

Draft Report

Hawkesbury-Nepean River System Coastal Management Program

HNRS CMP Steering Committee

2 October 2025

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Cover Image: Hawkesbury River at Crosslands. Source: Petra Holland

ACKNOWLEDGEMENT OF COUNTRY

The Board and employees of Water Technology acknowledge and respect the Aboriginal and Torres Strait Islander Peoples as the Traditional Custodians of Country throughout Australia. We specifically acknowledge the Traditional Custodians of the land on which our offices reside and where we undertake our work.

We respect the knowledge, skills and lived experiences of Aboriginal and Torres Strait Islander Peoples, who we continue to learn from and collaborate with. We also extend our respect to all First Nations Peoples, their cultures and to their Elders, past and present.



Artwork by Maurice Goolagong 2023. This piece was commissioned by Water Technology and visualises the important connections we have to water, and the cultural significance of journeys taken by traditional custodians of our land to meeting places, where communities connect with each other around waterways.

The symbolism in the artwork includes:

- *Seven circles representing each of the States and Territories in Australia where we do our work*
- *Blue dots between each circle representing the waterways that connect us*
- *The animals that rely on healthy waterways for their home*
- *Black and white dots representing all the different communities that we visit in our work*
- *Hands that are for the people we help on our journey*

Image Source: Robyn Green

EXECUTIVE SUMMARY

Overview of the CMP

The Hawkesbury-Nepean River System (HNRS) is one of the most significant river systems in New South Wales (NSW) and represents the largest estuary system in the Greater Sydney Metropolitan Region. It supports a remarkable natural environment, contains places of deep cultural significance, provides recreational amenity for one of the nation's largest population bases, and underpins a thriving blue economy.

However, the HNRS is facing increasing pressures from urban development, population growth, coastal hazards, and the escalating impacts of climate change. In response, the 6 local councils adjoining the tidal waterways of the HNRS have joined together in an unprecedented partnership to prepare a whole-of-estuary Coastal Management Program (CMP) under the NSW Coastal Management Framework.

This CMP presents a coordinated program of management actions that address critical issues while also harnessing emerging opportunities. It provides a clear pathway for implementation over a 10-year horizon, guided by the objectives of the *Coastal Management Act 2016* (CM Act). In doing so, it seeks to protect and enhance the social, cultural, environmental, and economic values of the coastal zone for current and future generations.

This document has been prepared with funding and technical support from the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), and in consultation with various state agencies, First Nations groups, and the local communities of the HNRS.

Study Area

The CMP applies to the coastal zone of the HNRS as defined under the CM Act and the State Environmental Planning Policy (Resilience and Hazards) 2021 (R&H SEPP). The CMP will encompass the tidal sections of the waterway, starting from the river's entrance at Broken Bay and extending more than 145 km upstream to Yarramundi near Richmond (the tidal limit). It also includes the interconnected waterways of Pittwater and Brisbane Water, which flow into the Lower Hawkesbury estuary at Broken Bay forming one large, integrated river system (Figure EX-1).

The decision to adopt a river-wide study area reflects the recognition that key coastal processes, pressures, and opportunities extend across council boundaries. By taking an integrated, system-scale perspective, the CMP promotes management actions are strategically aligned, mutually reinforcing, and more effective than if the Partner Councils acted in isolation. This collaborative approach provides the best opportunity to safeguard the HNRS and deliver enduring outcomes for the communities who depend on it.

The Vision for the HNRS

A local vision statement has been developed for the CMP to help identify with the future of the HNRS, and foster commitment to its implementation. The Vision for the CMP is:

> *To preserve and enhance the environmental, social and economic values of the Hawkesbury-Nepean River system and its catchment for current and future generations, and ensure its status as one of Australia's premier river systems.*

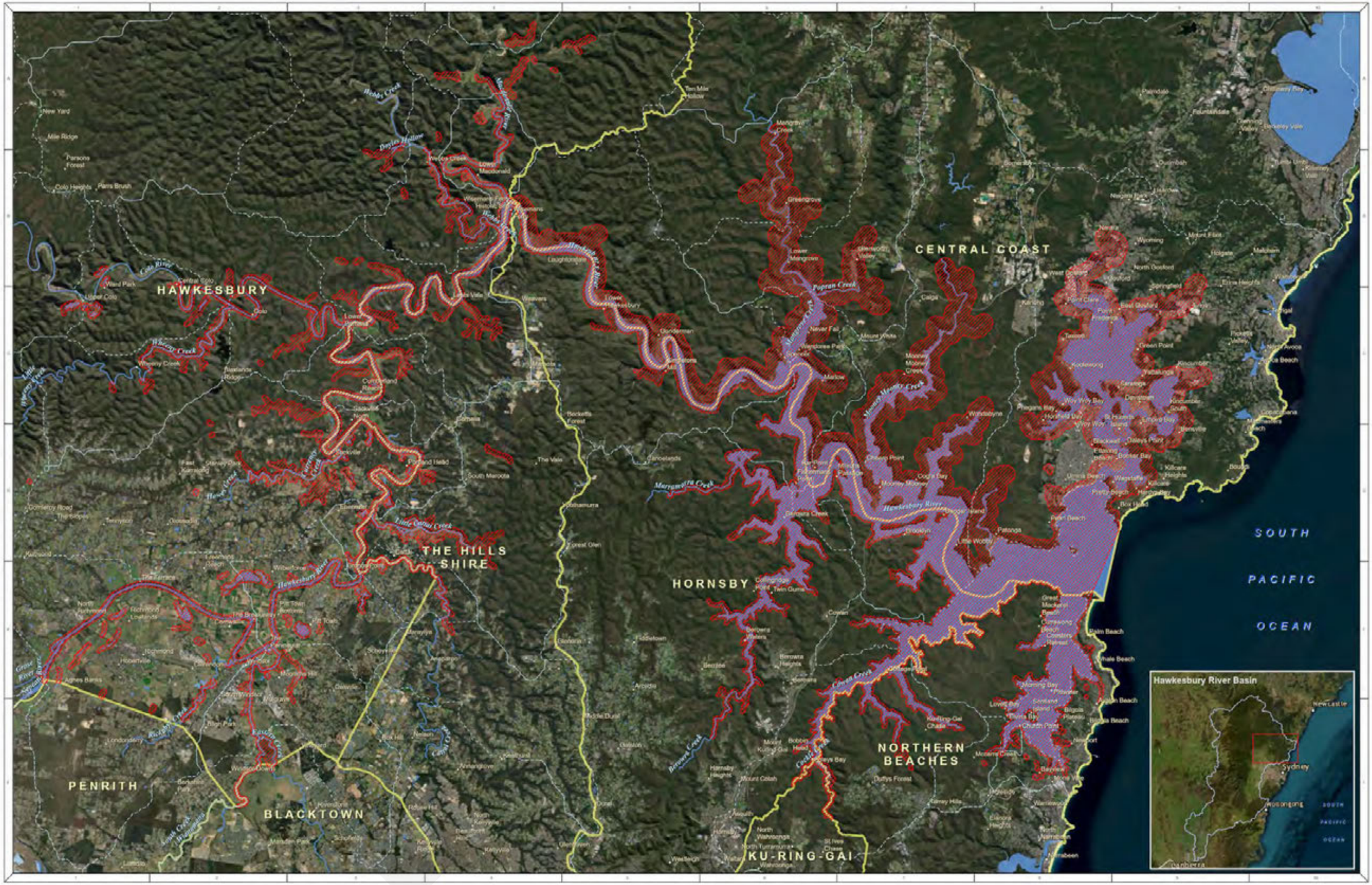


Figure EX-1 CMP Study Area

Hawkesbury-Nepean River System CMP

Goals

A suite of detailed objectives has been developed for the CMP, in order to ensure that the program recognises and protects the environmental, social, cultural, and economic values of the study area. These objectives have been developed to enable consistency and alignment with a range of local, regional, and state policies and plans - including the CM Act. In general terms, the goals of the CMP are to:

- Improve and maintain water quality
- Reduce coastal hazard risks
- Protect waterway ecosystems
- Improve recreational access and amenity
- Protect cultural heritage values
- Improve river governance

Snapshot of Issues

The development of the CMP involved extensive assessment of the diverse issues and risks currently affecting the HNRS, as well as those projected to intensify over the next 100 years. These pressures are wide-ranging and interconnected, cutting across environmental, social, and governance domains.

Key estuarine threats include the impacts of **coastal and estuarine hazards**, such as erosion, inundation, and flooding, alongside the pressures of **urbanisation and land use change**, which continue to alter catchment inputs and place strain on estuarine ecosystems. Increasing **competition for waterway use and resources** presents further challenges, as recreational, commercial, cultural, and ecological values intersect and, at times, conflict. Overlaying these issues is the need for strong and **effective governance**, ensuring that the multiple councils, agencies, and community groups with responsibility for the system are able to work in a coordinated and collaborative way. These threats are being amplified by the twin drivers of **population growth** and **climate change**. As the region's population expands and climate impacts accelerate, the scale and urgency of the challenges facing the HNRS will continue to grow, underscoring the importance of a long-term, integrated management approach.

