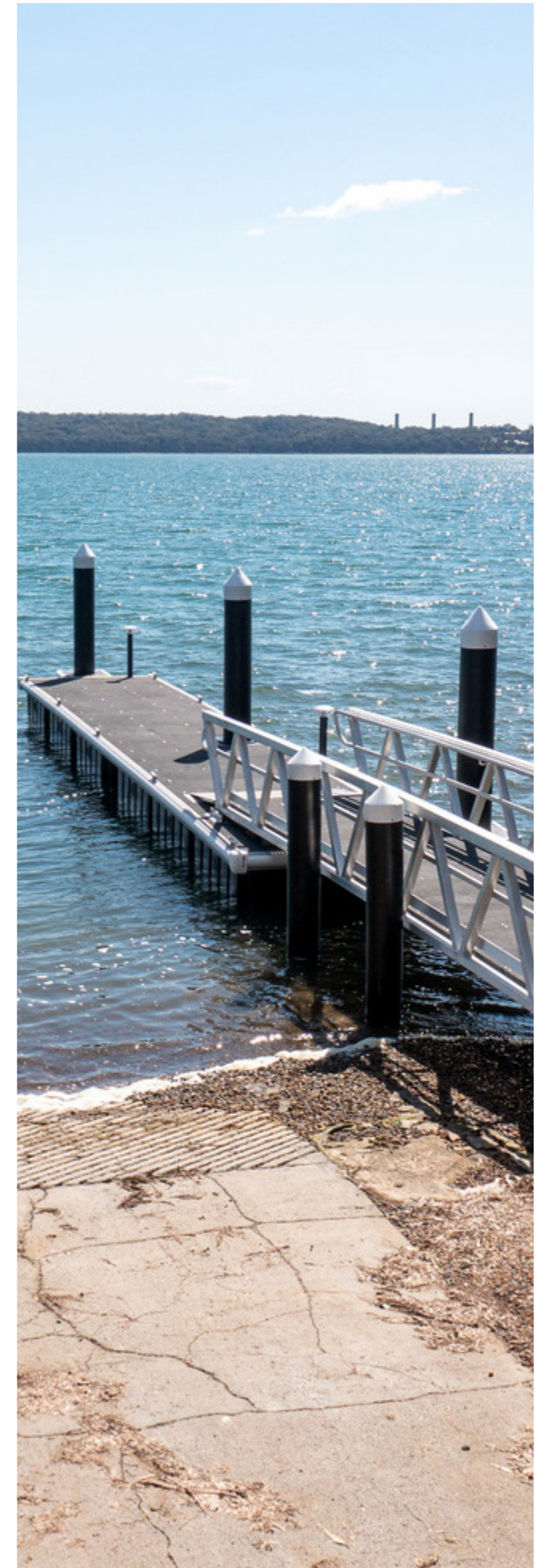
When viewed from the lake, swimming pools must be visually unobtrusive and screened with low scale, native endemic foreshore vegetation to reduce visual impact and contribute towards re-establishing a native vegetated foreshore.

## Fencing

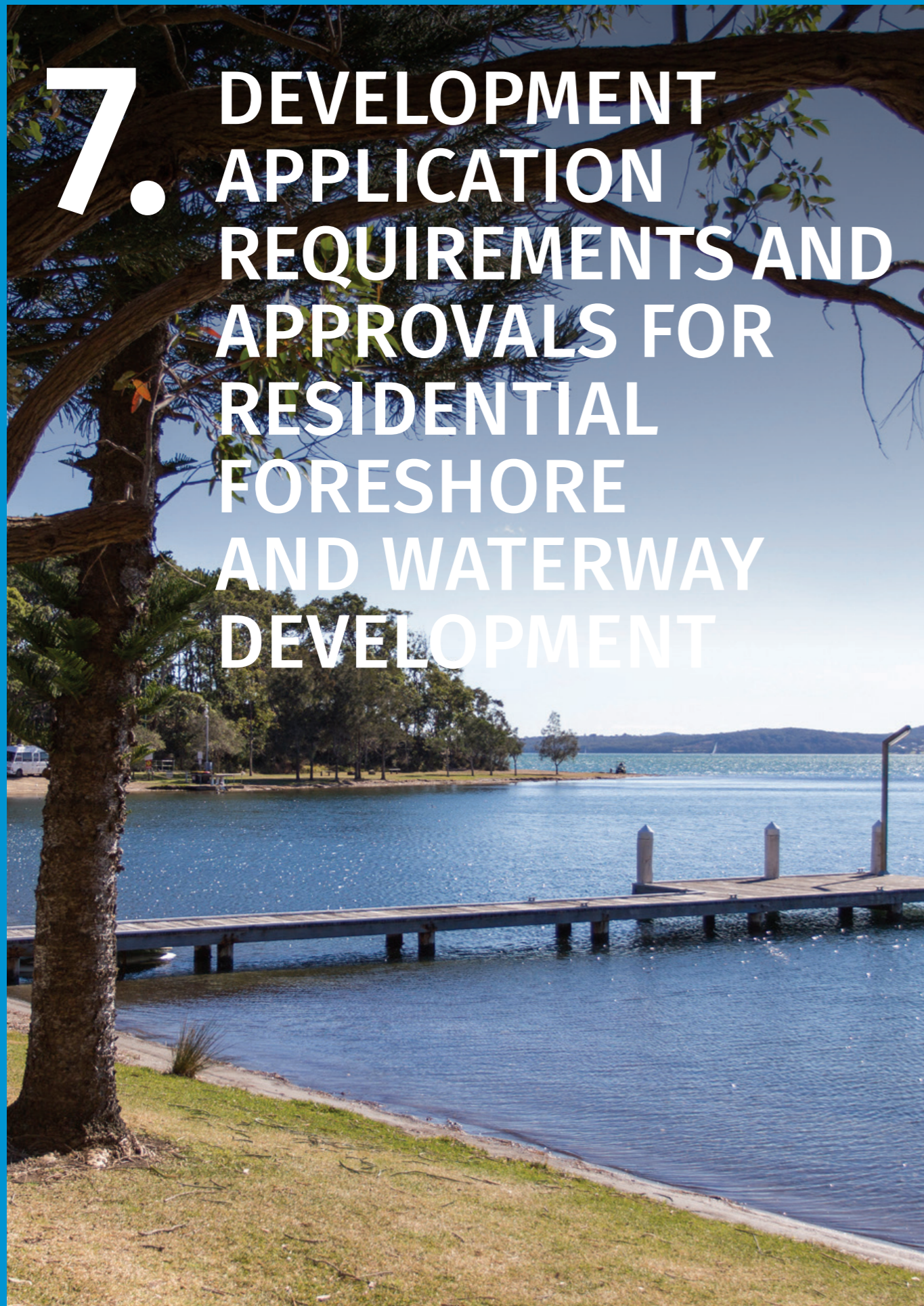
Fencing in the foreshore area should be visually unobtrusive and maintain public access to the foreshore.

## Inclinators and stairs

Some properties on the foreshore of Lake Macquarie contain a steep descent down to the lake's edge. To access the lake, stairs or even inclinators are required. Inclinators or stairs are to be constructed as close as practical to natural ground level. Natural topographical and landscape elements along the foreshore are to be retained and the removal of natural rock, trees and other vegetation for the construction of the stairs or inclinators will not be supported. Stairs should be made from timber, masonry, or metal. If metal is used, it must be galvanised and blend into the natural foreshore environment.



# 7. DEVELOPMENT APPLICATION REQUIREMENTS AND APPROVALS FOR RESIDENTIAL FORESHORE AND WATERWAY DEVELOPMENT



A development application is required to be submitted to Council when planning foreshore and waterway development. The following table outlines applicable requirements.

## Development application requirements for residential scale foreshore and waterway development

Documentation	Detail required	Required for development below MHWM	Required for development above MHWM
<b>Survey plan</b>	<p><b>The plan must be completed by a qualified surveyor and include:</b></p> <ul style="list-style-type: none"> <li>✓ contours at 0.5m intervals and related to AHD</li> <li>✓ existing vegetation</li> <li>✓ buildings</li> <li>✓ existing structures</li> <li>✓ fences, boundaries and easements</li> <li>✓ any other significant site features (e.g. rocky outcrops, wetlands, watercourses)</li> <li>✓ location of the foreshore building line</li> <li>✓ mean high water mark.</li> </ul>	Yes	Yes
<b>Hydrographic survey</b>	<p><b>The plan must be completed by a qualified surveyor and include:</b></p> <ul style="list-style-type: none"> <li>✓ survey showing water depth</li> <li>✓ proposed structure (jetty/slipway)</li> <li>✓ mean high water mark</li> <li>✓ extent of highest astronomical tide (where saltmarsh is in the vicinity of works).</li> <li>✓ deed high water mark.</li> </ul>	Yes	No
<b>Development proposal plans</b>	<p><b>The plans must include:</b></p> <ul style="list-style-type: none"> <li>✓ plan view of proposed structures overlain on aquatic vegetation map and depth survey</li> <li>✓ elevations – profiles of the proposed development including details of surface finishes, colours, construction materials and finished ground levels.</li> <li>✓ sections – a cross section through proposed structures indicating building materials and construction methods</li> <li>✓ erosion and sediment control plans.</li> </ul>	Yes	Yes
<b>Statement of Environmental Effects</b>	Consider the requirements of Council's LEP and DCP, the <i>Coastal Management Act 2016</i> , the <i>State Environmental Planning Policy (Coastal Management) 2018</i> , the relevant CMP and any associated coastal zone emergency action sub-plan.	Yes	Yes
<b>Aquatic Habitat Assessment</b> (see Council's <i>Flora and Fauna Survey Guidelines for acceptable methodologies</i> )	<p><b>The assessment must be completed by a qualified aquatic ecologist and include:</b></p> <ul style="list-style-type: none"> <li>✓ description of intertidal and subtidal habitat</li> <li>✓ flora and fauna species observed, or likely to be present</li> <li>✓ aquatic vegetation map including species, distribution and density of seagrass, mangroves and saltmarsh</li> <li>✓ threatened species assessment</li> <li>✓ identified potential ecological impacts of the construction and on-going use of the structure and proposed mitigation strategies</li> <li>✓ identify the presence of any marine pests such as <i>Caulerpa taxifolia</i>.</li> </ul>	Yes	No



Documentation	Detail required	Required for development below MHWM	Required for development above MHWM
<b>Landscape Plan</b>	<p><b>The plan must include:</b></p> <ul style="list-style-type: none"> <li>✔ proposed landscaping works</li> <li>✔ existing and proposed changes in contours</li> <li>✔ measures to protect vegetation during construction</li> <li>✔ proposed planting including species</li> <li>✔ description of the landscape design intent</li> <li>✔ existing and proposed changes in contours including any walling and structures</li> <li>✔ existing trees to be retained or felled, description of other existing site vegetation</li> <li>✔ proposed landscape planting including species and density</li> <li>✔ measures to protect vegetation during construction.</li> </ul>	Yes	Yes
<b>Visual Impact Statement</b>	<ul style="list-style-type: none"> <li>✔ Identify Scenic Management Zone for the site from Council's Scenic Management Guidelines.</li> <li>✔ Identify how proposal meets desired future character and scenic management guidelines.</li> <li>✔ Identify complementary design response including vegetation, building design, colours and materials, and reflectivity.</li> </ul>	Yes	Yes
<b>Aboriginal or European Heritage Assessment</b>	Consider/address the requirements contained in Parts 2-7 and 11 of Council's Development Control Plan	Yes	Yes
<b>NSW Maritime Approval</b>	In relation to potential impacts on navigation	Yes	No

Depending on the design and location of the proposed works, licenses, permits and/or consent from other public authorities may also be required. Applications and forms for permits may take multiple months to be reviewed by the relevant agency and a fee is charged upon submission.

