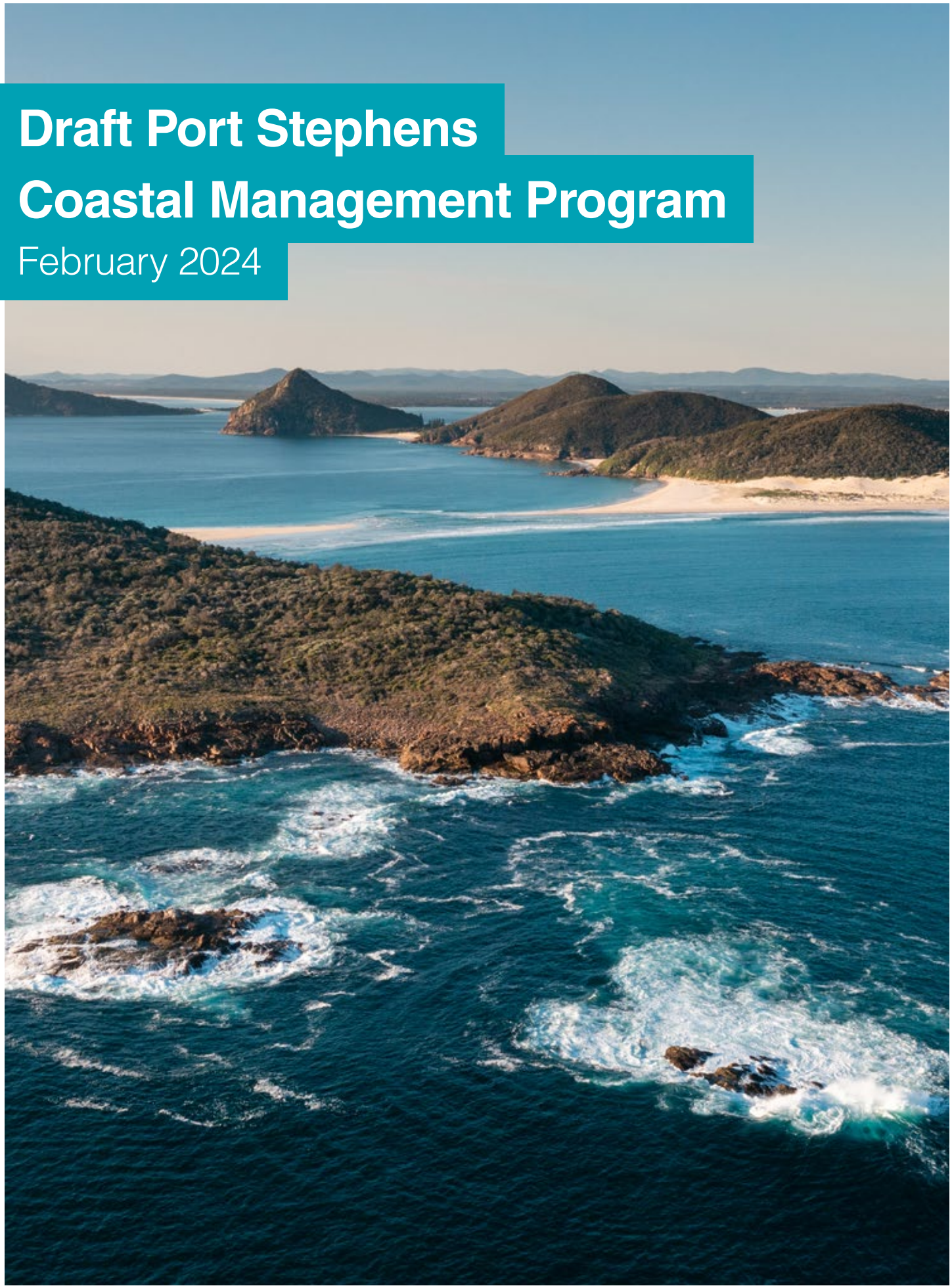
Draft Port Stephens Coastal Management Program

February 2024



This document provides strategic direction and actions to address threats to the coast and maintain the ecological, social and economic values Port Stephens' coastal zone.

PORT STEPHENS COUNCIL

Contact Information

Rhelm Pty Ltd
ABN : 55 616 964 517
50 Yeo Street
Neutral Bay NSW 2089
Australia

Lead Author:
Tanja Mackenzie
tanja.mackenzie@rhelm.com.au

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Acknowledgements

Acknowledgement of Traditional Owners

We acknowledge the Worimi as the original Custodians and inhabitants of Port Stephens.

May we walk the road to tomorrow with mutual respect and admiration as we care for the beautiful land and waterways together.

Acknowledgement of Financial Assistance

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Photo: Tomaree Mountain, viewed from Shoal Bay (T. Mackenzie)

Glossary and Abbreviations[1]

Abbreviation / Term	Description
Adaptation	Adjustment in natural or human systems in response to actual or expected climate change or its effect, to moderate harm or to take advantage of beneficial opportunities.
Aeolian sand transport	The erosion, transport and deposition of sand by the action of wind.
ASS	Acid Sulfate Soils
Average Recurrence Interval (ARI)	The Average Recurrence Interval (ARI) refers to the long-term average number of years between the occurrence of an event (e.g. a coastal storm) as big as (or larger than) the selected event. ARI is another way of expressing the likelihood of occurrence of a storm event Also known as Return Period.
Beach erosion	Refers to landward movement of the shoreline and/or a reduction in beach volume, usually associated with storm events or a series of events, which occurs within the beach fluctuation zone. Beach erosion occurs due to one or more process drivers; wind, waves, tides, currents, ocean water level, and downslope movement of material due to gravity.
Beach nourishment	Beach restoration or augmentation using clean dredged or fill sand. Dredged sand is usually hydraulically pumped and placed directly onto an eroded beach or placed in the littoral transport system. When the sand is dredged in combination with constructing, improving, or maintaining a navigation project, beach nourishment is a form of beneficial use of dredged material.
Beach scraping	Also referred to as 'nature assisted beach enhancement' is a mechanical intervention to speed up the natural processes of berm and foredune recovery after a storm event.
CBA	Cost-benefit Analysis
CEA	Coastal Environment Area
CM Act	NSW *Coastal Management Act 2016*
CM Manual	The NSW Coastal Management Manual (OEH, 2018b).
Coastal dune	Vegetated and unvegetated sand ridges built-up at the back of a beach. They comprise dry beach sand that has been blown landward and trapped by plants or other obstructions. Stable sand dunes act as a buffer against wave damage during storms, protecting the land behind from saltwater intrusion, sea spray and strong winds. Coastal dunes also act as a reservoir of sand to replenish and maintain the beach at times of erosion.
Coastal hazard	Defined in the CM Act to mean the following: • beach erosion • shoreline recession • coastal lake or watercourse entrance instability • coastal inundation • coastal cliff or slope instability • tidal inundation • erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.
Coastal inundation	Flooding of low-lying areas by ocean waters, caused by a higher than normal sea level (e.g., due to storm tide).

[1] Where possible, definitions for terms have been sourced from the Coastal Management Glossary (OEH, 2018a).

Abbreviation / Term	Description
Coastal Management Area (or CMA)	Any one of four areas that make up the coastal zone as defined in the CM Act. These are the coastal wetlands and littoral rainforests area, coastal vulnerability area, coastal environment area, and the coastal use area.
Coastal Management Program (CMP)	A long-term strategy for the coordinated management of land within the coastal zone, prepared and adopted under Part 3 of the CM Act.
Coastal processes	Coastal processes are the set of mechanisms that operate at the land-water interface. These processes incorporate sediment transport and are governed by factors such as tide, wave and wind energy.
Coastal protection works	The CM Act defines coastal protection works as: a) beach nourishment b) activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters, including (but not limited to) seawalls, revetments and groynes.
Coastal threat	A process or activity that is putting pressure on or impacting on the health or function of a coastal ecosystem, or on the amenity and social or cultural value of the coastal landscape.
CN	City of Newcastle
CUA	Coastal Use Area
CVA	Coastal Vulnerability Area
CWLRA	Coastal Wetlands and Littoral Rainforest Area
CZEAS	Coastal Zone Emergency Action Strategy
DCCEEW	NSW Department of Climate Change, Energy, the Environment and Water
DCP	Development Control Plan
DPE	Former NSW Department of Planning and Environment; now split into two departments, DPHI and DCCEEW.
DPHI	NSW Department of Planning, Housing and Infrastructure
DPI	NSW Department of Primary Industries
Dune transgression (or major sand drift)	Sand drift describes the movement of sand by wind. On the coast, this generally describes sand movement resulting from natural or human-induced degradation of dune vegetation, resulting in either nuisance or major sand drift. Dune transgression is classified as major sand drift.
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
ESD	Ecologically Sustainable Development
FM Act	NSW *Fisheries Management Act 1994*
Foredune	The larger and more mature dune lying between the incipient dune and the hinddune area. Foredune vegetation is characterised by grasses and shrubs. Foredunes provide an essential reserve of sand to meet the erosion demand during storm conditions. During storm events, the foredune can be eroded back to produce a pronounced dune scarp.
Foreshore	The part of the shore, lying between the crest of the seaward berm (or upper limit of wave wash at high tide) and the ordinary low water mark, that is ordinarily traversed by the uprush and backrush of the waves as the tides rise and fall; or the beach face, the portion of the shore extending from the low water line up to the limit of wave uprush at high tide. The CM Act defines the foreshore as 'the area of land between highest astronomical tide and the lowest astronomical tide'.

Abbreviation / Term	Description
Highest astronomical tide (HAT)	The highest level which can be predicted to occur under average meteorological conditions and any combination of astronomical conditions.
HWC	Hunter Water Corporation
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
LG Act	NSW *Local Government Act 1993*
LLS	Local Land Services
Longshore transport (littoral drift)	Refers to the sediment moved along a coastline under the action of wave-induced longshore currents.
MCC	MidCoast Council
Mean High Water Mark (MHWM)	The line of the medium high tide between the highest tide each lunar month (the springs) and the lowest tide each lunar month (the neap) averaged out over the year.
MHL	Manly Hydraulics Lab
MIDO	Maritime Infrastructure Delivery Organisation (within Transport for NSW)
Multi-criteria analysis (MCA)	A logical and structured decision-making tool for complex problems involving multiple factors or criteria, where a consensus is difficult to achieve. It may involve processes such as ranking, rating (with relative or ordinal scales) or pairwise comparisons. The process allows participants to consider, discuss and evaluate complex trade-offs among alternatives.
NP&W Act	NSW *National Parks and Wildlife Act 1974*
No or low regrets options	Options which would be justified under any plausible future scenario (i.e., they are best practice in any circumstance), and similarly, actions which require only moderate investment to achieve a beneficial outcome.
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NSW IP&R Framework	The NSW Integrated Planning and Reporting Framework
NSW SES	NSW State Emergency Service
PoM	Plan of Management
Probabilistic hazard assessment	A risk-based approach to managing coastal hazards that takes uncertainty into account by considering both the likelihood and consequence of hazard occurrence. It applies a stochastic simulation to evaluate coastal processes. The technique uses a distribution of values for each parameter to account for expected variation, or uncertainty, rather than single values. Parameters are then combined using a Monte-Carlo technique to produce a probabilistic forecast of future shoreline position.
PSC	Port Stephens Council
PSLEP 2013	Port Stephens Local Environmental Plan 2013
Resilience	The ability of a system (human or natural) to adapt to changing conditions (including hazards or threats, variability and extremes), and rapidly recover from disruption due to emergencies. Resilient systems or communities have the capacity to 'bounce back' after a disrupting event

Abbreviation / Term	Description
	such as a major storm or an extended heat wave, to moderate potential damages, take advantage of opportunities, maintain or restore function or to cope with the consequences.
Resilience and Hazards SEPP	State Environmental Planning Policy (Resilience and Hazards) 2021
Revetment or seawall	A type of coastal protection works which protects assets from coastal erosion by armouring the shore with erosion–resistant material. Large rocks/boulders, concrete or other hard materials are used, depending on the specific design requirements.
Riparian	Pertaining to the banks of a body of water, such as an estuary.
SEPP	State Environmental Planning Policy
Shoreline recession	Refers to continuing landward movement of the shoreline, that is, a net landward movement of the shoreline, generally assessed over a period of several years. As shoreline recession occurs the beach fluctuation zone is translated landward.
SLSC	Surf Life Saving Club
TfNSW	Transport for NSW
Threats	In the coastal management context, a threat is a process or activity which puts pressure on one or more coastal assets or values. Threats may include land uses (e.g., urban, recreation), land management, climate change, industrial discharges, stormwater runoff, overfishing, invasive species as well as the pressures from coastal hazards.
Threshold	Can be identified for aspects of coastal systems, to highlight tipping points for irreversible change. An ecological threshold is the point at which there is an abrupt change in the structure, quality, or functioning of an ecosystem or where external changes produce large and persistent responses in an ecosystem. A species threshold may disrupt aspects of the species population, productivity, reproduction, or habitat in response to a stressor. Such 'tipping points' can lead to unwanted changes in ecosystems and may slow the recovery of ecosystems or limit their ability to achieve more resilient states following a disturbance. Similarly, a social or economic threshold of change in a coastal community indicates the point at which the structure, function, social connectedness, equality or economic activity of the community changes beyond recovery. Thresholds can also be defined for coastal water levels as they relate to the resilience of certain types of development.
Tidal inundation	The inundation of land by tidal action under average meteorological conditions and the incursion of sea water onto low lying land that is not normally inundated, during a high sea level event such as a king tide or due to longer-term sea level rise.
Trigger	Pre-negotiated decision-making points and commitments, so that action on coastal risks is taken when necessary, and when it is most convenient and affordable for the affected community.
Wave run-up	The vertical distance above mean water level reached by the uprush of water from waves across a beach or up a structure.
Wave set-up	The rise in the water level above the still water level when a wave reaches the coast. It can be very important during storm events as it results in further increases in water level above the tide and surge levels.
WCLB	Worimi Conservation Lands Board

Executive Summary

Port Stephens Council (hereafter 'Council' or PSC) has with the assistance of the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW) prepared a Coastal Management Program (CMP) to provide strategic direction and specific actions to address threats to the coast and maintain the ecological, social and economic values of the Port Stephens coastal zone.

The CMP is a plan of action for Council, public authorities and land managers responsible for management of the Port Stephens coastal zone to:

- Address coastal hazard risks;
- Preserve habitats and cultural uses and values;
- Encourage sustainable agricultural, economic and built development in the coastal zone;
- Maintain or improve recreational amenity and resilience; and
- Adapt to emerging issues such as population growth and climate change.

The NSW Coastal Management Manual (OEH, 2018b) specifies five stages in preparing a CMP (**Figure E-1**).

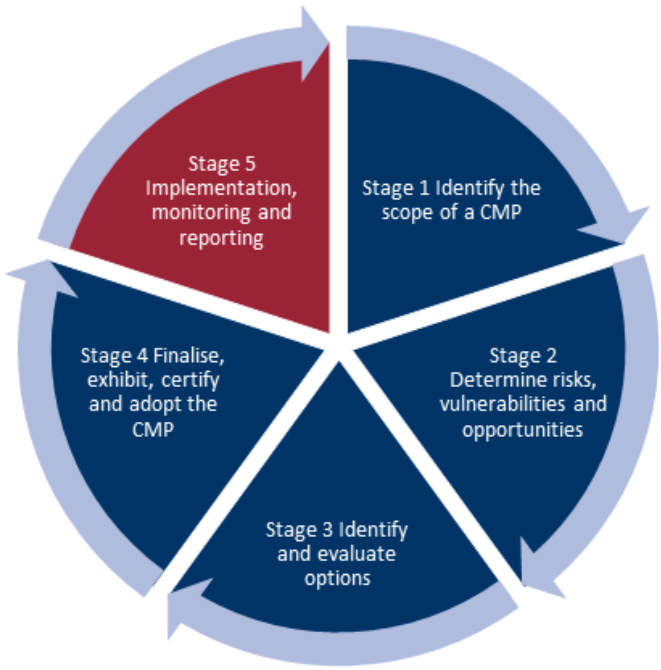

Figure E-1 Stages in preparing and implementing a CMP (after: OEH, 2018b)

The CMP Study Area

The study area comprises the coastal zone of the Port Stephens Local Government Area (LGA), encompassing the Open Coast, Outer Port and Inner Port areas. As discussed in the Scoping Study (PSC, 2020), each of these three regions within the broader study area (the Open Coast, Inner Port and Outer Port) differ with respect to their exposure and vulnerability to different types of coastal hazards and their environmental and social values and uses. A map of the study area is provided in **Figure E-2**.

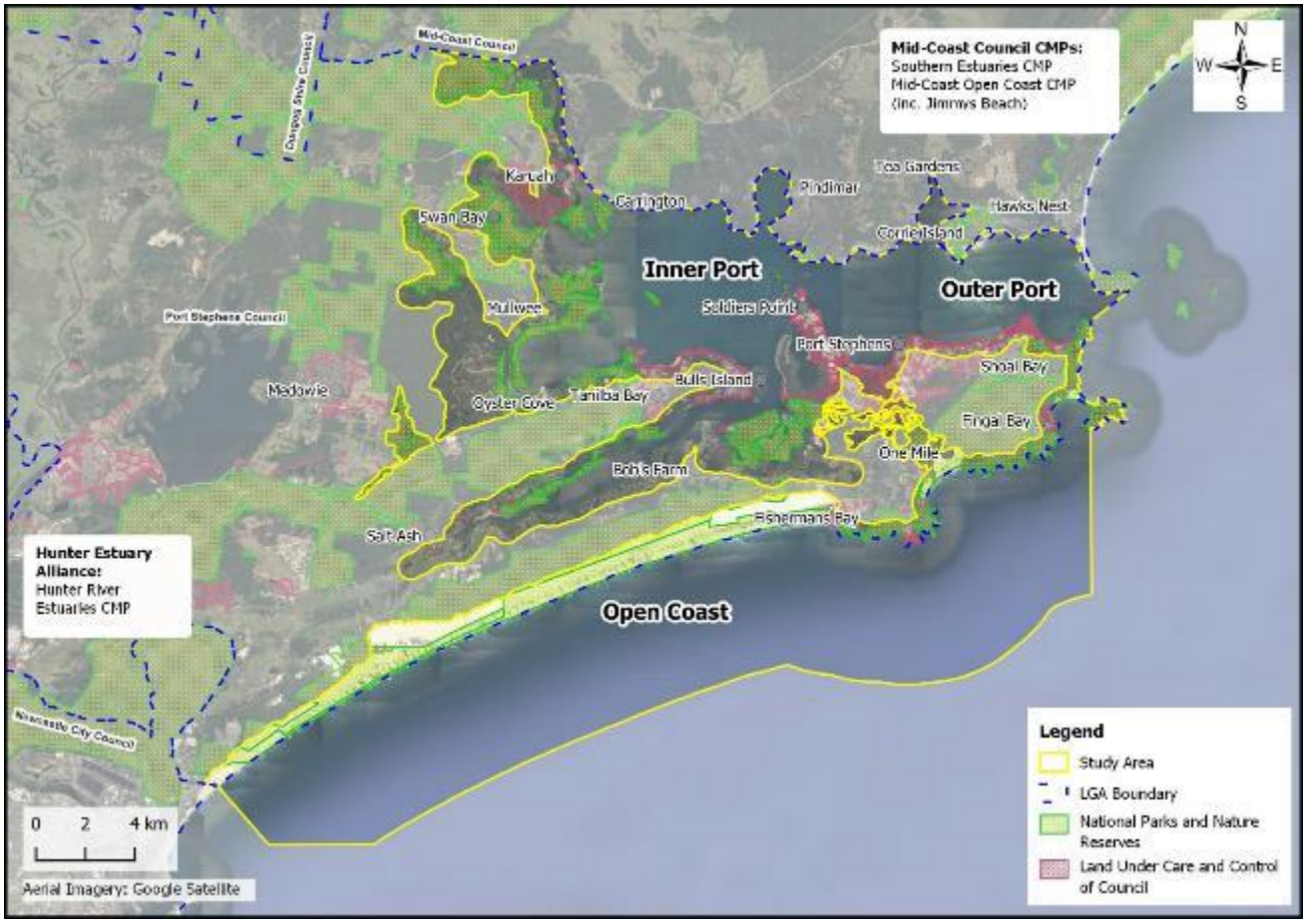

Figure E-2 Port Stephens CMP Study Area

Separate CMPs are being prepared for the coastal zones adjacent to the Port Stephens CMP study area, including the Hunter River estuary CMP, which Port Stephens Council is also involved with, and the Southern Tidal Estuaries CMP being prepared by MidCoast Council, which will include the northern shore of the Port.

Purpose, Vision, Objectives and Strategic Direction

The purpose of the CMP, as defined in the NSW *Coastal Management Act 2016* (CM Act), is to set the long-term strategy for the coordinated management of land within the coastal zone, with a focus on the objects of the CM Act.

The CMP provides a strategic and collaborative approach for relevant land managers to implement a range of credible, evidence-based actions to address current and future risks, not only from coastal hazards, but for a broad range of community, stakeholder, economic, climate change, catchment processes and environmental issues and values. Certification of the CMP will allow Council to access State Government funding to implement coastal management actions on a priorities basis for the coastline, estuaries and catchments of the study area.

The long-term strategic direction for the study area is encapsulated in a vision established for management of the Port Stephens coastal zone, and is consistent with the objects of the Act and community values identified in the Stage 1 Scoping Study. The strategic vision statement for the Port Stephens CMP is as follows:

Our community is resilient to environmental risks, coastal hazards and climate change.

Supporting the vision are a series of local coastal management objectives that have been developed to align with the objects of the CM Act, as further detailed in **Section 1.4**.

Values of, and Threats to, the Study Area

The Stage 1 Scoping Study provides a review of the community and stakeholder engagement undertaken to better understand how the community value the coastal zone. The key coastal values have been synthesised and summarised and are presented in **Table E-1**.

Table E-1 Key values of the study area

Theme	Values
 **Unique character**	• Natural beauty, natural coastal landscapes • Aboriginal cultural heritage and European heritage • Visual amenity • Conservation and scientific values
 **Public access & amenity**	• Safe and accessible public open spaces along the foreshore for people to gather, socialise and participate in community activities • Encourages an active healthy lifestyle • Boating and fishing • Water quality
 **Sustainable development**	• Maintenance of the local character and values • Infrastructure to support the development, use and enjoyment of the coastal zone • Economic activities, including agriculture, fishing, tourism and commercial sand extraction • Sustainability and efficiency
 **Resilience**	• Resilience of the natural and built environment to coastal and other natural hazards • Resilience of the natural and built environment to climate change
 **Biodiversity & ecosystem integrity**	• Important habitat for key species such as seagrasses, migratory shorebirds and koalas • Wildlife corridors • Coastal wetlands and littoral rainforest • Good water quality and healthy ecosystems
 **Equity & fairness**	• Access to the foreshore reserves, waterways and natural environment for all

The key threats to the Port Stephens coastal zone are summarised in **Table E-2**. The first-pass risk assessment undertaken in Stage 1 considered 16 key threats with respect to both the environmental and socio-economic impacts for each of the three parts of the study area individually.

Stage 2 of the CMP (BMT, 2021a) undertook a range of coastal hazard and vulnerability studies to build on the risk assessment undertaken in Stage 1.

The risk assessment identified locations where coastal threats (such as beach erosion or coastal inundation) may result in unacceptable consequences (e.g. damage to built assets, public safety risk, impacts to cultural or natural heritage).

The Stage 2 Vulnerability Assessment (BMT, 2021a), and engagement with the community and stakeholders assisted Council and the community to understand the complexity of the issues and risks affecting the environmental, heritage, social and economic assets and values within each of the Coastal Management Areas (CMAs).

Table E-2 Threats to the Port Stephens Coastal Zone and Risk Assessment Outcomes

Threat	Consolidated Present Day Risk	2040	2070	2120
Coastal Hazard Threats				
CH Threat 1 – Beach erosion	Medium	High	High	High
CH Threat 2 – Shoreline recession	Medium	High	High	Extreme
CH Threat 3 – Inundation with wind-blown sand	Medium	Medium	High	High
CH Threat 4 – Coastal inundation	High	High	High	Extreme
CH Threat 5 – Tidal inundation	Low	High	Extreme	Extreme
CH Threat 6 – Cliff / slope instability	Medium	Medium	Medium	Medium
CH Threat 7 – Accretion of marine sand	High	High	High	High
Water Quality Threats				
WQ Threat 1 – Urban stormwater pollution	Medium	High	High	High
WQ Threat 2 – Acid sulfate soils runoff	Medium	Medium	Medium	Low
WQ Threat 3 – Agricultural runoff pollution	Medium	High	High	High
WQ Threat 4 – Point source discharge	Medium	High	High	High
WQ Threat 5 – Marine debris	High	High	High	High
Biodiversity Threats				
BD Threat 1 – Land clearing	High	High	High	High
BD Threat 2 – Biosecurity	High	High	High	High
Development and Industry Threats				
LC Threat 1 – Land contamination	High	High	High	High
ME Threat 1 – Mining & extractive industries	High	High	High	High
Recreational Activity Threats				
RA Threat 1 – Boating pressures	Medium	High	High	High
RA Threat 2 – Encroachment onto public land	Medium	High	High	High

Key: CH = Coastal Hazard, WQ = Water Quality, BD = Biodiversity, LC = Land Contamination, ME = Mining and Extractive Industries, and RA = Recreational Activity.

Identification and Evaluation of Coastal Management Options

This CMP provides a management framework that aims to protect the socio-economic, biodiversity and cultural values associated with the Port Stephens coastal zone, and to manage the potentially conflicting desires of protecting coastal biodiversity and enhancing recreational and economic opportunities.

There are many aspects of the management of the Port Stephens coastal zone that can be targeted through the coastal management framework, while some aspects are beyond the reach of this process. Development of management actions was focused on those mechanisms that are available through the CMP process and 10-year delivery timeframe.

As described in **Section 3.1**, a total of 158 potential management options spread across the Port Stephens coastal zone were compiled via an audit of previous management plans and studies, engagement with the community and agency stakeholders, and the outcomes of the Stage 2 CMP vulnerability assessments. There is a higher density of options in the Outer Port, reflective of the higher density of development and economic activity in this part of the study area, which results in a higher overall risk from coastal hazards and impacts of human activities on the coastal zone.

Initially, a feasibility assessment was undertaken to 'rule out' any options that did not address an existing or future risk to the coast, to consolidate overlapping options, or to identify options that were not feasible from an engineering, legal or implementation perspective. Feasible options progressed to a viability assessment, which involved a simple economic analysis and a multi-criteria analysis (MCA). The acceptability of the management option to the community, Council and key stakeholders was also considered. Management options that are feasible, viable and acceptable are included in this CMP.

Photo: Community engagement session at Tomaree Sports Centre (M. Whitehouse)

Recommended Coastal Management Actions

The CMP provides a suite of coastal planning and management actions that have been developed and prioritised based on the assessment of threats and risk to the values associated with the study area, and with respect to how well the proposed actions addressed the CMP management objectives.

Actions consist of a range of knowledge building activities, investigations and engineering designs, on-ground works, and monitoring programs. The CMP includes 60 management actions that have been grouped according to the key threat addressed by each action, although many actions address more than one threat and would also achieve a range of other benefits or positive outcomes.

Of the 60 management actions in the Port Stephens CMP, there are:

- 26 actions that address Coastal Hazard Threats, including one action that provides for implementation of the Coastal Zone Emergency Action Subplan (CZEAS);
- 17 actions that address Recreation and Access Threats;
- 8 actions that address Water Quality Threats;
- 8 actions that address Biodiversity Threats; and
- 1 action that addresses a Mining and Extractive Industries Threat.

The management actions for Council and those to be led by other stakeholders are identified in **Section 3.2**.

On the basis of a planning review undertaken in Stage 3 of the CMP (Rhelm and Bluecoast, 2023; refer **Section 4**), the CMP includes a management action (Action CH011) to prepare a planning proposal to incorporate provisions to manage the risk to life and development arising from coastal hazards for inclusion in the Port Stephens Local Environmental Plan 2013 and to update the Development Control Plan 2014 to include provisions to minimise risk to property and life from coastal hazards. The planning provisions will be supported by a coastal risk planning map, which has been included in **Appendix E**.

The Business Plan

A Business Plan has been developed for the CMP which outlines the key components of the funding strategy for the CMP, including the cost of proposed actions, proposed cost-sharing arrangements and other potential funding mechanisms (**Section 5**). Once the program is certified, Port Stephens Council will be responsible for facilitating the implementation of the plan through its governance and budgetary processes. This will proceed using both specific staff resources and existing elements of the NSW Integrated Planning and Reporting (IP&R) Framework of Council to undertake, track and measure the success of actions in the CMP.

Management actions have been developed for a 10-year period and have been aligned with Council's four-year Delivery Programs under the NSW IP&R Framework.

This CMP and the progress of the management actions will be reviewed periodically as detailed in **Section 7** to ensure the actions remain relevant and the implementation of the plan is being achieved.

Delivery of the Port Stephens CMP is estimated to cost $14.39 million (2023 dollars) over 10 years. The CMP actions are expected to be funded through Port Stephens Council and State Government contributions, monetary grants and volunteer works by community members and organisations. Port Stephens Council contribution is costed to be $6.34 million over 10 years, with anticipated State Government and agency contributions of $8.05 million over 10 years.

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1 Introduction

Port Stephens Council (hereafter 'Council' or PSC) has, with the assistance of the NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW), prepared a Coastal Management Program (CMP) to provide strategic direction and specific actions to address threats to the coast and maintain the ecological, social and economic values of the Port Stephens coastal zone.

1.1 Purpose of the Port Stephens CMP

The State Government requires that CMPs be prepared in accordance with the mandatory requirements for CMPs specified in the *Coastal Management Act 2016* (the CM Act) and accompanying NSW Coastal Management Manual (CM Manual; OEH, 2018b).

The CMP outlines the strategic aims for the coordinated management of the coastal zone and identifies specific actions to mitigate the threats and issues identified for the coast that are to be implemented over the next 10 years. The CMP is an operational document for the community and government to take action to manage, preserve, improve, promote and rehabilitate the coast.

In effect, the CMP is a plan of action for Council, public authorities and land managers responsible for management of the Port Stephens coastal zone to:

- Address coastal hazard risks;
- Preserve habitats and cultural uses and values;
- Encourage sustainable agricultural, economic and built development in the coastal zone;
- Maintain or improve recreational amenity and resilience; and
- Adapt to emerging issues such as population growth and climate change.

1.2 Strategic and Statutory Context

Under Part 3 of the CM Act, local Councils are required to prepare CMPs in accordance with the coastal management framework (**Figure 1-1**), which reflects the broader suite of statutory instruments and strategies that provide for the Ecologically Sustainable Development (ESD) of the coastal zone of NSW.

The CM Manual (OEH, 2018b) provides information and guidance to Councils in preparing their CMPs.