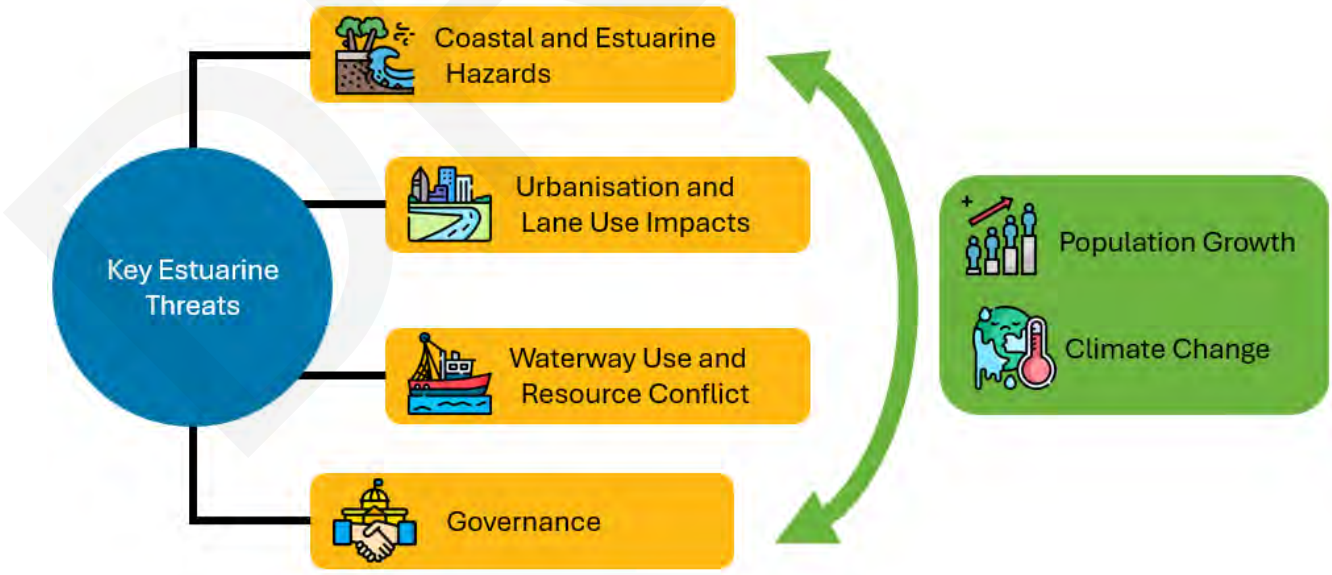


Figure EX-2 Key Issues and Risks across the HNRS

Development of the CMP

The HNRS CMP has been prepared in accordance with the requirements of the NSW Government's Coastal Management Framework. Specifically, it has been prepared in accordance with the:

- Statutory Requirements of the CM Act, and
- The Mandatory Requirements of the NSW Coastal Management Manual (OEH, 2018a).

As per the Coastal Management Manual, the CMP has been delivered through the 5-stage risk management process (see Figure EX-3).

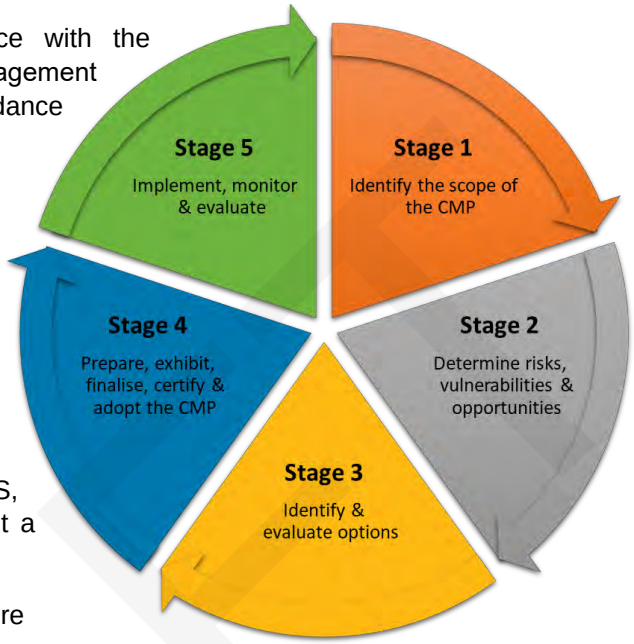


Figure EX-3 The CMP Process

In Stage 1, a comprehensive Scoping Study was completed **reviewed the history** of the HNRS, documented existing studies and initiatives, and set out a program for development of this CMP.

During Stage 2, a range of **detailed technical studies** were undertaken to enhance understanding of the key issues facing the river system. These studies examined physical and ecological processes, bank erosion, coastal inundation, and the community's values and use of the river system.

In Stage 3, a wide range of **potential management options** were identified to address potential risks across the system and unlock new opportunities for improved management. A long list of over 800 potential management actions was evaluated in line with the requirements of the NSW Coastal Management Manual, considering the technical **feasibility**, economic **viability**, and the **acceptability** amongst stakeholders and communities. This rigorous assessment process prioritised the progression of 141 management actions through to Stages 4 and 5 of the CMP.

Community and Stakeholder Engagement

Given the scale of the river system and the diversity of interests, the HNRS CMP has been supported by one of the most extensive community and stakeholder engagement programs undertaken for any CMP in NSW. The process was designed to ensure broad representation and meaningful input from government agencies, industry, community groups, and the wider public. Engagement has included:

- 6 Partner Councils directly responsible for tidal sections of the river system
- 18 Upper Catchment Councils whose management decisions influence the estuary downstream
- 15 State Government entities providing policy, regulatory, and technical expertise
- Local First Nations groups, sharing cultural knowledge and perspectives
- Border communities of the HNRS, reflecting the lived experience of residents and river users.

This inclusive approach has ensured that the CMP reflects a wide spectrum of values, knowledge, and priorities. It has also strengthened collaboration across jurisdictions, laying the foundation for coordinated implementation. An overview of the engagement program is provided in Figure EX-4.

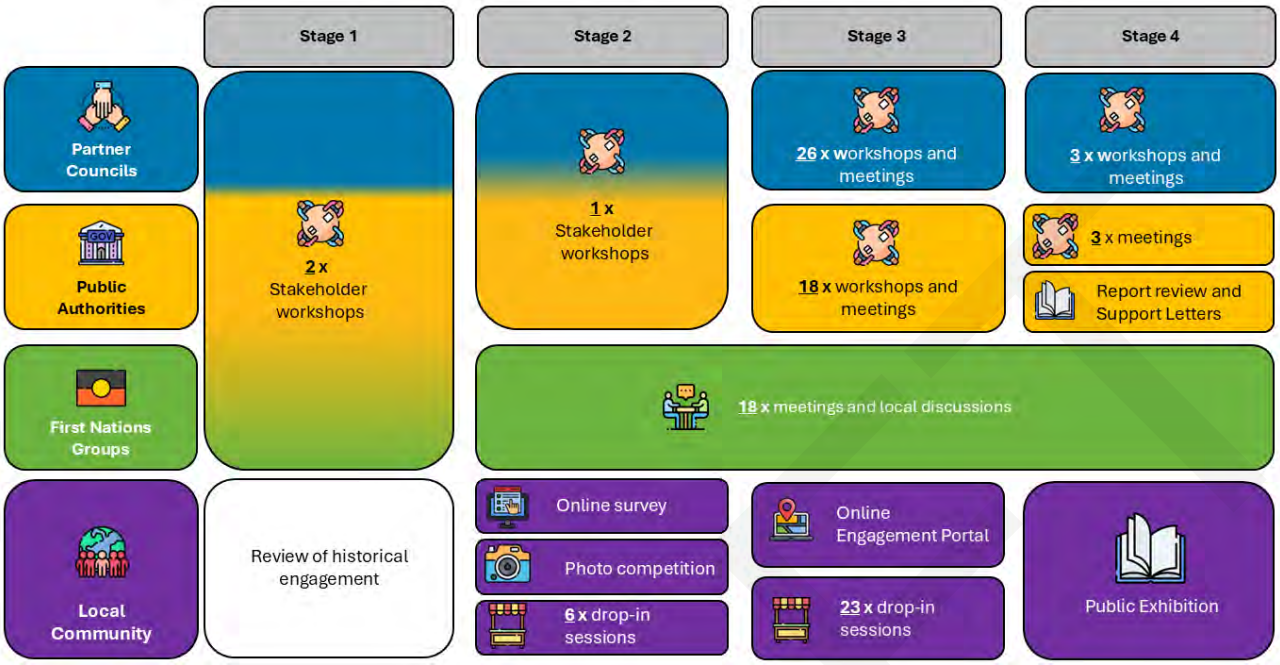


Figure EX-4 Community and stakeholder engagement

Management Strategies and Actions

To respond to these challenges, a Strategic Direction Workshop was convened with the CMP Steering Committee at the outset of Stage 3 (see Section 4.4.2). This workshop resulted in a codesign process that developed the delivery structure of the CMP. A summary of this structure is provided in Figure EX-5, and includes:

- **Nine (9) overarching strategies** that provide the CMP with strategic direction.
- **Eight (8) Implementation Plans** that provide the CMP with specific focus, including:
  - *A Collaborative System Implement Plan* to facilitate a large scale, coordinated approach to coastal zone and estuary management. Actions in the plan are delivered by multiple Councils through coordinated delivery partnerships.
  - *6 LGA-Based Implementation Plans* that provide granularity at a local level for each of the Partner Councils These plans are also intended to assist in the integration of the CMP actions into each Partners Councils' IP&R Framework.
  - *An NPWS Implementation Plan* that provides specific focus for actions located within NPWS land tenure.
- **A Catchment Companion** which is external to the certifiable CMP and contains actions that are located outside of the legal defined coastal zone in the broader HNRS catchment. While clearly marked as non-certifiable under the CM Act, these actions are included within the CMP document to maintain integration with coastal zone actions and to support holistic estuary management. This approach aligns with the NSW Government's guidance on *Coastal Management Programs and Integration with Catchment Management* (DPE, 2022).