The following table outlines the approvals, permits and consents, when these will be required, and where to access each form.

Approval/permit/consent	When is this required?	How do I complete this?
<b>NSW Department of Primary Industries Fisheries Approval</b>	<p>Required if works that occur on water land (i.e.) below the highest astronomical tide) are in key fish habitat.</p> <p>Required if marine vegetation is onsite, if foreshore works are built lakeward or if foreshore works involve dredging or reclamation.</p>	Online forms are available at; <a href="http://www.dpi.nsw.gov.au/fishing/habitat/protecting-habitats">www.dpi.nsw.gov.au/fishing/habitat/protecting-habitats</a>
<b>NSW Department of Primary Industries - Fisheries Permit</b>	Required if works that occur on water land, and in key fish habitat, would potentially harm marine vegetation, if works involve dredging or reclamation, or if fish passage would be blocked.	Online forms are available at <a href="http://www.dpi.nsw.gov.au/fishing/habitat/protecting-habitats">www.dpi.nsw.gov.au/fishing/habitat/protecting-habitats</a>
<b>NSW Maritime Approval</b>	Required if potentially impacting on navigation.	Online forms are available at <a href="http://www.transport.nsw.gov.au">www.transport.nsw.gov.au</a>
<b>NSW Department of Planning, Housing and Infrastructure – Crown Lands Landowner's Consent</b>	Required if coastal protection works occur on Crown Land (below MHWM)	Online forms are available at <a href="http://www.crownland.nsw.gov.au">www.crownland.nsw.gov.au</a>
<b>NSW Department of Planning, Housing and Infrastructure – Crown Lands Licence Application</b>	Required if coastal protection works occur on Crown Land (below MHWM)	Online forms are available at <a href="http://www.crownland.nsw.gov.au">www.crownland.nsw.gov.au</a>
<b>Aboriginal Heritage Impact Permit</b>	Required if coastal protection works are likely to affect an Aboriginal site	<p>Determine if the site is within an area sensitive to Aboriginal heritage.</p> <p>Further investigation may be required depending on the type and scope of the proposed development.</p> <p>If an Aboriginal Heritage Impact Permit is required, visit <a href="http://www.environment.nsw.gov.au">www.environment.nsw.gov.au</a></p>



## Development application process for foreshore and waterway development below the MWHM

The process for foreshore and waterway development is outlined in the following tables, the first table outlines the process when the development is below the MWHM and the second table outlines the process when the development is above the MWHM.

Step	Description	Actions
<b>Step 1</b>	Obtain Land Owners Consent from NSW Department of Planning, Housing and Infrastructure – Crown Lands	<p><b>Current process</b></p> <ol style="list-style-type: none"> <li>1. Compile information and documentation to apply for landowners consent including: <ul style="list-style-type: none"> <li>• Survey plan</li> <li>• Development proposal plans</li> <li>• Prepare impact statements</li> </ul> </li> <li>2. Contact NSW Department of Primary Industries – Fisheries for letter of advice</li> <li>3. Contact Transport for NSW for Letter of Concurrence</li> <li>4. Lodge application with NSW Department of Planning, Housing and Infrastructure – Crown Lands and pay fee</li> </ol> <p><b>New process once Domestic Waterfront Structures Land Owners Consent Strategy has been published for Lake Macquarie (expected in 2024)</b></p> <p>Foreshore coded green</p> <p>Lodge application with NSW Department of Planning, Housing and Infrastructure – Crown Lands and pay fee.</p> <p>Foreshore coded orange</p> <ol style="list-style-type: none"> <li>1. Compile information and documentation to apply for landowners consent including: <ul style="list-style-type: none"> <li>• Survey plan</li> <li>• Development proposal plans</li> <li>• Prepare impact statements</li> </ul> </li> <li>2. Contact NSW Department of Primary Industries – Fisheries for letter of advice</li> <li>3. Contact Transport for NSW for Letter of Concurrence</li> <li>4. Lodge application with NSW Department of Planning, Housing and Infrastructure – Crown Lands and pay fee</li> </ol> <p>Foreshore coded red</p> <p>Application should not proceed</p>
<b>Step 2</b>	Lodge Development Application with Council	<p>Compile information and documentation to lodge development application including:</p> <ul style="list-style-type: none"> <li>• Survey plan</li> <li>• Hydrographic survey</li> <li>• Development proposal plans</li> <li>• Statement of Environmental Effects</li> <li>• Aquatic habitat assessment</li> <li>• Landscape plan</li> <li>• Visual impact statement</li> <li>• Aboriginal or European heritage assessment</li> </ul>
<b>Step 3</b>	Application is assessed by Council	<ol style="list-style-type: none"> <li>1. Application assigned to assessment planner</li> <li>2. Neighbouring properties notified of application and invited to comment</li> <li>3. Referrals sent to expert Council officers and NSW Department of Primary Industries – Fisheries NSW for comment</li> <li>4. Development planner assesses application and makes determination</li> </ol>

Step	Description	Actions
<b>Step 4</b>	Application is determined by Council	Development consent issued with conditions to be complied with for construction and operation of development.
<b>Step 5</b>	Obtain Licence from NSW Department of Planning, Housing and Infrastructure – Crown Lands	Submit the approved development application and licence application to NSW Department of Planning, Housing and Infrastructure – Crown Lands.
<b>Step 6</b>	Obtain Construction Certificate	Submit application to Council or Private Certifier for a construction certificate.
<b>Step 7</b>	Obtain NSW Department of Primary Industries – Fisheries NSW permit	<ol style="list-style-type: none"> <li>1. Works that may harm marine vegetation require a Section 205 permit.</li> <li>2. Works that require dredging or reclamation require a Section 201 permit.</li> <li>3. Works that obstruct the free passage of fish require a Section 219 permit.</li> </ol>
<b>Step 8</b>	Undertake construction	
<b>Step 9</b>	Obtain Occupation Certificate	
<b>Step 10</b>	Submit works as executed survey to NSW Department of Planning, Housing and Infrastructure – Crown Lands	

## Development application process for foreshore and waterway development above the MWHM

Step	Description	Actions
<b>Step 1</b>	Lodge Development Application with Council	<p>Compile information and documentation to lodge development application including:</p> <ul style="list-style-type: none"> <li>• Survey plan</li> <li>• Landscape plan</li> <li>• Development proposal plans</li> <li>• Statement of Environmental Effects</li> <li>• Visual impact statement</li> <li>• Aboriginal or European heritage assessment</li> </ul>
<b>Step 2</b>	Application is assessed by Council	<ol style="list-style-type: none"> <li>1. Application assigned to assessment planner</li> <li>2. Neighbouring properties notified of application and invited to comment</li> <li>3. If works are proposed below the highest astronomical tidal limit, Council to consider whether to refer it to DPI Fisheries for concurrence ( e.g. if there is saltmarsh in the footprint of the proposed works).</li> <li>4. Development planner assesses application and makes determination</li> </ol>
<b>Step 3</b>	Application is determined by Council	Development consent issued with conditions to be complied with for construction and operation of development.
<b>Step 4</b>	Obtain Construction Certificate	Submit application to Council or Private Certifier for a construction certificate.
<b>Step 5</b>	Undertake construction	
<b>Step 6</b>	Obtain Occupation Certificate	

# 7. DESIGN EXAMPLES

## Best practice treatment designs

The images included here provide examples of foreshore stabilisation measures from recently constructed works around Australia, including Lake Macquarie. They embody best practice in design, addressing the enhancement of environmental values, high-quality design and foreshore access.



A rock revetment used to stabilise an eroding foreshore in an area that experiences ocean tides. The treatment retains and encourages foreshore vegetation (mangroves). It uses loose rock walls to protect against erosion and provide habitat, creates tidal pools for saltmarsh, the revetment has a sloping bank at high water mark to catch sea grass wrack, and steps down to provide access to the water.



Combination of cobble beach, sand and rock revetment at Belmont.



Combination of sandy beach and rock revetment at Belmont.

Revetment and native vegetation along lake foreshores. A combination of treatments – cobble beach, rock revetment and native vegetation – on a beach exposed to strong winds and waves. The combination of treatments allows a high level of protection from erosion, while retaining habitat and natural foreshore functions.



Shallow beach shore profile on lake foreshore with cobbled foreshore and emergent vegetation behind.



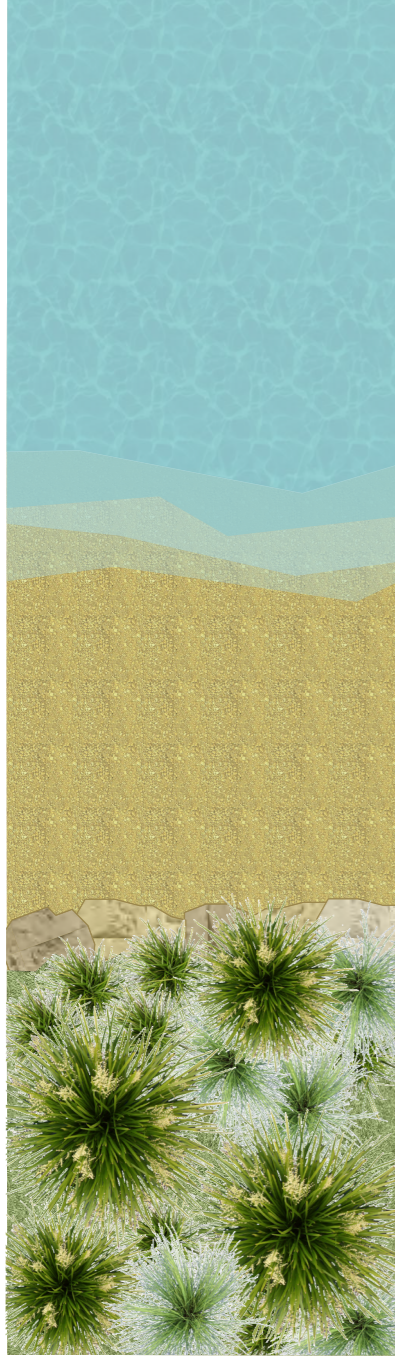
Seawall made from boulders of various size and shape with spaces between boulders providing sheltered habitat for wildlife (Source: Department of Environment and Climate Change NSW, 2009).



Seawall created without cement between the blocks to leave crevices, which provides valuable habitat (Source: Department of Environment and Climate Change NSW, 2009).