Figure 1-1 Coastal Management Framework (after: OEH, 2018b)

A CMP is prepared in five stages as illustrated in **Figure 1-2**. Previous stages that have been completed for the Port Stephens coastal zone to date include:

- **Coastal Management Program Stage 1 Scoping Study (PSC, 2020)**, which set the context and scope for the CMP, including evaluation of threats to the Port Stephens coastal zone;
- **Port Stephens Coastal Management Program – Stage 2 (BMT, 2021a)**, which involved a range of coastal hazard and risk assessments to fill existing knowledge gaps; and
- **Port Stephens Coastal Management Program –Stage 3 Report (Rhelm and Bluecoast, 2023)**, which details the outcomes of the options identification and evaluation process, including the community and stakeholder engagement undertaken in Stage 3 of the CMP.

This document constitutes Stage 4 of the CMP process.

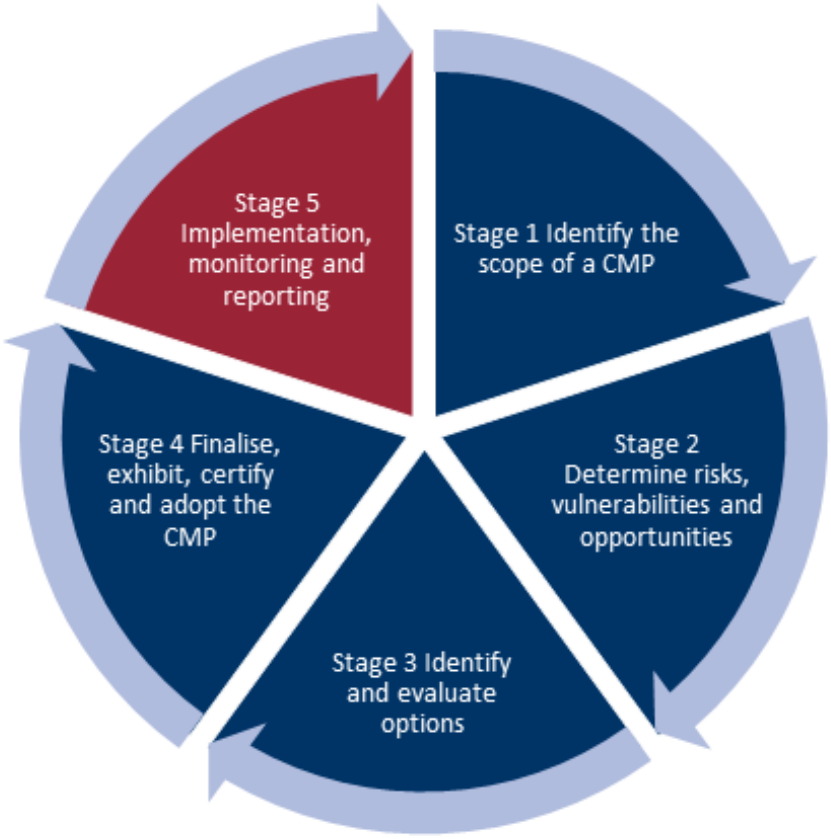


Figure 1-2 Stages in Preparing and Implementing a CMP (after: OEH, 2018b)

1.3 Area Covered by this CMP

Rationale for the CMP Study Area

The extent of the study area for the Port Stephens CMP was defined in consultation with key stakeholders (including the former DPE (now NSW DCCEEW) and the Councils with adjacent coastline) during the Stage 1 Scoping Study (PSC, 2020). At that time Council determined that they would prepare one CMP for the coastal zone of the Port Stephens Local Government Area (LGA), extending from Fern Bay Iin the south to Yacaaba Headland in the north, and including the Port Stephens estuary.

The primary rationale for defining the study area as such was the desire to prepare a single CMP for the LGA, noting that Port Stephens Council had not previously progressed through the NSW Coastal Management Framework and therefore did not have a holistic and comprehensive understanding of the risk from coastal hazards to public safety, built and natural assets. Nor was there any CMP or Coastal Zone Management Plan (CZMP) prepared in compliance with the CM Act in place for any part of the LGA, leaving a gap with respect to the requirements of the CM Act. The one exception is a single site-specific management plan, the Sandy Point / Conroy Park Foreshore Erosion and Drainage Management Plan (Whitehead and Assoc., 2015), which was certified by the Minister as a Coastal Zone Management Plan (CZMP). In acknowledgement of the need to promptly address this gap, Port Stephens Council decided to proceed with a CMP that related solely to the Port Stephens LGA.

The secondary consideration in defining the Port Stephens CMP study area was the understanding that a separate CMP would be prepared for those portions of the coastal zone within the LGA falling within the catchment of the Hunter River estuary, and that therefore these parts of the coastal zone (which include the Hunter River and Fullerton Cove) should be excluded from the study area.

Port Stephens CMP Study Area

The Port Stephens CMP study area encompasses the Open Coast, Outer Port and Inner Port areas as shown on **Map RG-00-01** in **Appendix A**. As discussed in the Scoping Study (PSC, 2020), each of these three regions within the broader study area (the Open Coast, Inner Port and Outer Port) differ with respect to their exposure and vulnerability to different types of coastal hazards and their environmental and social values and uses.

The landward extent of the study area is defined by the Coastal Management Areas (CMAs) mapped in the *State Environmental Planning Policy (Resilience and Hazards) 2021* (the Resilience and Hazards SEPP). Along the northern shoreline, the landward extent is defined by the gazetted LGA boundary.

While the Port Stephens waterway falls within the Port Stephens CMP study area, in practical terms management of the Inner and Outer Port is shared across a number of stakeholders including both PSC and MCC, as well as Transport for NSW (TfNSW), Crown Lands and Public Spaces with the Department of Planning, Housing and Infrastructure (DPHI), and Department of Primary Industries (DPI) – Marine Parks. Ongoing communication and coordination between these stakeholders would be undertaken with respect to waterway management under this CMP and other existing mechanisms (e.g. the Port Stephens-Great Lakes Marine Park Advisory Committee, to which PSC is a member).

Status of CMPs for Adjacent Coastline

As discussed in **Section 0**, for that portion of the coastal zone falling within the LGA boundaries that lies within the Hunter River estuary catchment (and including Fullerton Cove), a separate CMP is being progressed. As Councils that intersect the catchment, both PSC and City of Newcastle (CN) are involved in the Hunter River Estuary CMP.

Separate CMPs are also being progressed by MidCoast Council (MCC) for their LGA. MCC is currently in the process of developing a CMP for its Southern Estuaries. The CMP will address key catchments throughout the MidCoast LGA including the Karuah River, North Arm Cove, Myall River and Kore Kore Creek catchments which form the Northern foreshore of the Port Stephens Estuary. Work on the Southern Estuaries CMP commenced after the Port Stephens CMP had been substantially progressed. As such, the boundaries for the Port Stephens CMP had been established and confirmed to boundary of the two LGAs. To accommodate this, the study area to be covered in the Southern Estuaries CMP includes the northern foreshore of Inner Port Stephens, from

Yallimbah Creek to Pindimar (including Tea Gardens and Hawks Nest) and including North Arm Cove and The Karuah River up to the limit of tidal influence, one kilometre south of the village of Booral (Water Technology, 2022).

In addition, MCC is also in the process of preparing the MidCoast Open Coast CMP, which will include Jimmy Beach.

The interfaces of these CMPs with the Port Stephens CMP are indicated in **Map RG-00-01** in **Appendix A**.

1.3.1 Coastal Management Areas Included in the CMP

There are four CMAs defined under the CM Act. All four CMAs, as mapped under *State Environmental Planning Policy (Resilience and Hazards) 2021* (hereafter the Resilience and Hazards SEPP). Three of these CMAs are mapped for the study area and therefore fall within the scope of the Port Stephens CMP:

- **Coastal Wetlands and Littoral Rainforest Area (CWLRA)** – there are extensive areas of Coastal Wetlands around Tilligerry Creek, between Oyster Cove and Medowie, west and north of Swan Bay, and extending from Salamander Bay through Taylors Beach, Bobs Farm and to Anna Bay (**Map RG-00-02**). There are small areas of Littoral Rainforest mapped at Nelson Head, Soldiers Point and Taylors Beach (**Map RG-00-03**).
- **Coastal Environment Area (CEA)** – Comprises land containing coastal features such as the coastal waters of the State, estuaries, coastal lake, coastal lagoons and land adjoining these features, including headlands and rock platforms (OEH, 2018a). The extent of the CEA within the study area is mapped in **Map RG-00-04**.
- **Coastal Use Area (CUA)** – The coastal use area includes land adjacent to coastal waters, estuaries, coastal lakes and lagoons where development is or may be carried out (now or in the future) (OEH, 2018a). There are a range of social and economic activities and development within the Port Stephens CUA, as mapped in **Map RG-00-05**.

The abovementioned maps are provided in **Appendix A**.

Large parts of the study area are vulnerable to coastal hazards, as identified through the CMP Stage 2 report (BMT, 2021a). However, there is presently no mapping of a CVA under the Resilience and Hazards SEPP. The context for Council's decision on whether or not to prepare a planning proposal to map the CVA for the study area is provided in **Section 4** and **Section 8.4**.

1.3.2 Coastal Sediment Compartments

The Port Stephens CMP study area is located within one primary sediment compartment, the Port Stephens compartment, which extends from Cape Hawke to Nobbys Head. Within this larger primary sediment compartment there are three secondary sediment compartments that extend across the study area (refer **Map RG-00-06** in **Appendix A**):

- The Stockton Bight compartment which extends along the open coast from Birubi Point to the south and beyond the CMP study area;
- The Anna Bay compartment that extends along the open coast from Birubi Point north to Tomaree Point; and
- The Port Stephens compartment, which encompasses the Inner and Outer Port areas.

The Port Stephens primary sediment compartment extends across parts of the MCC LGA to the north and the CN LGA to the south.

1.4 Vision, Objectives and Strategic Direction

The long-term strategic direction for the study area is encapsulated in a vision established for management of the Port Stephens coastal zone and is consistent with the objects of the Act and community values identified in the Stage 1 Scoping Study. The strategic vision statement for the Port Stephens CMP is as follows:

Our community is resilient to environmental risks, coastal hazards and climate change.

Supporting the vision are a series of local coastal management objectives that have been developed to align with the objects of the CM Act. The management objectives for the Port Stephens CMP are summarised in **Table 1-1**.

Table 1-1 Port Stephens Coastal Management Objectives

Collaboration	Encourage collaboration and partnership with government, agencies and our community to manage and protect the coastal zone.
Biodiversity & ecosystem integrity	Protect biological diversity and ecosystem integrity by maintaining and improving water quality and estuary health.
Climate change	Mitigate and build resilience to current and future coastal hazards and risks.
Land use planning	Facilitate ecologically sustainable development in the coastal zone and prioritise sustainable land use planning in decision making to maintain and improve public access, amenity and use.
Aboriginal custodianship	Support and protect our Aboriginal community's spiritual, social, customary and economic use of the coastal zone.
Coastal economies	Support sustainable economic opportunities within the coastal zone.

The CM Act requires that, in preparing a CMP, a local Council must:

- Consider and promote the objects of the CM Act; and
- Give effect to the management objectives for CMAs covered by the Program.

These requirements are addressed in **Table 1-2** and **Table 1-3**, respectively. It is noted that, although there is no mapped CVA for the Port Stephens coastal zone, the objects for Coastal Vulnerability Areas have still been discussed in the context of the Port Stephens CMP.

Table 1-2 Alignment with the Objects of the CM Act

Objects of the Act	How this is addressed in this CMP
3 The objects of this 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	This object is reflected in the 'Biodiversity & ecosystem integrity', 'Climate change' and 'Land use planning' management objectives for the CMP (refer **Table 1-1**). Consideration of these values and relevant threats have been detailed in **Sections 2.1 and 2.2**, and a number of management actions developed accordingly (refer **Section 3**). There are seven actions targeting threats to biodiversity and ecosystems included in the CMP.
(b) To support the social and cultural values of the coastal zone and	This object is reflected in the 'Climate change' and 'Land use planning' management objectives for the CMP (refer **Table 1-1**).

Objects of the Act	How this is addressed in this CMP
maintain public access, amenity, use and safety, and	Consideration of these values and relevant threats have been detailed in **Sections 2.1 and 2.2**, respectively, and a number of management actions developed accordingly (refer **Section 3**). This includes a number of activities to provide for public access and safety, as well as a Coastal Zone Emergency Subplan (CZEAS; refer **Appendix C**).
(c) To acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone, and	This object is reflected in the 'Aboriginal custodianship' management objective for the CMP (refer **Table 1-1**). Engagement was undertaken with Traditional Owners during preparation of this CMP, as detailed in **Section 1.5** and **Appendix B**. Several management actions are included in the CMP to address identified threats and support Aboriginal cultural heritage values and practices (refer **Section 3**).
(d) To recognise the coastal zone as a vital economic zone and to support sustainable coastal economies, and	This object is reflected in the 'Coastal economies' management objectives for the CMP (refer **Table 1-1**). Consideration of these values and relevant threats have been detailed in **Sections 2.1 and 2.2**, respectively, and a number of management actions developed accordingly (refer **Section 3**).
(e) To facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making, and	This object is reflected in the 'Land use planning' management objective for the CMP (refer **Table 1-1**). A review of the current planning controls was undertaken in Stage 3 (refer Rhelm and Bluecoast, 2023) and provided recommendations to Council on potential pathways to provide appropriate management of risk to development from coastal hazards. A number of relevant management actions were developed as a result of this review and other engagement activities (refer **Section 3**). Council has determined not to proceed with a planning proposal for a CVA but will utilise the coastal hazard mapping to inform planning decisions and development controls. The discussion provided in **Section 4** and in the review of existing planning instruments and development controls provided in Appendix B of the Stage 3 Report (Rhelm and Bluecoast, 2023) provides context for this decision. Council has adopted within this CMP an action to prepare a planning proposal for a local coastal risk planning clause and map in their Local Environmental Plan (LEP), with associated controls through the Development Control Plan (DCP).
(f) To mitigate current and future risks from coastal hazards, taking into account the effects of climate change, and	This object is reflected in the 'Climate change' management objective for the CMP (refer **Table 1-1**). Current and future risk from coastal hazards was assessed in Stage 2 (BMT, 2021b). A total 25 of management actions have been included in the CMP to directly address the threat from coastal hazards under current and future sea levels, including planning controls (see above), works, adaptation planning, monitoring, and education and awareness raising activities (refer **Section 3**).
(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	Local and regional coastal processes were described in the Stage 2 study undertaken by BMT WBM (2021a). A range of management actions have been included in this CMP to ensure improved recognition of coastal processes and provide for improved resilience in this regard, including recommendations for planning controls, monitoring and community education (refer **Section 3**).

Objects of the Act	How this is addressed in this CMP
(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	This object is reflected in the 'Collaboration' management objective for the CMP (refer **Table 1-1**). Reference is also made to **Section 1.5** and **Appendix B**. Several management actions have been included in this CMP to facilitate coordination (refer **Section 3**), and where other agencies are partnering or leading implementation of actions, this is identified in the Business Plan (**Section 5**).
(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	This object is reflected in the 'Climate Change' and 'Land use planning' management objectives for the CMP (refer **Table 1-1**). Risks to coastal assets are to be addressed through a number of management actions included in this CMP (refer **Section 3**), including land use and planning controls, preparation of adaptation strategies to address long-term risk, and emergency management measures in the CZEAS.
(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	This object is realised through preparation of this CMP, with stakeholder engagement activities documented in **Section 1.5** and **Appendix B**. Letters of support from agencies will be provided in the final CMP following the public exhibition period.
(k) To support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions, and	Community engagement activities undertaken in development of this CMP are documented in **Section 1.5** and **Appendix B**. In addition, there are a number of management actions in this CMP that aim to provide for ongoing community participation and improved public awareness (refer **Section 3**).
(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	No land acquisition has been proposed as part of this CMP; however, a range of activities on public land are proposed to provide for protection, enhancement, maintenance and restoration of the coastal environment (refer **Section 3**).
(m) To support the objects of the Marine Estate Management Act 2014.	Refer to stakeholder engagement undertaken for this CMP as summarised in **Section 1.5**. In addition, management actions have been developed that address threats to the Port Stephens coastal zone that align with several of those identified in the NSW Marine Estate Threat and Risk Assessment for the Marine Estate (BMT WBM, 2017); for example, the impact of marine debris on aquatic fauna (WQ Threat 5, see **Section 2.2**).

Table 1-3 Alignment with the Management Objectives for CMAs under the Resilience and Hazards SEPP

Objects for CMAs	How this is addressed in this CMP
*6(2) The management objectives for the **coastal wetlands and littoral rainforests area** are as follows—*	
(a) to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity,	Threats to CWLRAs in the study area are identified in **Table 2-3**. Related threats identified in the risk assessment (refer **Section 2.3**) include: CH Threat 5, WQ Threats 1 to 4, BD Threats 1 and 2, LC Threat 1 and RA Threat 2. A range of management options were considered in Stage 3 to address these threats, and several have been adopted as management actions in this CMP (see **Section 3**), including: CH029, E001, E004, E005, E008 and E018. These management actions are considered consistent with the State policies and programs for wetlands and littoral rainforest management.
(b) to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests,	
(c) to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration,	
(d) to support the social and cultural values of coastal wetlands and littoral rainforests,	
(e) to promote the objectives of State policies and programs for wetlands or littoral rainforest management.	
*7(2) The management objectives for the **coastal vulnerability area** are as follows—*	
(a) to ensure public safety and prevent risks to human life,	As previously discussed, Council has decided not to proceed with mapping of a CVA for the study area. However, the land that would be vulnerable to coastal hazards has been identified in Stage 2 (refer BMT WBM, 2020). The risk to both land and built and natural assets from coastal hazards is discussed in **Table 2-3** and **Section 2.3** and include: all CH Threats and RA Threat 2. A range of management options were considered in Stage 3 to address these threats, and several have been adopted as management actions in this CMP (see **Section 3**), in particular all actions with a unique identifier starting with CH. In addition, a number of actions to maintain beaches and dunes, and to maintain public access and amenity, are proposed under management actions with a unique identifier starting with RA or E.
(b) to mitigate current and future risk from coastal hazards by taking into account the effects of coastal processes and climate change,	
(c) to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place,	
(d) to maintain public access, amenity and use of beaches and foreshores,	
(e) to encourage land use that reduces exposure to risks from coastal hazards, including through siting, design, construction and operational decisions,	
(f) to adopt coastal management strategies that reduce exposure to coastal hazards— (i) in the first instance and wherever possible, by restoring or enhancing natural defences including coastal dunes, vegetation and wetlands, and (ii) if that is not sufficient, by taking other action to reduce exposure to those coastal hazards,	
(g) if taking that other action to reduce exposure to coastal hazards— (i) to avoid significant degradation of biological diversity and ecosystem integrity, and (ii) to avoid significant degradation of or disruption to ecological, biophysical, geological and geomorphological coastal processes, and (iii) to avoid significant degradation of or disruption to beach and foreshore amenity and social and cultural values, and	

Objects for CMAs	How this is addressed in this CMP
(iv) to avoid adverse impacts on adjoining land, resources or assets, and *(v) to provide for the restoration of a beach, or land adjacent to the beach, if any increased erosion of the beach or adjacent land is caused by actions to reduce exposure to coastal hazards,*	
(h) to prioritise actions that support the continued functionality of essential infrastructure during and immediately after a coastal hazard emergency,	
(i) to improve the resilience of coastal development and communities by improving adaptive capacity and reducing reliance on emergency responses.	
*8(2) The management objectives for the **coastal environment area** are as follows—*	
(a) to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity,	Threats to the Port Stephens CEA are identified in **Table 2-3**. Related threats identified in the risk assessment (refer **Section 2.3**) include: all WQ Threats, BD Threats 1 and 2, LC Threat 1, ME Threat 1, and RA Threats 1 and 2. A range of management options were considered in Stage 3 to address these threats, and several have been adopted as management actions in this CMP (see **Section 3**), including: all actions with a unique identifier starting with WQ and other actions such as: RA001, RA002, CH074, and CH003.
(b) to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change,	
(c) to maintain and improve water quality and estuary health,	
(d) to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons,	
(e) to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place,	
(f) to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.	
9(2) The management objectives for the **coastal use area** are as follows—	
1. to protect and enhance the scenic, social and cultural values of the coast by ensuring that— *(i) the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast, and* *(ii) adverse impacts of development on cultural and built environment heritage are avoided or mitigated, and* *(iii) urban design, including water sensitive urban design, is supported and incorporated into development activities, and* *(iv) adequate public open space is provided, including for recreational activities and associated infrastructure, and* *(v) the use of the surf zone is considered,*	Threats to the Port Stephens CUA are identified in **Table 2-3**. Related threats identified in the risk assessment (refer **Section 2.3**) include: all CH Threats, LC Threat 1, ME Threat 1, and RA Threats 1 and 2. A range of management options were considered in Stage 3 to address these threats, and several have been adopted as management actions in this CMP (see **Section 3**), such as: CH074, CH082, DI001, E012, E016, and E017.
2. to accommodate both urbanised and natural stretches of coastline.	

1.5 Key Stakeholders, Their Interests and Issues

Key stakeholders including Federal and State Government Agencies, other local organisations and Traditional Owners are in some way involved in governance of the Port Stephens coastal zone (or aspects thereof) due to a regulatory or customary role in coastal management. The CMP study area comprises a mix of tenures and regulatory or statutory jurisdictions. Relevant land tenures include:

- One of the biggest tenures is **Crown land**, including dedicated or reserved Crown land and unreserved Crown land, with the latter including all land below the MHWM;
- **National Park estate** lands are also a major land tenure, comprising National Parks, Nature Reserves and State Conservation Areas gazetted under the NP&W Act and under care and control of the NPWS (in conjunction with the Worimi Conservation Lands Board for the Worimi Conservation Lands);
- Land held under **Native Title** under the Commonwealth *Native Title Act 1993* or subject to a successful Aboriginal Land Claim under the NSW *Aboriginal Land Rights Act 1984*. In addition, there are a number of pending claims associated with the study area. Any management actions proposed on Crown land will need to consider the potential for existing or future claims made under either Act;
- Land owned by the **Worimi Local Aboriginal Land Council** (LALC);
- **Council-owned lands**, including Operational and Community Land managed under the *Local Government Act 1993* (LG Act);
- The **Port Stephens – Great Lakes Marine Park**, which is managed by the Department of Primary Industries (DPI) – Marine Parks. The majority of the CMP study area falls within the Marine Park, with the exception of the area south of Birubi Point; and
- Land owned by various utilities and other agencies, including Transport for NSW (TfNSW), Hunter Water Corporation (HWC), Ausgrid and the Commonwealth Department of Defence.

Various agencies also have a regulatory role with jurisdictions intersecting the coastal zone including DPHI - Crown Lands and Public Spaces, NPWS, DPI – Marine Parks and DPI – Fisheries and TfNSW. The need for landowner consent, or to obtain any required approvals, permits or licences, would be addressed in consultation with the relevant organisations at the time of implementation of individual management actions.

A Community and Stakeholder Engagement Plan and Summary Report (PSC and Rhelm, 2023) was prepared for this CMP and is provided in **Appendix B**. That document sets out the strategy that was adopted to engage with the community and key stakeholders, as required by the CM Act and CM Manual.

The engagement activities undertaken in preparing this CMP are summarised in **Table 1-4**. This table will be updated to include engagement activities undertaken during public exhibition of the draft CMP prior to finalisation of this report.

During preparation of this CMP PSC has engaged with CN and MCC, being the two neighbouring Councils to the south and north of the Port Stephens LGA respectively, as documented in **Appendix B** and **Table 1-4**. Along with Port Stephens LGA, these two LGAs intersect the Port Stephens sediment compartment, with Council and CN sharing the Stockton Bight secondary sediment compartment, and PSC and MCC sharing the Port Stephens secondary sediment compartment. The only management action in this CMP that specifically targets cross-boundary coordination is action WQ002 ('Enter into a data sharing agreement to enable sharing of historical and ongoing water quality monitoring data from Port Stephens').

Public authorities and other organisations which will be affected by implementation of the CMP have been consulted regarding the coastal zone management issues and actions in this CMP, as documented in **Appendix B** and **Table 1-4.**

Table 1-4 Summary of Engagement Activities Undertaken During Each Stage of the CMP

CMP Stage	Engagement Activities
Stage 1	• Provision of information on the CMP and updates on progress via Council's dedicated project webpage, including fact sheets and a Have Your Say webpage; • Meetings of the PSC CMP Steering Group on a monthly basis; • Meetings with a range of key agency stakeholders; and • Surveys of community values.
Stage 2	• Provision of information on the CMP and updates on progress via Council's dedicated project webpage, including fact sheets, online mapping tool, and a Have Your Say webpage; • Meetings of the PSC CMP Steering Group on a monthly basis; • Presentations to Councillors; • Engagement with Traditional Owners via Council's Aboriginal Strategic Committee, • A webinar series on coastal hazards, which were then uploaded to the project webpage; • Youth Week 'Pizza for the planet' event; • Meetings with the Tomaree Ratepayers and Residents Association and Econetwork community groups; and • Water quality workshops with the Stakeholder Reference Group.
Stage 3	• Meetings of the PSC CMP Steering Group on a monthly basis; • Initial engagement with Traditional Owners via members of the boards of the Worimi LALC and WCLB. In addition, a presentation was made to the Birubi Point Cultural Heritage Advisory Committee; • Workshops with PSC staff on: - Council assets subject to risk from coastal hazards, - Land use planning and development controls for management of risk from coastal hazards, - Potential management options for the CMP; • Workshops with the Stakeholder Reference Group comprised of the range of agency and other stakeholders involved in different aspects of management of the study area. These workshops included an initial presentation on coastal hazards and a management options workshop; • Four face-to-face community drop-in sessions over 3-4 May 2023 on the coastal hazard mapping; • Council staff also held on-site meetings with directly affected landholders in key locations; • One virtual and two face-to-face workshops with community members over 7-8 June 2023 to discuss potential management options; • Opportunity for community members to identify management issues and suggest management options via an online Social Pinpoint map made available on Council's webpage; and • Separate meetings between PSC and MCC and CN on interfaces between the Port Stephens CMP and adjacent CMPs, primarily with respect to consistency of the respective CMPs, coastal hazard studies and mapping for the adjacent study areas, responsibility for any management initiatives currently undertaken (or proposed) that may overlap CMP boundaries. • An additional meeting between PSC and MCC to discuss the Port Stephens CMP study area boundary and any potential implications for forthcoming CMPs being prepared by MCC.

CMP Stage	Engagement Activities
Stage 4	• Engagement via email and telephone with various agency stakeholders to discuss and refine management actions; • Presentation of the first draft CMP to the Stakeholder Reference Group; • Review of the first draft CMP by members of the Stakeholder Reference Group, including the NSW DECCW; • Issue of letters to each affected landholder and organisation nominated as having a role in implementation of management actions under the CMP; and • Additional discussion with MCC on the northern CMP study area boundary and interface between the Port Stephens CMP and CMPs being prepared by MCC. Stage 4 engagement activities will be updated pending implementation of additional engagement activities during Stage 4, including during the public exhibition period.

Photo: Tanilba Boardwalk (M. Rosenthal)

A potential governance structure for the CMP is outlined in **Table 1-5**.

Table 1-5 Potential Governance Structure for the CMP

Organisation	Responsibility
Port Stephens Council	Lead agency for the development, coordination and implementation of the CMP.
State Government Agencies / Land Managers ▪ NSW DCCEEW – Environment and Heritage Group (EHG) ▪ DPHI – Crown Lands and Public Spaces ▪ DPI – Marine Parks ▪ DPI – Fisheries ▪ Worimi and Karuah LALCs ▪ WCLB ▪ NPWS ▪ Hunter Local Land Services (LLS) ▪ TfNSW (incl. Maritime Infrastructure Delivery Organisation or MIDO) ▪ NSW State Emergency Service (NSW SES)	Provide support with respect to recommendations for management, collaboration and action(s) for which they are nominated with a lead or supporting implementation role. Engagement should be undertaken with the relevant authority when actions at the time of implementation where this is the case, or where they have a regulatory function such as the issue of any relevant approvals, permits or licences to enable the action to proceed.
CMP Stakeholder Reference Group ▪ Port Stephens Council ▪ State Government Agencies (listed above) ▪ The adjacent Councils, MCC and CN ▪ Regional organisations (incl. Hunter LLS and LALCs) ▪ NSW SES ▪ Select community and user groups	Committee with a non-statutory role who are involved in coordination and oversight of the CMP planning and implementation, and who assist in facilitating local community and stakeholder involvement. The Stakeholder Reference Group has an advisory role only, potentially as a committee of Council under Section 355 of the LG Act.

1.6 Review of Existing Information and Management Arrangements

The adequacy review of existing information and management arrangements for the Port Stephens coastal zone was undertaken during the CMP Stage 1 Scoping Study (PSC, 2020). The Stage 1 Scoping Study also identified additional studies and investigations that must be undertaken during Stage 2 of the CMP.

A first pass risk assessment was completed during preparation of the Stage 1 Scoping Study (PSC, 2020). Coastal threats and risks were identified through a review of background information, risk workshops with key stakeholders and community consultation. During the preparation of the CMP, the risk assessment was

amended to reflect to the outcomes of the CMP as documented in the Stage 2 vulnerability and risk assessments (BMT, 2021b) and the options development and engagement undertaken during Stage 3 (Rhelm and Bluecoast, 2023). The updated risk assessment findings are summarised in **Section 2.2.**

Management options and opportunities to mitigate the priority threats and risks to the Port Stephens coastal zone were developed during Stage 3 in consultation with the community and key stakeholders, as documented in the Stage 3 report (Rhelm and Bluecoast, 2023) and summarised in **Section 3.1**.

2 A Snapshot of Issues

The Port Stephens coastal zone encompasses a wide range of environments, including:

- The Stockton Bight transgressive sand dunes;
- The rocky headlands and embayed beaches of the open coast;
- The towns and villages scattered around the Port;
- The National Parks and Nature Reserves, including the Worimi Conservation Lands;
- The Port Stephens-Great Lakes Marine Park.

The coastal zone supports a diversity of activities and uses spanning residential, passive and active recreation, industrial and commercial, agriculture, fisheries, tourism and biodiversity conservation.

The Stage 1 Scoping Study (PSC, 2020) describes in detail the environmental, social and cultural, economic and future context for coastal management planning for Port Stephens. This sets the scope for the CMP and provided an increased understanding of the values of and priority threats to the study area.

Sections 2.1 and 2.2 of this report provide a summary of the values of the study area and the priority threats to these values, respectively. These were identified during preparation of the Stage 1 Scoping Study based on consultation with key stakeholders and feedback from the community.