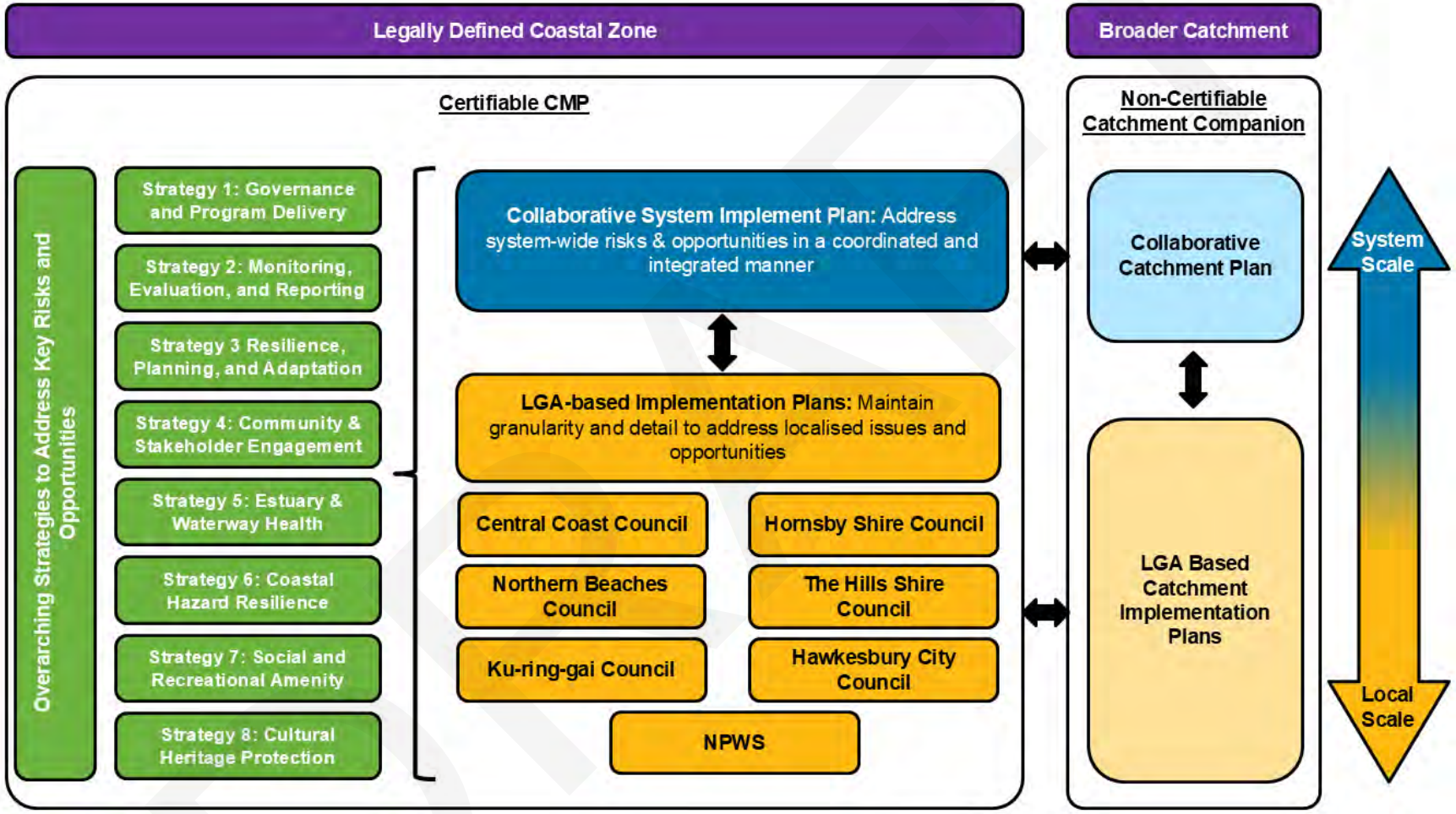


Figure EX-5 CMP Delivery Structure

The CMP includes a total of 141 management actions, with an additional 9 management actions included in the associated Catchment Companion. These actions are broken down by strategy and implementation plan in Table EX-1 below. For each action, this document provides a summary of the tasks involved, roles and responsibilities, costs, and timeframes for delivery, and well as objectives and performance indicators.

Management actions have been developed for a ten-year period and have been aligned with the Partner Council's respective four-year Delivery Programs under the NSW Integrated Planning and Reporting Framework.

Table EX-1 Breakdown of Actions across both the Certifiable CMP and the Catchment Companion

Total Number of Actions	Strategy 1: Governance and Program Delivery	Strategy 2: Monitoring, Evaluation, and Reporting	Strategy 3: Resilience, Planning, and Adaptation	Strategy 4: Community & Stakeholder Engagement	Strategy 5: Estuary & Waterway Health	Strategy 6: Coastal Hazard Resilience	Strategy 7: Social and Recreational Amenity	Strategy 8: Cultural Heritage Protection	Total
Collaborative System Implement Plan	2	3	7	4	3	2	1	7	**29**
Local Implementation Plan: Central Coast Council	0	3	7	0	4	24	10	1	**49**
Local Implementation Plan: Northern Beaches Council	0	4	4	0	2	11	2	0	**23**
Local Implementation Plan: Ku-ring-gai Council	0	0	0	0	0	0	0	0	**0**
Local Implementation Plan: Hornsby Shire Council	0	0	0	0	3	7	8	0	**18**
Local Implementation Plan: The Hills Shire Council	0	0	0	0	0	5	0	0	**5**
Local Implementation Plan: Hawkesbury City Council	0	0	2	2	1	5	1	0	**11**
NPWS Implementation Plan	0	0	0	0	0	6	0	0	**6**
Catchment Companion	0	1	1	2	5	0	0	0	**9**
Total	**2**	**11**	**21**	**8**	**18**	**60**	**22**	**8**	**150**

Business Plan

A Business Plan has been developed 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 CMP is estimated to cost $75 Million (2025 dollars) over 10 years.

Sustainable funding and financing arrangements for management actions will be established in consultation with key stakeholders. Funding for management actions may be gained from various sources, including competitive State Government grant programs, the Councils' internal funds, and local third parties.

Implementation and Review

This CMP is considered a 'living document' that is to be reviewed and updated over time. A strategic review of the CMP should occur at least once every 10 years to assess the effectiveness of the CMP in achieving its objectives and to incorporate changes in light of new information, legislative and policy changes, and improved understanding of the local coastal processes.

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ACKNOWLEDGEMENTS

This Coastal Management Program (CMP) has been developed through the contributions, dedication, and shared commitment of a diverse group of stakeholders.

The authors of this CMP acknowledge the 6 Partner Councils that have worked collaboratively over many years to deliver this program. Their sustained cooperation, effective sharing of knowledge and resources, and collective commitment to a common purpose have been fundamental to the success of this program. This partnership demonstrates the value of coordinated local government action in addressing complex coastal and estuary management issues.

We also acknowledge the many State agencies who have actively engaged in the development of this CMP. Their advice, technical expertise, and consistent involvement have ensured the program is informed by sound science, robust policy, and practical knowledge.

Our sincere thanks are extended to the local First Nations groups across the Hawkesbury-Nepean River System. Their generosity in sharing time, perspectives, and cultural connections to Country has provided invaluable insights and enriched our collective understanding of place. Their contributions have been vital in ensuring that cultural values and local knowledge are interwoven throughout this CMP.

Finally, we acknowledge the local communities who care deeply for the HNRS. Their passion, local knowledge, and commitment to the river's long-term health have guided and informed this program at every stage. The energy and enthusiasm of community members - whether through participation in workshops, drop-in sessions, or written feedback - has been central to shaping a CMP that reflects the values and aspirations of the people who live, work, and recreate along the river.

This document features a wide range of photographs generously provided by community members during Stage 2 of the CMP. These images, interwoven throughout the report, provide a powerful reminder of the deep connection between people and the river system. They not only capture the natural beauty of the waterways but also reflect the strong sense of place, pride, and stewardship held by those who care for the Hawkesbury–Nepean River.

Image Source: Thomas Banner

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1 INTRODUCTION

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Image Source: Belinda Faught

1.1 Purpose of this Coastal Management Program

The purpose of this Coastal Management Program (CMP) is to establish an integrated program for the coordinated management of the Hawkesbury-Nepean River System (HNRS). The 6 local councils that border the estuarine reach of the river system have agreed to partner in the development of an integrated, whole-of-estuary, CMP. The 6 councils, hereafter referred to as the Partner Councils, comprise:

- Central Coast Council (CCC)
- Hawkesbury City Council (HCC)
- The Hills Shire Council (THSC)
- Hornsby Shire Council (HSC)
- Ku-ring-gai Council (KC)
- Northern Beaches Council (NBC)



Figure 1-1 The HNRS CMP Partner Councils

The CMP provides strategic direction and a program of integrated management actions that are intended to achieve the objects of the *Coastal Management Act 2016* (CM Act), and preserve the environmental, social, and economic values of the coastal zone. It outlines specific actions that are to be implemented over a forward 10-year management timeframe and provides clear details for how actions will be implemented, funded, monitored, and reviewed.

This CMP aims to address the various risks, threats, and opportunities across the coastal zone over a range of timeframes (immediate, 20 years, 50 years, 100 years), as required by the CM Act. Longer-term pressures such as climate change and population growth have been considered in the formulation of management actions, to ensure resilience against future threats and the conservation of the values of the coastline for future generations.

The HNRS CMP has been prepared in accordance with the mandatory requirements for CMPs specified in the CM Act, and the NSW Coastal Management Manual (OEH, 2018a) (hereby referred to as the CM Manual). This document has been prepared on behalf of HNRS with funding and technical support from the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), and in consultation with various state agencies and other relevant stakeholders.