## Design 1 - Typical sandy beach treatment

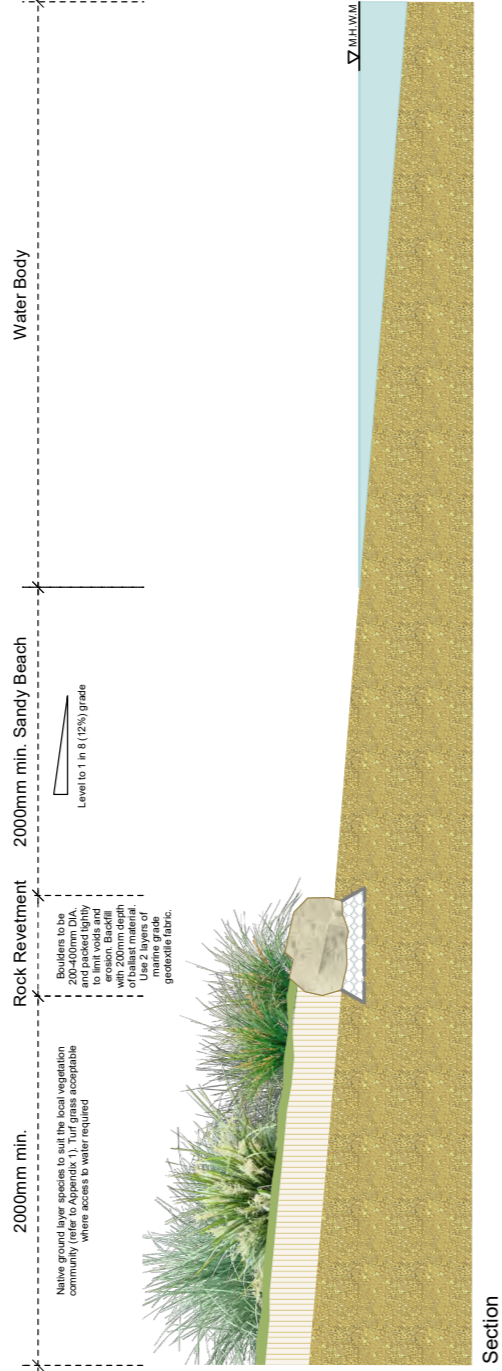
Plan



Precedent Images

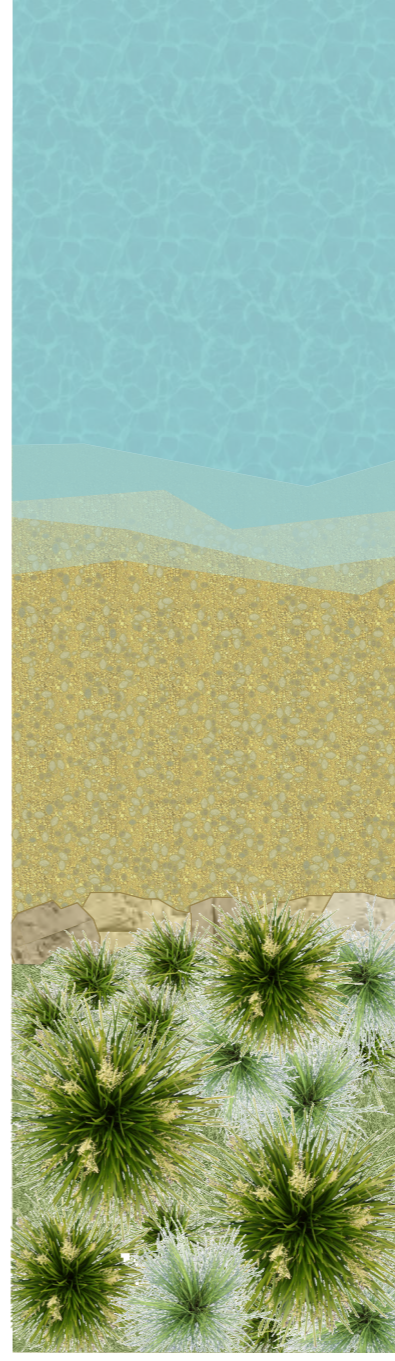


Sandy Beach  
Source: Lake Macquarie City Council, Strategy Team (March 2023)