Section 2.3 of this report provides a summary of the Stage 2 Vulnerability Assessment outcomes, which relate primarily to coastal hazards, addressing knowledge gaps identified in Stage 1 with respect to the Port Stephens LGA.

2.1 Values of the Study Area

The Stage 1 Scoping Study provides a review of the community and stakeholder engagement undertaken in relation to how the community value the coastal zone. The key coastal values have been synthesised and summarised and are presented in **Table 2-1**.

Table 2-1 Key Values of the Study Area

Theme	Values
 **Unique character**	• Natural beauty, natural coastal landscapes • Aboriginal cultural heritage and European heritage • Visual amenity • Conservation and scientific values
 **Public access & amenity**	• Safe and accessible public open spaces along the foreshore for people to gather, socialise and participate in community activities • Encourages an active healthy lifestyle • Boating and fishing • Water quality
 **Sustainable development**	• Maintenance of the local character and values • Infrastructure to support the development, use and enjoyment of the coastal zone • Economic activities, including agriculture, fishing, tourism and commercial sand extraction • Sustainability and efficiency

Theme	Values
Resilience	• Resilience of the natural and built environment to coastal and other natural hazards • Resilience of the natural and built environment to climate change
Biodiversity & ecosystem integrity	• Important habitat for key species such as seagrasses, migratory shorebirds and koalas • Wildlife corridors • Coastal wetlands and littoral rainforest • Good water quality and healthy ecosystems
Equity & fairness	• Access to the foreshore reserves, waterways and natural environment for all

2.2 Threats to the Study Area

2.2.1 First-Pass Risk Assessment

There are a number of threats to the Port Stephens coastal zone, its coastal uses and values. A key outcome of the Stage 1 Scoping Study (PSC, 2020) was to understand and prioritise the threats to the coastal zone. The list of threats was developed from a range of sources of information, including community and stakeholder feedback, and the level of risk from each threat was evaluated for different planning horizons.

The first-pass risk assessment undertaken in Stage 1 adopted Council's Corporate Risk Matrix, modified to include additional descriptors, enabled an assessment of risk to the wider community within the study area.

The Stage 1 Scoping Study considered 16 key threats with respect to both the environmental and socio-economic impacts for each of the three parts of the study area individually. Risk was evaluated for the present day for each of the three parts of the study area individually, and for the study area as a whole for a future planning horizon. Aspects considered in the risk assessment included:

- The effects of climate change;
- The local and regional-scale effects of coastal processes;
- The ambulatory and dynamic nature of the shoreline;
- Population growth and demographic changes; and
- Projected use and development of the coastal zone.

The key threats to the coastal zone identified through a literature review and via engagement with key stakeholders that were considered in Stage 1 Scoping Study (PSC, 2020) included:

- Beach erosion (referred to hereafter as 'coastal erosion', consistent with the CM Act and CM Manual);
- Aeolian sand inundation (referred to hereafter as 'inundation with wind-blown sand');
- Coastal inundation (which was assumed to include tidal inundation);
- Cliff / slope instability;
- Marine sand inundation (referred to hereafter as 'accretion of marine sand');
- Urban stormwater runoff;

- Acid Sulfate Soils (ASS) runoff;
- Agricultural runoff;
- Point source discharges;
- Marine debris;
- Land clearing;
- Weeds, pests and diseases;
- Land contamination;
- Mining and extractive industries;
- Boating pressures; and
- Encroachment onto public land.

Photo: Dune vegetation impacted by informal access (foreground) and aeolian sand transport (or dune transgression, see mid-right), One Mile Beach (M. Rosenthal)

2.2.2 Threats Refined by Stage 2 Vulnerability Assessments

Stage 2 of the CMP (BMT, 2021a) undertook a range of coastal hazard and vulnerability studies to build on the risk assessment undertaken in Stage 1.

The work undertaken in Stage 2 included a probabilistic assessment of beach erosion and shoreline recession to derive probable **coastal erosion** hazard lines (or extents). The coastal erosion hazard lines were prepared for the Open Coast area only. Coastal erosion is the sum of:

- *Beach erosion* - which occurs over a period of days during a coastal storm event. Once the storm passes, the beach then gradually recovers over a period of months or years as the sand is transported back onto the beach under normal wave conditions.
- *Shoreline recession* – which results from a net loss of sand and occurs over a period of years to decades. If a very big storm has occurred, the sand eroded from the beach may be taken too far away and unable to make it back onto the same beach. If there is no new sand coming into the system, this can become a permanent loss of sand and the coastline gradually moves landward. Higher water levels due to sea level rise will accelerate shoreline recession.

The 'most likely' coastal erosion hazard lines for the present day and the 2120 planning horizon are mapped for the Open Coast in **Map set RG-00-07 A to C** (refer **Appendix A**).

A semi-qualitative assessment of risk from coastal erosion was undertaken for the Outer Port only, but no erosion hazard lines were developed for these locations. No erosion hazard assessment was undertaken for the Inner Port.

A **coastal inundation** assessment which considers elevated ocean water levels (storm tide) for the 20-year Average Recurrence Interval (ARI) and 100-year ARI storm events. Coastal inundation is primarily associated with storms resulting in storm surge and waves. It means that ocean levels rise above normal elevations and inundate low-lying areas by overtopping dunes, structures and barriers. The duration of coastal inundation may be several hours and will vary depending on the timing of the storm (e.g., if storm surge peaks on the high tide). Once the coastal storm passes, the water recedes, and ocean water levels return to their normal tidal levels. The risk of coastal inundation will increase as sea levels rise. The 'expected' 20-year ARI and 100-year ARI coastal inundation extents are mapped in **Map RG-00-08** and **Map RG-00-09** (refer **Appendix A**), respectively.

A **tidal inundation assessment**, which adopted the Highest Astronomical Tide (HAT) to show areas that are vulnerable to inundation by the regular astronomical tides. Low-lying land would be inundated for a period of hours during the highest tidal water levels. Under sea level rise conditions, the extent of tidal inundation will increase, and low-lying areas will become permanently inundated. The 'expected' tidal inundation extents corresponding to the HAT are mapped for the present day and 2120 in **Map RG-00-10** (refer **Appendix A**).

An assessment of **dune transgression** at Stockton Bight was undertaken, which developed sand drift hazard set back lines. Dune transgression is the landward movement of sand due to aeolian (wind) transport. The dune transgression hazard lines for the 2120 planning horizon are mapped for the open coast in **Map RG-00-07 A and B** (refer **Appendix A**).

The hazard assessments described above considered the present day (2020), 2040, 2070 and 2120 planning horizons, taking into account sea level rise under climate change conditions.

2.2.3 Key Threats to the Port Stephens Coastal Zone

As an outcome of the additional studies, information and stakeholder inputs received in Stages 2 and 3 of the CMP, the risk assessment was updated as part of Stage 3 of the CMP (Rhelm and Bluecoast, 2023).

The outcomes of the updated threat and risk assessment for the Port Stephens coastal zone are summarised in **Table 2-2.**

The full risk assessment (including descriptions of each threat) is provided in the CMP Stage 3 Report (Rhelm and Bluecoast, 2023).

Table 2-2 Risk Assessment Outcomes

Threat	Consolidated Present Day Risk	2040	2070	2120
Coastal Hazard Threats				
CH Threat 1 – Beach erosion	Medium	High	High	High
CH Threat 2 – Shoreline recession	Medium	High	High	Extreme
CH Threat 3 – Inundation with wind-blown sand	Medium	Medium	High	High
CH Threat 4 – Coastal inundation	High	High	High	Extreme
CH Threat 5 – Tidal inundation	Low	High	Extreme	Extreme
CH Threat 6 – Cliff / slope instability	Medium	Medium	Medium	Medium
CH Threat 7 – Accretion of marine sand	High	High	High	High
Water Quality Threats				
WQ Threat 1 – Urban stormwater pollution	Medium	High	High	High
WQ Threat 2 – ASS runoff	Medium	Medium	Medium	Low
WQ Threat 3 – Agricultural runoff pollution	Medium	High	High	High
WQ Threat 4 – Point source discharge	Medium	High	High	High
WQ Threat 5 – Marine debris	High	High	High	High
Biodiversity Threats				
BD Threat 1 – Land clearing	High	High	High	High
BD Threat 2 – Biosecurity	High	High	High	High
Development and Industry Threats				
LC Threat 1 – Land contamination	High	High	High	High
ME Threat 1 – Mining & extractive industries	High	High	High	High
Recreational Activity Threats				
RA Threat 1 – Boating pressures	Medium	High	High	High
RA Threat 2 – Encroachment onto public land	Medium	High	High	High

2.3 Snapshot of Issues for Each Coastal Management Area

Table 2-3 identifies the coastal management issues that arise within each of the four CMAs, recognising that some issues may affect more than one area.

Table 2-3 Key Coastal Management Threats Within Each Coastal Management Areas

Coastal Management Area (CMA)	Threats within CMA	Context for Threats	Key Locations for Threats
Coastal Wetlands and Littoral Rainforests Area	CH Threat 5 WQ Threats 1-4 BD Threats 1 & 2 RA Threat 2	There are extensive areas of Coastal Wetlands and small areas of Littoral Rainforest in the study area (**Section 1.3.1**). The identified threats present a risk to the ecosystem health, biodiversity, resilience and long-term functioning of these areas.	Coastal Wetland and Littoral Rainforest Areas are mapped in maps **Map RG-00-02** and **Map RG-00-03** respectively. The main threats to the Littoral Rainforest relate to their proximity to urban development. Coastal Wetlands are subject to pressure from urban development and agriculture, particularly with respect to water quality impacts and modifications to wetland hydrology. The latter will become an increasing concern under climate change conditions due to sea level rise and changes to rainfall patterns.
Coastal Vulnerability Area	All CH Threats BD Threat 1 ME Threat 1 RA Threat 2	While there is no CVA mapped for the study area under the Resilience and Hazards SEPP, the extent of land vulnerable to coastal hazards has been identified through the Stage 2 vulnerability studies (BMT, 2021a) and is mapped in map sets **RG-00-07 A to C, RG-00-08, RG-00-09, and RG-00-10.** The ambulatory and dynamic nature of the shoreline has been considered in the CMP via evaluation of coastal processes to inform management responses, including consideration of how coastal hazards will increase due to climate change. Of the coastal hazard threats the key ones are: • Beach erosion; • Shoreline recession; • Inundation with wind-blown sand (referred to hereafter as dune transgression); • Coastal inundation; • Tidal inundation; and • Accretion of marine sand. These coastal hazards present a risk to public safety, a risk to life, and a risk to built and natural assets. On the open coast, beach erosion due to cross-shore sediment transport that occurs due to wave activity (particularly during coastal storms) is the key issue. Dune transgression (aeolian transport of large amounts of sand) is also a key issue. Affected locations include the portion of the Stockton Bight that falls within the study area and One Mile Beach. Sand mining of the extensive dune systems also occurs in the Stockon Bight. Within the Inner and Outer Port, coastal erosion is less of an issue due to the sheltered nature of the waterway, although complex sediment transport processes lead to shoreline recession and recovery from short-term beach erosion events (although relatively minor) can be limited in the low wave energy environment. The key hazards are coastal and tidal inundation, which affect large areas of low-lying land throughout the study area, an impact that will escalate as rise in mean sea level occurs, with implications for the long-term viability of some current uses of the coastal zone. Loss of vegetation and disturbance, whether associated with sand mining, improper public access, encroachment, recreational 4WDs, or other activities, can materially reduce the resilience of dunes and estuarine foreshores to coastal erosion and dune transgression. These threats may also impact Aboriginal cultural heritage sites, ceremonial and other important locations, resources and other activities.	The key locations identified as being affected by coastal and/or tidal inundation in the Stage 2 vulnerability studies (BMT, 2021a) include: • Large parts of the Tomaree Peninsula including Anna Bay and Bobs Farm; • Large parts of the Tilligerry Peninsula including Lemon Tree Passage, Salt Ash and parts of Tanilba Bay; • Salamander Bay and Taylors Beach; and • Swan Bay and Karuah. Key locations identified as being affected by coastal erosion in the Stage 2 vulnerability studies (BMT, 2021a) include: • The Open Coast beaches; • Shoal Bay and Nelson Bay Beaches; and • Sandy Point / Corlette and Soldiers Point. Wind-blown sand, and specifically dune transgression, is generally confined to the Open Coast, and can cause issues due to the accumulation of sand (e.g., in car parks or around recreational facilities) at Birubi Point and One Mile Beach.

Coastal Management Area (CMA)	Threats within CMA	Context for Threats	Key Locations for Threats
		All stakeholders and the community play an important role in managing these threats to the coastal environment and to appropriately reducing risk and improving resilience to coastal hazards.	
Coastal Use Area	WQ Threats 1, 3 and 4 BD Threats 1 and 2 LC Threat 1 ME Threat 1 RA Threats 1 and 2	The CUA encompasses much of the Port Stephens coastal zone. Threats to this CMA identified in the CMP relate to visual and landscape character, economic uses of the coastal zone, recreational activities, and social and cultural values. In 2021 the population of the Port Stephens LGA comprised 76,414 people (ABS, 2023). The population is growing and is projected to reach 93,658 people by 2041, corresponding to an average annual increase of 1.1%, which is higher than the NSW average (DPHI, 2024). Of note is the high proportion of people over the age of 60, including retirees, in the study area. Tourism, recreational and commercial fishing and sand mining are major economic uses of the coastal zone. Tourism in particular can contribute to significant increases in population. According to the Port Stephens 2016/17 Tourism Monitor, over that period the LGA had 1.31 million visitors, around half of which were overnight visitors. These seasonal increases in population can place pressure on resources, services and utilities. Traditional Owners play an important role in Caring for Country, such as via the Worimi Lands Conservation Board. There is significant opportunity to improve collaboration with, and involvement of, Traditional Owners in coastal management and to facilitate improved access to Country (in particular Sea Country), and there is frustration amongst First Nations people about these issues. Effective coastal management cannot occur without the involvement of Traditional Owners.	Some of the key locations where conflict over access to resources are occurring include: • Important cultural sites located in National Parks; • Traditional fishing grounds located in the Marine Park and other important cultural resources and cultural sites; • Where recreational and commercial boating activities co-occurs with aquaculture operations; • Along the Stockton Bight, where recreational use adversely impacts heritage sites, the dune ecosystem, nesting shorebirds and eco-tourism activities; • Encroachment by private landholders on public land through inappropriate land clearing (e.g., mowing of public reserves, etc.) and construction of foreshore structures, which can prevent or reduce public access to or along the foreshore, including from the foreshore to the water; and • Improper public access to beaches that results in loss of foreshore and dune vegetation and reduced coastal resilience. Key sites include One Mile Beach and Fingal Bay, amongst others. Council undertakes a range of activities to manage encroachment and improper public access, and to ensure public safety and ongoing access to beaches and coastal reserves, including: • Dune rehabilitation, foreshore management and sand management activities; and • Supporting DuneCare and LandCare volunteers.
Coastal Environment Area	All WQ Threats All BD Threats LC Threat 1 ME Threat 1 All RA Threats CH Threats 3, 5 and 7	The CEA encompasses most of the Port Stephens coastal zone. There is a diverse range of identified threats to the CEA, relating to water quality threats, development and land use, recreational activities, and some coastal hazards. These threats are adversely impacting terrestrial and aquatic ecosystem health and resilience and biological diversity within the study area. This is of particular concern in relation to conservation significant communities, populations and species, of which there are many located within the study area. These include: • Various National Parks and Nature Reserves; • The Port Stephens-Great Lakes Marine Park as a whole; • Estuarine macrophytes and other aquatic habitats, including Endangered populations of *Posidonia australis* seagrasses, sponge beds and soft corals; • A significant population of, and habitat for, Koalas; • Significant shorebird and wader bird habitat areas; and • Extensive coastal wetlands and dune systems. Key impacts on these environmental values arise from urban development, agricultural activities, recreational activities (including boating), and pests and weeds.	As detailed above, some of the key locations where recreational activities (including 4WD vehicle access) are adversely impacting ecosystems includes the Stockton Bight, One Mile Beach, and the foreshores of the Inner Port, which are heavily utilised by residents and visitors. These activities can result in damage to and loss of vegetation, damage to dune structures, spread of pests and weeds, wildlife strike, and disturbance of native animals (e.g., nesting shorebirds). Boating activities result in a range of impacts including wildlife strike, water quality impacts, damage to foreshore vegetation and estuarine macrophytes (e.g., via moorings or propellor damage), and general wildlife disturbance. Pest and weed management and water quality are issues of key concern to stakeholders and the community, and there is a desire to protect and enhance the natural environment of Port Stephens to support ecosystem health and biodiversity.

3 Actions to be Implemented by the Council or by Public Authorities

3.1 Evaluation of Coastal Management Options

The CMP process detailed in the CM Manual (OEH, 2018b) involves councils identifying coastal management issues affecting the area to which the CMP is to apply and identifying coastal management actions required to address those coastal management issues in an integrated and strategic manner. The aim is to develop strategies and identify coastal management actions that address coastal management issues, reduce exposure to coastal hazards, and to take advantage of opportunities, consistent with provisions in Clauses 14 and 15 of the CM Act. Councils also decide the priority of identified coastal management actions and propose integrated and strategic delivery pathways.

The process prescribed in the CM Manual follows four steps, summarised in **Figure 3-1.**

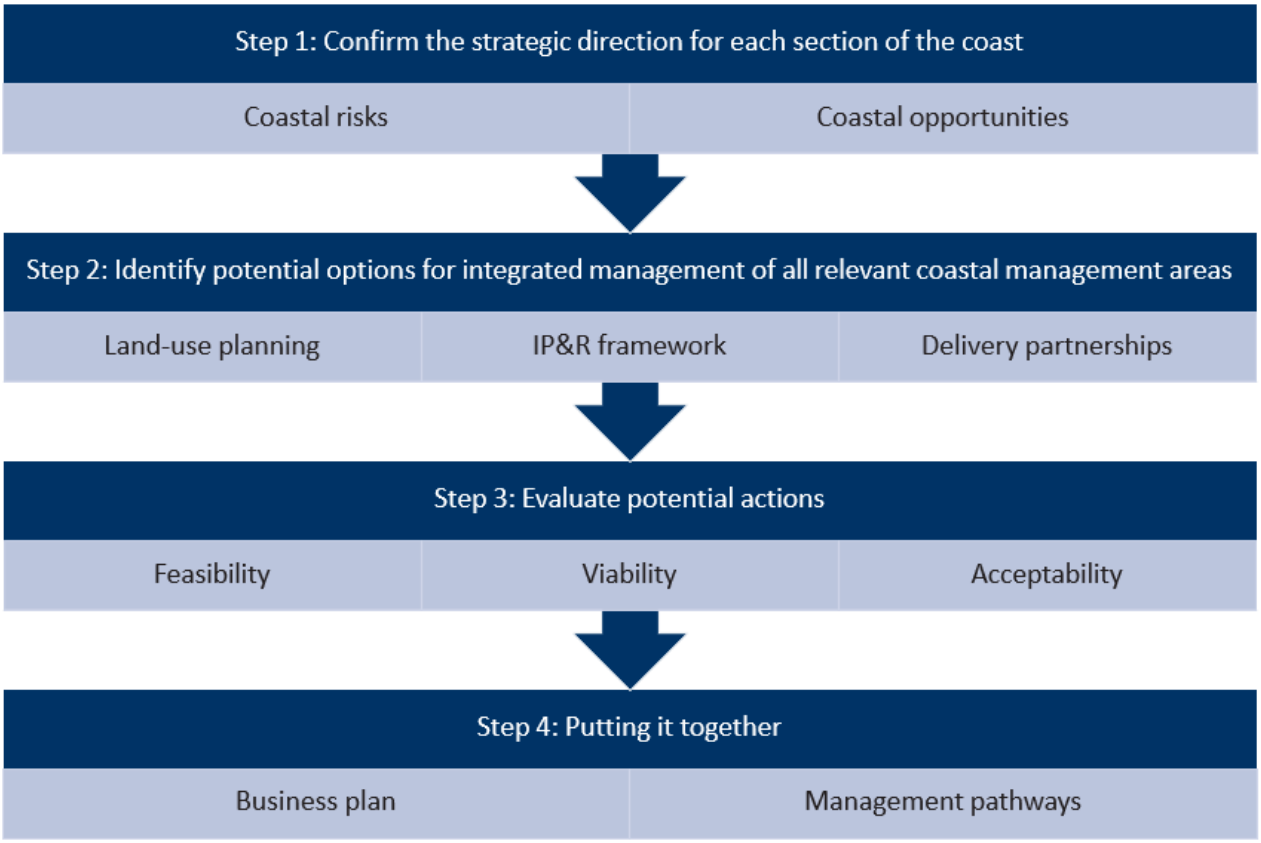


Figure 3-1 Options Identification and Evaluation Process (after: OEH, 2018b)

Stages 1 and 2 of the CMP (including the engagement activities undertaken) developed an understanding of the coastal management issues, including an analysis of the risks, vulnerabilities and opportunities in the study area. As per Step 1 in **Figure 3-1**, the key values, risks and opportunities identified (**Section 2**) provided the basis for the strategic direction of the Port Stephens CMP (**Sections 1.4 and 3.1.1**).

Stage 3 of the Port Stephens CMP has involved identification and evaluation of management options, as per Steps 2 and 3 in **Figure 3-1,** to select preferred coastal management actions for inclusion in the CMP with a focus on achieving the objects of the CM Act (**Table 1-2**) and alignment with management objectives for CMAs under the Resilience and Hazards SEPP (**Table 1-3**).

Community and stakeholder engagement informed this process through the identification of options at workshops and meetings (refer **Appendix B**).

The Stage 3 report (Rhelm and Bluecoast, 2023) provides a more comprehensive summation of the options development and evaluation process.

3.1.1 Confirm Strategic Direction

The purpose of a CMP is to set the long-term strategy for the coordinated management of land within the coastal zone with a focus on achieving the objects of the CM Act. The long-term strategic direction for the Port Stephens coastal zone is articulated in the vision that has been developed for the CMP, which is supported by a series of local coastal management objectives aligned with the CM Act. The vision and objectives are presented in **Section 1.4.**

The strategic context for coastal management of the Port Stephens coastal zone is defined in detail in the Stage 1 Scoping Study (PSC, 2020), which sets the environmental, social, cultural, economic, governance and planning context for coastal management. This includes consideration of demographics, housing and settlement patterns, regional strategic planning, tourism, recreation, environmental conservation and Aboriginal cultural heritage, and how each of these aspects may change over time. All these aspects have been considered by Council in the development of this CMP including evaluation of threats and its long-term strategy which includes management actions around knowledge building (e.g., CH001 and CH072) and planning for change (e.g., CH011 and CH005).

3.1.2 Identifying Options

A total of 158 management options were developed based on a review of the implementation status of the relevant existing coastal studies and plans of management that had been prepared for the study area, the outcomes and recommendations of the Stage 2 vulnerability assessments and engagement with the community, key stakeholders and Traditional Owners.

The full list of management options and information on how they were identified (i.e., 'source of option') is provided in Appendix D of the Stage 3 report (Rhelm and Bluecoast, 2023). The following details are provided for each option:

- A unique identifier in the form of an 'Option ID' number for tracking through the options evaluation process;
- An option description, including the option location (which was mapped, where feasible);
- The key coastal threat that the option addresses;
- The CMA(s) to which the option applies; and
- The category applicable to the management option (i.e., Alert, Avoid Future Impact, Active Intervention, Planning for Change, Emergency Response).

3.1.3 Evaluating Options

The CM Manual recommends councils undertake a methodical and transparent evaluation process to select and adopt the most appropriate coastal management options as actions in the CMP. It is recommended that proposed coastal management options be evaluated in relation to feasibility, viability and acceptability. An overview of the options assessment process, which was adopted in this CMP, is illustrated in **Figure 3-2**.

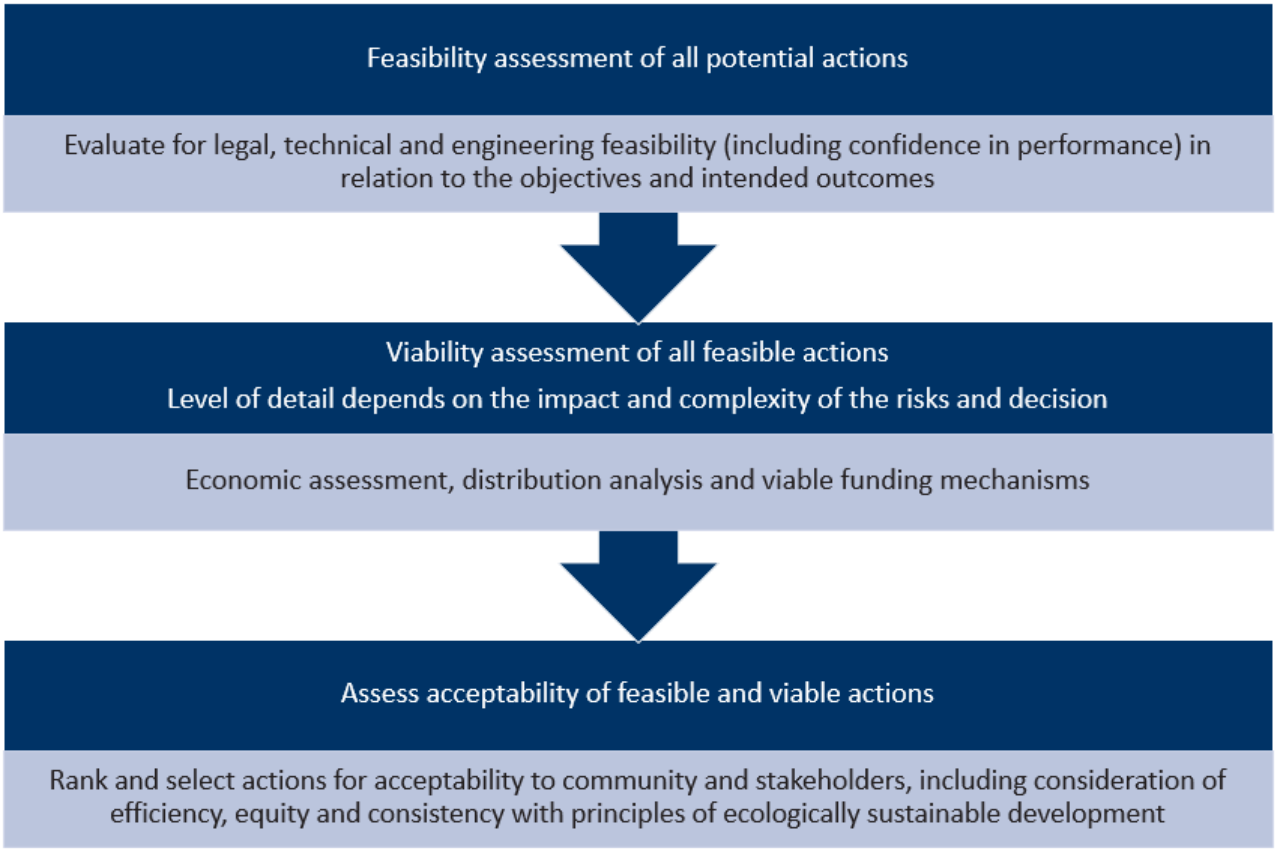


Figure 3-2 Staged Option Evaluation Process (after: OEH, 2018b)

The long list of 153 options identified in Stage 3 of the CMP were subject to assessment for feasibility, viability and acceptability.

The first step was the feasibility assessment, which comprised a first-pass screening of all options to 'rule out' any options that did not address an existing (or future) risk to the coast or were in some other way infeasible and to consolidate overlapping options.

The viability assessment was undertaken for those options that progressed through the feasibility assessment and comprised:

- A multi-criteria assessment based on how well the option addressed coastal threats and its alignment with the CMP management objectives; and
- A simplified 'value for money' assessment with respect to the relative cost of implementation over the 10-year CMP.

None of the management options were subject to detailed cost-benefit analysis (CBA), preliminary design or viability analyses (e.g., modelling). It was considered that none of the options were sufficiently high cost, complex or high risk to necessitate such analyses.

This section summarises the options assessment process and outcomes, which are more comprehensively documented in the Stage 3 report (Rhelm and Bluecoast, 2023).

3.1.3.1 The Feasibility Assessment

The feasibility of each of the management options was evaluated for their legal, technical and engineering feasibility (including confidence in performance) in relation to the objectives and intended outcomes. This evaluation was undertaken using the guidance in the CM Manual, by assessing the options against the criteria shown in **Table 3-1.**

Table 3-1 Feasibility Assessment Criteria

Feasibility Criteria	CM Manual Guidance
Statutory and policy compliance	Demonstrates how the CMP gives effect to the objects of the CM Act and management objectives of the coastal management areas
	Would be permissible under the legislation
	Comply with policy requirements at local, state and Commonwealth levels
Engineering feasibility	Are feasible in engineering terms (i.e., a structure can realistically be built, given the local process context)
	Are broadly able to be implemented, in terms of available capacity and capability, and would address the intended issue
Reduces risk	Can address the identified threats and risks to the coastal zone, or enhance opportunities, based on previous experience / professional judgement
	Are likely to contribute new knowledge for effective and adaptive management; for instance, a response that is structured as a carefully controlled trial of new technology

When evaluating the feasibility of the options, the following aspects were also considered in consultation with Council and NSW DCCEEW:

- The timeframe over which a management option would remain effective and if there are any limits to the effectiveness of the option (e.g., is there a threshold beyond which the response would fail or is rendered obsolete?);
- Evidence from application of the option in similar situations;
- The potential for any unintended or unanticipated negative consequences (sometimes referred to as perverse outcomes or maladaptation);
- Whether the option is irreversible and locks in a specific future action or adaptation pathway;
- Alternatively, whether the option is a low risk or 'no regrets' option, one that would be beneficial to implement irrespective;
- The level of expertise required to evaluate the design, implementation, monitoring and review of actions;
- Whether the selection of a strategy allows for adaptive management.

The feasibility assessment outcomes are provided in Appendix E of the Stage 3 report (Rhelm and Bluecoast, 2023). The feasibility assessment short-listed a total of 64 feasible options to progress to the viability assessment.

3.1.3.2 The Viability Assessment

The viability of coastal management options was assessed on a largely qualitative basis via a multi-criteria analysis (MCA).

The criteria adopted for the MCA were driven by:

- The need to confirm consistency with the CM Act and the requirements of the CM Manual;
- The need to ensure the CMP contains actions that can be funded and implemented; and
- Consideration of the likely acceptance by the key stakeholders and the community (i.e., the acceptability assessment).