1.2 Area Covered by this CMP

1.2.1 Coastal Management Areas

In accordance with the CM Act, this CMP gives effect to the management objectives for the 4 coastal management areas (CMAs) that define the coastal zone of the study area. Each CMA has different characteristics and objectives, and the areas may overlap. The CM Act provides the definition and objectives for each of the management areas. The State Environmental Planning Policy (Resilience and Hazards) 2021 (R&H SEPP) provides development controls for each of the management areas, and state-wide mapping of 3 of the 4 areas. The 4 coastal management areas as defined by the CM Act are:

- **Coastal environment area (CEA):** Land containing coastal features such as the coastal waters of the state, estuaries, coastal lakes, coastal lagoons, and land adjoining those features including headlands and rock platforms. Beaches, dunes, and foreshores are included in this area.
- **Coastal use area (CUA)**: Land adjacent to coastal waters, estuaries, coastal lakes and lagoons where development is or may be carried out (at present or in the future) and impacts of development on the

scenic and cultural values and use and enjoyment of the beaches, foreshores, dunes, headlands, rock platforms, estuaries, lakes and the ocean need to be considered.

- **Coastal wetlands and littoral rainforests area (CWLR)**: Land which displays the hydrological and floristic characteristics of coastal wetlands or littoral rainforests, as well as a surrounding proximity area to manage impacts of adjacent development.
- **Coastal vulnerability area (CVA)**: Land which is subject to any of the coastal hazards listed in the CM Act, including beach erosion, shoreline recession, coastal lake or watercourse entrance instability, coastal inundation, tidal inundation, coastal cliff and slope instability. Mapping for the coastal vulnerability area has not been provided from the R&H SEPP, and no such coastal vulnerability area (CVA) map yet exists for the study area. Nonetheless, it is recognised that the HNRS is subject to coastal hazards and that the scope of this CMP also covers managing coastal vulnerability.

The study area for the CMP therefore comprises the envelope extent of these CMAs across the HNRS catchment. A map of the CMP study area is provided in Figure 1-2, with mapping of associated CMAs provided in Figure 1-3 and Figure 1-4. A detailed mapping compendium providing this mapping in greater spatial resolution is provided in Appendix A.

1.2.2 Rationale for the CMP Study Area

The overall objects of the CM Act seek to protect and enhance the environmental values and natural processes of the coastal zone as outlined in Section 1.2.1. In alignment with these objectives, the 6 Partner Councils elected during Stage 1 of the CMP to adopt a whole-of-river approach (Water Technology, 2020). As a result, the study area for this CMP extends across the entire Hawkesbury–Nepean River system, including the Brisbane Water Estuary, Pittwater Estuary, Hawkesbury River Estuary, and Broken Bay.

The rationale for adopting a broader, river-wide study area for the CMP is underpinned by the need for a more integrated, strategic, and effective approach to estuary management. This systems-based approach offers several key advantages:

- It supports coordinated and strategic management of the interconnected river system, allowing CMP actions to be aligned with the physical, ecological, and chemical processes that shape estuary health. These natural systems operate across catchment boundaries and are not confined by local government boundaries, making a regional approach essential to effective management.
- It enables more efficient and targeted responses to catchment-scale issues, threats, and risks, such as water pollution, sedimentation, altered flow regimes, and the cumulative impacts of urban development. A system-wide lens allows these pressures to be understood and addressed at the scale at which they actually occur.
- It better reflects First Nations cultural connections to Country, recognising that Aboriginal cultural values and heritage are deeply tied to the river system as a whole - not local government boundaries. This approach supports more meaningful engagement and representation of cultural knowledge across the full extent of the catchment.
- It aligns more effectively with regional planning and governance frameworks, including those led by State government agencies. This allows for better coordination across policies, data, and investment priorities.
- It increases cost-effectiveness through shared investment, collaborative delivery, and reduced duplication of effort. By pooling resources and addressing common issues collectively, councils can achieve greater impact, avoid fragmentation, and reduce the risk of CMP outcomes being limited by individual council budget and resource constraints.

1.2.3 Legal Definition of the CMP Study Area

Whilst a systems-based approach to estuary management is beneficial, there are some legislative considerations that affect the legally defined study area of the CMP. They are:

- Section 12 of the CM Act outlines the purpose of a coastal management program, being 'to set the long-term strategy for the coordinated management of land within the coastal zone with a focus on achieving the objects of this Act'.
- Section 13(2) of the CM Act specifies that, 'a Coastal Management Program may be made in relation to the whole, or any part of the area included within the coastal zone'.

In considering the statutory requirements, there is no provision in the CM Act for land or actions to be included in a CMP, where that land or those actions reside outside the "coastal zone". The coastal zone is legally defined in the CM Act as the envelope extent of the four CMAs mapped in the Resilience and Hazards SEPP (2021) (R&H SEPP) – see Section 1.2.1.

For the HNRS estuaries, it is acknowledged that the defined coastal zone is generally only a small portion of the catchment – around 2%. However, as is required under the CM Act, the focus of a CMP must be directed to activities contained within the defined coastal zone. For development of this CMP, the implications of this are:

- The study area of the CMP must be comprised only of the legally defined coastal zone as depicted in Figure 1-2.
- Any actions that are to be included in the certified CMP document must be located within the legally defined coastal zone.
- Whilst the CMP should describe areas outside the coastal zone (i.e., the broader catchment areas) and the effects these areas may have on land within the coastal zone, these areas should be distinguished from the area to which a CMP applies.
- Broader catchment-based actions that are located outside of the coastal zone are to be clearly identified and distinguished from those actions that are to be delivered as part of the certified CMP.

Subsequently, this CMP has also included a catchment-based companion section which identifies actions located outside the legally defined coastal zone. While clearly marked as non-certifiable under the CM Act, these actions have been included within the CMP document to maintain integration with coastal zone actions and to support holistic estuary and catchment management. This approach aligns with the NSW Government's guidance on *Coastal Management Programs and Integration with Catchment Management* (DPE, 2022).

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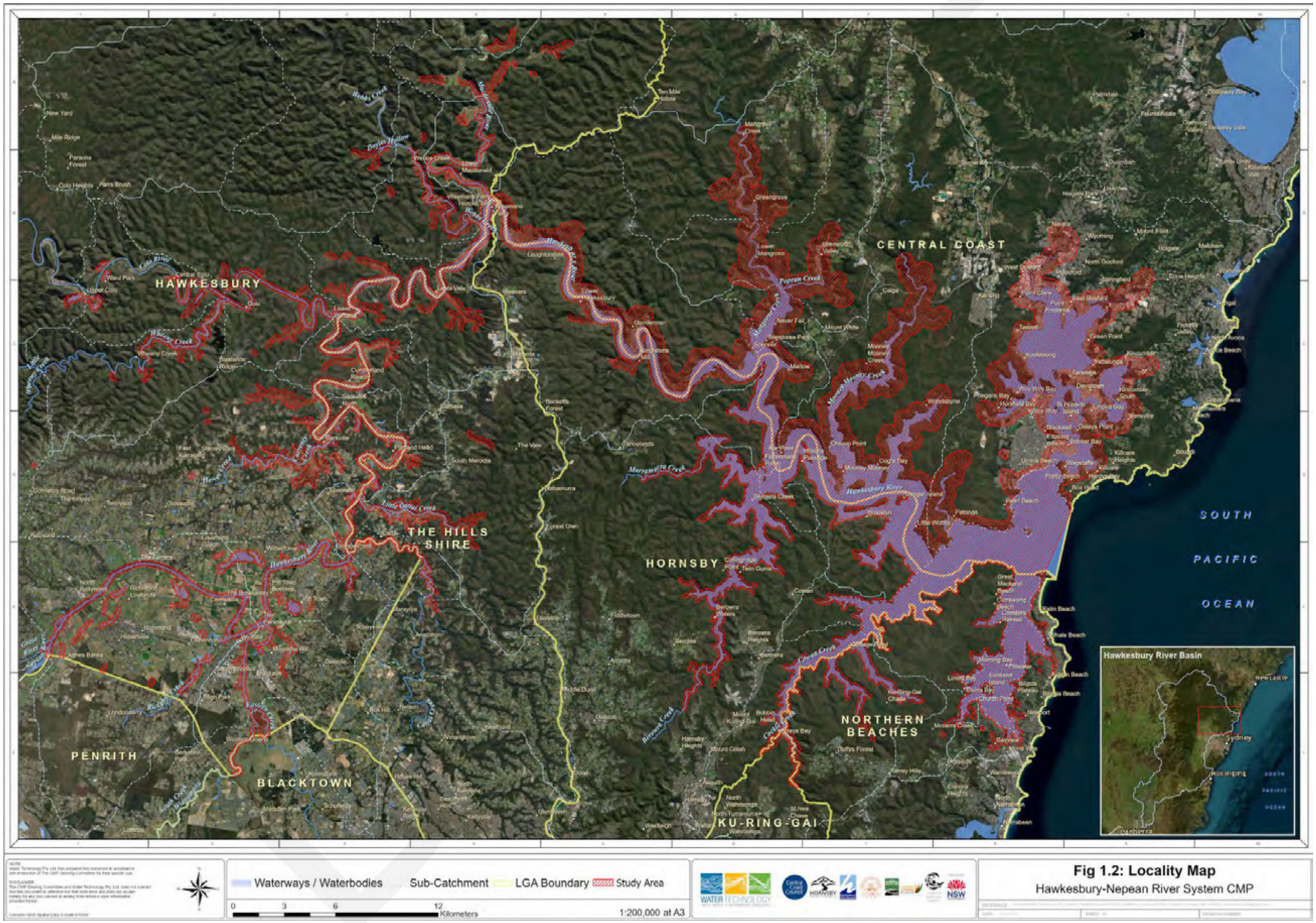