## Design 2 - Typical cobble beach treatment

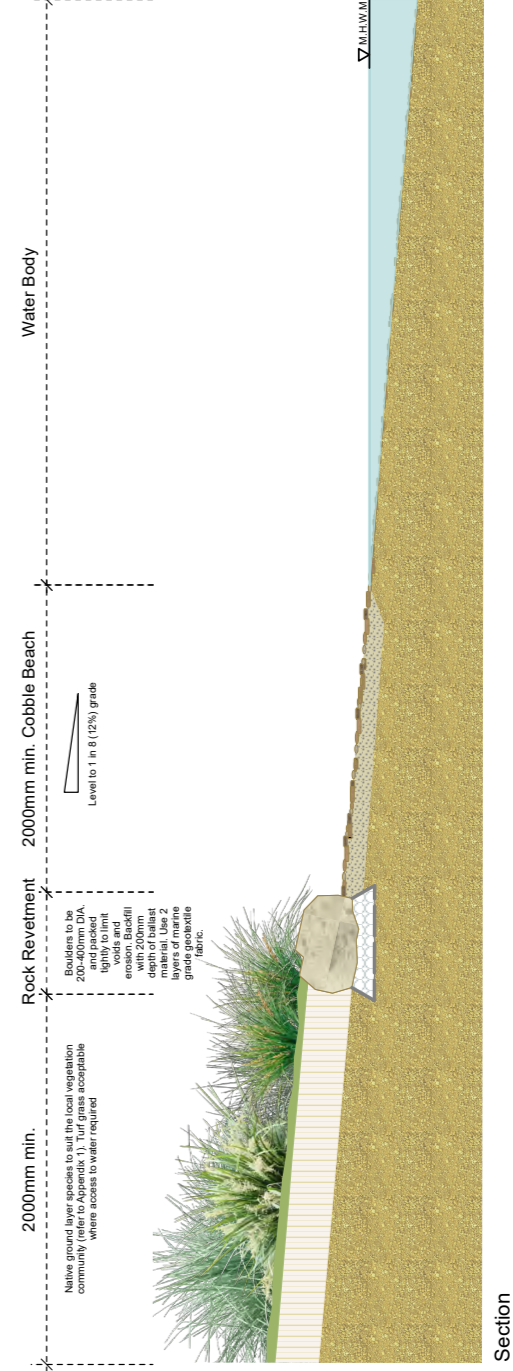
Plan



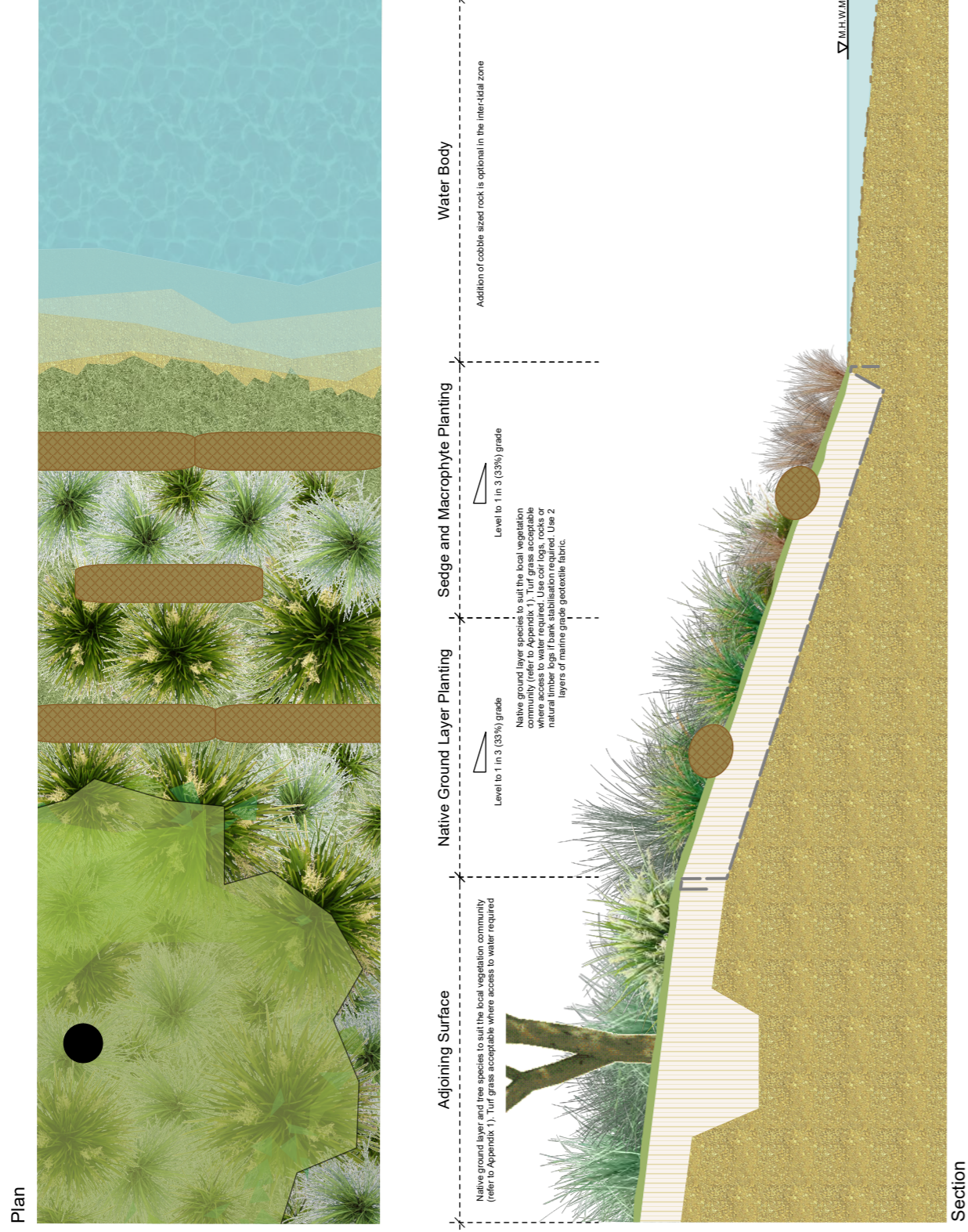
Precedent Images



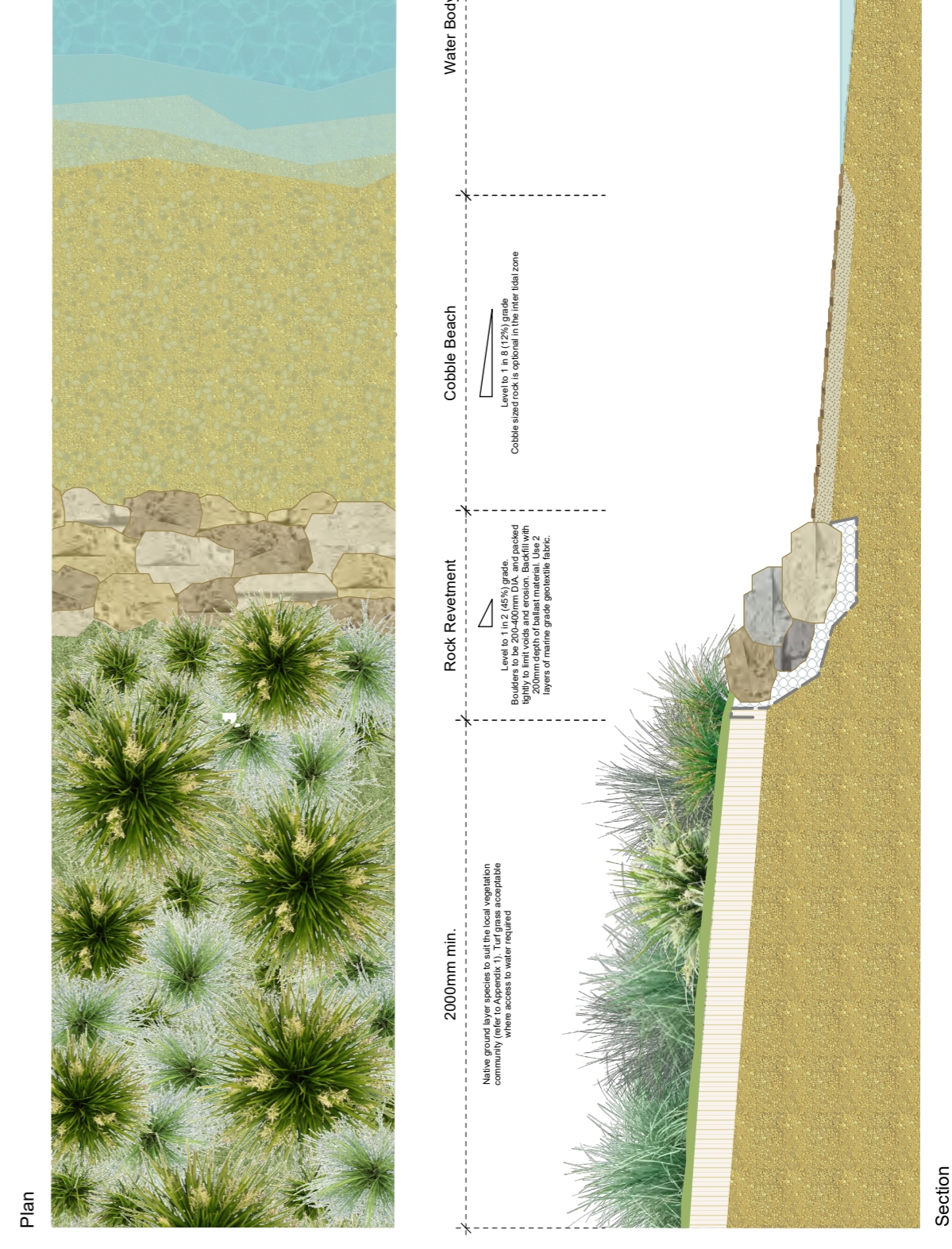
Cobble Beach  
Source: Lake Macquarie City Council, Strategy Team (March 2023)



## Design 3 - Revetment - shallow riparian streambank typical treatment



## Design 4 - Revetment - shallow tidal frontage (lake foreshore) typical treatment



## Design 5 - Retevment - deep tidal frontage typical treatment

Plan



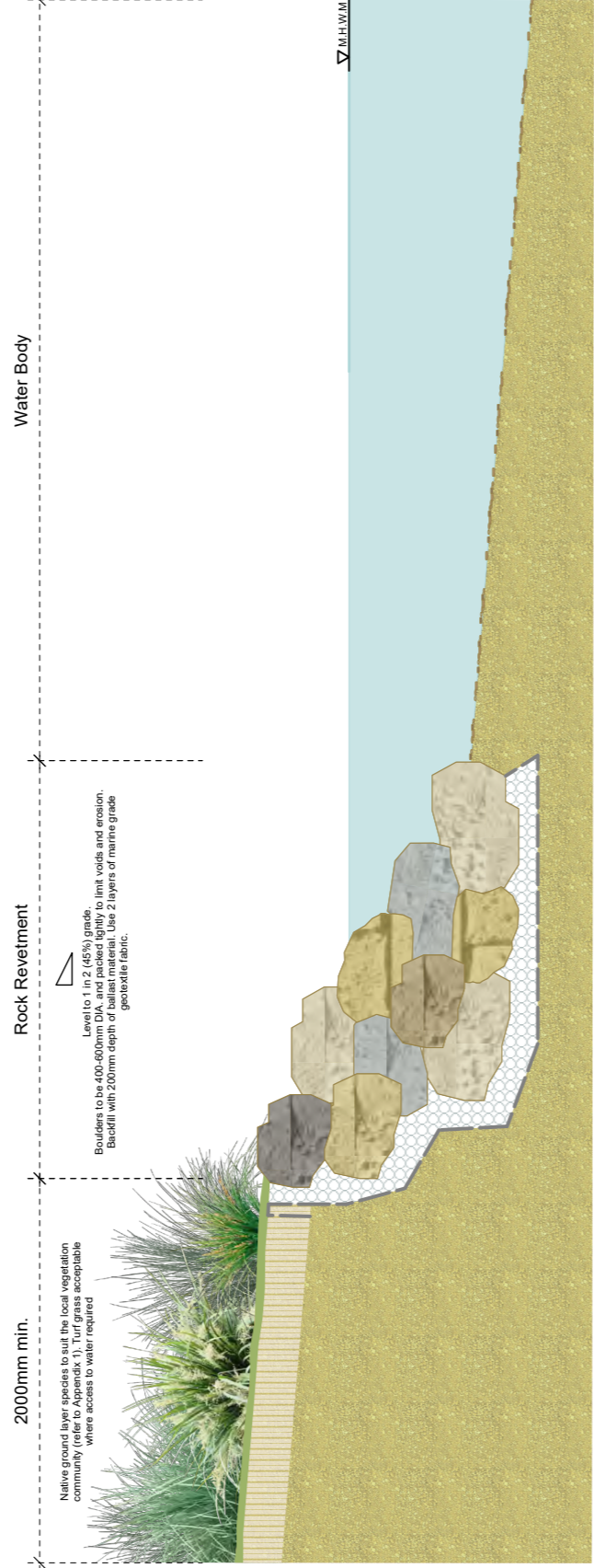
2000mm min.

Native ground layer species to suit the local vegetation community (refer to Appendix 1). Turf grass acceptable where access to water required

Rock Revetment

Level to 1 in 2 (45%) grade. Boulders to be 400-600mm dia. (max voids and erosion Backfill with 200mm depth of ballast material. Use 2 layers of marine grade geotextile fabric.

Water Body



Section

## Design 6 - Retevment - Deep tidal frontage with rock fillet treatment

Plan



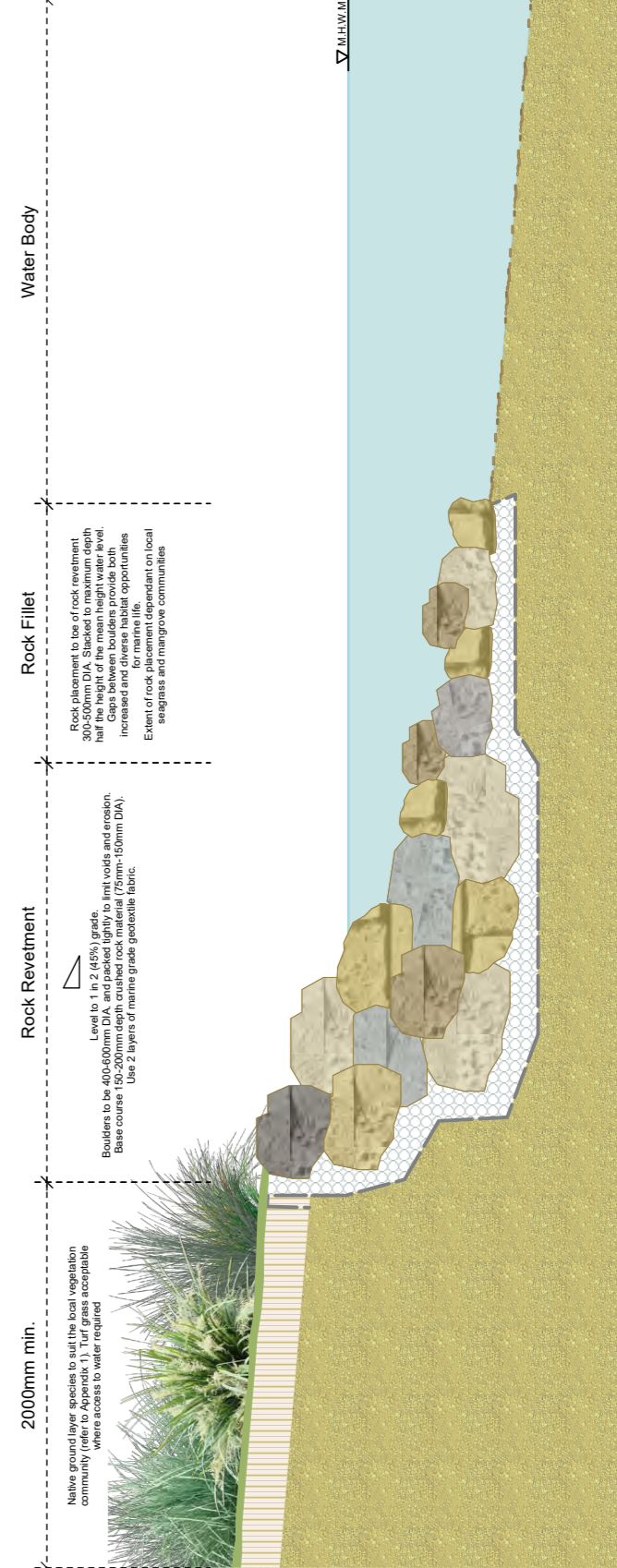
2000mm min.

Native ground layer species to suit the local vegetation community (refer to Appendix 1). Turf grass acceptable where access to water required

Rock Revetment

Level to 1 in 2 (45%) grade. Boulders to be 400-600mm dia. (max voids and erosion. Base course 150-200mm depth crushed rock material (75mm-150mm DIA). Use 2 layers of marine grade geotextile fabric.