The MCA involved evaluation of:

- **Threat Mitigation Score (effectiveness) –** based on scoring of the option with respect to how well it addressed each of the threats listed in **Table 2-2**. The scores were weighted based on the risk rating for the coastal threats (i.e., threats with a 'very high' level of risk were given a higher weighting than those with a 'low' level of risk);
- **Achievement of the management objectives (benefits realisation) –** each option was scored as to how well it would contribute to positive social, environmental and economic outcomes as articulated by the objectives, or if it would have adverse impacts on benefits realisation;
- **Acceptability score (community and stakeholders) –** estimates the likely community and stakeholder acceptance of the option based on Council's previous experience with the community and inputs received during community and stakeholder engagement activities undertaken as part of Stages 1 to 3 of the CMP. This score will be updated as an outcome of the Stage 4 engagement activities; and
- **Cost score –** was applied as a weighting to the total score (being the sum of the scores for each of the criteria listed above) as an indication of 'value for money', whereby less expensive options and/or those that achieved the greatest benefits and risk reduction were weighted higher.

A CMP is also required to consider projected population growth and demographic changes. However, the population of the Port Stephens LGA (75,253 people as at 2021; DPHI, 2024) is expected to experience relatively modest growth rates of 1.1% per annum up to 2041. Hence, it was considered that explicit consideration of population growth in the MCA was not necessary. Similarly, potential future changes in demographics were not included in the MCA as it is considered such changes are difficult to predict in the post-COVID environment with the increase in remote-working and ability of younger people to move further away from larger cities (and noting also the higher proportion of the population aged 60 years and over).

Based on the outcomes of the viability assessment, Council's Project Steering Group for the CMP determined to proceed with the majority of management options in the 'short-list' that went to viability assessment. The viability assessment allowed for:

- The selection of the highest ranking of mutually exclusive options; and
- The identification of lower priority options within the context of the available resources for implementation of the CMP.

Further, as part of the viability assessment, a number of options that had proceeded through the feasibility assessment, were identified to have in fact already been completed. Others were identified as no longer relevant.

The viability assessment resulted in a total of 60 management options being recommended for inclusion as management actions in this CMP.

3.2 Recommended Management Actions

3.2.1 Overview

Management strategies and actions have been developed for an initial 10-year period for the CMP.

The management actions have been categorised in terms of the key threats (**Section 2.2**) being addressed.

A timeframe for implementation of the actions is specified, using time that is equivalent with the key Council Integrated Planning and Reporting (IP&R) framework documents, as follows:

- **Year 1** – to align with the Operational Plan (which typically extends for one financial year);
- **Years 2 to 4** – to match with the Delivery Program which is a four-year program (including the Operational Plan);
- **Years 5 to 10** – to match with the Resourcing Plan which is a 10-year financial plan;
- The term 'ongoing' is used where an action will need to be repeated regularly.

Actions are presented in terms of actions to be implemented by Council (**Section 3.2.2**) and by other public authorities (**Section 3.2.3**).

All recommended actions that have a specific location associated with them are shown on map series **RG-00-11**. All actions in this CMP only apply to areas within the coastal zone.

The following information is provided for each management action:

- Action ID;
- Action name and description (detailed descriptions are provided for select options in **Section 3.2.4**);
- Coastal Management Area;
- Location(s) for implementation;
- Indicative (capital and annually recurrent) costs;
- Responsible and supporting organisations;
- Proposed year of implementation; and
- Performance measures.

Where environmental protection works are proposed, it has been assumed (and identified) that these may occur within the CWLRA.

3.2.2 Actions to be Implemented by Council

There are 55 management actions for implementation by Council, including:

- 25 actions that address Coastal Hazard Threats, including one action that provides for implementation of the CZEAS;
- 16 actions that address Recreation and Access Threats;
- 7 actions that address Biodiversity Threats;
- 6 actions that address Water Quality Threats;
- 1 action that addresses a Mining and Extractive Industries Threat.

The management actions for implementation by Council are presented in **Table 3-2**.

Table 3-2 Actions to be Implemented by Council

Action ID	Relevant CMAs	Management Action	Action Details	Location	Lead Agency	Partners	Timing	Performance Measures
Actions that Address Coastal Hazard Threats								
CH001	CWLRAs, CEA, CUA	Develop and implement a coastal hazard monitoring strategy.	There is opportunity to build knowledge on the impact of coastal hazards on Port Stephens including long-term climate change. Monitoring will also inform adaptive management as identified in this CMP. The monitoring should consider: • measuring the impacts of climate change, • improving understanding of coastal processes and the impacts of events on the coastal zone, • tracking change or identifying trends, and • identifying if triggers for adaptive management have been reached for relevant management options. This action is linked to action CH009, which proposes an additional CoastSnap monitoring station as part of Council's existing suite of CoastSnap locations. The CoastSnap data and analyses should form part of the monitoring program. Further information on this action is provided in **Section 3.2.4**.	All	PSC	DCCEW-EHG	Year 1 and ongoing	Annual reporting of monitoring program.
CH002	CEA, CUA	Develop and implement a program for monitoring the condition of coastal structures owned and/or maintained by Council.	This action will provide for the ongoing monitoring of Council's coastal structures as part of their asset management system. The monitoring framework will in the first instance require a survey to establish the baseline condition of existing structures, building on the survey undertaken for Stage 2, the BMT (2021b) Coastal Structures Audit. The outcomes of the monitoring could be used to inform any remedial or maintenance works required for the structures.	All	PSC	NA	Year 1 and ongoing	Annual reporting of monitoring program.
CH003	CEA, CUA	For those Aboriginal cultural heritage sites and Aboriginal Places located on Council land or Crown land for which Council is the Reserve Manager, work with Traditional Owners to evaluate the level of risk and develop a plan to manage the impacts to cultural heritage from coastal hazards, including sea level rise.	A similar study is currently underway for the Worimi Conservation Lands and this study proposes to evaluate risk to sites located on Council land and Crown land managed by Council.	All	PSC	NA	Year 4	Hazard and risk assessment completed.
CH005	Coastal Wetland Area, CEA, CUA	Prepare a climate change adaptation strategy for the Tilligerry Peninsula in consultation with the local community and key stakeholders. The output of the strategy will be an agreed and costed adaptation pathway that identifies thresholds and triggers for action.	Large areas of land along the Tilligerry Peninsula are subject to coastal inundation in the present day, a risk that will increase in future. In addition, the low-lying land of the peninsula is also at risk from permanent tidal inundation. This has implications for the overarching approach for managing risk from all coastal and flood hazards. Further information on this action is provided in **Section 3.2.4**.	All	PSC	DCCEEW-EHG, Utilities (e.g., HWC), TfNSW, NPWS, DPHI - Crown Lands	Year 6-7	Adaptation strategy completed.
CH009	CWLRAs, CEA, CUA	Install an additional Coast Snap monitoring point at Fingal Beach.	Coast Snap monitoring points provide valuable data about shoreline changes over time. There are already official CoastSnap points at Shoal Bay, Nelson Bay and Birubi Point.	Fingal Bay	PSC	DCCEW-EHG	Year 2	Ongoing monitoring and analyses of CoastSnap sites.
CH011	CWLRAs, CEA, CUA	Prepare a planning proposal to incorporate provisions to manage the risk to life and properties from coastal hazards for inclusion in the Port Stephens LEP 2013 and update the DCP 2014 accordingly.	To provide mitigation of risk to life and property arising from coastal hazards for existing and proposed development. This management action is discussed further in **Section 4**.	All	PSC	NA	Year 1	Successful planning proposal; adoption of LEP and DCP amendments.

Action ID	Relevant CMAs	Management Action	Action Details	Location	Lead Agency	Partners	Timing	Performance Measures
CH012	CWLRAs, CEA, CUA	Document a long-term strategy for local and regional roads under the care and control of Council that are key access roads at risk from tidal inundation aimed at the ongoing provision of access for the community in future.	The coastal hazard study identified that several local roads are inundated in the present day due to coastal inundation. Some of these roads provide the only emergency access and egress to parts of the LGA.	All	PSC	TfNSW	Year 1 to 3	Strategy prepared
CH017	CEA, CUA	Undertake investigations to assess the risk to Shoal Bay Road from coastal erosion and evaluate the feasibility of different strategies to manage the identified risk. Based on the outcomes of the investigations, identify a suitable option to progress to detailed design.	Shoal Bay Road is the sole access for Shoal Bay and Fingal Bay. The section of the road east of Beach Road is close to the shoreline. In the absence of erosion hazard lines for the Outer Port, the extent and timing of coastal erosion risk to the road is unknown. This action proposes a coastal erosion risk assessment and, if required, an assessment of feasible options to protect the road.	Shoal Bay	PSC	NA	Year 2 to 3	Investigations and design complete.
CH022	CEA, CUA	Progress investigations, detailed design and costings for priority options from the Whitehead and Assoc. (2015) Management Plan for Sandy Point/Conroy Park; namely, to demolish existing structures and construct new coastal protection works in Precinct 3, 4 and 5.	At present the absence of erosion hazard mapping in the Outer Port precludes a distribution analysis to allocate costs to public and private beneficiaries of coastal protection works. This option proposes progressing previously identified options for Sandy Point so that they can be progressed promptly to implementation through the economic analyses and grant application process for co-funding by the State, PSC and benefitting individuals. Further information on this action is provided in **Section 3.2.4**.	Sandy Point	PSC	DPHI – Crown Lands	Year 6-7	Investigations and design complete.
CH023	CEA, CUA	Undertake maintenance works / repairs to the existing rock revetment.	An audit of coastal structures undertaken by BMT (2021) concluded the existing foreshore protection measures at Sandy Point require significant repairs and modifications to achieve functionality. This action proposes maintenance works in the form of toe protection works to improve the functionality of the existing structure on the eastern shoreline of Sandy Point. It is noted the structure is an abandoned asset. Further information on this action is provided in **Section 3.2.4**.	Sandy Point	PSC	DPHI – Crown Lands	Year 2	Completed works, annual maintenance actioned.
CH029	Coastal Wetland Area, CEA, CUA	Prepare a climate change adaptation strategy for the Foreshore Drive locality in consultation with the local community and key stakeholders. The output of the strategy will be an agreed and costed adaptation pathway that identifies thresholds and triggers for action.	Foreshore Drive is exposed to coastal hazards under existing sea levels. In addition, it is apparent the risk to natural and built assets at this location will increase under climate change conditions. The protection of Mambo wetlands is an important issue for the community and needs special consideration, to include a water balance and hydrological study. Further information on this action is provided in **Section 3.2.4**.	Salamander Bay	PSC	NA	Year 5 to 6	Strategy prepared
CH072	CWLRAs, CEA, CUA	Undertake a coastal erosion hazard investigation for the Inner and Outer Port.	The erosion hazard mapping prepared in Stage 2 of the CMP only covered the open coast. The lack of erosion hazard mapping in the Inner and Outer Port means that there is a lack of information about the potential risk from shoreline erosion and how the risk will change over time. The lack of erosion hazard lines also means that it is not possible to undertake distribution analyses to identify beneficiaries of coastal protection works in the Inner and Outer Port and therefore any such works would not be eligible for funding under the C&E Grants program.	Inner Port Outer Port	PSC	DCCEEW-EHG	Year 1 to 2	Investigation / mapping completed.

Action ID	Relevant CMAs	Management Action	Action Details	Location	Lead Agency	Partners	Timing	Performance Measures
CH073	CEA, CUA	Develop a climate change adaptation plan for the Shoal Bay precinct. The output of the plan will be an agreed and costed adaptation pathway that identifies thresholds and triggers for action.	The adaptation plan should aim to develop a more detailed understanding of the existing and future risk from coastal hazards to natural and built assets and infrastructure in Shoal Bay which can then be discussed with the stakeholders with respect to the key attributes and activities undertaken in Shoal Bay that the community would like to maintain into the future and under climate change conditions. One key issue that has been identified to date is the risk to Shoal Bay Road from coastal hazards - it is the only road servicing this locality. Further information on this action is provided in **Section 3.2.4**.	Shoal Bay	PSC	DCCEEW-EHG, DPHI – Crown lands, Utilities (e.g., HWC), NPWS	Year 2-3	Plan prepared.
CH074	CWLRAs, CEA, CUA	Develop a policy to articulate Council's position regarding the protection of private land along estuarine foreshores and the prioritisation of public funds for the protection of public land, public access and recreational amenity.	Some owners of foreshore properties are of the understanding that Council will be wholly responsible for the protection of foreshore land from coastal hazards. Consistent with the State Government policy, Council wishes to make clear that their priority is the protection of public land and assets. Further, the community members have identified that equity and prioritisation of public benefit is important to them. In addition, there is an expectation that Council will maintain existing works, whether or not they are owned by Council. Council wishes to clarify that they are only responsible for maintenance of seawalls for which they are the identified owner or responsible party (e.g. under a Crown lands licence).	All	PSC	NA	Year 2	Policy developed and adopted.
CH075	CEA, CUA	Investigate risk of tidal ingress of stormwater outlets and identify outlets requiring tide gates.	A catchment balance assessment will be undertaken to ensure the balance between catchment flows and tidal inundation risk is considered. The works will then be prioritised on a risk basis considering adjacent land use, history of issues/complaints and the potential reductions in economic damages arising from alleviation of the associated nuisance flooding.	All	PSC	NA	Year 3	Investigation completed.
CH077	CEA, CUA	Prepare for implementation of the CZEAS (if triggered) by obtaining the necessary planning approvals, permits and licences.	This action has been included to assist Council in undertaking the preparatory activities required to facilitate implementation of the CZEAS, if triggered. It is assumed that these approvals, permits and licences would be in place for a maximum of five years, and therefore would require re-application or renewal during the 10 year period of implementation. Further information can be found in **Appendix C**.	All	PSC	NA	Year 1 & ongoing	Preparedness activities detailed in Section 6 of the CZEAS completed in Year 1. Review and reporting of the CZEAS.
CH078	Coastal Wetland Area, CEA, CUA	Undertake maintenance works / repairs to the existing seawall and clean out stormwater outlet.	Applies to part of the Swan Bay Seawall that is failing and requires toe protection works to ensure its ongoing functionality. In addition to the coastal inundation risk at this location, the structure is retaining land that is filled with building waste. A clean out of the stormwater outlet is also required.	Swan Bay	PSC	DPHI – Crown Lands	As required	Works completed.
CH079	CEA, CUA	Undertake foredune stabilisation works at Birubi Point in accordance with the NSW Coastal Dune Management Manual (DLWC, 2001).	The aeolian transport of sand into the car park and other facilities at Birubi Point is an ongoing issue. This action proposes to undertake dune stabilisation works to facilitate the accretion and capture of sand, including barrier dune reformation, fencing and revegetation.	Birubi Point	PSC	NA	Year 3	Works completed and reduction of sand present in the car park and other impacted facilities.
CH080	CEA, CUA	Investigate and undertake detailed design coastal protection works to mitigate coastal erosion risk.	This option is proposing design and investigation of a permanent solution to the ongoing coastal erosion issue at this location.	Nelson Bay Beach	PSC	DPHI – Crown Lands	Year 2	Investigations and design complete.
CH081	CEA, CUA	Install tide gates/flaps on priority stormwater outlets.	This option provides for implementation of priority works identified under option CH075 at up to 20 sites.	All	PSC	NA	Year 1	Works completed as programmed, reduction in nuisance drainage complaints.

Action ID	Relevant CMAs	Management Action	Action Details	Location	Lead Agency	Partners	Timing	Performance Measures
CH083	CEA, CUA	For those Council buildings located within the present day coastal inundation extent prepare/update the emergency action plans to provide guidance on preparedness and response to a coastal inundation event.	There are a number of Council owned buildings that are exposed to risk from coastal inundation in the event of a coastal storm such as an East Coast Low. It is recommended that these facilities have a plan in place to mitigate the impacts of inundation and manage the safety risk to occupants at the time of such an event.	All	PSC	NA	Year 1	Plans prepared / updated and enacted in accordance with the CZEAS.
RA011	CEA, CUA	Undertake sand carting / beach nourishment to provide improved beach access and amenity.	Council has historically undertaken sand carting to transfer accreted sand from the western end of the beach further east for improved beach width and volume for amenity reasons. While the primary intent of the action is to improve beach amenity, there would also be a short-term co-benefit with respect to coastal protection. Further information on this action is provided in **Section 3.2.4**.	Shoal Bay	PSC	NA	Year 1 to 10	Sand carting undertaken annually and improved beach amenity.
RA016	CEA, CUA	Undertake sand carting / beach nourishment to provide improved beach access and amenity.	Sand carting and beach nourishment activities have previously been undertaken at Conroy Park. The ongoing sand deficit at this location results in reduction in beach volume/width. This action is based on Priority Action 1 from the Management Plan for Sandy Point/Conroy Park (Whitehead and Assoc, 2015). While the primary intent of the action is to improve beach amenity, there would also be a short-term co-benefit with respect to coastal protection. Further information on this action is provided in **Section 3.2.4**.	Sandy Point / Conroy Park	PSC	NA	Year 3	Works completed. Improved beach amenity.
RA020	CEA, CUA	Landscaping works for bank stabilisation. This action involves re-vegetation works (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	The intent of this action is to undertake landscaping to assist in bank stabilisation. Where necessary some geotextile matting or coir logs may be placed to assist bank stabilisation. The extent of foreshore proposed for landscaping works is around 110 m long.	Tanilba	PSC	NA	Year 6	Works completed. Improved foreshore vegetation coverage and condition.
RA031	CEA, CUA	Replace and relocate stairs and fix fencing to reinstate public access from the car park.	There have been concerns raised by the community regarding the length of time these stairs have been closed. They were closed and barricaded following erosion sufficient to render the stairs inaccessible and a safety risk.	Dutchmans Beach	PSC	NA	Year 1	Works completed and safe public access reinstated.
Actions that Address Mining and Extractive Industries Threats								
DI001	CWLRAs, CEA, CUA	Work collaboratively and share information about major (CSSI/SSI) projects proposed for the open coastal waters to ensure appropriate consideration of the vision and objectives of this CMP and the objects of the CM Act.	On 12 July 2023 the Federal Minister for the Climate Change and Energy declared the Hunter Offshore Renewable Area, extending offshore from Norah Head in the South to Port Stephens in the north. Being offshore of the study area for this CMP, there is potential for the infrastructure to pass through the study area. This option proposes a Memorandum of Understanding between Council and the WCLB (which includes Native Title claimants for the relevant State waters) to share information and work together to ensure sustainable coastal and offshore development.	All	PSC	WCLB	Year 1 to 5	Memorandum of Understanding established and at least one meeting held per year.
Actions that Address Biodiversity Threats								

Action ID	Relevant CMAs	Management Action	Action Details	Location	Lead Agency	Partners	Timing	Performance Measures
E001	CWLRAs, CEA, CUA	Continue to support pest and weed control management activities on Council owned or managed land in the coastal zone through the Hunter Regional Strategic Pest Animal Management Plan and Hunter Regional Strategic Weed Management Plan 2023-2027. This may involve Council undertaking a range of activities such as: • Weed control (e.g. removal, spraying); • Activities to reduce numbers of pest species (e.g. trapping to reduce risk of feral cats breeding, release of bio-control agents for rabbits and/or destroying warrens); • Monitoring and reporting of pests and weeds on coastal land managed by Council.	These plans have been developed by Hunter LLS and provide for coordinated pest and weed control by the relevant stakeholders. Biosecurity was identified as a key threat to coastal biodiversity.	All	PSC	NA	Year 1 and ongoing	Successful control, containment and eradication of pests and weeds.
E004	Coastal Wetland Area, CEA, CUA	Support implementation the Mambo Wetlands Plan of Management (PoM; PSC, 2006) , as updated from time to time. Activities to be implemented under the PoM include environmental protection and other works including: • Annual weed control programs. • Identify and control weeds at the source, using bush regenerators in on-ground control works. • Annual bush regeneration program as prioritised by PSC Bushland Assessment Tool. • Annual feral animal control program. • Ensure fire trails are maintained. • Periodic, mosaic burning regime.	The Mambo Wetlands comprises a large area of Coastal Wetland.	Mambo Wetlands	PSC	NA	Year 1 and ongoing	Annual activities undertaken as per the program in the PoM.
E005	Littoral Rainforest Area, CEA, CUA	Support implementation of the Soldiers Point Littoral Rainforest Management Plan (Kleinfelder, 2021). Activities to be implemented under the Plan include environmental protection and other works, such as: • Monitoring the condition of the rainforest and undertaking works according to prioritisation by the PSC Bushland Assessment Tool. • Weed control by spot spraying and removing invasive species. • Planting local, endemic rainforest species in suitable locations. • Formalising walking tracks.	There is an area of Littoral Rainforest located at Soldiers Point.	Soldiers Point	PSC	NA	Year 1 and ongoing	Annual activities undertaken as per the program in the Management Plan.
E008	Coastal Wetland Area, CEA, CUA	Conduct an ecological survey of Mambo Wetlands to include habitat mapping and identify any trends in the habitat extents and condition since the previous survey(s).	The most recent survey was undertaken over 20 years ago. In addition, the recent replacement of the Foreshore Drive culverts with a bridge has altered the hydrological regime in the wetlands and is likely to have implications for wetland biodiversity.	Mambo Wetlands	PSC	NA	Year 2	Survey completed.

Action ID	Relevant CMAs	Management Action	Action Details	Location	Lead Agency	Partners	Timing	Performance Measures
E018	Coastal Wetland Area, CEA, CUA	Prepare a new, updated Plan of Management for Mambo Wetlands.	The current Plan of Management for Mambo Wetlands was prepared in 2006 and could benefit from an update to better reflect the changes in the statutory environment and catchment land use, as well as the current condition, threats and pressures affecting the wetland. The new Plan should reflect the outcomes of related management actions E008 (Ecological survey of Mambo Wetlands) and CH029 (Adaptation Plan for Foreshore Drive locality).	Mambo Wetlands	PSC	NA	Year 3	New PoM prepared and adopted by Council.
HE002	Littoral Rainforest Area, CEA, CUA	Progress the implementation of the Soldiers Point Aboriginal Place Plan of Management in partnership with the Traditional Owners. Management strategies identified in the plan include: • Ongoing conservation and protection of significant heritage and cultural sites; • Environmental protection works including vegetation management, weed control, rehabilitation and re-vegetation works; and • Beach management work in the form of sand nourishment to minimise erosion, protection habitat and improve access and amenity.	This important site benefits from a co-management approach.	Soldiers Point	PSC	NA	Year 1 and ongoing	PoM implementation ongoing.
WQ004	CEA	In order to maintain vegetated riparian corridors through the development process, planning proposals to re-zone land within the CEA developed or evaluated by Council will adopt land use zonings appropriate to maintain Vegetated Riparian Zones consistent with those specified in the Controlled activities - Guidelines for riparian corridors on waterfront land.	Port Stephens is an environmentally sensitive waterway with conservation significance. There is a need to minimise the impact of urban stormwater runoff. Ancillary benefits relate to visual amenity and wildlife corridors.	All	PSC	DPHI - Planning	Year 1 and ongoing	Planning proposals prepared or reviewed by Council demonstrate consideration of requirement. Progressive improvement in extent of vegetated riparian corridors.
Actions that Address Public Recreation and Access Threats								
E002	CEA, CUA	Undertake works to manage access and rehabilitate the dunes. This action involves renewal of dune fencing and dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Informal access through the dunes is negatively impacting vegetation and the dune system in several locations along the beach. While Council has a regular program of maintenance of dunes, this location requires more intensive efforts to manage the existing level of impact through a stand-alone option.	One Mile Beach	PSC	NA	Year 3 and ongoing	Works completed and informal access impacts reduced.
E011	CEA, CUA	Undertake works to manage access and rehabilitate the dunes. This action involves renewal of dune fencing and dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Dune re-vegetation and management of accessways supports dune stability and reduces impacts from public access. While Council has a regular program of maintenance of dunes, this location requires more intensive efforts to manage the existing level of impact through a stand-alone option.	Fingal Bay	PSC	NA	Year 4	Works completed and informal access impacts reduced.

Action ID	Relevant CMAs	Management Action	Action Details	Location	Lead Agency	Partners	Timing	Performance Measures
E012	CWLRAs, CEA, CUA	Undertake an ongoing program of sand management and dune rehabilitation works for all coastal foreshore land managed by Council. This includes managing public accessways, fencing, weeding and replanting with locally endemic species, as detailed in **Section 3.2.4** and **Appendix D**. Co-benefits of this option relate to improved beach access and amenity, improved beach user safety, environmental rehabilitation, and coastal protection.	Sand management is a key issue for the study area and requires ongoing management by Council. In some locations, aeolian transport of sand is significant and can inundate recreational areas, accessways and other assets. In other locations coastal sediment transport processes (e.g., littoral drift) can result in accretion of sand in some locations and/or erosion others. Sand carting or beach scraping may be required to address these issues. At the same time, foreshore vegetation, dunes and accessways are subject to coastal erosion, an issue that may be compounded by members of the public cutting across dunes to access the beach rather than using formal accessways, resulting in loss of vegetation and further erosion. This compromises the integrity of the dunes, which function to provide protection for landward assets and also have ecosystem value. Beach accessways can become unsafe at times due to erosion (e.g., undermining) and regularly require repairs or replacement. Hence there is a need for ongoing active management of public beaches and dunes. Further information on this action is provided in **Section 3.2.4**.	All	PSC	NA	Year 1 and ongoing	Ongoing works completed. Maintenance of safe access for the public and SLSCs. Maintenance of dune vegetation.
E016	CEA, CUA	Encourage local volunteer groups to support dune rehabilitation activities.	Provide direction, funding and support for community involvement in dune rehabilitation projects along the coast. Coordination of volunteers is by the Strategy and Environment team but would be delivered by the Public Domain and Services team.	All	PSC	NA	Year 1 and ongoing	Support of at least one Coastcare / Landcare project per year
E017	CEA, CUA	Undertake ongoing compliance monitoring and enforcement of regulations relating to unauthorised 4WD access and off-leash dog walking on Council managed land.	This action complements Action E013, which provides for Council to undertake compliance monitoring of these activities on Council land where they have jurisdiction.	All	PSC	NA	Year 1 and ongoing	Monitor number of incidents per year, with no increase over time.
HE001	CWLRAs, CEA, CUA	Develop an engagement protocol and strategy for Council engagement with Traditional Owners and Knowledge Holders.	Traditional Owners and Knowledge Holders play an important role in providing input on various projects and activities undertaken in the coastal zone by Council (and vice versa) and this function would benefit from formal acknowledged and support.	All	PSC	NA	Year 1 to 2	Engagement protocol developed and endorsed by Council.
RA001	CWLRAs, CEA, CUA	Develop a guideline and education program for private landholders detailing their responsibilities with respect to undertaking coastal protection works on private land and the relevant requirements with respect to engineering design, development controls and environmental approvals.	Private coastal protection and other works are contributing to key threats to the coastal zone, including encroachment on public land and environmental and heritage impacts.	All	PSC	DCCEEW-EHG	Year 2	Guideline and education program developed. Guideline made available on PSC webpage. At least two education sessions implemented.
RA002	CEA, CUA	Progress the implementation of Council's *Boating and Fishing Infrastructure Plan* (Otium Planning Group, 2023).	Fishing and boating are key recreational activities that support the coastal economy. Sufficient and appropriate infrastructure minimises user conflicts.	All	PSC	TfNSW - MIDO	Year 1 and ongoing	Grant applications submitted and projects progressively completed.
RA003	CEA, CUA	Develop a governance framework for coastal protection structures of unknown management status.	For many existing coastal structures the authority or person responsible for maintenance of the structure is not known and they are not maintained. Potential impacts of these structures on the environment and/or public safety and access may not be understood or managed appropriately. Liaise with Crown lands regarding the Marine Estate Management Strategy (MEMS) Breakwall governance and management project and agree to appropriate governance for foreshore structures ('breakwalls') in Port Stephens for which the party responsible for maintenance of the structure is not known.	All	PSC	DPHI - Crown Lands	Year 2	Framework developed and endorsed by Council.

Action ID	Relevant CMAs	Management Action	Action Details	Location	Lead Agency	Partners	Timing	Performance Measures
RA012	CEA, CUA	Undertake works to manage access and rehabilitate the dunes. This action involves renewal of dune fencing and dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Undertake works to control public access and revegetate the dune. A combination of high intensity public visitation and periodic erosion events has resulted in a need to repair or replace dune fencing, restrict access through eroded locations, and re-vegetate sections of the dune. While Council has a regular program of maintenance of dunes, this location requires more intensive efforts to manage the existing level of impact through a stand-alone option.	Shoal Bay	PSC	NA	Year 1 and ongoing	Works completed. Improved dune stability and vegetation coverage.
RA017	CEA, CUA	Undertake works to manage access and rehabilitate the dunes. This action involves renewal of dune fencing and dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Dune re-vegetation and management of accessways supports dune stability and reduces impacts from public access. While Council has a regular program of maintenance of dunes, this location is affected by an ongoing sand deficit and would benefit from a more targeted action. While Council has a regular program of maintenance of dunes, this location requires more intensive efforts to manage the existing level of impact through a stand-alone option.	Corlette	PSC	NA	Year 4	Works completed. Improved dune stability and vegetation coverage.
RA027	CEA, CUA	Undertake works to manage access and rehabilitate the dunes. This action involves dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Dune re-vegetation and management of accessways supports dune stability and reduces impacts from public access. While Council has a regular program of maintenance of dunes, this location requires a more extensive fencing and re-vegetation works.	Salamander Bay	PSC	NA	Year 5	Works completed. Improved dune stability and vegetation coverage.
RA030	CEA, CUA	Undertake works to manage access and rehabilitate the dunes. This action involves dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Dune re-vegetation and management of accessways supports dune stability and reduces impacts from public access. While Council has a regular program of maintenance of dunes, this location requires a more extensive fencing and re-vegetation works.	Dutchmans Beach	PSC	NA	Year 4	Works completed. Improved dune stability and vegetation coverage.
RA034	CEA, CUA	Undertake works to manage access and rehabilitate the dunes. This action involves renewal of dune fencing and dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Dune re-vegetation and management of accessways supports dune stability and reduces impacts from public access. While Council has a regular program of maintenance of dunes, this location requires a more extensive fencing and re-vegetation works.	Nelson Bay Beach	PSC	NA	Year 4	Works completed. Improved dune stability and vegetation coverage.
RA036	CEA, CUA	Minor shoreline re-profiling and landscaping works to stabilise the foreshore and provide improved amenity, as per the detailed description provided in **Section 3.2.4** of the CMP.	The community is concerned about the ongoing erosion at this location. The proposed works would involve some minor re-profiling to create a shoreline profile similar to the nearby beach, with additional stabilisation provided by geotextile or jute meshing and coir logs, as required. Landscaping would be used to both stabilise the shoreline and control public access. Further information on this action is provided in **Section 3.2.4**.	Kangaroo Point	PSC	NA	Year 7	Works completed. Improved foreshore vegetation coverage and condition.
RA045	CEA, CUA	Undertake minor dredging for ongoing access to Little Beach boat ramp, Nelson Bay Marina, Soldiers Point boat ramp, and Taylors Beach boat ramp.	Naturally occurring sediment transport processes can result in the accretion of sand in navigational areas, limiting access to boat ramps or marinas. This action provides for maintenance dredging to address this issue.	Little Beach Nelson Bay Soldiers Point Taylors Beach	PSC	NA	Year 1 and ongoing as required	Dredging is undertaken in accordance with the appropriate licenses and approvals. No increase in complaints about access to boat ramps.
Actions to Address Water Quality Threats								
E014	Coastal Wetland Area, CEA, CUA	Engage with NSW DPI on the implementation of the Marine Parks Network Management Plan within the Port Stephens-Great Lakes Marine Park.	There are a number of activities listed in the forthcoming Plan that identify Council as an implementation partner.	All		DPI - Marine Parks	Year 1 and ongoing	Council staff attend regular meetings of the Port Stephens-Great Lakes Marine Park management committee.