Fig 1.2: Locality Map
Hawkesbury-Nepean River System CMP

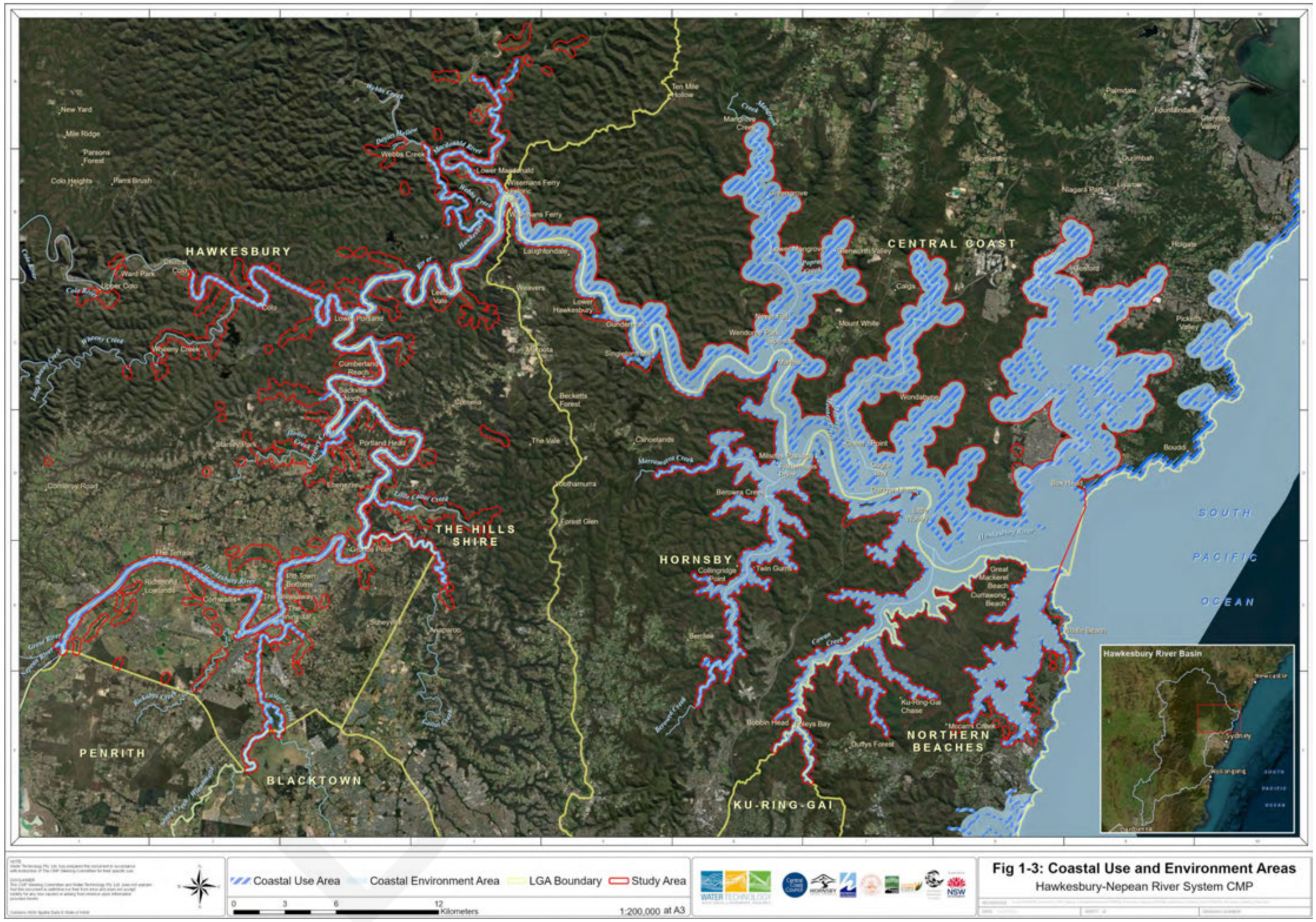


Fig 1-3: Coastal Use and Environment Areas
Hawkesbury-Nepean River System CMP

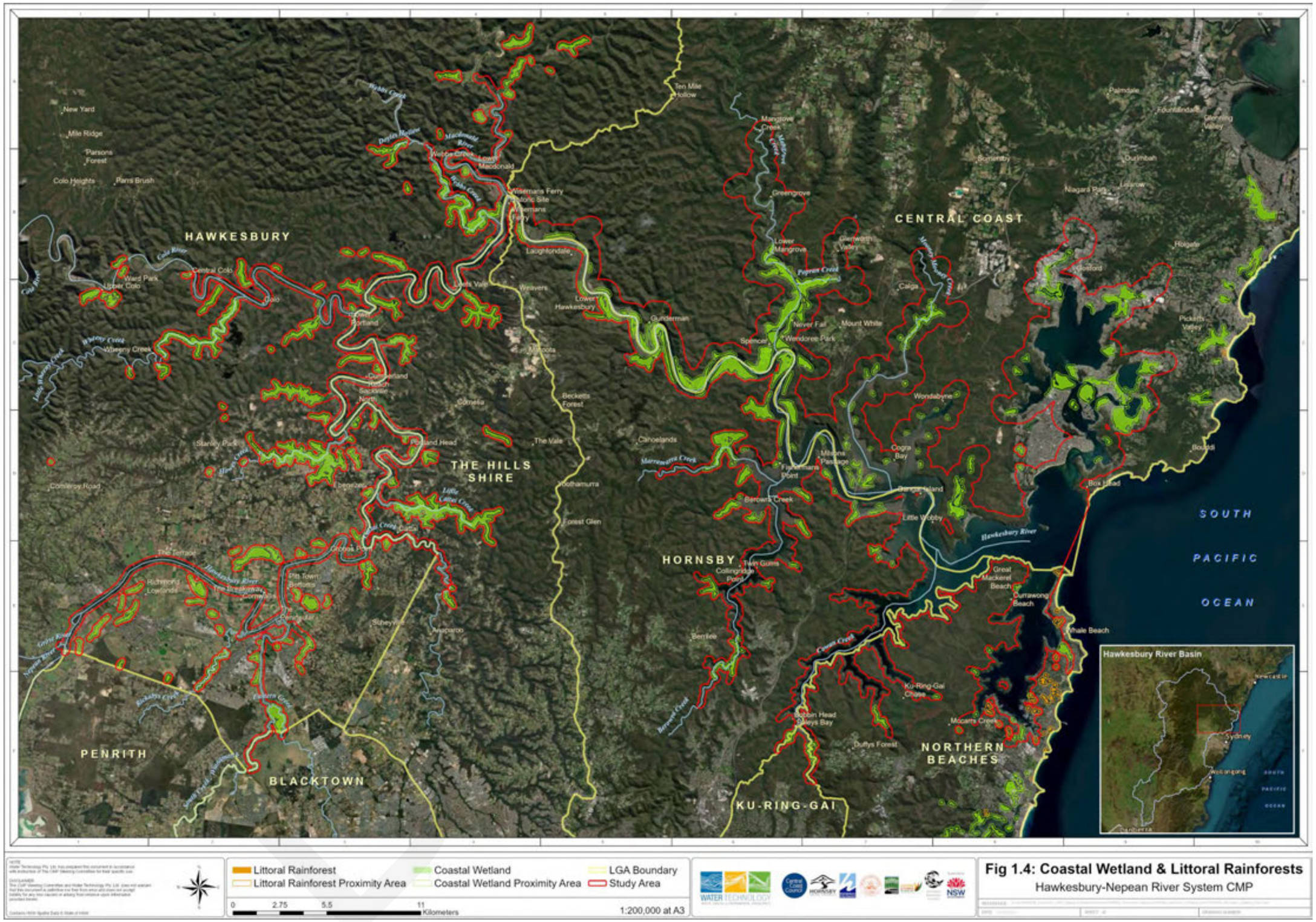


Fig 1.4: Coastal Wetland & Littoral Rainforests
Hawkesbury-Nepean River System CMP

1.3 Vision, Purpose, and Objectives

The purpose of the CMP is to create a comprehensive framework for the future management of the HNRS. This framework aims to align with the principles of ecologically sustainable development and promote the well-being of the community in social, cultural, and economic aspects.

During Stage 1 of the CMP (Water Technology, 2020), the Vision, Purpose, and Management Objectives for the project were developed. The Vision and Purpose play a crucial role in the CMP hierarchy, as they provide the framework for defining strategic objectives. These strategic objectives, in turn, enable the establishment of specific objectives. The relationship between the Vision, Purpose, and Specific Objectives is illustrated in Figure 1-5.