Water Body



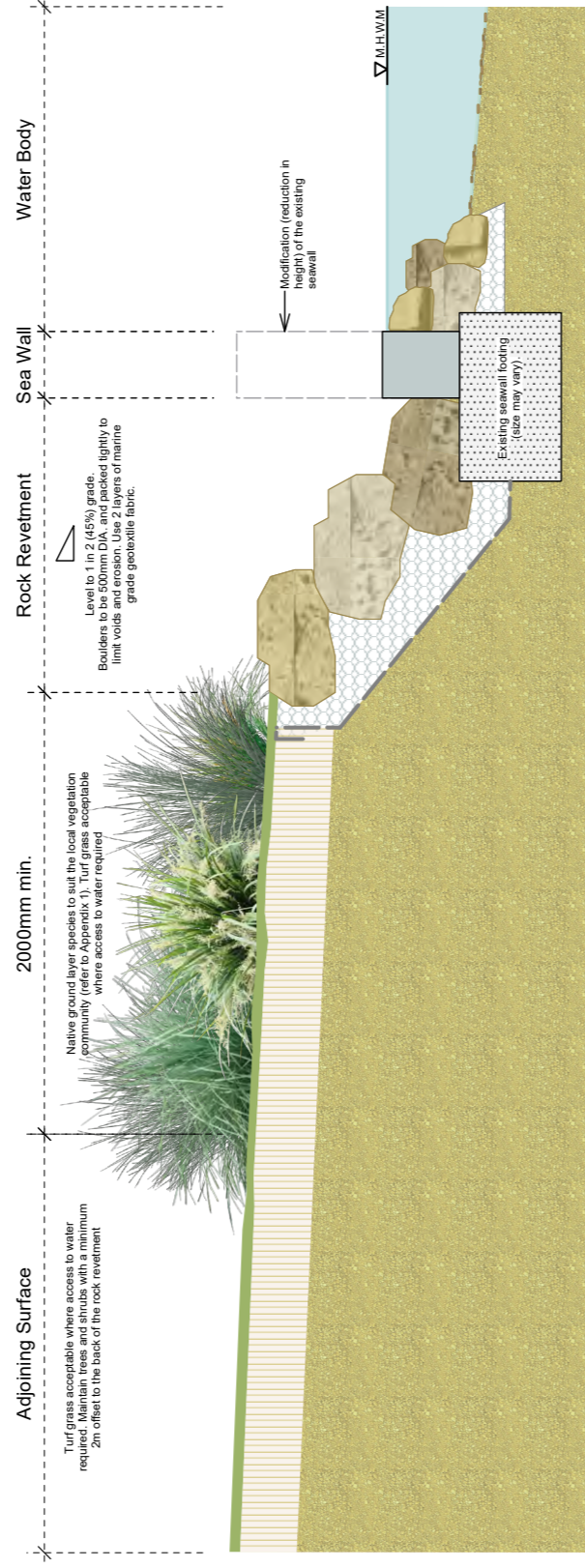
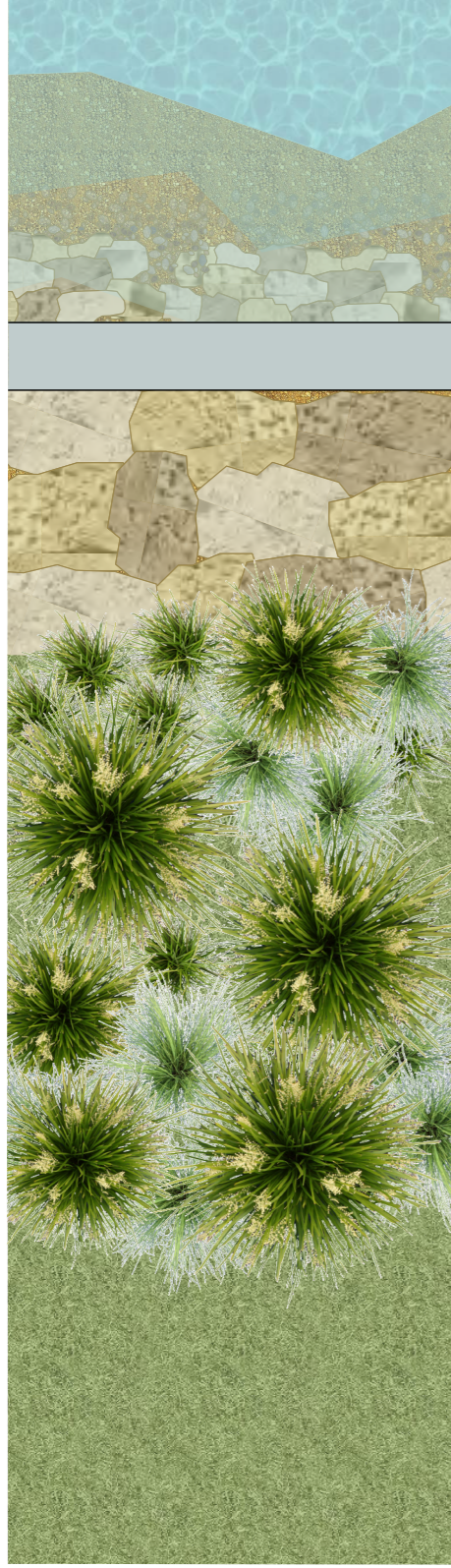
Section

Rock Fillet

Rock placement to be of rock revetment 300-500mm DIA. Staked to maximum depth half the height of the mean height water level. Gaps between boulders provide both increased and diverse habitat opportunities. Extent of rock placement dependant on local seagrass and mangrove communities

## Design 7 - Modification to existing seawall - remove wall or reduce wall height

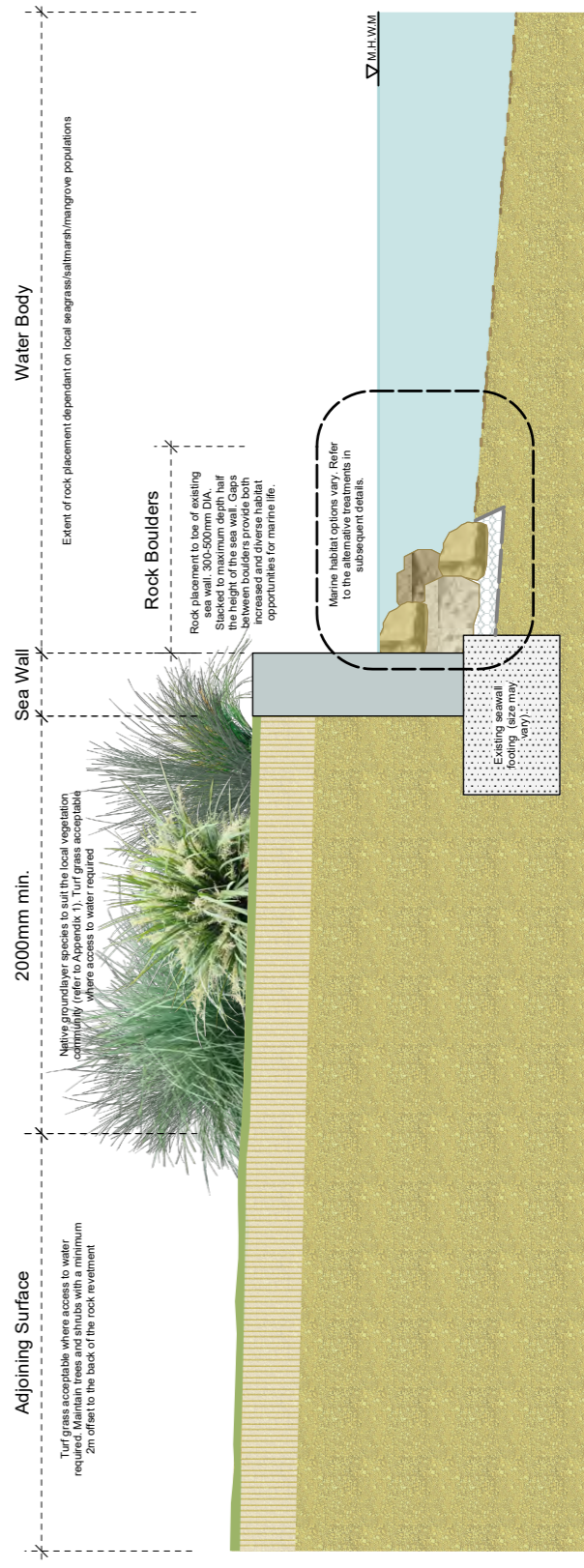
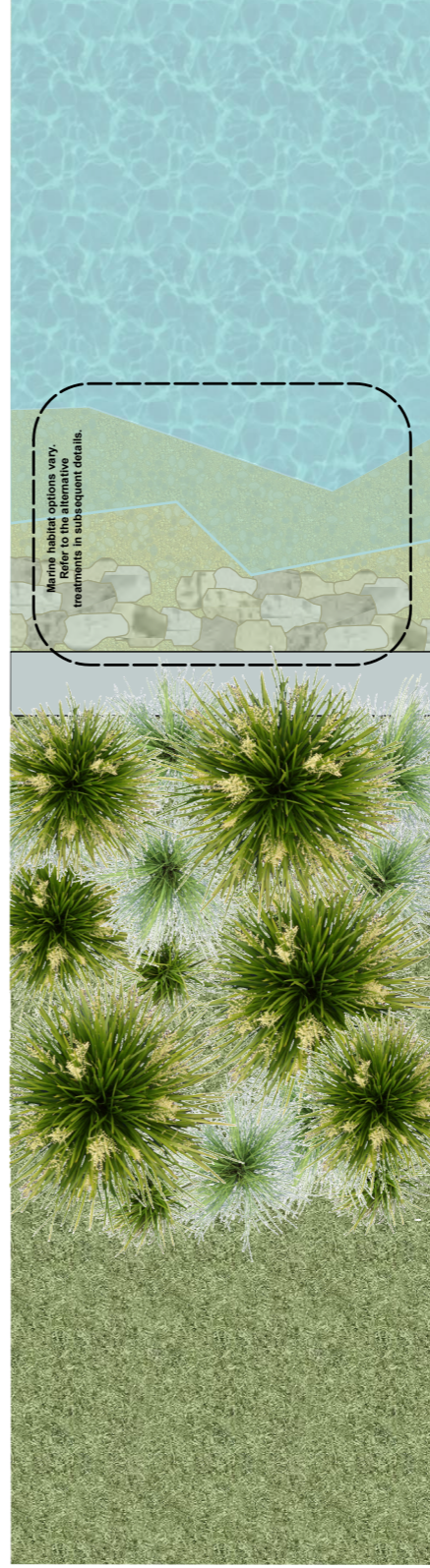
Plan