Action ID	Relevant CMAs	Management Action	Action Details	Location	Lead Agency	Partners	Timing	Performance Measures
WQ002	Coastal Wetland Area, CEA, CUA	Enter into a data sharing agreement to enable sharing of historical and ongoing water quality monitoring data undertaken in Port Stephens.	There are a number of stakeholders engaging in monitoring. This option facilitates ease of data sharing for water quality monitoring, studies and investigations.	All	PSC	DCCEEW-EHG, DPI - Fisheries, DPI - Marine Parks, MCC	Year 1	Data sharing agreement in place. Opportunities for data sharing realised.
WQ003	Coastal Wetland Area, CEA, CUA	Implement a Water Quality Monitoring Program focussed on risk to aquatic recreation. As a secondary objective, the monitoring should evaluate catchment pollutant inputs.	The health of aquatic recreational users can also be impacted by poor water quality, in particular faecal contamination. This option proposes to sample popular swimming beaches during the peak swimming season to evaluate risk to people engaging in recreational activities. As a secondary objective for the monitoring program, sampling for key parameters (i.e., nutrients) will be undertaken at key stormwater outlets at the same locations with a view to identifying potentially problematic pollutant sources in the catchment.	Shoal Bay Beach Little Beach Nelson Bay Beach Corlette	PSC	DCCEEW-EHG	Year 1 and ongoing	Water quality monitoring undertaken as programmed. Annual monitoring, analyses and reporting undertaken.
WQ005	Coastal Wetland Area, CEA, CUA	Develop and implement a campaign targeted at improving the awareness of the general community on catchment management practices relating to water quality improvement in Port Stephens.	The practices of private landholders are a key diffuse source of stormwater pollutants. Key issues include but are not limited to: Failure of Onsite Sewage Management Systems (e.g., from flooding or coastal hazards), companion animal faeces on water quality, use of fertilisers, herbicides and pesticides, erosion and sedimentation, and general diffuse sources of pollution associated with activities around the home.	All	PSC	NA	Year 2 and ongoing	Education campaign developed and materials made available on PSC webpage. At least one educational event is undertaken each year.
WQ008	CEA, CUA	Provide for ongoing enforcement of regulations in dog on-leash areas. In addition, undertake a review of dog on-leash and off-leash areas with a view to confirming the appropriateness of off-leash dog areas with respect to community uses of these areas and their environmental sensitivity (e.g. shorebird roosting or nesting areas). Review existing dog on-lead signage in key locations (e.g. Tanilba Bay) and provide more signage where required.	Studies have shown dog faeces is a material source of faecal contamination in coastal waters. Stakeholders identified that off-leash dogs can disturb other recreational users and can have a material impact on migratory waders and shorebirds. Reference should also be made to Option WQ005, which provides for community education.	All	PSC	NA	Year 2	Completion of the review of dog on-leash and off-leash areas. Minimum one campaign a year. Reduction in number of complaints received by Council.
WQ010	CEA, CUA	Support the community to dispose of recreational fishing waste appropriately.	Install tackle bins at popular recreational fishing sites to reduce the incidence of fishing waste (e.g. hooks, lines) entering coastal waters. Three tackle bins have been manufactured and installed by the South Tomaree Community Associated to date. OzFish can provide tackle bins upon request. Council could assist the community with installation and education programs that promote the use of the bins via Council's webpage, environmental newsletter, and local media. DPI - Fisheries offer programmes for community Tackle Bins.	All	PSC	DPI - Fisheries	Year 1 and ongoing	Tangle bins installed for at least six popular fishing sites (e.g., wharves) in Years 1-2.

3.2.3 Actions Recommended for Public Authorities

Public authorities have been identified to support Port Stephens Council to implement the majority of the management actions in the CMP, predominately through the provision of technical or project management support. However, there are also several actions for which a public authority has been identified as the lead agency.

There are five management actions identified for implementation by public authorities, including:

- Two actions that address Water Quality Threats;
- One action that addresses a Coastal Hazard Threat;
- One action that addresses a Recreation and Access Threat; and
- One action that addresses a Biodiversity Threat.

These actions are presented in **Table 3-3**.

Table 3-3 Actions to be Implemented by Public Authorities

Action ID	Relevant CMAs	Management Action	Action Details	Location	Lead Agency	Partners	Timing	Performance Measures
Actions that Address Coastal Hazard Threats								
CH082	Coastal Wetland Area, CEA, CUA	Incorporate consideration of risk arising from coastal hazards into National Parks Plans of Management as part of scheduled updates.	NPWS periodically updates their Plans of Management for National Parks, Nature Reserves and other National Park Estate lands.	National Parks & Nature Reserves	NPWS	NA	As required	Updated Plans of Management.
Actions that Address Biodiversity Threats								
E019	CEA, CUA	Undertake management activities to contribute to threatened shorebird protection on NPWS Estate in accordance with approved conservation strategies and plans.	NPWS undertakes shorebird conservation and protection activities in accordance with approved Threatened Species Management Plans.	National Parks & Nature Reserves	NPWS	NA	Ongoing	Implementation records.
Actions that Address Recreation and Access Threats								
E013	CEA, CUA	Undertake ongoing compliance monitoring and enforcement of regulations along Stockton Beach and the Worimi Conservation Land in relation to unauthorised 4WD access and off-leash dog walking.	This is an activity currently undertaken by NPWS and WCLB, but could benefit from increased enforcement activities to discourage inappropriate activities	Stockton Beach	NPWS	WCLB	Ongoing	Monitor number of incidents per year, with no increase over time.
Actions that Address Water Quality Threats								
WQ007	CEA, CUA	Undertake an investigation to identify wastewater pump stations in the Port Stephens catchment that require upgrading as part of a broader wastewater pump station improvement program that will reduce the risk of wastewater overflows by providing additional emergency storage at selected sites.	The community has expressed concern about the risk of overflows from the wastewater pump station in Shoal Bay. However, HWC advised that addressing this risk is part of a broader program and has committed to undertaking the initial investigation to scope the improvements that might be required (if any) at this site and others in the catchment.	Shoal Bay	HWC	NA	Year 1	Investigation completed.
WQ009	CEA, CUA	Beachwatch monitoring program for recreational water quality at ocean beaches (continued program).	The Beachwatch Program, in partnership with NSW DCCEEW, is undertaken every year from the start of November to the end of March, with five samples collected each month from four ocean beaches.	Box Beach Fingal Beach One Mile Beach Zenith Beach	HWC	DCCEEW - EHG	Year 1 and ongoing	Ongoing reporting of Beachwatch monitoring results.

3.2.4 Details on Complex Actions

A number of management actions listed in **Sections 3.2.2 and 3.2.3** refer to additional information provided on the following pages. The actions included in this summary are listed below:

- **Action CH001** – Develop and implement a coastal hazard monitoring strategy (**Table 3-4**);
- **Action CH012** – Develop a long-term strategy for local and regional roads under care and control of Council that are key access roads at risk from tidal inundation (**Table 3-5**);
- **Action RA011** – Sand carting / beach nourishment for improved beach amenity at Shoal Bay Beach (**Table 3-6**);
- **Action CH017** - Undertake investigations to assess the risk to Shoal Bay Road from coastal erosion and evaluate the feasibility of different strategies to manage the identified risk (**Table 3-7**);
- **Action CH073** – Climate change adaptation strategy for the Shoal Bay precinct (**Table 3-8**);
- **Action CH029** – Climate change adaptation strategy for the Foreshore Drive locality (**Table 3-9**);
- **Action CH022** – Progress investigations, detailed design and costings for priority options from the Whitehead and Assoc. (2015) Management Plan for Sandy Point/Conroy Park (**Table 3-10**);
- **Action CH023** – Undertake maintenance works / repairs to the existing rock revetment at Sandy Point (**Table 3-11**);
- **Action RA016** – Sand carting / beach nourishment at Corlette Beach (**Table 3-12**);
- **Action RA036** – Minor foreshore re-profiling and stabilisation works at Kangaroo Point (**Table 3-13**);
- **Action CH005** – Climate change adaptation strategy for the Tilligerry Peninsula (**Table 3-14**);and
- **Action E012** – Ongoing program of sand management activities (**Table 3-15**); and
- **Action RA045** – Maintenance dredging (**Table 3-16**).

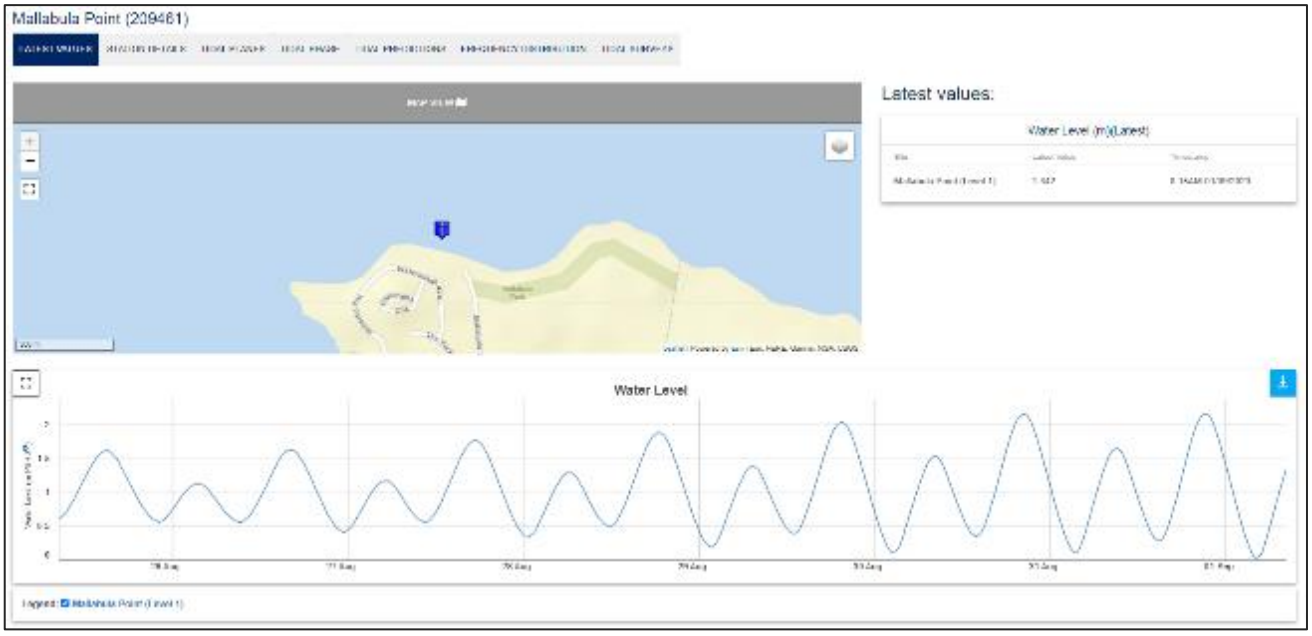
Table 3-4 Detailed Description - Action CH001

Action CH001 – Develop and implement a coastal hazard monitoring strategy
Location(s): Port Stephens coastal zone.
Coastal threat(s) to be addressed: All coastal hazard threats.
Cost: The cost estimate includes: • $15,000 for a consultant to scope the monitoring strategy. • $67,000 annually recurrent cost to undertake annual beach surveys and after large storm events, assumed to occur every three years on average.
Action Description: Data collection is integral to developing an understanding of coastal processes and the impacts of coastal hazards on the study area. Analysis and quantification of coastal processes is a data driven process that is heavily reliant on long time series data sets. The monitoring program should aim to: • Establish a high quality, fit for purpose data set suitable for monitoring coastal processes, identifying trends and tracking change; • Better understand the impacts of coastal processes on the study area in relation to storm events and inter- and intra-annual variation (e.g., in relation to El Niño – Southern Oscillation cycle); • Measure the impacts of climate change, in particular sea level rise; and • Identify if triggers for adaptive management have been reached for relevant management actions.

Action CH001 – Develop and implement a coastal hazard monitoring strategy

Council currently has three CoastSnap monitoring sites at Shoal Bay, Nelson Bay and Birubi Point and the CMP includes an action for an additional site at Fingal Bay (Action CH009). The data and analyses derived from these CoastSnap sites should form part of the monitoring program.

There is currently one Manly Hydraulics Laboratory (MHL) water level gauge in Port Stephens at Mallabula Point (209461) that can be used along with data from the Crowdy Head water level gauge to evaluate sea level rise. A screen shot of the MHL web portal for this gauge is shown in the image below (source: https://mhl.nsw.gov.au/Station-209461).



CMP Assessment:

Effectiveness and benefits:	• The monitoring would support knowledge building and improve understanding of coastal processes and the impact of coastal hazards on Port Stephens, including longer term trends such as climate change. • It would enable monitoring and evaluation of coastal hazard mitigation actions implemented under the CMP.
Action Type:	☒ **Alert** ☐ Avoid future impact ☐ Active intervention ☐ Planning for change ☐ Emergency response

Timing: The action has been programmed to commence in Year 1 of the CMP.

Related management actions:

- CH002 – Monitoring of Council coastal protection structures.
- CH009 – Additional CoastSnap monitoring site.
- CH077 – Supported dune recovery following erosion events.
- E012 – Sand management action.
- Actions that will incorporate the use of 'triggers' or 'thresholds', including CH005, CH012, CH014, CH029, RA011, and RA016.

Table 3-5 Detailed Description - Action CH012

Action CH012 - Develop and implement a strategy for key access roads impacted by tidal inundation
Location(s): This action relates to low-lying local and regional roads at risk of permanent tidal inundation (or more regular coastal inundation) that act as key access roads; that is, they provide the only emergency access and evacuation routes for parts of the LGA. The roads that are the subject of this option include: • Marsh Road; • Lemon Tree Passage Road; • Fenninghams Island Road; • Taylors Point Road; • Nelson Bay Road; • Cabbage Tree Road; • Port Stephens Drive; • Swan Bay Road; and • Davis Road.
Coastal threat(s) to be addressed: Primarily tidal inundation and also coastal inundation.
Cost: The cost of this action relates to the preparation of a strategy and associated modelling, civil design and stakeholder engagement in relation to key low-lying key access roads. This has been estimated at a cost of $200,000.
Option description: There are large areas of the coastal zone that are low-lying and vulnerable to inundation due to elevated estuary water levels. The coastal hazard modelling undertaken by BMT (2021a) in Stage 2 of the CMP showed that there are a number roads that would be subject to tidal inundation (HAT) in 2120. The accompanying risk assessment report (BMT, 2022a) identified all roads at risk from coastal and tidal inundation for each of the four planning horizons (present day, 2040, 2070 and 2120). Some of these roads (e.g. Shoal Bay Road, Shoal Bay, and Meredith Avenue, Lemon Tree Passage) would be considered under the adaptation plans proposed for those localities, and these have been excluded from this option for that reason. However, a subset comprise key access roads under care and control of Council. The maps provided below show the 2120 tidal inundation extent (HAT) in blue and 2120 100-year ARI coastal inundation extent in green. Sections of road highlighted in red were identified by BMT (2022a) as being at high risk of inundation in the present day due to a 100-year ARI coastal inundation event, which means they would have 1% likelihood of being inundated due to elevated estuary water levels in any given year. Sections of roads highlighted yellow were considered by BMT (2022a) to be at 'high' or 'extreme' risk of inundation by 2120 due to tidal inundation and would be inundated quite regularly (e.g. on King Tides) or even permanently due to astronomical tides. Where these are combined with a storm event resulting in even higher estuarine water levels, the depth and duration of inundation would be even greater.  *Salt Ash*

Action CH012 - Develop and implement a strategy for key access roads impacted by tidal inundation

Salt Ash to Bobs Farm

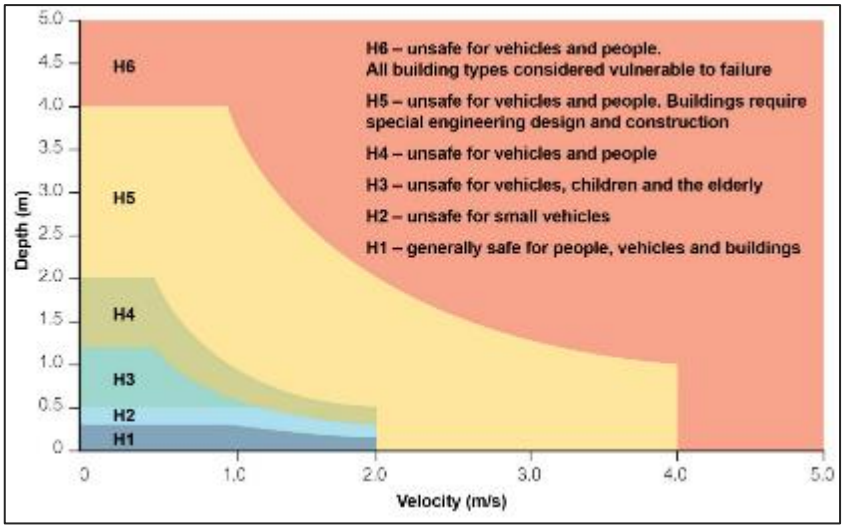
Bobs Farm to Nelson Bay

Swan Bay

This would affect both day to day access to properties and services in some parts of the study area, but is of particular concern during an emergency, such as for the evacuation of people who are experiencing a medical emergency by ambulance to John Hunter Hospital.

Action CH012 - Develop and implement a strategy for key access roads impacted by tidal inundation

Flood Risk Management Guideline FB03 (DPE, 2023), part of the NSW Floodplain Management Manual, identifies that inundation depths ≥0.3 m present a hazard to vehicles (see figure below) and roads would be considered impassable under these conditions.



Those roads that are tidally inundated to a depth ≥0.3 m in 2120 are indicated with an orange line in the figure below. These sections of low-lying roads would be deemed impassable to light vehicles. The blue area indicates the 2120 tidal inundation extent.

Another impact associated with inundation of roads is the increased maintenance and repair requirements. IPWEA's *Practice Note 12.1 – Climate Change Impacts on the Useful Life of Infrastructure* (2018) note issues such as lifting of bitumen surfaces from submerged roads and reduced bond strength of bitumen exposed to salt. Aspects that would need to be considered as part of the strategy include (but are not limited to):

- Understanding the frequency, depth and duration of inundation due to tidal and coastal inundation;

Action CH012 - Develop and implement a strategy for key access roads impacted by tidal inundation

- Interactions between catchment flooding and coastal and tidal inundation (joint occurrence);
- A range of engineering options to reduce inundation risk such as road raising levees, drainage improvements, or planned retreat or provision of alternative access;
- The need for utility relocations or modifications (e.g. stormwater, potable water, sewage, telecommunications and electricity), as well as consideration of service requirements (e.g. clearances for over height vehicles (e.g. garbage trucks) where roads and utilities are to be raised;
- Maintenance of property access;
- Evaluation of potential planning approvals pathways and environmental impacts of the options considered;
- Asset life-cycle modelling to evaluate the optimal timing of capital expenditure associated with adaptation works (e.g. road raising) versus increase in expenditure on maintenance under increased inundation frequency and duration;
- An analysis of the frequency of inundation (e.g. no. days per year inundated / inundated >0.3 m) would assist with prioritisation of these key access roads and to inform the life-cycle analysis;
- A costed adaptation pathway (sequence of works and timeframe);
- Multi-stakeholder involvement.

CMP Assessment:

Benefits:	• Ongoing access for residents and to services. • Emergency access and evacuation routes maintained.
Disadvantages	• Requires coordination with a number of stakeholders. • Modification of drainage patterns has potential to have adverse impacts on the environment.
Action Type:	☐ Alert ☐ Avoid future impact ☐ Active intervention ☒ **Planning for change** ☐ Emergency response

Timing: The long-term strategy would need to identify 'Thresholds' or 'Triggers' specific to the affected roads which represent a point at which the level of impact from tidal inundation on access becomes unacceptable and a different adaptation pathway is adopted. These would be established during asset life-cycle modelling and development of the adaptation pathway. The trigger point for the adopted thresholds for each road requires analysis of the timeline between when the threshold is reached and when the response is required (i.e. the time available to implement the response). This analysis would include consideration of a monitoring period, response time, and a safety buffer for uncertainty, as well likely availability of funding and Council's ongoing program of road maintenance.

In order to adequately plan, prepare and implement adaptation, the planning should commence as soon as possible. The preparation of an adaptation plan at a concept stage has been included in this CMP. If the concept stage plan identifies the need for more detailed planning, this would then proceed, or be considered in the revision of this CMP if more than 10 years has passed.

Related management actions:

- CH005 – Adaptation plan for Tilligerry Peninsula;
- CH029 – Adaptation plan for Foreshore Drive;
- CH073 – Adaptation plan for Shoal Bay precinct.

Table 3-6 Detailed Description - Action RA011

Action RA011 – Sand carting / beach nourishment for improved beach amenity
Location: Shoal Bay Beach
Coastal threat(s) to be addressed: Beach erosion, shoreline recession.
Cost: The cost is estimated at a cost of $240,000 per sand carting operation based on: • $15,000 for site establishment by the Contractor; and • $225,000 for the sand carting operations (based on a rate of $22.50/$m^3$ for an assumed average volume of 10,000m^3). For purposes of the business plan, it is assumed sand carting would be undertaken annually. In addition, provision has been made for expenditure as follows: • $15,000 to undertake initial studies to inform the sand carting works design and methodology in Year 1 (e.g. beach survey, etc.); • $40,000 for preparation of an environmental impact assessment, permits and approvals (and including Traditional Owner engagement for due diligence assessment purposes), assuming undertaken once every 5 years (in Years 1 and 6) as is typically required for permits and licences; and • $10,000 for annual beach monitoring surveys to identify if the works have been triggered.
Action Description: Shoal Bay has a dynamic 2.5 km long sandy shoreline extending from Nelson Head to Tomaree Head. The western end of the beach is reflective and has a wider beach and dune system. This area is supplied with sand by the dominant westward longshore transport, which is estimated in the order of 10,000 m^3/year, 5,000 m^3 (normal conditions) to over 15,000 m^3 (under higher energy conditions) (BMT, 2011). The eastern side of the bay has a narrower beach and a very limited dune system (narrower and lower dunes). With limited sand supply, the central to eastern part of Shoal Bay Beach is gradually eroding. The lack of beach width in this location adversely affects recreational usage and enjoyment of the beach by the community and visitors. In addition, the ongoing sand deficit causes undermining of stairs and accessways and is eating into the dunes in locations. A co-benefit of this activity is short-term coastal protection. This action proposes carting of sand from the western section of the beach and nourishment of the eroding sections of Shoal Bay Beach with around 5,000 m^3 of sand twice a year or 10,000 m^3 of sand annually to provide improved beach access and amenity. Littoral drift causes the western section of the beach to accumulate sand before bypassing around Nelson Head (estimated at 10,000 m^3/year on average). Frequent beach survey should be performed, and sand carting should be activated when trigger levels relating to beach volume are met (e.g., eroded beach sand volume above HAT level).
CMP Assessment:

Effectiveness:	• The works would be effective over the short to medium term in addressing shoreline erosion arising from sediment transport processes. The sand would gradually be transported from the east back to the west and accumulate at the western end of the beach, hence the requirement for repeated carting of sand.
Benefits:	• Provides improved recreational amenity for visitors to the beach.
Disadvantages:	• Requires ongoing commitment on behalf of Council to maintain the works, particularly in relation to episodic erosion events. • Short-term temporary disruption to beach users and nearby residents.
Action Type:	☐ Alert ☐ Avoid future impact ☒ **Active intervention** ☐ Planning for change ☐ Emergency response

Timing: The action has been programmed to commence in Year 1 and each year thereafter for the 10-year CMP.

Table 3-7 Detailed Description - Action CH017

Action CH017 – Progress investigations to assess coastal erosion risk to Shoal Bay Road and (if required) evaluate feasible coastal protection options
Location: Shoal Bay Road
Coastal threat(s) to be addressed: Beach erosion, shoreline recession.
Cost: The cost of engaging a suitably qualified consultant to undertake the study is estimated at $200,000.
Action Description: A semi-quantitative assessment of coastal erosion risk for the Outer Port undertaken by BMT (2021a) rated the shoreline adjacent to this section of Shoal Bay Road as being at 'moderate' risk of erosion (orange line in the figure overpage) with limited potential for recovery on the basis of the following shoreline characteristics: • Degraded dune and narrow beach; • Being semi-exposed to wave activity; • Having a minor longshore sediment transport deficit; and • With some adaptive capacity due to the presence of dune between the beach and adjacent assets. As shown in the map below, the road was not identified by BMT (2021a) as being at risk of coastal inundation in the present day (darker green) or by 2120 (lighter green) for the 100-year ARI event. Irrespective of the present day risk, given Shoal Bay Road provides the only access to parts of Shoal Bay and Fingal Bay, Council is concerned that the level of risk is unacceptably high.    It is noted that the outcome of the investigations may be that there is no imminent risk to the road from coastal erosion and that the works could be delayed until a future point in time. Reference should also be made to option CH073, which proposes an adaptation strategy for the Shoal Bay precinct. The preferred option identified in the study for Shoal Bay Road should be consistent with the approach proposed under the adaptation plan. For example, if the adaptation plan determines to relocate Shoal Bay Road, this option would no longer be required. In the interim, the CZEAS prepared for

Action CH017 – Progress investigations to assess coastal erosion risk to Shoal Bay Road and (if required) evaluate feasible coastal protection options	
the CMP will provide for protection of the road in the event of an increase in erosion risk that triggers action under the CZEAS.	
CMP Assessment:	
Benefits:	• The study would provide Council with an understanding of the level of risk to this key access road. • Enables development of a 'shovel-ready' project ready for implementation in the next CMP (2035-2045).
Disadvantages:	• The coastal erosion hazard extents have not been quantified for this location, and therefore the timing and magnitude of risk to public and private land is not at this time known. • In order to obtain funding under the NSW Coastal and Estuary Management Program, the coastal erosion hazard extents and a detailed CBA are required to apportion the cost of implementation to identified beneficiaries.
Action Type:	☐ Alert ☒ **Avoid future impact** ☐ Active intervention ☐ Planning for change ☐ Emergency response
Timing: The option has been programmed to commence in Year 3 of the CMP, which aims to have the preferred option identified in time to input into the next (2035-2045) CMP.	
Related management actions: • CH073 – Adaptation plan for the Shoal Bay precinct. • CH072 – Coastal erosion hazard investigation. • RA011 – Sand carting at Shoal Bay. • RA012 - Access management and dune rehabilitation.	

Table 3-8 Detailed Description – Action CH073

Action CH073 - Adaptation strategy for the Shoal Bay precinct
Location(s): Shoal Bay
Coastal threat(s) to be addressed: Coastal inundation, tidal inundation, coastal erosion, shoreline recession.
Cost: The action in the CMP is the preparation of an adaptation strategy and associated modelling, civil design and community and stakeholder engagement. This has been estimated at a cost of $200,000.
Action Description: Shoal Bay appears to be affected by a sand deficit resulting in long-term shoreline recession, placing some private and public assets at risk. Frequent undermining of stairs and dune erosion is placing at risk public assets near the boat ramp (see photos below), and Council regularly has to replace or repair the stairs, as shown in the photo below (left). The ongoing and repeated erosion issues at this location have also necessitated the removal of some fencing in the eroded area and retreat of other recreational assets is currently being considered. The section of Shoal Bay Road that is located closest to the dune (see photo below right, image source: NearMap) is also of concern to Council due to its exposure to erosion hazard. Shoal Bay Road provides the only road access into Shoal Bay and Fingal Bay. The decision whether to protect this road in its current location or whether it should be relocated is a key decision; however, the absence of coastal erosion hazard mapping for this location means that the degree and timing of risk to the road is not yet known.

Action CH073 - Adaptation strategy for the Shoal Bay precinct

In addition, there is a degree of risk from coastal and tidal inundation, and other natural hazards (such as bushfire) that are likely to be important considerations. The coastal inundation modelling undertaken by BMT (2021a) in Stage 2 of the CMP showed that the eastern portion of Shoal Bay Road and adjacent properties will be subject to coastal inundation in 2120, as shown in the green areas on the map. In addition, the narrow beach and public open space along the shoreline would be inundated several times a year by 2120 due to sea level rise; that is, these areas are below the 2120 tidal inundation level (HAT) shown in blue on the map overpage.

Given the current level of development of Shoal Bay and the importance of this precinct for tourism and the regional economy, the potential risk from coastal hazards indicates a need to consider a more holistic approach to protection from coastal hazards and the future development and use of this area. The potential risk to Shoal Bay Road in itself is of particular concern. To this end Council has already commenced discussions with key stakeholders, namely NPWS and Crown lands, who are both key landholders in the area, about the potential of relocating Shoal Bay Road. Hence, it is proposed that an adaptation strategy be developed for Shoal Bay to ensure an appropriate balance between development and maintenance of the natural and other assets that attract visitors to Shoal Bay.

Action CH073 - Adaptation strategy for the Shoal Bay precinct

Detailed assessments are required to ensure the effectiveness of the strategy, including consideration of:

- Interactions between catchment flooding and coastal and tidal inundation (joint occurrence);
- Land acquisition or land swaps to facilitate planned relocation and/or provide for future public open space and recreational areas;
- Ongoing provision of services and the need for utility relocations or modifications (e.g., stormwater, potable water, sewage, telecommunications and electricity);
- Drainage improvements for local rainfall events;
- A costed adaptation pathway (sequence of works and timeframe); and
- Multi-stakeholder involvement.

CMP Assessment:

Benefits:	• Enables improved understanding of the impacts of climate change on the precinct, particularly with respect to joint occurrence events (e.g., combined catchment flooding and coastal inundation due to an east coast low). • Facilitates improved community understanding of the hazards and risk, and discussion on acceptable and unacceptable levels of risk to built, natural and cultural assets. • Facilitates planning for and coordination of a response by the various relevant stakeholders.
Disadvantages:	• It may be difficult to address all views in the community or amongst the stakeholders on the preferred risk management strategy. • The benefits are likely to be accrued primarily in the long-term, whereas the cost may be incurred primarily in the short to medium-term.
Action Type:	☐ Alert ☐ Avoid future impact ☐ Active intervention ☒ **Planning for change** ☐ Emergency response

Timing: The adaptation plan will identify 'Thresholds' or 'Triggers', which represent a point at which the level of impact from tidal inundation becomes unacceptable and a different adaptation pathway is adopted. These would be established during development of the adaptation pathway. The trigger point for this threshold requires analysis of the timeline between when the threshold is reached and when the response is required (i.e., the time available to implement the response). This analysis would include consideration of a monitoring period, response time, and a safety buffer for uncertainty.