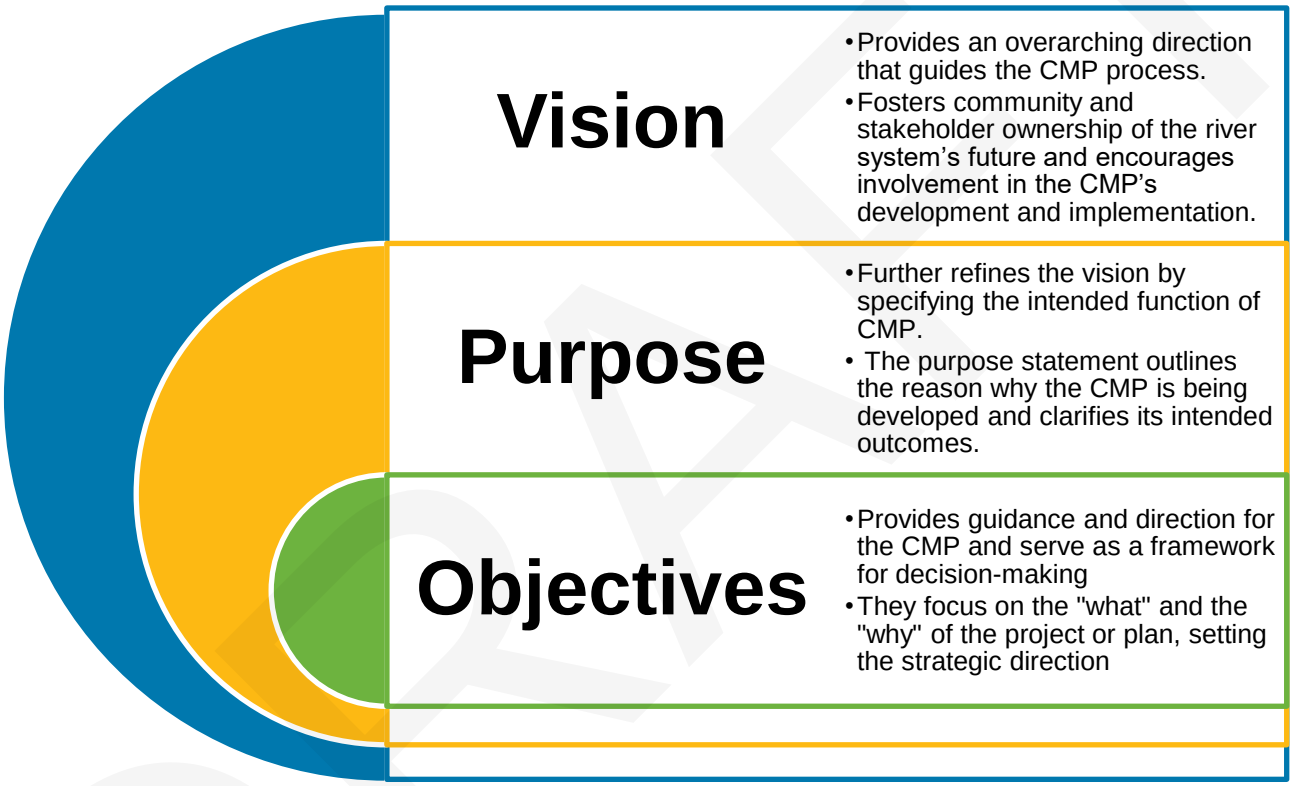


Figure 1-5 The Vision, Purpose, and Objectives of the CMP

1.3.1 Vision

The vision statement derived in Stage 1 of the CMP (Water Technology, 2020) provides an overarching direction that guides the CMP process:

> *To preserve and enhance the environmental, social and economic values of the Hawkesbury-Nepean River system and its catchment for current and future generations, and ensure its status as one of Australia's premier river systems.*

1.3.2 Purpose

The purpose statement further refines the vision by specifying the intended function or role of CMP:

The purpose of the CMP is to set the long-term strategy for the coordinated management of the Hawkesbury-Nepean River system, encompassing the estuaries of Broken Bay, Pittwater, the Hawkesbury River and Brisbane Water. The CMP seeks to achieve the objectives of the CM Act through a program to identify coastal management issues, pressures, risks and opportunities - and the actions required to address these issues in a strategic and integrated way.

The purpose of the CMP is to set the long-term strategy for the coordinated management of the HNRS.

1.3.3 Objectives

The strategic management objectives determined during Stage 1 of the CMP are summarised in Table 1-1. It should be noted that the objectives of this CMP have been designed with consider of, and are intended to be complimentary to, the NSW Water Quality Objectives (see Section 2.6).

Table 1-1 Objectives of the CMP

Objectives
a) to protect and enhance the integrity and resilience of the environmental values of the Hawkesbury River, Brisbane Water and Pittwater estuaries, including healthy, diverse aquatic ecosystems.
b) to maintain and protect water quality across the system and its impacts on environmental, social and economic values - including ecological condition, recreational amenity and agricultural uses;
c) to maintain and preserve the unique scenic amenity and natural character of the Hawkesbury River, Brisbane Water and Pittwater estuaries;
d) to support the social and cultural values of the system and maintain public access and recreational amenity;
e) to maintain the health, safety and wellbeing of those using the coastal zone (both directly and indirectly) - and to protect the health of human consumers of aquatic foods;
f) to acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the Hawkesbury and to protect local indigenous cultural heritage;
g) to recognise the coastal zone as a vital economic zone and to support sustainable coastal economies such as recreational and commercial fishing, aquaculture and tourism;
h) to facilitate appropriate management of the coastal zone through ecologically sustainable development, and the promotion of sustainable land use planning and decision-making that is consistent with regional and local strategic plans;

Objectives
i) to mitigate current and future risks from population growth, urbanisation and coastal hazards (erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment flooding);
j) to ensure co-ordination between relevant government and public authorities relating to the river system - and to facilitate the proper integration of management activities across all levels of government;
k) to maintain meaningful engagement with the community, and to support public participation in coastal management and planning, and to create greater public awareness, education and understanding of coastal processes and management actions;
l) to encourage and facilitate research and monitoring – and to maintain the scientific and educational values of the river system;
m) to support the objects of the *Marine Estate Management Act 2014*; and
n) to align with the NSW Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions.

1.4 The NSW Coastal Management Framework

1.4.1 The Framework

The NSW coast provides a multitude of values and uses for the community. However, the coastal zone is under increasing pressure from a growing population, urbanisation, natural hazards, and climate change (OEH, 2018b). Planning for coastal communities must carefully balance the need to provide jobs, housing, community facilities and transport for a changing population, while maintaining the unique qualities and managing risks associated with development along the State's coastlines (DPIE, 2019).

Sustainable management of the coastal zone often involves local councils, their communities and public authorities balancing a diverse range of challenges and opportunities. The context is one of rapid environmental, social, and economic change along with dynamic coastal processes affecting the open coast, estuaries and coastal lakes (OEH, 2018b).

In order to plan for development, protect environmental assets and manage coastal hazards across the state, the NSW Government has implemented the *NSW Coastal Management Framework*, which includes legislation and planning policy, and aims to provide an integrated framework for coastal management across the state.

Key components of the framework include:

- ***Coastal Management Act 2016* (CM Act):** An act that provides for the integrated management of the coastal environment of NSW, consistent with the principles of ecologically sustainable development, for the social, cultural, and economic wellbeing of the people of the state.
- ***Marine Estate Management Act 2014* (MEM Act):** An act that provides for the management of the marine estate of NSW in a manner that promotes a biologically diverse, healthy and productive marine estate and which facilitates the economic cultural, social and recreational use of the marine estate, scientific research, education and management of marine parks.
- ***The NSW Environmental Planning and Assessment Act 1979* (EP&A Act)**: An act that governs land use planning and development in NSW, focusing on sustainable development, environmental protection, community participation, and compliance measures.
- **State Environmental Planning Policy (Resilience and Hazards) 2021 (R&H SEPP):** One of the key environmental planning instruments for land use planning in the coastal zone. It gives effect to the

objectives of the CM Act 2016 and delivers the statutory management objectives of the act by specifying how development proposals are to be assessed if they fall within the coastal zone.

- **Coastal Management Programs (CMPs):** A 5 stage coastal management process intended to set the long-term strategy for the coordinated management of the coastal zone for a given region.
- **The NSW Coastal Management Manual (The CM Manual):** A manual that sets forth mandatory requirements and provides guidance to coastal councils in connection with the preparation, development, adoption, implementation, amendment, and review of CMPs.
- **The NSW Coastal Council:** It is responsible for providing independent and expert advice on matters relating to the Minister's functions under the CM Act, and in relation to the development and implementation of CMPs by local councils.
- **The NSW Coastal and Estuary Grants Program:** It provides technical and financial support to local government to help manage the coastal zone.

A schematic of the NSW Coastal Management Framework (and linkages to the relevant legislation and policies for the management of the NSW marine estate) is provided in Figure 1-6.



Figure 1-6 The NSW coastal management and marine estate management framework

1.4.2 Coastal Management Programs

The purpose of a CMP is to establish a long-term, strategic approach to managing the coastal zone - balancing environmental, social, cultural, and economic values. A CMP considers a broad range of coastal management issues and actions and sets the framework for coordinated management of a defined coastal area. It is intended to achieve the objects and objectives of the CM Act at a local level. Appendix D provides a summary of how the actions in this CMP align with the objects and objectives of the CM Act.

CMPs provide a structured opportunity for councils, public authorities, and local communities to clearly identify and balance competing interests, values, and priorities within the coastal zone (OEH, 2018a).

CMPs are prepared through a five-stage risk-based management process, as outlined in the CM Manual and depicted in Figure 1-7. This process supports councils and their communities to identify, assess, and manage risks to the environmental, social, and economic values of their coastal zone.

- **Stage 1 – Scoping Study**: Establishes the vision, objectives, study area, key stakeholders, and priority coastal management issues. It also identifies knowledge gaps and outlines the intended process for developing the CMP (OEH, 2018b).
- **Stage 2 – Technical Studies**: Involves the collection and analysis of data to understand coastal processes, hazards, vulnerabilities, and current management responses. It also assesses risks to coastal values (OEH, 2018c).
- **Stage 3 – Options Evaluation**: Identifies and evaluates potential management actions, using tools such as cost-benefit analysis, feasibility assessments, and community/ stakeholder input to identify preferred options (OEH, 2018d).
- **Stage 4 – CMP Preparation:** Prepares the full Coastal Management Program, including a clear and costed implementation program that outlines what actions will be taken, who is responsible, when they will be delivered, how much they will cost, and how they may be funded. This draft CMP is publicly exhibited, revised in response to submissions, and submitted to the Minister for certification under the CM Act (OEH, 2018e).