Section

## Design 8 - Modification to existing seawall - habitat creation

Plan

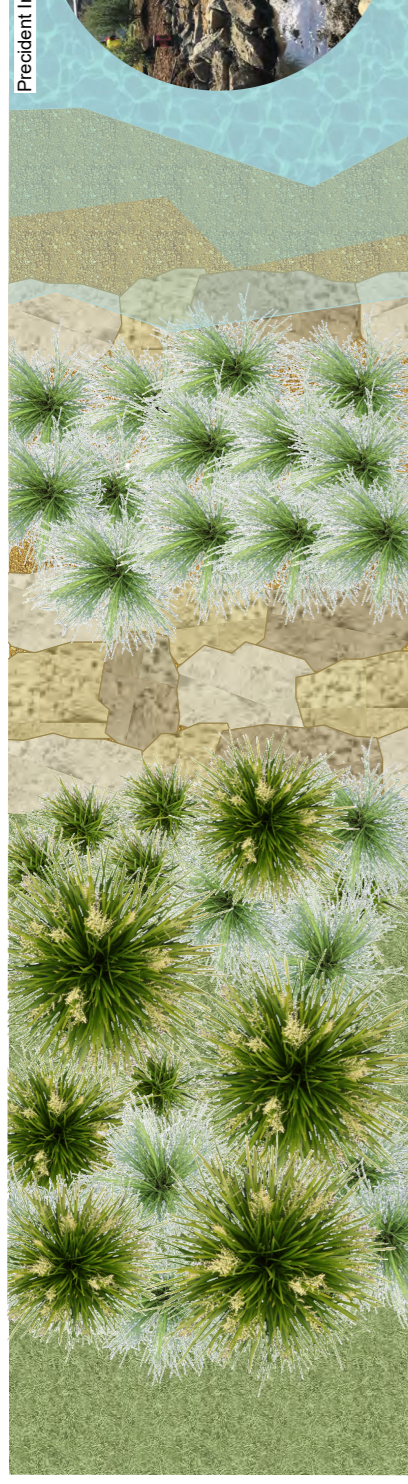


Section

Pre

# Design 9 - Modification to existing seawall - saltmarsh & rock revetment

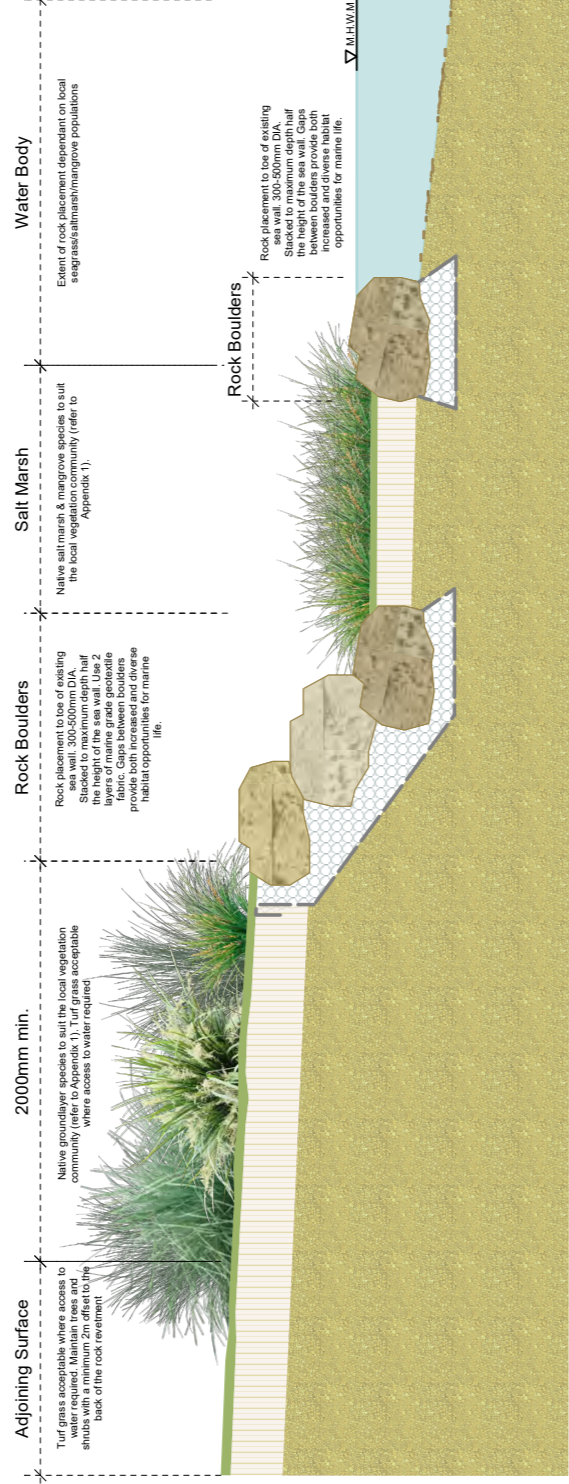
Plan



Precedent Images



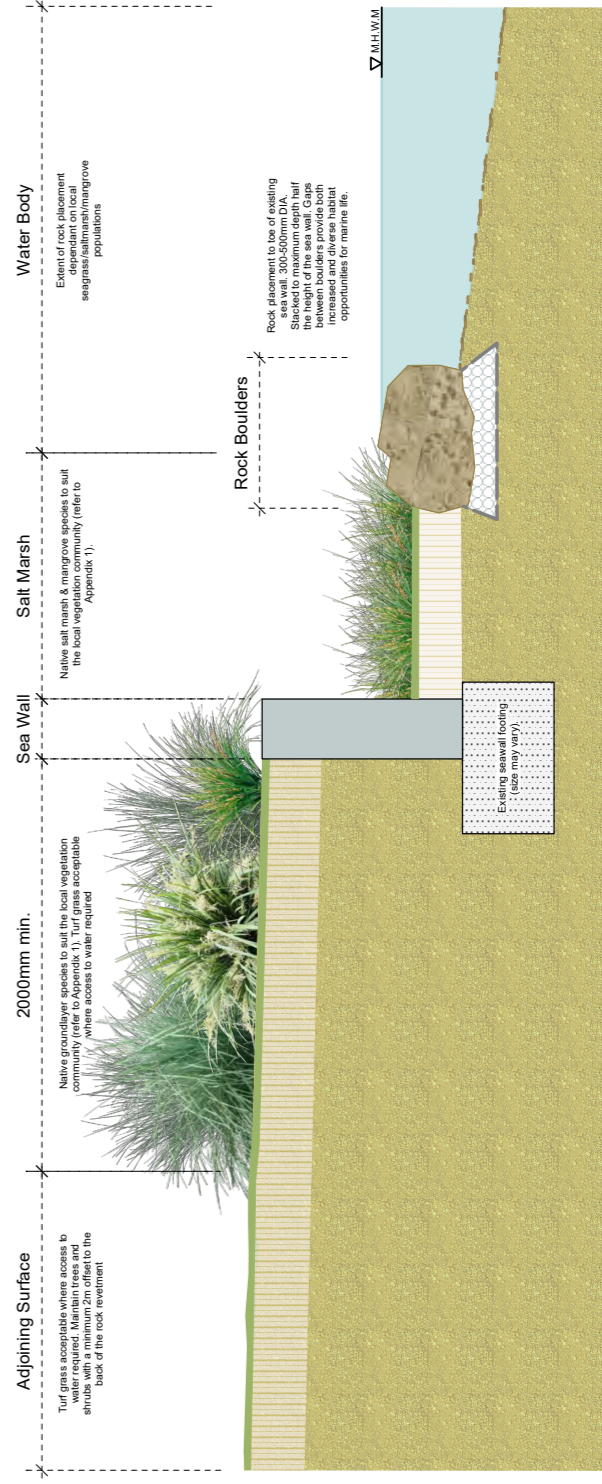
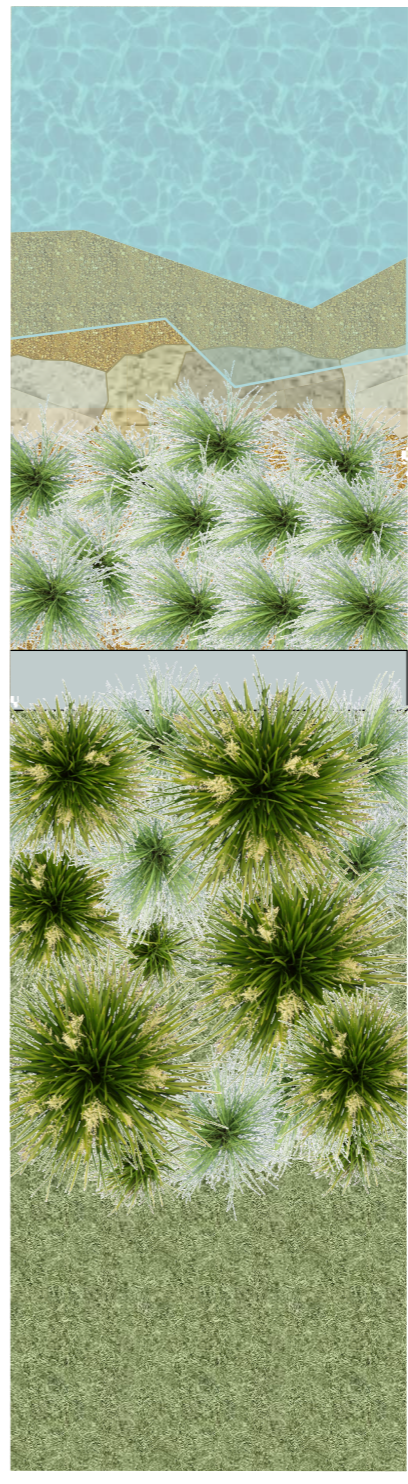
Saltmarsh & Rock Revetment  
© 2018 Lake Macquarie City Council



Section

# Design 10 - Modification to existing seawall - saltmarsh & rock revetment

Plan

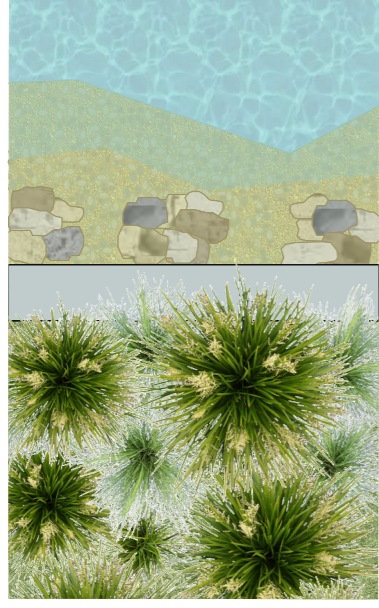


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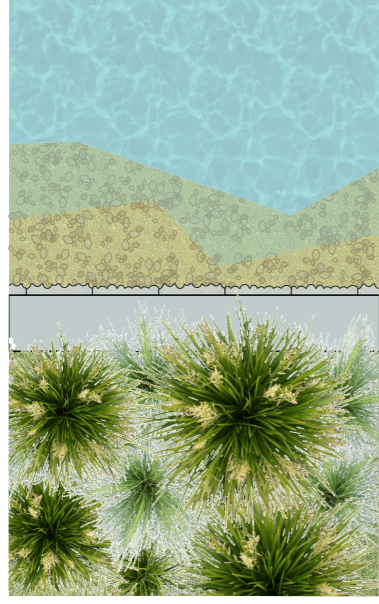