In order to adequately plan, prepare and implement adaptation, the planning should commence as soon as possible. It is currently programmed for Year 2-3 of the CMP. The preparation of an adaptation plan at a concept stage has been included in this CMP. If the concept stage plan identifies the need for more detailed planning, this would then proceed, or be considered in the revision of this CMP if more than 10 years has passed.

Related management actions:

- CH001 – Coastal hazard monitoring strategy,
- CH072 – Coastal hazard investigation for Port Stephens.

There were also a number of options identified in the long-list of options that did not proceed beyond the feasibility assessment due to the need to develop a holistic adaptation strategy. These may be re-visited during the development of the adaptation strategy, where appropriate. They include options:

- CH008 – Planned retreat of recreational assets near boat ramp,
- CH014 – Coastal protection works for Shoal Bay Road,
- CH015 – Groyne to mitigate coastal erosion,
- CH016 – Groyne at Western Shoal Bay to mitigate erosion,
- CH017 – New seawall to mitigate coastal erosion risk to Shoal Bay Road,
- CH018 – Relocate Shoal Bay Road,
- CH069 – Beach nourishment, and

Action CH073 - Adaptation strategy for the Shoal Bay precinct
• CH070 – New seawall to mitigate coastal erosion risk to built assets near the boat ramp.

Table 3-9 Detailed Description – Action CH029

Action CH029 - Adaptation strategy for the Foreshore Drive locality
Location(s): Salamander Bay
Coastal threat(s) to be addressed: Coastal inundation, tidal inundation, coastal erosion, shoreline recession.
Cost: The action recommended for inclusion in the CMP is the preparation of an adaptation plan and associated modelling, civil design and community and stakeholder engagement. This has been estimated at a cost of $200,000.
Action Description: Foreshore Drive in Salamander Bay is located adjacent to the conservation significant Mambo Wetlands. The culverts at one of the key outlets of the wetlands to the Port were washed away during coastal storms in 2021, highlighting the vulnerability of this location to both catchment flooding and coastal hazards. The road was closed for months while the culvert was replaced with a new bridge. The coastal hazard modelling undertaken by BMT (2021a) in Stage 2 of the CMP showed that large areas of the Foreshore Drive locality will be inundated several times a year by 2120 due to sea level rise; that is, these areas are below the 2120 tidal inundation level (HAT) shown in blue on the map below. The modelling also identified that, by the year 2120, an even larger area of low-lying land would be impacted by coastal inundation during a 100-year ARI storm, shown in green on the map below.      While the majority of the subject land is undeveloped, this frequency of inundation represents an unacceptable level of risk with respect to public and private assets and public safety. The key impacts on the locality would likely include:

Action CH029 - Adaptation strategy for the Foreshore Drive locality

- Loss of (or decline in) functionality due to rising groundwater levels (e.g., stormwater or sewage infrastructure);
- Increased maintenance cost due to deterioration of materials (e.g., road pavement, foundations);
- Short-term and eventually permanent loss of access for both pedestrians and vehicles along Foreshore Drive;
- Safety risks associated with electrical services; and
- Debris impacts and wave loading associated with coastal inundation.

This would likely render the area uninhabitable or unfit for its current use.

In addition, there is a risk to the biodiversity values of Mambo Wetlands, which are mapped as a Coastal Wetlands Coastal Management Area under the Resilience and Hazards SEPP. It is of note that the community has observed significant changes in the wetlands since the construction of the new bridge, which permits greater tidal flows into and out of the wetland. One community member remarked that water quality appears to have improved since the works. Under sea level rise conditions with increased tidal inundation, it is reasonable to anticipate changes to the wetland hydrology and hydraulics and water quality, resulting in changes in wetland vegetation and associated species.

Mambo wetlands are also of significant cultural value to the Worimi. There are a range of tangible and intangible values associated with the wetlands, including a number of heritage listed and other cultural sites, as well as cultural resources and plants, animals and birds significant as spiritual totems. These values could be placed at risk due to tidal inundation.

The tidal inundation mapping prepared by BMT (2021a) highlights that the level of risk will increase over time and an adaptation strategy would provide an avenue to consider the appropriate balance between protection of public, private, natural and cultural assets.

Adaptation planning should consider the ongoing viability of the current use of the land and which values or uses the community would like to maintain in the long-term based on the risk appetite of the community. Given the level of risk, retreat may be a suitable option for some assets, such as Foreshore Drive. The risk to private development may require a combination of re-zoning land, land acquisition and property development controls. The removal of built assets from low lying areas may also provide opportunities for intertidal species migration and other adaptation of natural assets.

Detailed assessments are required to ensure the effectiveness of the strategy, including consideration of:

- Interactions between catchment flooding and coastal and tidal inundation (joint occurrence);
- Water quality, water balance and hydraulics in Mambo Wetland;
- The impacts of changes in the abovementioned processes for the biodiversity of Mambo Wetland;
- Potential impacts of tidal inundation and any adaptation strategies on Aboriginal cultural heritage and values;
- A range of engineering options to reduce risk to property such as levees, filling of land, drainage improvements, planned relocation, house raising, etc.;
- Ongoing provision of services and the need for utility relocations or modifications (e.g., stormwater, potable water, sewage, telecommunications and electricity);
- Land acquisition or land swaps;
- Maintenance of property access and management of inter-lot drainage for retained properties;
- A costed adaptation pathway (sequence of works and timeframe);
- Multi-stakeholder involvement.

CMP Assessment:

Benefits:	• Enables improved understanding of the impacts of climate change on built, natural and cultural assets in and adjacent to the Mambo Wetlands, particularly with respect to joint occurrence events (e.g., combined catchment flooding and coastal inundation due to an east coast low). • Facilitates improved community understanding of the hazards and risk, and discussion on acceptable and unacceptable levels of risk to built, natural and cultural assets. • Facilitates planning for and coordination of a response by the various relevant stakeholders.

Action CH029 - Adaptation strategy for the Foreshore Drive locality	
Disadvantages:	• It may be difficult to address all views in the community or amongst the stakeholders on the preferred risk management strategy. • The benefits are likely to be accrued primarily in the long-term, whereas the cost may be incurred primarily in the short to medium-term.
Action Type:	☐ Alert ☐ Avoid future impact ☐ Active intervention ☒ **Planning for change** ☐ Emergency response
Timing: The adaptation strategy will identify 'Thresholds' or 'Triggers', which represent a point at which the level of impact from tidal inundation becomes unacceptable and a different adaptation pathway is adopted. These would be established during development of the adaptation pathway. However, for the purpose of CMP planning, it is apparent that frequent inundation of the low-lying properties near Foreshore Drive would likely occur by 2070. This may be considered the threshold where these locations begin to lose their liveability. The trigger point for this threshold requires analysis of the timeline between when the threshold is reached and when the response is required (i.e., the time available to implement the response). This analysis would include consideration of a monitoring period, response time, and a safety buffer for uncertainty. In order to adequately plan, prepare and implement adaptation, the planning should commence as soon as possible. It is currently programmed for Year 5 of the CMP. The preparation of an adaptation plan at a concept stage has been included in this CMP. If the concept stage plan identifies the need for more detailed planning, this would then proceed, or be considered in the revision of this CMP if more than 10 years has passed.	
Related management actions: • CH001 – Coastal hazard monitoring strategy • E018 – Prepare new, updated Plan of Management (PoM) for Mambo Wetlands. There were also a number of options identified in the long-list of options that did not proceed beyond the feasibility assessment due to the need to develop a holistic adaptation strategy. These may be re-visited during the development of the adaptation strategy, where appropriate. They include Options: • CH030 – Flood gates to prevent tidal inundation, • CH031 – Retreat of Foreshore Drive, and • CH032 – Road raising.	

Table 3-10 Detailed Description – Action CH022

Action CH022 - Progress investigations, detailed design and costings for priority options from the Whitehead and Assoc. (2015) Management Plan for Sandy Point/Conroy Park
Location(s): Sandy Point
Coastal threat(s) to be addressed: Coastal erosion, shoreline recession, coastal inundation, encroachment onto public land.
Cost: The total cost of $285,000 includes: • Aboriginal cultural heritage due diligence assessment (incl. Traditional Owner engagement) - $15,000 • Investigations (rock sourcing and geotechnics) - $40,000 • Detailed design - $200,000 • Costing studies - $30,000.

Action CH022 - Progress investigations, detailed design and costings for priority options from the Whitehead and Assoc. (2015) Management Plan for Sandy Point/Conroy Park

Action Description: The gradual movement of the 'Flood Tide Delta' into the Port has amplified refraction swell waves entering Port Stephens from the northeast, causing erosion along Conroy Park and Sandy Point (Whitehead & Assoc., 2018). Over the years the erosion process has slowly shifted from east to west, necessitating the expansion of foreshore protection efforts in the same direction. The initial protective structures at Sandy Point were constructed in the late 1950s. Foreshore revetments made of either rock or geobags are present along Sandy Point and the western section of Conroy Park.

East of Sandy Point, rock groynes were also built to intercept a portion of the sand being transported westward. Over the past two decades, the erosion issue has become particularly pronounced at Conroy Park. This is supported with analyses indicating that sand tends to move from the eastern end to the western end of the foreshore at a rate of 1,750 m^3/year (Whitehead & Assoc., 2018), causing widening of the western section of Corlette Beach, adjacent to The Anchorage marina.

The following erosion and sedimentation issues were identified from the existing studies (Whitehead & Assoc., 2018; BMT, 2021a; and BMT 2021b):

- The build-up of sand has impacted seagrass and caused burial of two stormwater outlets adjacent to The Anchorage breakwater in Precinct 1.
- Erosion has caused severe undermining behind the geobag revetment near Conroy Park, resulting in the loss of some trees.
- In Precinct 3, incoming swell waves hit the shoreline at a sharp angle, causing erosion that has removed most of the sand and the steep foreshore revetment lacks proper structural support and adequate armour, making it highly prone to slumping.
- In precincts 4, 5 and 6, the narrow sandy beaches vary in location and size depending on wave direction (a rotation from west to east is observed following periods of westerly wind waves). In these precincts (primarily precincts 4 and 5), wave overtopping has caused scouring/slumping of the land surface immediately behind the revetment and also caused failure to the foreshore revetment (e.g., slumping in some sections).

The gradual and fragmented approach to foreshore protection along Conroy Park and Sandy Point, focusing on individual properties, does not offer adequate protection from wave action to all residential properties and public assets.

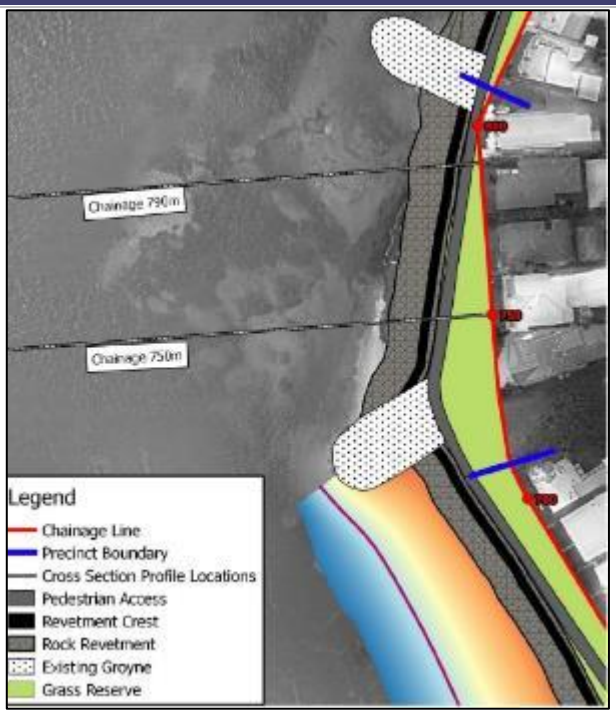
This management action proposes to progress recommended priority actions 2, 4 and 7 for Precincts 4, 5 and 6 from Table E3 in the Sandy Point / Conroy Park Foreshore Erosion and Drainage Management Plan (Whitehead and Assoc., 2018), including:

- Priority action 2 – Construct robust revetment in Precinct 5. This would require removal of all unauthorised access ways and boat ramps to ensure the integrity of the revetment and minimise risk from wave overtopping. Some reclamation may be required;
- Priority action 4 – Demolish foreshore protection and re-construct revetment in Precinct 4; and
- Priority action 7 – Replace existing foreshore protection works with a new, continuous revetment in Precinct 6. This would require removal of all unauthorised access ways and boat ramps to ensure the integrity of the revetment. No work is proposed for the existing groyne.

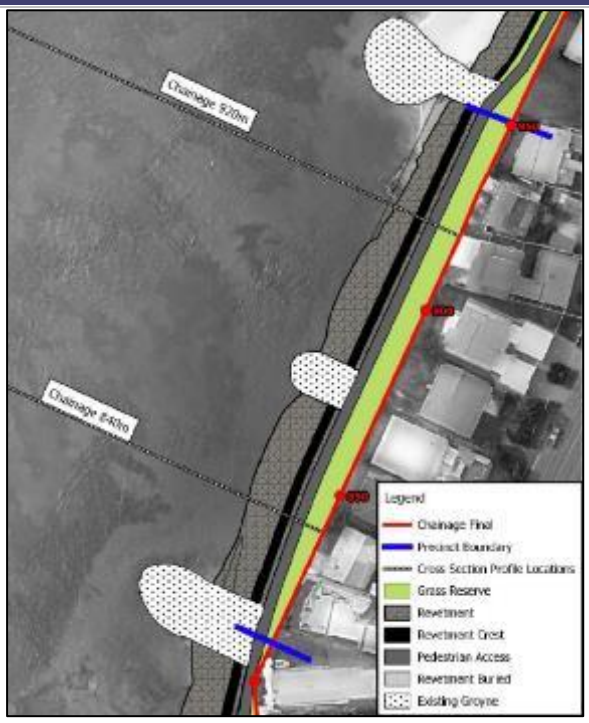
Figures are provided below, reproduced from Whitehead & Assoc. (2018), illustrating these actions.

Initial studies would be undertaken to determine if a protection structure could be designed to be stable for a 100-year ARI event which has a 39% probability of occurrence over a 50-year design lifetime, subject to adequate monitoring and repairs are conducted. This action provides for investigations, detailed design and costing for a new coastal protection structure east of Sandy Point.

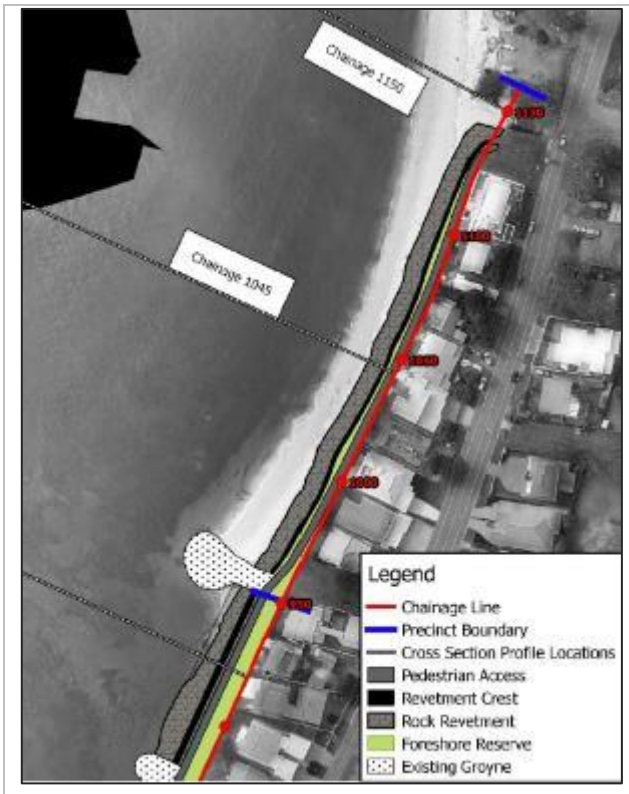
Action CH022 - Progress investigations, detailed design and costings for priority options from the Whitehead and Assoc. (2015) Management Plan for Sandy Point/Conroy Park



Priority Action 4, Precinct 4 (source: Whitehead & Assoc., 2018)



Priority Action 2, Precinct 5 (source: Whitehead & Assoc., 2018)



Action CH022 - Progress investigations, detailed design and costings for priority options from the Whitehead and Assoc. (2015) Management Plan for Sandy Point/Conroy Park

Priority Action 7, Precinct 6 (source: Whitehead & Assoc., 2018)

The intent of this action is that it progresses the detail required to implement the proposed works sufficiently that they are 'shovel ready' and could be subjected to a CBA for a grant application in the next (2035-2045) Port Stephens CMP. The progression of these works to a CBA for the next CMP is reliant on the completion of Action CH072 – Coastal erosion hazard investigation for the Inner and Outer Port. The coastal erosion hazard lines that are an output of the hazard investigation are required to determine the level and timing of risk from coastal erosion and also the identification of beneficiaries of such works (distribution analysis, which forms part of the economic assessment), consistent with the requirements of the CM Act and CM Manual.

In the interim, the CZEAS will consider any actions required to protect public infrastructure at risk from shoreline erosion at Sandy Point and Corlette.

CMP Assessment:

Benefits:	• Provides an opportunity to remove existing unauthorised structures that increase risk from wave run-up and overtopping. • Opportunity to consider design options to minimise the impacts of the works on the environment. • Enables develop of a 'shovel-ready' project ready for implementation in the next CMP (2035-2045).
Disadvantages:	• The coastal erosion hazard extents have not been quantified for this location, and therefore the timing and magnitude of risk to public and private land is not at this time known. • In order to obtain funding under the NSW Coastal and Estuary Management Program, the coastal erosion hazard extents and a detailed CBA are required to apportion the cost of implementation to identified beneficiaries.
Action Type:	☐ Alert ☐ Avoid future impact ☒ **Active intervention** ☐ Planning for change ☐ Emergency response

Timing: The action has been programmed to commence in Year 6 of the CMP, which aims to have the detailed design of the works completed in time to input into the next (2035-2045) CMP.

Related management actions:

- CH023 – Undertake maintenance/repairs to the existing rock revetment.
- CH072 – Coastal erosion hazard investigation.
- RA016 – Sand carting.

Table 3-11 Detailed Description – Action CH023

Action CH023 – Undertake maintenance works / repairs to the existing rock revetment
Location(s): Eastern revetment at Sandy Point
Coastal threat(s) to be addressed: Coastal erosion, shoreline recession.
Cost: The capital cost of this option is estimated at $1,156,500, including: • $20,000 for studies, • $35,000 for preparation of an environmental impact assessment and to obtain the necessary permits and approvals; • $1,096,500 for the construction works. • The annual ongoing costs relate to monitoring of the structure and repairs budgeted at $16,500.
Action Description: The detailed summary for Action CH022 provides information on the history of works and previous studies undertaken for this location. The existing rock and concrete block coastal protection structures located east of Sandy Point (see figure above) were rated at immediate risk of failure and requiring immediate repairs (BMT WBM, 2021). Maintenance of existing coastal protection structures is required to prevent further damage to the structure and temporarily reduce coastal risk level until new priority options are progressed (see Action CH022). Given the extent of damage and urgency of required action to reduce coastal risk, a cost and time efficient approach is recommended consisting of building a rock toe protection made of rocks at the base of existing structures until a more permanent approach is determined (see Action CH022). This management action proposes: • A temporary toe rock protection constructed along the 420 m long coastline section east of Sandy Point, including the eastern and western groynes. • Rock is well suited for this temporary shore protection works where the water depths are very shallow and local quarries can supply rock in sufficient quantities (i.e. Boral (Seaham) or Hunter Quarries). • Rock of similar size of existing would be recommended. Rock would be placed as a double rock layer of 2 to 3 stones wide at the base of the existing protection structure. • Construction duration within 1 to 2 months under normal conditions (i.e. no shortage of material). In the operational phase, regular visual inspection of the structure would be recommended to monitor potential damage to the revetment including overtopping induced damage and scouring. Inspection is recommended once every year and following any significant extreme events. The temporary protection structure could be designed to be stable for a 10-year ARI event which has a 39% probability of occurrence over a 5-year temporary design lifetime, subject to adequate monitoring and repairs are conducted. The photo below is of the existing rock revetment on the eastern shoreline of Sandy Point, which is the subject of this option. 

Action CH023 – Undertake maintenance works / repairs to the existing rock revetment	
CMP Assessment:	
Benefits:	• Provides improved structural integrity for the existing revetment with respect to its ability to withstand coastal processes.
Disadvantages:	• The construction details of the existing structure are not documented or known. As such, any remedial works may be susceptible to weaknesses in the existing structure. • The existing structure is an abandoned asset and therefore the management responsibility is unknown.
Action Type:	☐ Alert ☐ Avoid future impact ☒ **Active intervention** ☐ Planning for change ☐ Emergency response
Timing: The option has been programmed to commence in Year 2 of the CMP, with ongoing annually recurrent costs applied every year thereafter.	
Related management actions: • CH022 - Investigations and detailed design of priority options from Whitehead & Assoc. (2015). • CH072 – Coastal erosion hazard investigation. • RA016 – Sand carting / beach nourishment.	

Table 3-12 Detailed Description – Action RA016

RA016	Sand carting / beach nourishment at Corlette Beach
Location: Corlette Beach and Conroy Park, Sandy Point	
Coastal threat(s) to be addressed: Beach erosion, shoreline recession.	
Cost: The capital cost of this action is estimated at $122,500, including: • $42,500 for an environmental impact assessment and permits and approvals (and including Traditional Owner engagement for due diligence assessment purposes), as well as a detailed design study of sand carting works to fine-tune the operations based on previous experience (e.g., definition of sand trigger levels); • $80,000 for the sand carting contractor, including $5,000 for site establishment and assuming $5/m^3 of sand transported. • The annual ongoing costs relate to maintenance and are budgeted at $10,000.	
Action Description: The action description for CH022 above provides a summary of the sediment transport processes affecting this site. The photos below show the foreshore condition in 2023.  	

RA016	Sand carting / beach nourishment at Corlette Beach

The ongoing shoreline erosion is presenting a risk to public safety, with the foreshore at this location a popular thoroughfare. In addition, the recreational access and amenity of the beach near Conroy Park is impacted by reduced beach volume and width. This action proposes sand carting to move accumulated sand from the western end of the beach next to The Anchorage breakwater (shown in yellow in the figure below) further to the east (placement area shown in orange in the figure below) to enable it to be gradually transported eastward in front of Conroy Park to provide improved amenity value and prevent burial of stormwater outlets at Corlette Beach. It is a form of beach nourishment. A co-benefit of this activity is short-term coastal protection.

The action would involve an initial transport of 15,000 m^3 of sand, followed by up to around 2,000 m^3 (or 4,000 m^3 every two years) or when a trigger level (e.g., beach volume) is met.

CMP Assessment:

Effectiveness:	• The works would be effective over the short to medium term in addressing shoreline erosion arising from sediment transport processes. The sand would gradually be transported from the east back to the west and accumulate again near the marine breakwall, hence the requirement for repeated carting of smaller volumes of sand.
Benefits:	• Provides improved recreational amenity for visitors to the beach.
Disadvantages:	• Requires ongoing commitment on behalf of Council to maintain the works, particularly in relation to episodic erosion events. • Short-term temporary disruption to beach users and nearby residents.
Action Type:	☐ Alert ☐ Avoid future impact ☒ **Active intervention** ☐ Planning for change ☐ Emergency response

Timing: The action has been programmed to commence in Year 3 of the CMP.

Regular sand placement would need to balance the longshore sand transport. Frequencies of operations would depend on when sand level triggers are reached to balance ongoing erosion in precincts 2 and 3 and prevent burial of stormwater outlets at Corlette Beach.

Related management actions:

- CH022 - Progress investigations, detailed design and costings for priority options from the Whitehead and Assoc. (2015) Management Plan for Sandy Point/Conroy Park, namely, to demolish existing structures and construct new coastal protection works in Precinct 3, 4 and 5.
- CH023 - Undertake maintenance works / repairs to the existing rock revetment.

Table 3-13 Detailed Description – Action RA036

Action RA036 - Minor shoreline re-profiling and landscaping works at Kangaroo Point
Location(s): Kangaroo Point
Coastal threat(s) to be addressed: Encroachment on public land, shoreline recession.
Cost: The capital cost of this action is estimated at $233,000, including: • $49,000 for initial studies, including an environmental approval and permits (and including Traditional Owner engagement for due diligence assessment purposes) and beach profile survey; • $5,000 for beach scraping works; • $8,300 for coir logs (placement at toe, 2 coir logs of 0.2m height stacked); • $87,500 for plants; and • $37,500 for sediment controls. Ongoing annual maintenance (e.g., replacement of around 25% of plants, on average, plus weeding) is estimated at $21,875 per year.
Action Description: There are a large number of foreshore structures along the shoreline at Kangaroo Point, including a range of ad hoc structures. It is evident that improper fill was used at some time in the past, as visible in the eroding shoreline (see photos below), whether for backfilling or reclamation. The Kangaroo Point Foreshore Study (Whitehead & Assoc., 2015) considered a range of options to address the ongoing erosion and damage to foreshore structures at Kangaroo Point. Following the study, in 2017, a timber wall structure was removed and drainage constructed to collect private property stormwater and discharge it via the stormwater network to address the associated erosion issues. In recent years there has been ongoing erosion of the shoreline resulting in the undermining and loss of some trees along the foreshore (see photos below). The beach width at this location is also very narrow, much narrower than the beach further to the west. In addition, the public accesses the waterway at various locations along the shoreline (including launching watercraft) and this is in some locations exacerbating the shoreline stability issues. Of interest is the presence of coffee rock, visible as darker consolidated material in the photos below, which is currently acting to stabilise the shoreline somewhat.  

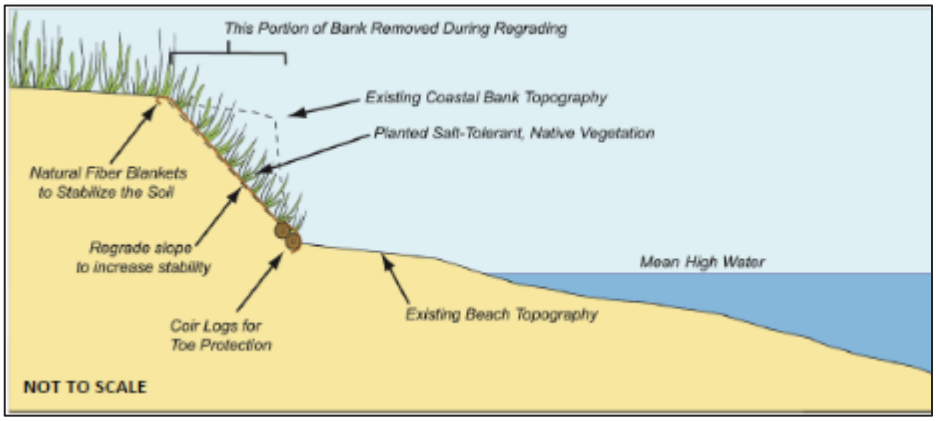
Action RA036 - Minor shoreline re-profiling and landscaping works at Kangaroo Point

This action proposes stabilising the foreshore using a nature-based solution to arrest the shoreline erosion and improve beach access and amenity along a roughly 120 metre section of shoreline where the timber wall was previously located. A co-benefit of this activity is short-term shoreline protection.

The works would involve:

- Shoreline re-profiling using a small bulldozer and placement of natural filter blankets over the reconstituted slope for stabilization. Beach scraping would be required in some areas to preserve existing trees and ensure a smooth plan layout of the shoreline. Sand would be pushed from around Mean Sea Level (MSL) to the top of the beach to reconstitute the dune profile (about 500 m^3 or about 4 m^3 per linear metre over the 120 m long section would allow an averaged one metre extra width of foreshore). Transitions with the stormwater outlet would be designed ensure no obstruction of stormwater discharge flow and reduce “edge effects”.
- Placement of coir logs at the base of the reconstituted foreshore to limit scour by waves and promote vegetation establishment. Coir logs allow vegetation to grow within them. As they slowly biodegrade into their environment, they become part of the soil that supports vegetation growth.
- Planting and sediment controls on about 2,500 m^2 leeward of the coir logs (approximately 10 to 15 m wide along the 120 m long beach section). Standard re-vegetation at four plants per square meter with infill of mature stock (300 mm pot size), watered for 10 weeks. Average erosion sediment controls include jute mesh.
- The intent of the vegetation is to preclude access except at select locations.

A general schematic of the proposal is provided below, sourced from https://www.northeastoceancouncil.org/.