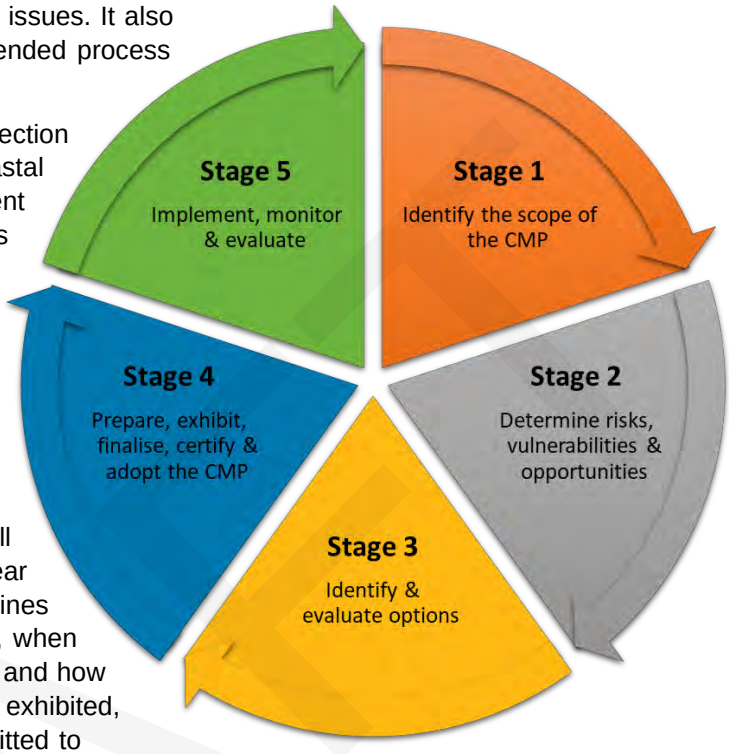


Figure 1-7 The CMP process

- **Stage 5 – Implementation:** Following certification, the CMP is implemented through council's planning and operational frameworks. Progress is monitored and reported, and the CMP is reviewed and updated as necessary to remain current and effective (OEH, 2018f).

The CM Manual sets forth mandatory requirements for CMPs, and provides guidance regarding their preparation, development, adoption, implementation, and review (OEH, 2018a). It also helps councils evaluate and select practical, locally tailored management actions. These actions are typically integrated into land use planning instruments and councils' broader Integrated Planning and Reporting (IP&R) Framework, established under the *Local Government Act 1993* (LG Act).

Under the NSW Coastal Management Framework, councils *may* prepare CMPs for their coastline, estuaries, or coastal wetlands - but *must* do so if directed by the Minister. CMPs are a key mechanism to ensure that the coast is managed in a coordinated, evidence-based, and forward-looking way.

1.4.3 Previous Coastal Zone and Estuary Management Plans

Historically, the approach to coastal zone management across the HNRS has been fragmented, and typically undertaken at a sub-estuary geographic scale. Subsequently, in recent decades there have been a range of Coastal Zone Management Plans and Estuary Management Plans that have applied to the various reaches of the HNRS, the most contemporary of which include:

- The Upper Hawkesbury Coastal Zone Management Plan (BMT WBM, 2014a)
- The Estuary Management Plan for the Lower Hawkesbury River (BMT WBM, 2008)
- The Brisbane Water Estuary Coastal Zone Management Plan (Cardno, 2012)
- The Pittwater Estuary Management Plan (BMT WBM, 2010)

- The Gosford Beaches Coastal Zone Management Plan (WorleyParsons, 2017)
- The Pearl Beach Lagoon Coastal Zone Management Plan (BMT WBM, 2014b)

This CMP introduces a coordinated, system-wide approach under the CM Act, superseding all previous plans listed above. It provides, for the first time, a unified framework for managing the entire Hawkesbury–Nepean River System, ensuring that actions are strategically aligned, resources are used efficiently, and management outcomes deliver benefits across the whole system. By building on the strengths of past plans while addressing gaps and overlaps, the CMP sets a clear and collaborative path forward to protect and enhance the river system for current and future generations.

1.5 Supporting Documentation

This CMP has been developed through a staged and evidence-based process. Each stage (Figure 1-7) has been documented through a suite of technical reports that provide the foundation for the analysis, decision-making, and recommendations presented in this CMP. In addition to these supporting documents, a range of relevant policies, guidelines, and best-practice manuals have been used to guide the assessment and ensure alignment with legislative and strategic planning requirements at the local, state, and national levels.

1.5.1 CMP Documentation

Table 1-2 outlines the key supporting technical documents produced as part of the CMP process. These reports form the technical evidence base for the CMP and are referenced throughout this document.

Table 1-2 Supporting documents for this CMP

CMP Stage	Technical Report	Reference
Stage 1	The Hawkesbury Nepean River System Coastal Management Program – Stage 1 Scoping Study	(Water Technology, 2020)
Stage 2	The Hawkesbury-Nepean River System Physical and Ecological Processes Abridgement Report	(Alluvium, 2022a).
	The Hawkesbury-Nepean River System Community Values and Uses Report	(Alluvium and Mosaic Insights, 2023).
	The Hawkesbury-Nepean River System Estuary Bank Erosion Assessment and Options Report	(Alluvium, 2022b)
	The Hawkesbury River Estuary Coastal Inundation Study	(Rhelm and Baird, 2023)
	Pittwater Beach Erosion and Shoreline Recession Assessment	(WRL, 2023)
Stage 3	The Hawkesbury Nepean River System Coastal Management Program: Stage 3 Strategic Direction Summary	(Water Technology, 2023a)
	The Hawkesbury Nepean River System Coastal Management Program: Stage 3 Summary Report	(Water Technology, 2025)

1.5.2 Relevant References, Guidelines, and Manuals

This report and its analysis have been undertaken in accordance with, and with a clear understanding of, the key requirements and guidance outlined in the following documents:

- Supporting documentation in the *NSW Coastal Management Toolkit*:
  - NSW Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions (OEH, 2017).

- NSW Water Quality Objectives (MEMA, 2025)
- NSW Marine Estate Management Strategy 2018 – 2028 (MEMA, 2018)
- NSW Marine Estate Threat and Risk Assessment (TARA) (BMT WBM, 2017)
- NSW Estuary Health Risk Dataset (DPIE, 2019b)
- NSW Coastal Design Guidelines (DPE, 2023a)
- NSW Coastal Crown Land Guidelines (DPE, 2023b)
- NSW Guide to Cost-Benefit Analysis (NSW Treasury, 2023)
- NSW Guidelines for using Cost-Benefit Analysis to Assess Coastal Management Projects (DPE, 2020).

- Industry standards and guidelines applied in coastal management:
  - Guidelines National Climate Resilience and Adaptation Strategy 2021–2025 (Commonwealth of Australia, 2021)
  - Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000)
  - The Engineers Australia National Committee on Coastal and Ocean Engineering - Climate Change Adaptation Guidelines in Coastal Management and Planning (NCCOE, 2012)
  - Guidelines for responding to the effects of climate change in coastal and ocean engineering (NCCOE, 2017)
  - ISO 31000:2018, Risk management – Principles and guidelines, provides principles, framework and a process for managing risk (ISO, 2018)
  - ISO 14090:2019 Adaptation to climate change - Principles, requirements and guidelines (ISO , 2019)
  - The Intergovernmental Panel on Climate Change 6th Assessment Report (IPCC, 2023).

Together, these documents and guidelines provide a strong technical foundation for the CMP and align it with best-practice standards across all levels of planning and policy.

1.6 Maps

This CMP incorporates a comprehensive suite of maps to support understanding, decision-making, and on-ground implementation. The mapping covers both estuary-scale and local-scale features, capturing key geographical, environmental, and legislative information. It also depicts the representative locations of proposed CMP management actions to assist in planning and prioritisation. Together, these maps provide a spatial framework for interpreting the CMP's technical assessments, legislative context, and recommended actions. A summary of all maps included in this CMP is provided in Table 1-3.

Table 1-3 Schedule of maps in this CMP

Content	Description	Figure(s)
Estuary-scale mapping: Key geographical and legislative features	The legally defined CMP study area	Figure 1-2
	R&H SEPP Coastal Use and Coastal Environment Area mapping	Figure 1-3
	R&H SEPP Coastal Wetland and Littoral Rainforest mapping	Figure 1-4
	Coastal sediment compartment mapping	Figure 2-20

Content	Description	Figure(s)
	LGA boundaries across the HNRS catchment	Figure 2-35
Local scale mapping: Key geographical and legislative features and land tenure	Mapping compendium depicting: ▪ Legally defined CMP study Area ▪ R&H SEPP Coastal Management Areas ▪ Geographic features and place names ▪ Land Tenure, including: – Council Reserve – Crown Land Reserve – NPWS Estate	Appendix A
CMP Management Actions	Maps containing the representative locations of CMP management actions.	Appendix B

1.7 Coastal Zone Emergency Action Subplan

Section 15(1)(e) of the CM Act requires that a Coastal Zone Emergency Action Subplan (CZEAS) be included in the CMP where:

- The study area contains land within a certified Coastal Vulnerability Area (CVA), and
- Beach erosion, coastal inundation or cliff and slope instability is occurring on that land due to storm activity or an extreme or irregular event.

The CM Act specifies emergency management requirements for these hazards. In particular, Section 15(3) of the Act defines a CZEAS as:

> *"A **coastal zone emergency action subplan** is a plan that outlines the roles and responsibilities of all public authorities (including the local council) in response to emergencies immediately preceding or during periods of **beach erosion**, **coastal inundation** or **cliff instability**, where the beach erosion, coastal inundation or cliff instability occurs through storm activity or an extreme or irregular event."*

While no CVA has been formally prepared for the HNRS study area at the time of certification, it is recognised that the HNRS coastal zone is subject to the coastal hazards of beach erosion and coastal inundation. Consequently, 3 CZEAS documents have been prepared in line with the mandatory requirements of the CM Act and accompanying CM Manual (OEH, 2018a).