# Design 11 - Modification to existing seawall - habitat options

Plan - Rock placement in clusters along length of Sea wall



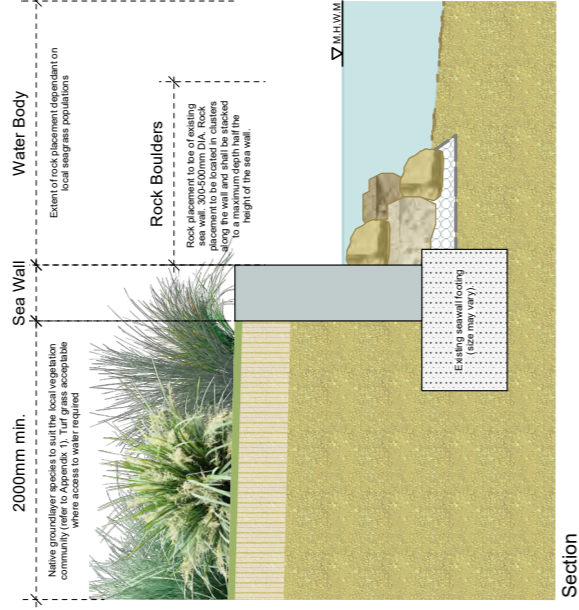
Plan - Retrofit Sea wall panels



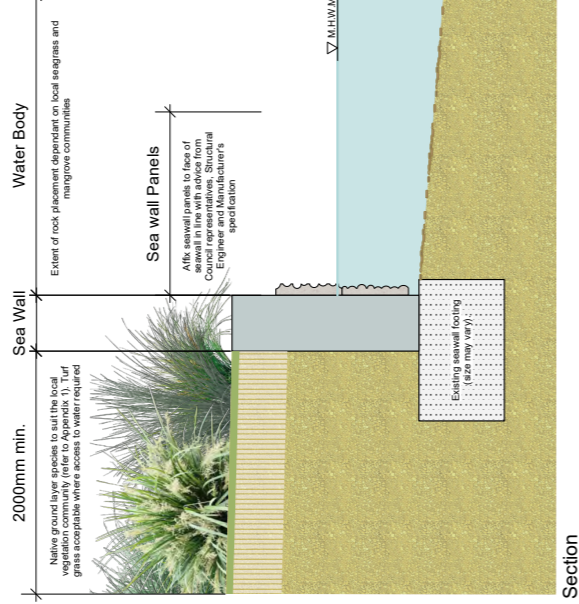
Precedent Images - Alternative Artificial Habitats



Seawall Panels  
Source: Long Beach Artificial Habitat Design Ltd (December 2012)



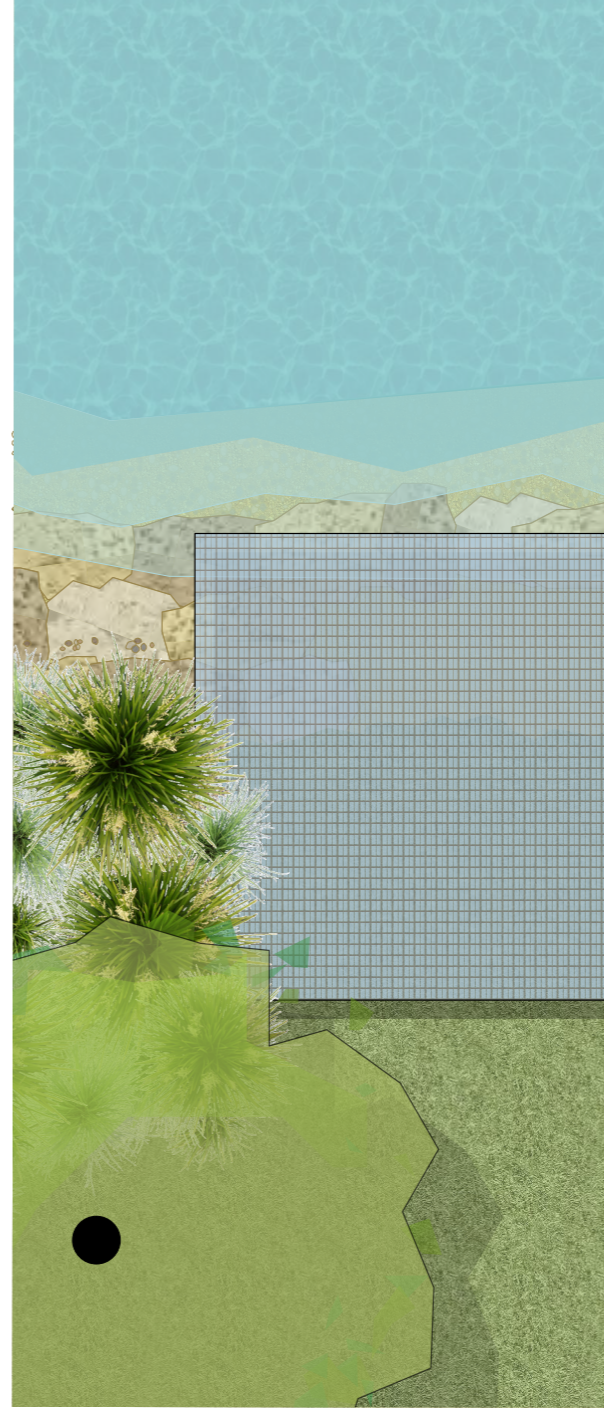
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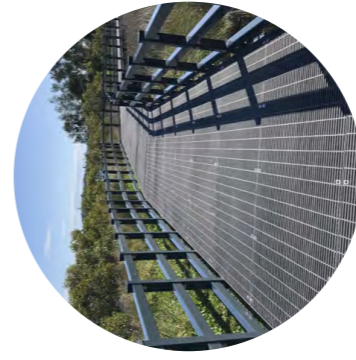
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# Design 12 - Typical landing platform treatment - tidal creeks

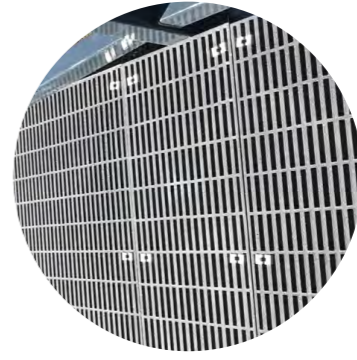
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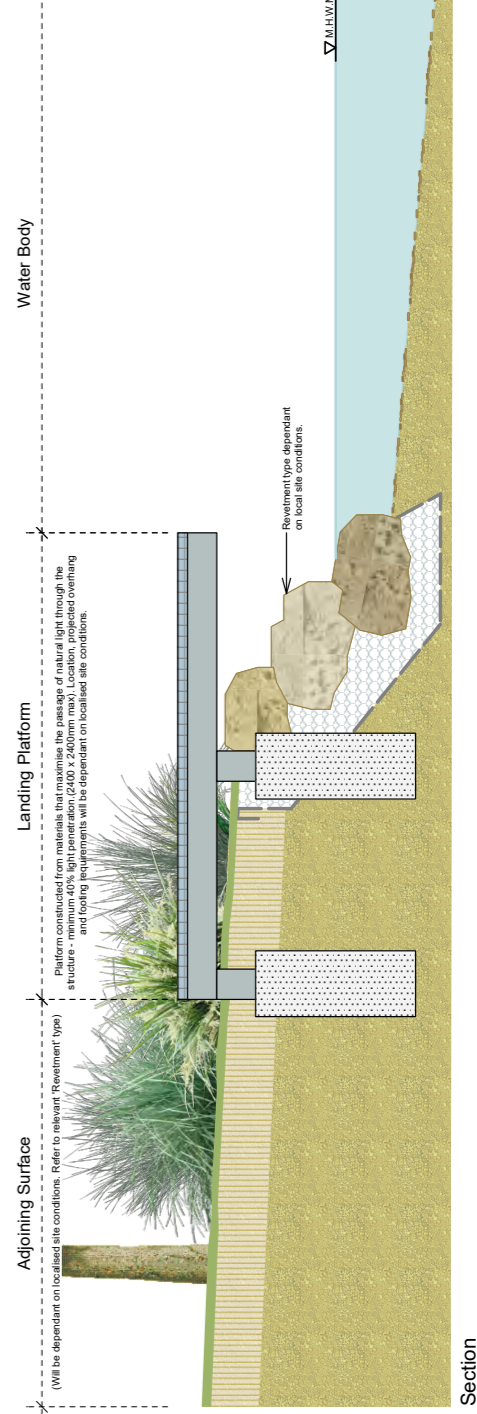
Design Themes



Platform/Boardwalk  
Source: Long Beach Artificial Habitat Design Ltd



FRP Decking Profile  
Source: Long Beach Artificial Habitat Design Ltd



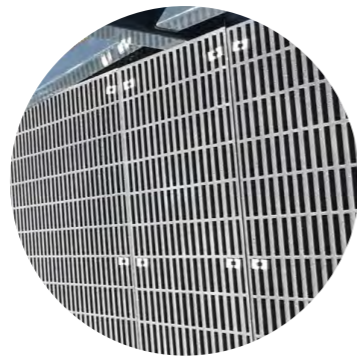
Section

# Design 13 - Typical landing platform treatment - Coastal foreshore

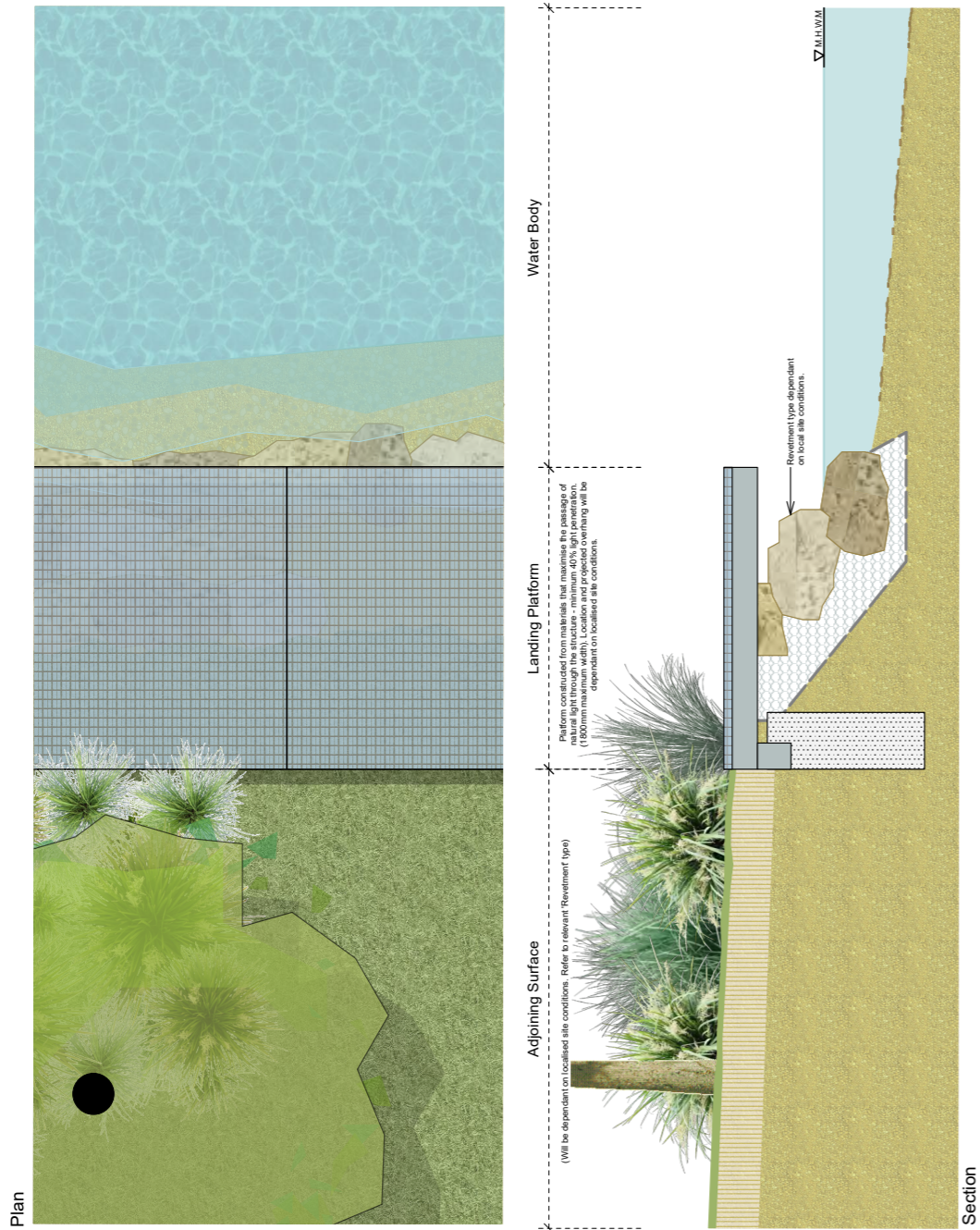
Design Themes



Platform/Boardwalk  
Source: Lake Macquarie City Council, November 2018



FRP Decking Profile  
Source: Lake Macquarie City Council, November 2018



## Appendix 1 – Recommended Native Species for Planting in the Foreshore Area

### TIDAL AND IMMEDIATE FORESHORE ZONE BELOW 1M ELEVATION - PLANTS DERIVED FROM SWAMP OAK - RUSHLAND FOREST/SALTMARSH AREAS