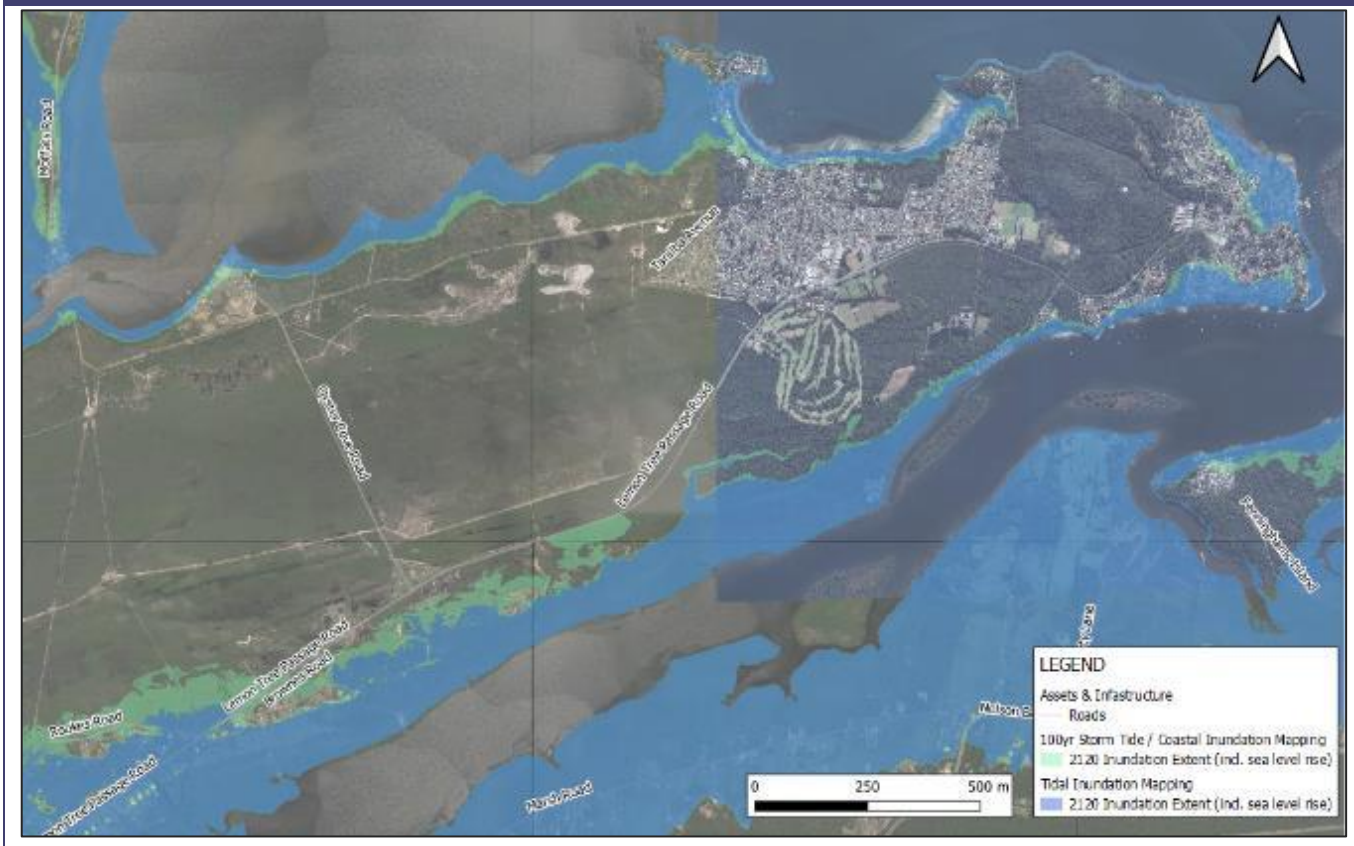


Action RA036 - Minor shoreline re-profiling and landscaping works at Kangaroo Point	
CMP Assessment:	
Effectiveness:	• The works are effective over the short to medium term in addressing shoreline erosion arising from public access and coastal processes.
Benefits:	• Reduces impacts of public access on foreshore vegetation and stability. • Supports foreshore stability and improves habitat value.
Disadvantages:	• Requires ongoing commitment on behalf of Council to maintain the works, particularly in relation to episodic erosion events. • Short-term temporary disruption to beach users and nearby residents.
Action Type:	☐ Alert ☐ Avoid future impact ☒ **Active intervention** ☐ Planning for change ☐ Emergency response
Timing: The action has been programmed for Year 7 of the CMP, with ongoing annual maintenance thereafter.	

Table 3-14 Detailed Description – Action CH005

Action CH005 - Adaptation strategy for Tilligerry Peninsula
Location(s): Tanilba, Mallabula, Lemon Tree Passage, Oyster Cove
Coastal threat(s) to be addressed: Primarily coastal inundation and tidal inundation.
Cost: Provides for the preparation of an adaptation plan and associated modelling, civil design and community and stakeholder engagement. This has been estimated at a cost of $200,000.
Action Description: There are extensive areas of low-lying land adjacent to Tilligerry Creek and along the Port Stephens foreshore that are vulnerable to inundation due to elevated estuary water levels. The coastal hazard modelling undertaken by BMT (2021a) in Stage 2 of the CMP showed that large areas of the Tilligerry Peninsula will be inundated several times a year by 2120 due to sea level rise; that is, these areas are below the 2120 tidal inundation level (HAT) shown in blue on the map below. The modelling also identified that, by the year 2120, an even larger area of low-lying land would be impacted by coastal inundation during a 100-year ARI storm, shown in green on the map overpage. This frequency of inundation represents an unacceptable level of risk with respect to public and private assets and public safety. It is understood there are also a number of development proposals being considered that would result in an increased development intensity within this area. The key impacts of tidal and coastal inundation on the Peninsula would likely include: • Loss of (or decline in) functionality of infrastructure due to rising groundwater levels (e.g., stormwater or sewage infrastructure); • Increased maintenance costs due to deterioration of materials (e.g., road pavement, foundations); • Short-term and eventually permanent loss of access along key access roads including Lemon Tree Passage Road, Rookes Road, Oyster Farm Road, John Parade, Cook Parade and Tanilba Avenue. In particular, the headland at Tanilba and including Wundabalaynbah Point would at some time become an island inaccessible from the Peninsula; • Loss of public open space areas, in particular along the estuary foreshores, and loss of recreational assets such as Tanilba boardwalk; • Safety risks associated with electrical services; and • Debris impacts and wave loading associated with coastal inundation. These impacts, if left unmitigated, would render parts of the Peninsula uninhabitable.

Action CH005 - Adaptation strategy for Tilligerry Peninsula



It is likely there are also a range of Aboriginal cultural heritage values associated with the Tilligerry Peninsula, including both tangible and intangible heritage, cultural sites, totems and resources. These values could be placed at risk due to tidal inundation.

The tidal inundation mapping prepared by BMT (2021a) highlights that the level of risk will increase over time and an adaptation strategy would provide an avenue to consider the appropriate balance between protection of public, private, natural and cultural assets.

Adaptation planning should consider the ongoing viability of the current uses of the land and which values or uses the community would like to maintain in the long-term based on the risk appetite of the community, land owners and managers. The risk to private development may require a combination of adaptation and mitigation options such as relocation of assets and changes to land use, filling and raising of assets and roads and property development controls.

Detailed assessments are required to ensure the effectiveness of the strategy, including consideration of:

- Interactions between catchment flooding and coastal and tidal inundation (joint occurrence);
- Potential impacts of tidal inundation and any adaptation strategies on Aboriginal cultural heritage and values;
- A range of engineering mitigation options to reduce risk to property such as levees, filling of land, drainage improvements, planned relocation, house raising, etc.;
- Where filling of the land is proposed, access to imported fill;
- Land acquisition or land swaps;
- Design to tie into existing surrounding ground levels;
- Maintenance of property access (i.e., driveways) and management of inter-lot drainage for retained properties;
- Ongoing provision of services and the need for utility relocations or modifications (e.g., stormwater, potable water, sewage, telecommunications and electricity);
- Drainage improvements for local rainfall events;
- A costed adaptation pathway (sequence of works and timeframe); and
- Multi-stakeholder involvement.

Action CH005 - Adaptation strategy for Tilligerry Peninsula

CMP Assessment:

Benefits:	• Enables improved understanding of the impacts of climate change on the peninsula, particularly with respect to joint occurrence events (e.g., combined catchment flooding and coastal inundation due to an east coast low). • Facilitates improved community understanding of the hazards and risk, and discussion on acceptable and unacceptable levels of risk to built, natural and cultural assets. • Facilitates planning for and coordination of a response by the various relevant stakeholders.
Disadvantages:	• It may be difficult to address all views in the community or amongst the stakeholders on the preferred risk management strategy. • The benefits are likely to be accrued primarily in the long-term, whereas the cost may be incurred primarily in the short to medium-term.
Action Type:	☐ Alert ☐ Avoid future impact ☐ Active intervention ☒ **Planning for change** ☐ Emergency response

Timing: The adaptation strategy would need to identify 'Thresholds' or 'Triggers', which represent a point at which the level of impact from tidal inundation becomes unacceptable and a different adaptation pathway is adopted. These would be established during development of the adaptation pathway. However, for the purpose of CMP planning, it is apparent that frequent inundation of low-lying properties in Lemon Tree Passage would likely occur by 2070. This may be considered the threshold where these locations begin to lose their liveability. The trigger point for this threshold would require analysis of the timeline between when the threshold is reached and when the response is required (i.e., the time available to implement the response). This analysis would include consideration of a monitoring period, response time, and a safety buffer for uncertainty.

In order to adequately plan, prepare and implement adaptation, the planning should commence as soon as possible. It is currently programmed for Year 6-7 of the CMP. The preparation of an adaptation plan at a concept stage has been included in this CMP. If the concept stage plan identifies the need for more detailed planning, this would then proceed, or be considered in the revision of this CMP if more than 10 years has passed.

Related management action: CH001 – Coastal hazard monitoring strategy.

There were also a number of options identified in the long-list of options that did not proceed beyond the feasibility assessment due to the need to develop a holistic adaptation strategy. These may be re-visited during the development of the adaptation strategy, where appropriate. They include the following options:

- CH034 - Establish trigger points for adaptation;
- CH035 – Flood gates to prevent tidal inundation;
- CH039 – Artificial berm to prevent coastal inundation; and
- CH046 – Bund to prevent coastal inundation.

Table 3-15 Detailed Description – Action E012

Action E012 - Ongoing program of beach maintenance and dune rehabilitation works for all coastal foreshore land managed by Council (also referred to as the 'sand management action')
Location(s): Birubi Point, Boat Harbour, One Mile Beach, Fingal Bay Beach, Little Beach, Nelson Bay, Lemon Tree Passage, and Tanilba.
Coastal threat(s) to be addressed: Encroachment onto public land, biosecurity risks, beach erosion, aeolian sand inundation.
Cost: The annual cost of these activities has been estimated at $140,000 (in total across all sites) based on information provided by Council and provides for contractors to assist with dredging, sand carting and beach scraping. This annual cost includes $20,000 to undertake annual beach surveys to evaluate sand movement. Further, it is assumed that an environmental impact assessment and any required permits, licences and approvals would need to be undertaken every 5 years (i.e. Years 1 and 6) at a cost of $50,000. The details of the annually recurrent cost estimates for each of the sand management activities are provided in **Appendix D**. The capital cost associated with this action, estimated at $25,000, provides for analysis of the sand at the sources and placement sites be undertaken to evaluate suitability of the material for its intended re-use with respect to particle grain size distribution and contamination status.
Action Description: The aim of this management action is to maintain beaches and associated dune systems for environmental protection and public safety purposes. The foreshores are subject to a range of coastal processes and this action provides for management of the resultant impacts on recreational access and amenity. The impacts may include: • Erosion around boat ramps, creating a drop off and making access difficult; • The accretion of sand in car parks and around SLSCs due to aeolian sand transport; • The undermining and/or erosion of public accessways due to coastal erosion or stormwater impacts, affecting paths, beach accessways, stairs and boat ramps resulting in loss or reduction in access and negatively impacting SLSC operations; and • Reduced recreational amenity (beach width and volume) due to coastal erosion, whether due to an event or an ongoing deficit of sand. The photos below provide some examples of these issues. All photos are sourced from Council.

Nelson Bay Foreshore Reserve

Stormwater outlet undercutting an accessway at Fingal Bay

Action E012 - Ongoing program of beach maintenance and dune rehabilitation works for all coastal foreshore land managed by Council (also referred to as the 'sand management action')

Before and after photos showing placement of sand to address undermining of stairs at Nelson Bay Beach. The sand was sourced via dredging of Little Bay boat ramp, where accreted sand was impacting the use of the boat ramp.

Sand accretion at Birubi Point SLSC due to aeolian transport.

The photos below, provided by Shoalhaven City Council, provide examples of beach scraping works.

The frequency at which sand management is required varies for each individual site depending on the weather conditions (e.g., in relation to seasonal erosion events or periodic storms) and coastal processes. **Appendix D** details all the activities that fall under this action.

Action E012 - Ongoing program of beach maintenance and dune rehabilitation works for all coastal foreshore land managed by Council (also referred to as the 'sand management action')

CMP Assessment:

Effectiveness:	• The works are effective over the short to medium term in addressing risk to public safety due to erosion at accessways.
Benefits:	• Reduces impacts of erosion and aeolian sand transport on beach access and amenity, and on built and natural infrastructure. • Mitigates impact of erosion and accretion cycles on use of boat ramps. • Mitigates impacts stormwater-induced erosion.
Disadvantages:	• Requires ongoing commitment on behalf of Council to manage cycles of erosion and accretion. • Short-term temporary disruption to beach users and nearby residents. • Localised direct impact to benthic infauna in dredge, sand placement and beach scraping areas. Rapid recovery expected. • Short-term water quality impacts during works.
Action Type:	☐ Alert ☐ Avoid future impact ☒ **Active intervention** ☐ Planning for change ☐ Emergency response

Timing: The action has been programmed as an ongoing program of works undertaken annually, noting not all activities under this action would be undertaken every year. The trigger for undertaking individual activities is largely observational, but could be supported by beach monitoring under Action CH001.

Related management actions:

- RA045 – Maintenance dredging.
- CH077 – Supported dune recovery following erosion events.
- E001 – Pest and weed management in the coastal zone.
- E016 – Encourage and facilitate local volunteer groups to support dune rehabilitation activities.

Table 3-16 Detailed Description – Action RA045

Action RA045 – Maintenance dredging activities
Location(s): Little Beach, Nelson Bay, Taylors Beach and Soldiers Point.
Coastal threat(s) to be addressed: Marine sand inundation.
Cost: The estimated cost of implementation of this option has been developed based on the details provided in below and is estimated at $174,500 in the first year, with an average of $50,600 each subsequent year.
Action description: This section provides details for each of the proposed dredging activities. The sand sourced via dredging may be beneficially re-used, where appropriate (e.g. via nourishment activities identified in Action E012). <u>Little Beach</u> Dredging of sand from below MHWM around the boat ramp. This activity is triggered by the building up of sand on the boat ramp and is undertaken around 8 times each year and is assumed to cost around $1,000 each time, to a total annual cost of $8,000. Typical volumes of 80-100 m^3 are dredged, and the sand is placed downdrift of the boat ramp, or if it is not required in this location, placed on Nelson Bay Beach adjacent to the splash park where erosion occurs.      <u>Nelson Bay Marina (refer map overpage)</u> 1. Dredging is undertaken every two years on average at a cost of around $62,500 each time. 2. Where appropriate, the sand may be placed on the adjacent beach within the marina.   

Action RA045 – Maintenance dredging activities

Soldiers Point Boat Ramp

Dredging is undertaken every five years at the boat ramp using an excavator from the toe of the ramp at a cost of around $100,000 (assuming 10,000 m^3 at $10/$m^3$). The dredging is required because bigger boats accessing the ramps bottom out due to accumulation of sand.

Taylors Beach Boat Ramp

Dredging (including debris removal) is undertaken once a year. Typically, around 50 m^3 of sand is dredged using an excavator and the sand is placed in front of the seawall where there are gaps. The cost is estimated at around $3,750 annually.

Timing: The trigger for undertaking dredging at each individual location is largely based on complaints received from the public, or from observations made by Council staff.

Related management actions:

- E012 – Sand management action.

4 Whether the CMP Identifies Recommended Changes to Planning Controls, Including any Proposed Maps

Land use planning and development controls are key instruments for managing existing and future risk to public safety and development from coastal hazards.

In addition to the overarching statutory framework set by the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the CM Act, the core land use planning instruments relevant to the study area are:

- The Resilience and Hazards SEPP; and
- Port Stephens Local Environment Plan (LEP) 2013 (PSLEP 2013) and Development Control Plan (DCP) 2014 (PDCP 2014).

This CMP has reviewed the current coastal planning arrangements for the study area, with a particular focus on the coastal hazard and vulnerability provisions and made recommendations for changes to the PSLEP 2013 and PDCP 2014 utilising the coastal hazard and vulnerability information developed as part of this CMP. This section provides a summary of the current and proposed planning controls as per Appendix B of the CMP Stage 3 Report (Rhelm and Bluecoast, 2023).

A summary of the current planning arrangements as they relate to coastal hazards is provided in **Table 4-1**. These have been reviewed in the context of establishing more contemporary approaches that reflect the outputs of Stage 2 Vulnerability Assessments to manage current and future coastal hazards.

Recommended changes to the coastal hazard planning arrangements are provided in **Table 4-2**.

Table 4-1 Current Coastal Hazard Planning Arrangements for the Port Stephens Coastal Zone

Instrument	Relevant Controls
Coastal Management Act 2016	• Clause 10(1) provides that LEPs may amend the Resilience and Hazards SEPP to identify (or amend) CMAs. • Clause 5 of the Act defines 'coastal hazards' but does not explicitly consider dune transgression within the definition and therefore dune transgression technically cannot be incorporated into mapping of the CVA. • Section 27 of the CM Act regulates coastal protection works. • Given dune transgression is not defined as a coastal hazard, works to manage dune transgression hazard would not be categorised as coastal protection works under the Act.
State Environmental Planning Policy (Resilience and Hazards) 2021	• Part 2.2 of the Resilience and Hazards SEPP provides development controls for CMAs consistent with the values, uses and/or risks associated with the subject land, as relevant. • Specifically, Clause 2.9 relates to development on land within the CVA. However, in the absence of a CVA for the study area, this clause is not operable. Nonetheless, Clause 2.12 of the SEPP does require the consent authority to be satisfied that any development in the coastal zone is not likely to increased risk of coastal hazards on that land or other land, and applies in the absence of a mapped CVA. • While the SEPP overrides the provisions of a LEP, it does not contain any specific development controls for the coastal zone in a regulation or guidance document. Hence, the LEP and DCP are important to give detail to the intentions around development control.
State Environment Planning Policy (Exempt and	• Clause 1.19(e) of the SEPP states that complying development is not permitted on land located within 'environmentally sensitive areas', which includes coastal waters, coastal lakes, and CWLRAs and their proximity areas.

Instrument	Relevant Controls
Complying Development Codes) 2008	• Clause 1.19(f) states that complying development may not be carried out on land that is identified by an Environmental Planning Instrument (EPI), a DCP or a policy adopted by the council as being or affected by— (i) a coastline hazard, or (ii) a coastal hazard, or (iii) a coastal erosion hazard.
PSLEP 2013 and PDCP2014	• The PSLEP 2013 does not currently contain any specific provisions relating to the control of coastal hazards. • Within the LEP, Part 7 Additional local provisions does not contain any provisions relevant to development in the coastal zone or management of risk from coastal hazards. • There are currently no controls related to coastal hazards within the PSDCP 2014, nor does Council have in place any policies or codes for development of land affected by coastal hazards.
Environmental Planning & Assessment Act 1979	• Planning certificates issued under Section 10.7 of the EP&A Act. A planning certificate under Section 10.7(2) discloses matters relating to the land, including whether or not the land is affected by a policy that restricts development of the land (e.g., development controls in a DCP). A Section 10.7(5) may include past, current or future coastal hazard issues. Council has issued Section 10.7(5) notifications to affected landholders based on the outcomes of the Stage 2 Vulnerability Assessments.
Local Planning Direction 4.2 Coastal Management	• Local Planning Direction 4.2 applies when an authority prepares a planning proposal that applies to land that is within the 'coastal zone' as defined under the CM Act. • Direction 4.2 requires that a planning proposal include provisions that give effect to and are consistent with: - The objects of the CM Act and the objectives of the relevant CMAs; - The NSW Coastal Management Manual and associated Toolkit; - The NSW Coastal Design Guidelines 2003 (now replaced by the NSW Coastal Design Guidelines 2023); and - Any relevant, certified CMP or CZMP that applies to the land.
NSW Coastal Design Guidelines 2023	• Chapter 3 establishes the requirements for planning proposals in the coastal zone. The planning proposal authority and local plan-making authority will assess a proposal against the requirements set out in section 3.2 of these guidelines. • In particular, Part E details outcomes relevant to responding to coastal hazards, including: - Outcome E.1 Respond to coastal processes - Outcome E.2 Account for the natural hazard risks - Outcome E.3 Account for climate change - Outcome E.4 Provide sustainable defences to coastal hazards - Outcome E.5 Protect essential infrastructure - Outcome E.6 Change land uses to manage legacy issues and avoid creating new ones. • Chapter 4 outlines urban design requirements for coastal places, in relation to built form, siting, materials and detailed environmental factors, including coastal hazards.

Table 4-2 Recommended Changes to Coastal Hazard Planning Arrangements for the Port Stephens Coastal Zone

Instrument	Relevant Controls
State Environmental Planning Policy (Resilience and Hazards) 2021	• Council's CMP Steering Group determined not to proceed with a planning proposal to identify a CVA for the Port Stephens coastal zone under Clause 10(1) of the CM Act.
Port Stephens LEP	• As an alternative to using the CVA provisions in the Resilience and Hazards SEPP, the existing LEP could be amended to include Local Provisions relating to development in the coastal zone and the management of risk from coastal hazards in Part 7 of the LEP. • A coastal risk planning map would need to be incorporated into the LEP to identify land subject to each of the coastal hazards investigated in the Stage 2 Vulnerability Assessments (including dune transgression) and to which the new planning provisions apply.
PSLEP 2013 and PDCP2014	• It is recommended that Council create DCP controls specific to management of coastal hazards across the LGA in accordance with the proposed LEP Local Provision amendments. • Investigate the following controls for all land use types in the coastal risk planning areas: - Appropriate (coastal inundation compatible) building materials are used below 100-year ARI coastal inundation levels with climate change (plus a freeboard) - Habitable floor levels are set above 100-year ARI coastal inundation levels with climate change (plus a freeboard) - Below ground level non-habitable areas and covered and bunded carparking facilities have all access, ventilation and any other potential water entry points above the 100-year ARI coastal inundation levels with climate change (plus a freeboard) and include an inundation free pedestrian evacuation route - All development is designed and constructed to have a low risk of damage and instability due to wave action, inundation, and / or erosion hazards in a 100-year ARI coastal storm event - All electrical services, wiring, fuel lines or any other service pipes and connections are waterproofed to 100-year ARI coastal inundation levels with climate change (plus a freeboard) - New development and major additions to existing development are sited on the landward side of the 2100 reduced foundation capacity line - A safe evacuation route is available from the development in the event of coastal inundation exceeding the habitable floor level. • Other controls may apply to ensure the safe and appropriate development of the coastal zone. These may express Council's aspirations as they relate to the coastal environment area and the coastal use area (with respect to built-form, landscaping, sustainability views etc). • Other explicit controls are recommended with respect to specifically addressing post-hazard event recovery. These controls are commonly referred to as 'Build Back Better' type controls, seek to ensure that any existing development in vulnerable areas that has been damaged or destroyed is either not built in the same location or, where appropriate, is built to a contemporary standard to withstand coastal hazards. These types of controls would be activated for use say for up to five years from the date of a hazard event. • Any coastal protection works that are required to support development will need to be consistent with the provision of Clause 27 of the CM Act, Clause 2.16 of the Resilience and Hazards SEPP and this CMP.

Instrument	Relevant Controls
	• Further definition will be required around what constitutes major additions in the preparation of the DCP. • Further consideration will be required around design life and service life of various development types with respect to sea level rise risk.
Environmental Planning & Assessment Act 1979	• Upon adoption / gazettal of the updated LEP and DCP, it is recommended that Council implement Section 10.7(2) notifications relating to the relevant development controls.
Local Planning Direction 4.2 Coastal Management	• The endorsement of the Port Stephens CMP by Council and the preparation of a planning proposal to amend the LEP would be consistent with the Direction.
Adaptation Planning	• There are extensive areas within the CMP study area that are currently at risk from coastal inundation hazards. In the coming decades, these areas will become increasingly inundated by extreme tides, and eventually will become uninhabitable due to regular tidal inundation. • Adaptation planning should commence immediately for these areas to identify suitable approaches to continue to viability of this land. This may involve a combination of rezoning land, landform adaptation through filling and raising of assets and roads, and property development controls. • This is discussed further in actions CH005, CH029 and CH073 (refer **Section 3.2.4**).

5 A Business Plan

5.1 Intent and Value of Implementing the Port Stephens CMP

The Port Stephens CMP is a program of physical works, monitoring and investigations, and planning and education initiatives that target the threats to the natural, social, cultural and economic values of the coastal zone. The CMP also includes actions to target coastal hazards impacting the coastline now and into the future.

Investment in the Port Stephens CMP provides an opportunity to directly preserve and improve the condition of the estuarine foreshore and dune ecosystems, cultural spaces, public access and recreational amenity opportunities of the coastal zone, and in doing so, provide benefits to the wellbeing and safety of the community and visitors to the region.

The Port Stephens CMP contains 60 management actions that aim to promote, protect and rehabilitate the coastal zone. An additional two actions have been recommended to monitor and evaluate the performance of the CMP implementation.

The actions contained within this Business Plan primarily mitigate coastal risks to public assets and beneficiaries, with consideration of balancing benefits across the range of locations and threats within the Port Stephens coastal zone. As such, no beneficiary pays models have been allocated to private beneficiaries in the business plan and therefore, a coastal protection service charge would not be activated.

Photo: George Reserve, Salamander Bay (T. Mackenzie)

5.2 Resourcing, Funding and Financing

A business plan has been developed for the CMP which outlines the key components of the funding strategy for the CMP, including the cost of proposed actions, proposed cost-sharing arrangements and other potential funding mechanisms. Delivery of the Port Stephens CMP is estimated to cost $14.39 million (2023 dollars) over 10 years.

The CMP actions are expected to be funded through Port Stephens Council and State Government contributions, monetary grants and volunteer works by community members and organisations. Port Stephens Council contribution is costed to be $6.34 million over 10 years, with anticipated State Government and agency contributions of $8.06 million over 10 years.

For all responsible or supporting organisations, the identified management actions remain subject to the availability of resources, contestable grant program processes (refer **Table 5-1**), funding allocations, policy and legislation changes, and organisational and/or government priorities. For example, Council's ability to implement numerous CMP actions will depend on successfully obtaining Government grant funding. If Council is unsuccessful in obtaining government grant funding, the program will need to be scaled back, affecting the timing of and/or ability to implement CMP actions. Notwithstanding, the management actions have been included in good faith, that the funds shown in **Table 5-2** are able to be obtained. Furthermore, Council will take advantage of any alternative funding opportunities that become available in the future to implement actions such as those identified for funding under the NSW Coast and Estuaries Grants Program. This could include new State and Federal funding programs and or other opportunities as they become available.

The CMP actions are expected to be funded through Council and State Government contributions, monetary grants and volunteer works by community members and organisations. Some actions are funded under Council's normal operating budgets or through existing programs and grants. As identified above it will not be possible for Council to implement all actions identified in this CMP without additional sources of funding. As such, identification of grants and the submission of successful funding applications is an important component of this CMP.

Potential sources of funding identified for the CMP actions are described in **Table 5-1**, the potential source of funding for each management action is provided in **Table 5-2**. It is noted that the NSW and Commonwealth Government grant programs referenced below may no longer be available at the time of implementation of any applicable management actions under this CMP. In that case, Council would review the grants available at that time and, if possible, identify an alternative source of State or Federal grant funding that may become available in future.

Table 5-1 Current Local and State Government Funding Mechanisms

Funding Source	Details
Council Funding Mechanisms	
Council Ordinary Rates	A key funding mechanism for Council are statutory rates and charges, which can be applied to private landowners and businesses. Under the LG Act, ordinary rates can be applied to all rateable land within an LGA. This money can be used to fund delivery of community assets and services and may also be used to implement coastal management actions.
Special Rates	Specific works, services, facilities or activities that benefit certain parcels of rateable land can be funded (in whole or in part) by Council by applying special rates under the LG Act. Where a coastal management action directly benefits a property owner, special rates provide a mechanism for Council to secure contributions from those landowners over time. Special rates can be implemented in different ways. Council can issue rates over a property or alternatively enter into an arrangement with the owner for payment of a lump-sum amount.
Development Contributions	Developer contributions enabled under the EP&A Act may be used for coastal management in some instances, such as funding capital works to manage the development impacts on the coast or reduce risk to the development from coastal processes. The criteria and ability to use those contributions will be dependent on the relevant Developer Contribution Plan and demonstrated suitability under the NSW local infrastructure contributions framework.
Revenue Generated by Council	Council can also fund coastal management initiatives through revenue they may generate through hire, rental or other commercial partnerships (e.g., SLSCs, Holiday Parks etc).
NSW Government Funding Mechanisms	

Funding Source	Details
NSW Coastal and Estuary Grants Program	Under this program, the NSW Government provides grants to local government to support coastal management planning (e.g., hazards studies, management plans/programs), actions to manage the risks of coastal hazards (e.g., erosion protection), and restore degraded coastal habitats (e.g., wetlands, dunes). Funding of up to two thirds of a project cost is available to successful applications and the program is administered by DCCEEW - EHG. This grant funding program is contestable, prioritised to Council applications with certified CMPs and subject to State government funding priorities and allocations.
NSW Floodplain Management Grants Program	The Floodplain Management Program provides financial support to local councils and eligible public land managers to help them manage flood risk in their communities. The program supports the implementation of the NSW Government's Flood Prone Land Policy, which is outlined in the Floodplain Development Manual. Support provided under the programs usually involves $2 from government for every $1 provided by the applicant. Grant funding is contestable and subject to State government funding priorities and allocations. Where a management action to mitigate tidal inundation risk also has a benefit with respect to catchment flood mitigation, there may be opportunity to consider this grant program.
NSW Environmental Trust	The NSW Environmental Trust provides funding to a range of community, government and industry stakeholders to deliver projects that conserve, protect and rehabilitate the NSW environment, or that promote environmental education and sustainability. The Trust provides this funding through a range of contestable grant programs and strategic investments. The Trust administers both long-standing annual programs and one-off, issue-specific programs. The funded programs support: • Action in conserving and restoring natural ecosystems • Protecting threatened species • Undertaking priority environmental research • Building community skills • Knowledge and capacity through education • Promoting cultural awareness • Dealing with pollution.
Crown Reserves Improvement Fund	The Crown Reserves Improvement Fund (CRIF) supports Crown land managers by providing funding for repairs, maintenance and improvements on Crown reserves. The funding aims to benefit the community, boost our economy and contribute to the cultural, sporting and recreational life of NSW.
Coastal Lands Protection Scheme	The Coastal Lands Protection Scheme is a long-running NSW Government program that began in 1973. The scheme is used to bring significant coastal lands into public ownership and supports long-term management and care of this land, while improving public access to our coastal environments. The department administers the scheme through an annual budget allocation of $3 million for strategic acquisitions. The scheme operates along the entire NSW coastal zone except for the Greater Sydney metropolitan area. Land acquired under the scheme must meet at least one of three criteria: • Public access - to promote public access to the coastal foreshore. • Scenic quality - to maintain the scenic quality of the NSW coast and to maintain landscape breaks to separate and articulate existing coastal towns and settlements. • Ecological values - to protect ecological sites of regional, state and/or national significance.

Funding Source	Details
NSW Heritage Grants Program	The NSW Heritage Grants Program provides grants to heritage owners and custodians, local government and the community, to deliver a broad range of heritage outcomes. The program is supported by the Heritage Council of NSW. Grants are available for: • Emergency works to declared Aboriginal places or State Heritage Register listed items that have been damaged by unexpected events (e.g., a storm) • Aboriginal cultural heritage grants • Activating State heritage grants • Caring for State heritage grants • Local government heritage grants.
Recreational Fishing Trust Grant	All revenue raised by the NSW Recreational Fishing Licence Fee is placed into the Recreational Fishing Trusts. There are two Trusts – one for freshwater and one for saltwater. Grants are provided from the Trusts to deliver a wide range of programs to boost recreational fishing opportunities in NSW. Grants are provided for: • Recreational fishing education • Fishing access and facilities • Research on fish and creational fishing • Enhancement of recreational fishing.
NSW Boating Now Grants	The NSW Government's Maritime Infrastructure Plan (2019 - 2024), released in December 2018, sets out a more strategic, coordinated approach to maritime infrastructure in NSW and makes a commitment to continue to provide support for maritime infrastructure owned by councils and other delivery partners, through the Boating Now Program. This investment supports the needs of recreational and commercial boaters and enables broader economic and social benefits for communities. TfNSW will contribute up to 75% towards the total cost of approved projects, with the delivery partner required to contribute the remaining 25%.
State Disaster Risk Reduction Stream Grants	Under two funding pathways, Discovery and Scale, the State Risk Reduction stream aims to reduce or enable the reduction of state-level risks, risks of state significance and systemic risks potentially impacting NSW. The Discovery Projects pathway offers funding of up to $500,000, for projects that will test and pilot new approaches to achieve breakthrough disaster risk reduction outcomes. The projects must have potential for state-wide significance or impact. The Scale Projects pathway offers funding of up to $2.5 million, for projects that aim to generate a new product, technology, platform or approach that will have state-wide impact at a scale beyond piloting or testing.
Infrastructure Grants: Disaster Readiness (Clubgrants Category 3)	The objective of the Clubgrants Category 3 Infrastructure Grants program is to fund the costs of construction, alteration, renovation, completion and fit-out of buildings and community infrastructure to deliver outcomes for disadvantaged NSW communities including regional and remote areas, culturally and linguistically diverse, disability and Aboriginal communities. Local council applicants are required to cash-match the funding amount requested.
Other Funding Opportunities	
Federal Disaster Ready Fund	The DRF is the Australian Government's key disaster resilience and risk reduction initiative which will deliver projects that support Australians to manage the physical and social impacts of disasters caused by climate change and other natural hazards. The objectives of the Disaster Ready Fund are to:

Funding Source	Details
	1. increase the understanding of natural hazard disaster impacts, as a first step towards reducing disaster impacts in the future; 2. increase the resilience, adaptive capacity and/or preparedness of governments, community service organisations and affected communities to minimise the potential impact of natural hazards and avert disasters; and 3. reduce the exposure to risk, harm and/or severity of a natural hazard's impacts, including reducing the recovery burden for governments, cohorts at disproportionate disaster risk, and/or affected communities. Up to $1 billion funding has been provided for the Disaster Ready Fund over five years, from 1 July 2023.
LandCare Grants	Landcare Australia works with governments, corporate and philanthropic organisations and donors to facilitate funding for good quality, hands on projects and programs that will improve environmental outcomes for the Landcare community.
CoastCare Grants	Coastcare grants support community groups working on projects across Australia. Grants support Landcare and Coastcare groups with projects like dune protection, revegetation of native coastal environments, protection of endangered coastal species habitats, collection and prevention of storm water pollution, weed and non-native plant removal, and control of human access to sensitive and vulnerable areas.

Photo: Corlette Beach (T. Mackenzie)

5.3 Alignment with the IP&R Framework

To assist with the scheduling of the implementation of actions, a Gantt chart for the actions (timeline and budget) has been included in **Table 5-2**.

Budgets have been allocated for capital and ongoing costs, where the action would only require existing staff time, assets and services, these are noted as "$ST".

Action ID	Management Action	Location	Lead Agency	Partners	Potential Funding Source	Cost Sharing	CMP Capital Cost	Annually Recurrent Cost	Total Cost Over CMP Business Plan	Council Costs	State Governme nt Costs	Year 1	Years 2 to 4	Years 5 to 10
CH001	Develop and implement a coastal hazard monitoring strategy.	All	PSC	DCCEEW-EHG	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$15,000	$67,000	$700,000	$233,333	$466,667	$ 97,000	$201,000	$402,000
CH002	Develop and implement a program for monitoring the condition of coastal structures owned &/or maintained by Council.	All	PSC	NA	PSC	PSC (1) : C&E Grant (2)	$-	$24,000	$240,000	$80,000	$160,000	$24,000	$72,000	$144,000
CH003	For those Aboriginal cultural heritage sites and Aboriginal Places located on Council land or Crown land for which Council, is the Reserve Manager, work with Traditional Owners to evaluate the level of risk and manage the impacts to cultural heritage from coastal hazards, including sea level rise.	All	PSC	NA	PSC, C&E Grants, NSW Heritage Grant, Environmental Trust	PSC (1) : C&E Grant (2)	$175,000	$-	$175,000	$58,333	$116,667	$-	$175,000	$-
CH005	Prepare a climate change adaptation strategy for the Tilligerry Peninsula in consultation with the local community and key stakeholders. The output of the plan will be an agreed and costed adaptation pathway.	All	PSC	DCCEEW-EHG, DPHI – Crown lands, Utilities (e.g., HWC), TfNSW, NPWS	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$200,000	$-	$200,000	$66,667	$133,333	$-	$-	$200,000
CH009	Install an additional Coast Snap monitoring point at Fingal Beach.	Fingal Bay	PSC	DCCEEW-EHG	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$11,800	$7,000	$74,800	$24,933	$49,867	$-	$32,800	$42,000
CH011	Prepare a planning proposal to incorporate provisions to manage the risk to life and properties from coastal hazards for inclusion in the Port Stephens LEP 2013 and update the DCP 2014 accordingly.	All	PSC	NA	PSC	PSC	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
CH012	Document a long-term strategy for local and regional roads under the care and control of Council that are key access roads at risk from tidal inundation aimed at the ongoing provision of access for the community in future.	All	PSC	TfNSW	PSC, C&E Grants, Floodplain Management Grants	PSC (1) : C&E Grant (2)	$200,000	$-	$200,000	$66,667	$133,333	$66,667	$133,333	$-
CH017	Undertake investigations to assess the risk to Shoal Bay Road from coastal erosion and evaluate the feasibility of different strategies to manage the identified risk. Based on the outcomes of the investigations, identify a suitable option to progress to detailed design.	Shoal Bay	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$200,000	$-	$200,000	$66,667	$133,333	$-	$200,000	$-
CH022	Progress investigations, detailed design and costings for priority options from the Whitehead and Assoc. (2015) Management Plan for Sandy Point/Conroy Park, namely, to demolish existing structures and construct new coastal protection works in Precinct 3, 4 and 5.	Sandy Point	PSC	DPHI – Crown Lands	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$285,000	$-	$285,000	$95,000	$190,000	$-	$-	$285,000
CH023	Undertake maintenance works / repairs to the existing rock revetment.	Sandy Point	PSC	DPHI – Crown Lands	PSC	PSC	$1,156,500	$16,500	$1,305,000	$1,305,000	$-	$-	$1,305,000	$-
CH029	Prepare an adaptation strategy for the Foreshore Drive locality in consultation with the local community and key stakeholders. The output of the plan will be an agreed and costed adaptation pathway.	Salamander Bay	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$200,000	$-	$200,000	$66,667	$133,333	$-	$-	$200,000
CH072	Undertake a coastal erosion hazard investigation.	Inner Port & Outer Port	PSC	DCCEEW - EHG	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$350,000	$-	$350,000	$116,667	$233,333	$175,000	$175,000	$-
CH073	Develop an adaptation strategy for the Shoal Bay precinct.	Shoal Bay	PSC	DCCEEW - EHG, Utilities, NPWS, DPHI - Crown Lands	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$200,000	$-	$200,000	$66,667	$133,333	$-	$200,000	$-

Action ID	Management Action	Location	Lead Agency	Partners	Potential Funding Source	Cost Sharing	CMP Capital Cost	Annually Recurrent Cost	Total Cost Over CMP Business Plan	Council Costs	State Governme nt Costs	Year 1	Years 2 to 4	Years 5 to 10
CH074	Develop a policy to articulate Council's position regarding the protection of private land along estuarine foreshores and the prioritisation of public funds for the protection of public land, public access and recreational amenity.	All	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$25,000	$-	$25,000	$8,333	$16,667	$-	$25,000	$-
CH075	Investigate risk of tidal ingress of stormwater outlets and identify outlets requiring tide gates.	All	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$175,000	$-	$175,000	$58,333	$116,667	$-	$175,000	$-
CH077	Prepare for implementation of the CZEAS (if triggered) by obtaining the necessary planning approvals, permits and licences.	All	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$50,000	$-	$100,000	$33,333	$66,667	$50,000	$-	$50,000
CH078	Undertake maintenance works / repairs to the existing seawall and clean out stormwater outlet.	Swan Bay	PSC	DPHI – Crown lands	PSC	PSC	$304,000	$15,000	$409,000	$409,000	$-	$-	$319,000	$90,000
CH079	Undertake foredune stabilisation works at Birubi Point in accordance with the NSW Coastal Dune Management Manual (DLWC, 2001).	Birubi Point	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$100,000	$20,000	$260,000	$86,667	$173,333	$-	$140,000	$120,000
CH080	Investigate and undertake detailed design coastal protection works to mitigate coastal erosion risk.	Nelson Bay Beach	PSC	Crown Lands	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$87,000	$-	$87,000	$29,000	$58,000	$87,000	$-	$-
CH081	Install tide gates/flaps on priority stormwater outlets.	All	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$135,000	$60,000	$435,000	$145,000	$290,000	$-	$135,000	$300,000
CH082	Incorporate consideration of risk arising from coastal hazards into National Parks Plans of Management as part of scheduled updates.	National Parks & Nature Reserves	NPWS	NA	NPWS	NPWS staff time	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
CH083	For those Council buildings located within the present day coastal inundation extent prepare/update the emergency action plans to provide guidance on preparedness and response to a coastal inundation event.	All	PSC	NA	PSC	PSC	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
DI001	Work collaboratively and share information about major (CSSI/SSI) projects proposed for the open coastal waters to ensure appropriate consideration of the vision and objectives of this CMP and the objects of the CM Act.	All	PSC	WCLB	PSC	PSC	$-	$5,000	$25,000	$25,000	$-	$5,000	$20,000	$-
E001	Continue to support pest and weed control management activities on Council owned or managed land located in the coastal zone through the Hunter Regional Strategic Pest Animal Management Plan and Hunter Regional Strategic Weed Management Plan 2023-2027. This may involve a range of activities such as: • Weed control (e.g. removal, spraying); • Activities to reduce numbers of pest species (e.g. trapping to reduce risk of feral cats breeding, release of bio-control agents for rabbits and/or destroying warrens); • Monitoring and reporting of pests and weeds on coastal land managed by Council.	All	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$-	$25,000	$250,000	$75,000	$175,000	$25,000	$75,000	$150,000
E002	Undertake works to manage access and rehabilitate the dunes.	One Mile Beach	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$197,000	$8,750	$258,250	$86,083	$172,167	$-	$205,750	$52,500

Action ID	Management Action	Location	Lead Agency	Partners	Potential Funding Source	Cost Sharing	CMP Capital Cost	Annually Recurrent Cost	Total Cost Over CMP Business Plan	Council Costs	State Governme nt Costs	Year 1	Years 2 to 4	Years 5 to 10
E004	Support implementation the Mambo Wetlands Plan of Management (PoM; PSC, 2006), as updated from time to time. Activities to be implemented under the PoM include environmental protection and other works, including: • Annual weed control programs. • Identify and control weeds at the source, using bush regenerators in on-ground control works. • Annual bush regeneration program as prioritised by PSC Bushland Assessment Tool. • Annual feral animal control program. • Ensure fire trails are maintained. • Periodic, mosaic burning regime.	Mambo Wetlands	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$-	$12,000	$120,000	$40,000	$80,000	$12,000	$36,000	$72,000
E005	Support implementation of the Soldiers Point Littoral Rainforest Management Plan (Kleinfelder, 2021). Activities to be implemented under the Plan include environmental protection and other works, such as: • Monitoring the condition of the rainforest and undertaking works according to prioritisation by the PSC Bushland Assessment Tool. • Weed control by spot spraying and removing invasive species. • Planting local, endemic rainforest species in suitable locations. • Formalising walking tracks.	Soldiers Point	PSC	NA	PSC	Council staff time &existing budget	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
E008	Conduct an ecological survey of Mambo Wetlands to include habitat mapping and identify any trends in the habitat extents and condition since the previous survey(s).	Mambo Wetlands	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$75,000	$-	$75,000	$25,000	$50,000	$-	$75,000	$-
E011	Undertake works to manage access and rehabilitate the dunes. This action involves renewal of dune fencing and dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Fingal Bay	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$197,000	$8,750	$249,500	$83,167	$166,333	$-	$197,000	$52,500
E012	Undertake an ongoing program of sand management and dune rehabilitation works for all coastal foreshore land managed by Council. This includes managing public accessways, fencing, weeding and replanting with locally endemic species as detailed in **Section 3.2.4** and **Appendix D**. Co-benefits of this option relate to improved beach access and amenity, improved beach user safety, environmental rehabilitation, and coastal protection.	All	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$25,000	$140,000	$1,425,000	$475,000	$950,000	$165,000	$420,000	$840,000
E013	Undertake ongoing compliance monitoring and enforcement of regulations along Stockton Beach and the Worimi Conservation Land in relation to unauthorised 4WD access and off-leash dog walking.	Stockton Beach	NPWS, WCLB	NA	NPWS & WCLB	Staff time	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
E014	Engage with NSW DPI on the implementation of the Marine Parks Network Management Plan within the Port Stephens-Great Lakes Marine Park.	All	PSC	DPI - Marine Parks	PSC	Council & agency staff time	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
E016	Encourage local volunteer groups to support dune rehabilitation activities.	All	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$-	$5,000	$50,000	$16,667	$33,333	$5,000	$15,000	$30,000

Action ID	Management Action	Location	Lead Agency	Partners	Potential Funding Source	Cost Sharing	CMP Capital Cost	Annually Recurrent Cost	Total Cost Over CMP Business Plan	Council Costs	State Governme nt Costs	Year 1	Years 2 to 4	Years 5 to 10
E017	Undertake ongoing compliance monitoring and enforcement of regulations relating to unauthorised 4WD access and off-leash dog walking on Council managed land.	All	PSC	NA	PSC	Council staff time	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
E018	Prepare a new, updated Plan of Management for Mambo Wetlands.	Mambo Wetlands	PSC	NA	PSC, C&E Grants, Environmental Trust	PSC (1) : C&E Grant (2)	$100,000	$-	$100,000	$33,333	$66,667	$-	$100,000	$-
E019	Undertake management activities to contribute to threatened shorebird protection on NPWS Estate in accordance with approved conservation strategies and plans.	National Parks & Nature Reserves	NPWS	NA	NPWS	NPWS staff time & existing budget	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
HE001	Develop an engagement protocol and strategy for Council engagement with Traditional Owners and Knowledge Holders.	All	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$75,000	$-	$75,000	$25,000	$50,000	$37,500	$37,500	$-
HE002	Progress the implementation of the Soldiers Point Aboriginal Place PoM in partnership with the Traditional Owners. Management strategies identified in the plan include: • Ongoing conservation and protection of significant heritage and cultural sites; • Environmental protection works including vegetation management, weed control, rehabilitation and re-vegetation works; and • Beach management work in the form of sand nourishment to minimise erosion, protection habitat and improve access and amenity.	Soldiers Point	PSC	NA	PSC, Aboriginal Cultural Heritage Grant, Environmental Trust	Council staff time and existing budget	$15,000	$15,000	$150,000	$50,000	$100,000	$15,000	$45,000	$90,000
RA001	Develop a guideline and education program for private landholders detailing their responsibilities with respect to undertaking coastal protection works on private land and the relevant requirements with respect to engineering design, development controls and environmental approvals.	All	PSC	DCCEEW-EHG	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$25,000	$-	$25,000	$8,333	$16,667	$-	$25,000	$-
RA002	Progress the implementation of Council's Boating and Fishing Infrastructure Plan (Otium Planning Group, 2023).	All	PSC	TfNSW - MIDO	PSC, Recreational Fishing Trust, NSW Boating Now	Council staff time and forward budget	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
RA003	Develop a governance framework for coastal protection structures of unknown management status.	All	PSC	DPHI - Crown Lands	PSC	Council & agency staff time	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
RA011	Undertake sand carting / beach nourishment to provide improved beach access and amenity.	Shoal Bay	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$295,000	$2,290,000	$2,585,000	$861,667	$1,723,333	$295,000	$750,000	$1,540,000
RA012	Undertake works to manage access and rehabilitate the dunes. This action involves renewal of dune fencing and dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Shoal Bay	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$450,000	$55,100	$945,900	$315,300	$630,600	$450,000	$165,300	$330,600
RA016	Undertake sand carting / beach nourishment to provide improved beach access and amenity.	Sandy Point /Conroy Park	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$122,500	$10,000	$192,500	$64,167	$128,333	$-	$142,500	$50,000
RA017	Undertake works to manage access and rehabilitate the dunes. This action involves dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Corlette	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$16,500	$5,250	$48,000	$16,000	$32,000	$-	$16,500	$31,500

Action ID	Management Action	Location	Lead Agency	Partners	Potential Funding Source	Cost Sharing	CMP Capital Cost	Annually Recurrent Cost	Total Cost Over CMP Business Plan	Council Costs	State Governme nt Costs	Year 1	Years 2 to 4	Years 5 to 10
RA020	Landscaping works for bank stabilisation. This action involves re-vegetation works (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Tanilba	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$41,750	$2,950	$53,550	$17,850	$35,700	$-	$-	$53,550
RA027	Undertake works to manage access and rehabilitate the dunes. This action involves dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Salamander Bay	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$50,000	$3,500	$67,500	$22,500	$45,000	$-	$-	$67,500
RA030	Undertake works to manage access and rehabilitate the dunes. This action involves dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Dutchmans Beach	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$52,500	$3,675	$74,550	$24,850	$49,700	$-	$52,500	$22,050
RA031	Replace and relocate stairs and fix fencing to reinstate public access from the car park.	Dutchmans Beach	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$10,000	$2,000	$28,000	$10,000	$18,000	$10,000	$6,000	$12,000
RA034	Undertake works to manage access and rehabilitate the dunes. This action involves renewal of dune fencing and dune re-vegetation (including sediment controls), with a provision for ongoing annual maintenance (e.g. weeding and replanting as required).	Nelson Bay Beach	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$114,000	$7,000	$156,000	$114,000	$42,000	$-	$114,000	$42,000
RA036	Minor shoreline re-profiling and landscaping works to stabilise the foreshore and provide improved amenity.	Kangaroo Point	PSC	NA	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$233,000	$21,875	$298,625	$233,000	$65,625	$-	$-	$298,625
RA045	Undertake minor dredging for ongoing access to Little Beach boat ramp, Nelson Bay Marina, Soldiers Point boat ramp, and Taylors Beach boat ramp.	Little Beach, Nelson Bay, Soldiers Point, Taylors Beach	PSC	NA	PSC	PSC	$174,500	Average of $50,611	$630,000	$630,000	$-	$174,250	$97,750	$358,000
WQ002	Enter into a data sharing agreement to enable sharing of historical and ongoing water quality monitoring data undertaken in Port Stephens.	All	PSC	DCCEEW-EHG, DPI – Fisheries / Marine Parks, MCC	PSC	PSC	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
WQ003	Implement a Water Quality Monitoring Program focussed on risk to aquatic recreation. As a secondary objective, the monitoring should evaluate catchment pollutant inputs.	Shoal Bay, Little, Nelson Bay & Corlette Beaches	PSC	DCCEEW-EHG	PSC, C&E Grants	PSC (1) : C&E Grant (2)	$22,500	$73,100	$753,500	$22,500	$731,000	$95,600	$219,300	$438,600
WQ004	In order to maintain vegetated riparian corridors through the development process, planning proposals to re-zone land within the Coastal Environment Area developed or evaluated by Council will adopt land use zonings appropriate to maintain Vegetated Riparian Zones consistent with those specified in the Controlled activities - Guidelines for riparian corridors on waterfront land.	All	PSC	DPHI - Planning	PSC	PSC	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
WQ005	Develop and implement a campaign targeted at improving the awareness of the general community on catchment management practices relating to water quality improvement in Port Stephens.	All	PSC	NA	PSC, C&E Grants, Environmental Trust	PSC (1) : C&E Grant (2)	$30,000	$-	$30,000	$30,000	$-	$-	$30,000	$-

Action ID	Management Action	Location	Lead Agency	Partners	Potential Funding Source	Cost Sharing	CMP Capital Cost	Annually Recurrent Cost	Total Cost Over CMP Business Plan	Council Costs	State Governme nt Costs	Year 1	Years 2 to 4	Years 5 to 10
WQ007	Undertake an investigation to identify wastewater pump stations in the Port Stephens catchment that require upgrading as part of a broader wastewater pump station improvement program that will reduce the risk of wastewater overflows by providing additional emergency storage at selected sites.	Port Stephens	HWC	NA	HWC	HWC	$100,000	$-	$100,000	$-	$100,000	$100,000	$-	$-
WQ008	Provide for ongoing enforcement of regulations in dog on-leash areas. In addition, review dog on-leash and off-leash areas to confirm the appropriateness of off-leash dog areas with respect to community uses of these areas and their environmental sensitivity (e.g., shorebird roosting or nesting areas). Review existing dog on-lead signage in key locations & provide more signage where required.	All	PSC	NA	PSC	PSC	$20,000	$-	$20,000	$20,000	$-	$-	$20,000	$-
WQ009	Beachwatch monitoring program for recreational water quality at ocean beaches (continued program)	Box, Fingal, One Mile & Zenith Beaches	HWC	DCCEEW-EHG	HWC	HWC	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST
WQ010	Support the community to dispose of recreational fishing waste appropriately.	All	PSC	DPI - Fisheries	PSC, Recreational Fishing Trust	PSC	$ST	$ST	$ST	$ST	$ST	$ST	$ST	$ST

6 Coastal Zone Emergency Action Subplan, if the *Coastal Management Act 2016* Requires that Subplan to be Prepared

Clause 15(1)(e) of the CM Act requires that a CZEAS be included in the CMP if Council's LGA contains land within the CVA and beach erosion, coastal inundation or cliff instability is occurring on that land due to storm activity or an extreme or irregular event.

Although there is no CVA prepared for the study area, the Port Stephens coastal zone is subject to the coastal hazards of beach erosion, coastal inundation, tidal inundation and dune transgression (BMT, 2021a). As such, a CZEAS has been prepared in accordance with the mandatory requirements specified in the CM Act and accompanying NSW Coastal Management Manual (OEH, 2018b).

The Port Stephens CZEAS is contained in **Appendix C**.

Photo: Kangaroo Point foreshore (T. Mackenzie)

7 Monitoring, Evaluation and Reporting Program

Management actions have been developed for a Monitoring Evaluation and Reporting (MER) Program for Port Stephens over a 10-year period, to monitor, evaluate and report on the success of the implementation of this CMP.

This CMP and all progressed actions should be reviewed to ensure the actions remain relevant and the implementation of the CMP is being achieved through evaluation of performance targets for the relevant management actions. Where performance targets have not been achieved, then remedial or corrective action would be required.

The actions to be implemented as part of the MER Program are listed in

Table 7-1. Reporting requirements for the program are captured in MER1 and end of implementation period reporting requirements for the program are captured in MER2.

The recommended MER actions in

Table 7-1 have been described in terms of:

- **Action ID** – code for each action for easy reference;
- **Description** – an outline of the scope of works required;
- **Lead Organisation** – agency responsible for implementation of the action;
- **Support Organisation(s)** – may be required and/or requested to assist in implementation of the action, either through on-ground works, in-kind contributions or as a potential funding or information source;
- **Indicative Cost** – an estimate of total costs for implementation over the ten-year life of the plan is provided (2023$). Where actions require Council staff resources, actual costs have only been applied where it is expected that implementation will exceed current resourcing levels and additional funding is required. Where the action would only require existing staff time, assets and services, these are noted as "$ST";
- **Indicative Timeframe** – indicative timeframe for implementation and alignment with Council's Delivery Program; and
- **Performance Targets** – these can be used to measure the level of success of the plan.

These MER actions are supported by several MER-related activities that are included as management actions in the CMP. These include:

- **CH001** – Coastal hazard monitoring program for the study area;
- **CH002** – Program for monitoring the condition of coastal structures owned and/or maintained by Council;
- **WQ003** – Water quality monitoring program focussed on risk to aquatic recreation;
- **WQ009** – Beachwatch monitoring program for recreational water at ocean beaches (continued program implemented by Hunter Water Corporation).

Table 7-1 Monitoring, Evaluation and Reporting (MER) Program for the Port Stephens CMP

MER ID	Action / Description	Lead	Support	Indicative Cost (10 year)	Indicative Timeframe	Performance Targets
MER1	**Review Progress of CMP** Documentation of the effectiveness of the proposed strategies and actions will be reported as part of Council's Annual Report (which is part of the IP&R framework), including progress towards or full achievement of the performance targets included for each action. Where performance targets have not been achieved, then remedial or corrective actions would be required, and these actions should also be documented in the Annual Report. The cause of non-compliance should be ascertained (i.e., lack of funding, lack of resources) and the remedial actions put in place to address the non-compliance (i.e., identify additional funding sources, allocate additional resources, etc.).	PSC	NA	$ST	Annually	CMP progress included in Annual Report
MER2	**10-year Review of the CMP** The CMP and the specified management actions should be reviewed to ensure they are being achieved and are resulting in the desired outcomes. A 10-year review (or earlier if warranted by legislative or management changes or improved scientific understanding) of the CMP is required to consider: a) Results of the Annual Reporting b) Review of status of CMP actions including overall success and any barriers to effective implementation c) Any new or updated scientific knowledge d) Data provided by MER actions in this CMP e) Prevailing community attitudes, government policy and strategic planning status.	PSC	Stakeholder Reference Group, NSW DCCEEW – EHG	$350,000	Year 10	Review and reporting undertaken by the end of Year 10. Adoption and certification of the amended CMP as required.

MER ID	Action / Description	Lead	Support	Indicative Cost (10 year)	Indicative Timeframe	Performance Targets
MER3	**Activation of the CZEAS** Section 2 of the CZEAS defines a coastal emergency and details triggers for emergency response actions. Once a coastal emergency event is triggered, Council will activate the CZEAS and follow the actions detailed in the emergency response actions for locations at risk, as detailed in Section 6 of that document (refer **Appendix C**).	PSC	NSW SES, Bureau of Meteorology	$ST	Ongoing	Records kept as per the post-storm event reporting and review procedure in Section 6.4.2 of the CZEAS.
MER4	**Annual Beach Monitoring Surveys** Annual beach monitoring surveys will be undertaken as part of the coastal hazard monitoring program (Action CH001). Along with visual observations made by Council personnel and complaints received from the public or SLSCs, the monitoring surveys will be used to identify if the following management actions have been triggered: • Action E012 – Ongoing program of sand management (i.e. the sand management activities at various locations); • Action RA011 – Sand carting / beach nourishment at Shoal Bay Beach; • Action RA016 - Sand carting / beach nourishment at Corlette Beach; • Action CH079 – Foreshore stabilisation works at Birubi Point	PSC	DECCW – EHG	Refer Action CH001	Annual	Annual survey data is collected and reviewed with respect to the relevant triggers for action.
MER5	**Navigational Access** Maintenance dredging under Action RA045 will be triggered by visual observations by Council officers and/or navigational issues identified by the public.	PSC	NA	$ST	Ongoing	No increase in complaints about navigational access.

8 Maps

8.1 Overview of Mapping

Maps provided in this CMP include:

- Mapping of CMAs, excluding the CVA;
- Coastal sediment compartments;
- Coastal hazard mapping; and
- Mapping of location-specific management from this CMP.

The following sections provide information on each of the above maps, which are included in **Appendix A** to this CMP.

8.2 Coastal Management Areas

As discussed in **Section 1.3.1**, there are four CMAs defined under the CM Act and mapped in the Resilience and Hazards SEPP. These include the:

- **Coastal Wetlands and Littoral Rainforest Area (CWLRA)** – Coastal Wetlands shown in **Map RG-00-02**; Littoral Rainforest mapped in **Map RG-00-03**;
- **Coastal Vulnerability Area (CVA)** – There is presently no mapping of a CVA for the study area. Land vulnerable to coastal hazards is discussed below in **Section 8.4**;
- **Coastal Environment Area (CEA)** – The extent of the CEA within the study area is mapped in **Map RG-00-04**; and
- **Coastal Use Area (CUA)** – The CUA is mapped in **Map RG-00-05**.

This CMP does not propose any changes to the CMA mapping, or to a planning proposal for a CVA for the study area.

8.3 Coastal Sediment Compartments

As discussed in **Section 1.3.2**, the Port Stephens CMP study area is located within the Port Stephens compartment, within which there are three secondary sediment compartments that extend across the study area (refer **Map RG-00-06**); the Stockton Bight, Anna Bay and Port Stephens compartments.

8.4 Coastal Risk Planning Maps

In lieu of a CVA, Port Stephens Council proposes to prepare a planning proposal to adopt Local Provisions for development in the coastal zone and the management of risk to development from coastal hazards in Part 7 of the Port Stephens LEP (refer **Section 4**). A new LGA-wide DCP would be developed to provide controls specific to management of coastal hazards in accordance with the proposed LEP Local Provision amendments.

A coastal risk planning area map layer has been prepared to identify the land subject to each of the coastal hazards investigated by BMT (2021a) in the Stage 2 Vulnerability Assessment. The coastal planning risk maps are provided in **Appendix E**. The coastal risk planning GIS layer is defined by the sum of each of these hazards, where they have been quantified, and incorporates the:

- 2120 ‘extreme’ coastal erosion hazard (i.e. the upper bound extent or 99% percentile);
- 2120 (95th percentile) 100-year ARI coastal inundation hazard;
- 2120 (95th percentile) tidal inundation hazard; and
- The 2070 upper limit dune transgression hazard.

The CM Act requires the consideration of future climate change. Consistent with the recommendations of the NSW Coastal Design Guidelines (2023), all extents that define the coastal risk planning area have been based on the 2120 planning horizon. This is to ensure the proposed development controls in the DCP are triggered for development (such as residential subdivisions) with a design life up to that planning horizon, which incorporates the projected effects of sea level rise on coastal hazards.

The exception is the dune transgression hazard, for which a 2070 planning horizon was adopted as the longer planning horizon, consistent with BMT (2021a), who noted that there is a degree of uncertainty in future wind patterns under climate change conditions. Dune transgression is not specifically identified as a coastal hazard under the CM Act and would therefore not have been able to be incorporated into a CVA.

It is noted that the Stage 2 Vulnerability Assessment prepared by BMT (2021a) did not investigate coastal erosion hazard for the Inner or Outer Port, and therefore no coastal erosion areas are mapped for these parts of the CMP study area at present. Management action CH072 proposes to undertake a coastal erosion hazard investigation for the Inner and Outer Port, and the subject estuarine foreshore land affected by coastal erosion hazard identified via that investigation could be incorporated into the coastal risk planning map once the management action has been implemented.

Photo: Sunrise over One Mile Beach (M. Rosenthal)

9 Reference List

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