Planting density: Canopy 2/10m<sup>2</sup>, Ground 6/1m<sup>2</sup>

### AREAS OF FORESHORE ABOVE 1M ELEVATION - PLANTS DERIVED FROM FORESHORE REDGUM-ROUGH-BARKED APPLE/IRONBARK FOREST

Planting density: Canopy 1/10m<sup>2</sup>, Sub Canopy 1/10m<sup>2</sup>, Midstory 1/1m<sup>2</sup>, Ground 6/1m<sup>2</sup> (n.b. twiners with potential to smother plantings denoted with a (T) should only make up 10% of total ground layer planting)

#### CANOPY

##### UPPER CANOPY - Elevation 0 - 0.5m

botanic name	common name
<i>Casuarina glauca</i>	swamp oak
<i>Eucalyptus tereticornis</i>	forest red gum

##### UPPER CANOPY

botanic name	common name
<i>Angophora floribunda</i>	rough-barked apple
<i>Casuarina glauca</i>	swamp oak
<i>Eucalyptus tereticornis</i>	forest red gum
<i>Eucalyptus paniculata</i>	grey ironbark

#### SUB CANOPY

botanic name	common name

botanic name	common name
<i>Allocasuarina littoralis</i>	black she-oak
<i>Melaleuca styphelioides</i>	prickly-leaved tea tree
<i>Glochidion ferdinandi</i>	cheese tree

#### MIDSTOREY

##### TALL SHRUB

botanic name	common name

botanic name	common name
<i>Acacia falcata</i>	sickle wattle
<i>Acacia implexa</i>	hickory wattle
<i>Acacia longifolia subsp. Longifolia</i>	sydney golden wattle
<i>Acacia ulicifolia</i>	prickly moses
<i>Breynia oblongifolia</i>	coffee bush
<i>Clerodendrum tomentosum</i>	downy chance tree
<i>Dodonaea triquetra</i>	large-leaf hop bush
<i>Leptospermum polygalifolium</i>	tantoon
<i>Melaleuca nodosa</i>	prickly-leaved paperbark
<i>Notelaea longifolia</i>	large mock-olive
<i>Pittosporum revolutum</i>	rough fruit pittosporum
<i>Rubus parvifolius</i>	native raspberry

**TIDAL AND IMMEDIATE FORESHORE ZONE BELOW 1M ELEVATION - PLANTS DERIVED FROM SWAMP OAK - RUSHLAND FOREST/SALTMARSH AREAS**

Planting density: Canopy 2/10m<sup>2</sup>, Ground 6/1m<sup>2</sup>

**AREAS OF FORESHORE ABOVE 1M ELEVATION - PLANTS DERIVED FROM FORESHORE REDGUM-ROUGH-BARKED APPLE/IRONBARK FOREST**

Planting density: Canopy 1/10m<sup>2</sup>, Sub Canopy 1/10m<sup>2</sup>, Midstory 1/1m<sup>2</sup>, Ground 6/1m<sup>2</sup> (n.b. twiners with potential to smother plantings denoted with a (T) should only make up 10% of total ground layer planting)

**GROUND LAYER**

**GROUND FERN**

botanic name	common name	botanic name	common name
		<i>Adiantum aethiopicum</i>	common maidenhair
		<i>Pteridium esculentum</i>	bracken

**GRASS**

botanic name	common name	botanic name	common name
<i>Sporobolus virginicus</i>	sand couch	<i>Aristida vagans</i>	threeawn speargrass
<i>Zoysia macrantha</i>	prickly couch	<i>Dichelachne micrantha</i>	shorthair plumegrass
		<i>Echinopogon caespitosus</i>	bushy hedgehog-grass
		<i>Entolasia marginata</i>	bordered panic
		<i>Entolasia stricta</i>	wiry panic
		<i>Imperata cylindrica</i>	blady grass
		<i>Microlaena stipoides</i>	weeping meadow grass
		<i>Oplismenus aemulus</i>	australian basket grass
		<i>Panicum simile</i>	two-colour panic
		<i>Paspalidium distans</i>	spreading panic-grass
		<i>Themeda australis</i>	kangaroo grass

**SEDGE**

botanic name	common name	botanic name	common name
<i>Juncus kraussii</i>	sea rush	<i>Gahnia clarkei</i>	tall saw sedge
<i>Baumea juncea</i>	bare twig rush		

**GRAMINOID/HERB/TWINER**

botanic name	common name	botanic name	common name
<i>Apium prostratum</i>	sea celery	<i>Cayratia clematidea (T)</i>	native grape
<i>Samolus repens</i>	creeping brookweed	<i>Centella asiatica</i>	indian pennywort
<i>Sarcocornia quinqueflora</i>	samphire	<i>Dianella caerulea</i>	blue flax lily
<i>Sesuvium portulacastrum</i>	sea purslane	<i>Dianella revoluta</i>	blue flax lily
<i>Suaeda australis</i>	seablite	<i>Dichondra repens</i>	kidney weed
<i>Tetragonia tetragonoides</i>	warrigal greens	<i>Eustrephus latifolius (T)</i>	wombat berry
		<i>Geranium homeanum</i>	rainforest crane's-bill
		<i>Gonocarpus tetragynus</i>	common raspwort
		<i>Hydrocotyle sibthorpioides</i>	lawn pennywort
		<i>Lomandra longifolia</i>	spiny-head matt rush
		<i>Pratia purpurascens</i>	white root
		<i>Stephania japonica (T)</i>	tape vine
		<i>Viola hederacea</i>	native violet

# GLOSSARY

**Absolute waterfront:** when the property boundary directly adjoins Lake Macquarie (most commonly along the DHWM). Where a reserve or land parcel lies between the property and the lake, the property is not classed as absolute waterfront

**Accretion:** the build-up of sediments to form land in the lake

**Adapt:** the ability to adjust to change

**Adaptive design:** designs that can be modified over time in response to change

**Ambulatory:** the movement of the foreshore landward or lakeward over time

**Anaerobic:** without oxygen

**Asset life:** the amount of time infrastructure will be effective for

**Australian Height Datum (AHD):** is the original height for all levels as fixed by the Surveyor General. It is about mean sea level

**Boat ramp:** a structure designed to launch recreational vessels from a domestic property

**Boatshed:** a building or other structure used for the storage and routine maintenance of a boat and which associated with a private residence.

**Breakwater:** a barrier built out into the sea to protect a coast or harbour from the force of waves

**Coastal hazard:** includes beach erosion, shoreline recession, coastal lake or watercourse entrance instability, coastal inundation, coastal cliff or slope instability, tidal inundation, erosion and inundation or foreshores caused tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters

**Davit:** mechanical device for lifting or steering a vessel out of the water.

**Deed High Water Mark (DHWM):** is the position of the mean high water mark as shown on the deposited plan on which the current title for the land to which the development relates is based

**Erosion:** the wearing away of land from natural forces such as waves and wind

**Fetch:** the total distance of a surface that wind can blow continuously over, such as the lake, that can form wind waves

**Foreshore area:** means the land between the foreshore building line and the mean high water mark of the nearest natural waterbody

**Foreshore development:** means boatsheds, jetties, slipways, boat ramps, swimming pools, inclinators, landscaping, coastal protection works, wharves, waterway access stairs, cycleways, picnic facilities recreation areas, pontoons, domestic landing platforms, fences or other similar structures within the foreshore area and below the mean high water mark

**Hard structures:** includes revetments and seawalls that retain and armour the shoreline

**Hazard:** a source of potential harm or a situation that may cause loss

**Jetty:** a horizontal, decked walkway that provides access from the foreshore of a property to the waterway, and is generally constructed on a pier or piled foundation

**key fish habitat:** includes all marine and estuarine habitats up to highest astronomical tide level (that reached by 'king' tides) and most permanent and semi-permanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank.

**Lake level rise:** a rise in water levels in the lake associated with both heavy rain events and sea level rise

**Longshore drift:** wave currents causing sediment to move along the shoreline

**Mean High Water Mark (MHWM):** is the position where the plan of the mean high water level of all ordinary local high tides intersects the foreshore. The mean high water of Lake Macquarie has been determined as + 0.132 metres on the Australian Height Datum (AHD)

**Prolongation:** is the extension or continuation of the boundary lines of a property beyond its physically marked or surveyed limits.

**Pontoon:** a floating structure used for access to the water that is supported by a jetty and ramp

**Recession:** is the landward movement of the shoreline from the combined effects of inundation and erosion

**Reclamation:** any works that involve placing material (e.g. sand, rocks) to fill the water

**Revetment:** is protective structure built along the banks of a waterway to prevent erosion and stabilise the banks.

**Risk:** chance of something happening that will have an impact

**Scarp:** a change in the natural shoreline caused by water and/or wind erosion

**Seagrass wrack:** dead seagrass leaves that builds up on the shore

**Sea level rise:** a continuous rise in global sea levels as warm water expands and ice sheets and glaciers melt, relative to human-induced climate change

**Seawall:** a wall or embankment erected to prevent the sea encroaching on or eroding an area of land

**Slipway:** Any structure, usually in the form of two support parallel rails, on which a wheeled cradle is run to draw a vessel by means of a powered or manual winch, a block and tackle or the like

**Soft structures:** includes beaches with coarse sand or pebble, and incorporates vegetation

**Storm surge:** an increase in water levels caused by the effect of storms

**Tidal inundation:** when daily lake tides cover the land

**Transference (of erosion):** coastal protection works that cause wave energy to be passed either side onto neighbouring properties

**Water land:** (with respect to *Fisheries Management Act 1994*) means land that is intermittently or permanently submerged by water (either naturally or artificially) and includes wetlands.

**Wave over-topping:** waves that wash over foreshore treatments onto the land

**Wrack:** the build-up of debris, including seagrasses and other material, on the foreshore

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