The CZEAS documents cover the locations and hazards summarised in Table 1-4 and are provided as appendices to this CMP.

Table 1-4 CZEASs accompanying this CMP

Area of Coverage	Coastal Hazards	Location
The Beaches of Broken Bay	▪ Beach erosion ▪ Coastal inundation	Appendix E
Pittwater	▪ Beach erosion ▪ Coastal inundation	Appendix F
Lower Hawkesbury River	▪ Coastal inundation	Appendix G

Proactive planning is critical to managing the risks associated with storm-related coastal hazards. The CZEAS framework provided herein provides a clear, coordinated approach for responding to emergencies such as

beach erosion, and coastal inundation. By outlining the roles and responsibilities of councils and other public authorities, the CZEAS helps deliver timely, effective, and well-integrated emergency responses that support broader coastal management objectives.

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2 THE HAWKESBURY-NEPEAN RIVER SYSTEM

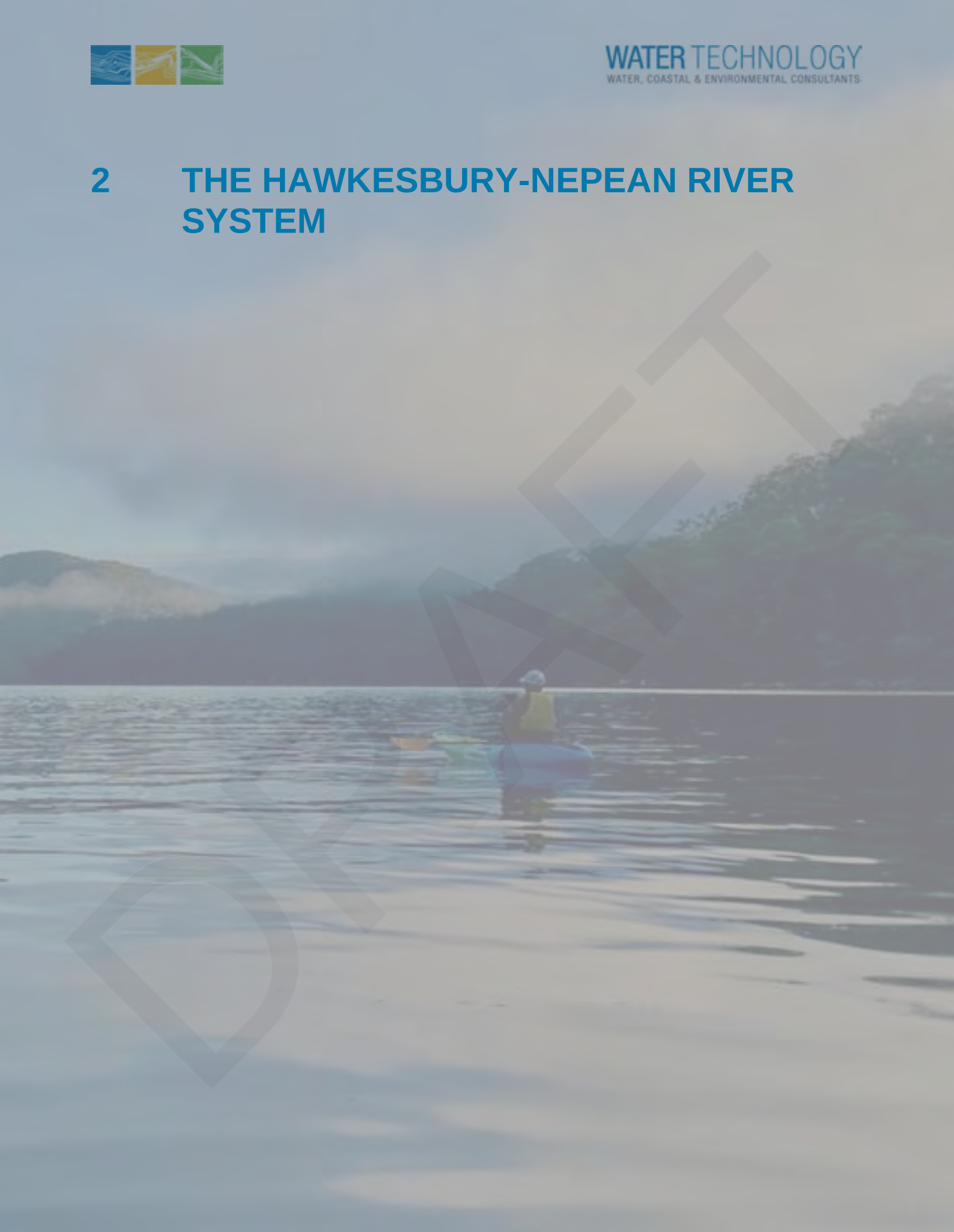


Image Source: Tony Field

2.1 An Introduction to the Hawkesbury–Nepean River System

2.1.1 Overview

The Hawkesbury-Nepean is one of the most important river systems in NSW and is the largest estuary system in the Greater Sydney Metropolitan region. The system occupies a unique location and bounds Sydney to the north and the west and is situated to the immediate south of a vibrant and growing Central Coast region. The tidal waterways of the HNRS are comprised of 3 predominant waterways that connect to the Tasman Sea via Broken Bay (see Figure 1-2 Locality Map):

- The Hawkesbury River Estuary
- The Brisbane Water Estuary
- The Pittwater Estuary.

Key estuary classification details for each of these waterways are provided in Table 2-1. A brief summary of the HNRS follows.

Table 2-1 HNRS snapshot

Category and Data Source	Parameter	Brisbane Water	Hawkesbury River	Pittwater
Classification (Roy, et al., 2001)	Estuary Group	Wave dominated	Tide dominated	Tide dominated
	Estuary Type	Barrier estuary	Drowned valley estuary	Drowned valley estuary
	Evolution Stage	Youthful	Semi-mature	Youthful
Waterbody Parameters (Roper, et al., 2011)	Waterbody Area (km^2)	28.3	114.5	18.4
	Estuary Volume (ML)	84,200	1,541,400	181,800
	Average Depth (m)	3.1	13.8	9.9
	Foreshore Perimeter (km)	125	810	56
Catchment Land Usage (Roper, et al., 2011)	Catchment Area (km^2)	170	21,400	77
	Undisturbed Forest (%)	45%	71%	84%
	Urban (%)	46%	2%	14%
	Agricultural (%)	5%	25%	0%
	Other (%)	3%	2%	2%
	Population /km^2	644	40	507
Catchment Hydrology (Roper, et al., 2011)	Annual Rainfall (mm/yr)	1,080	760	1,070
	Annual Surface Flow (ML/yr)	24,400	1,468,300	4,100
	Annual Base Flow (ML/yr)	16,500	951,800	2,200
	Total Annual Flow (ML/yr)	40,900	2,420,100	6,400
	Licenced Water Extraction (ML/yr)	120	768,000	122
	Seagrass (ha)	610	70	250

Category and Data Source	Parameter	Brisbane Water	Hawkesbury River	Pittwater
Estuarine Ecology (DPIRD, 2025b)	Mangrove (ha)	240	1,050	18
	Saltmarsh (ha)	60	250	2
	Total Coast Wetlands (ha)	910	1,370	270
	Aquaculture (ha)	170	420	0
Recreational Infrastructure (Rolyat Services, 2013)	Boat Ramps	23	10	3
	Public Wharfs	43	21	29
	Marinas	5	13	8
	Estimated wet berths	140	1,060	1,090

2.1.2 Estuary Descriptions

2.1.2.1 The Hawksbury River

The HNRS is the longest coastal catchment in NSW, extending over 470 km from the southern highlands near Goulburn to its mouth at Broken Bay, north of Sydney (Figure 1-2). The river drains a catchment area of approximately 21,400 km², which is predominantly forested (~70%), with around 25% used for agriculture and only 5% urbanised (HNCMA, 2013; Roper, et al., 2011).

The river system receives inflows from key tributaries including the Nepean River to the south and the Grose River to the west. The Warragamba Dam, located on the Warragamba River (a major tributary of the Nepean), is a key hydrological control structure within the system – see Figure 2-1.



Figure 2-1 Warragamba Dam (source: Australian National Trust)

The estuarine portion of the river is generally considered to begin at the confluence of the Nepean and Grose Rivers at Yarramundi, marking the upstream tidal limit (Boon, 2017; Alluvium, 2022a).

From here, the Hawkesbury River flows in a generally northerly direction, with a relatively sandy substrate, and passes through the towns of Richmond and Windsor (see Figure 2-3) - the largest settlements on the river. In this reach, the river exhibits broad meanders and wide floodplains, with associated lagoons and wetlands such as Pitt Town Lagoon and Long Neck Lagoon (Alluvium, 2022a).

At Windsor, the river is joined by South Creek, which already carries significant urban runoff from Sydney's western suburbs, and is projected to receive substantial additional urban development. From Windsor to Sackville, the river is wide and deep, with a cleared and cultivated foreshore (Hawkesbury City Council, 2025).



Figure 2-2 The Hawkesbury River at North Richmond (source: Irene Pridham)



Figure 2-3 The Hawkesbury River at Pitt Town (source: Steve Sass)

From Sackville to Spencer (Figure 2-4), the river is characterised by steep sandstone cliffs, largely undeveloped foreshore reserves, and a series of low-density floodplain settlements (Hawkesbury City Council, 2025). This stretch includes Lower Portland, where the river is joined by the Colo River. It then meanders in a generally north-easterly direction until reaching a distinct change in course at Wisemans Ferry, where it is

joined by the Macdonald River. This section is a popular destination for recreational boating, particularly waterskiing and wakeboarding (Alluvium and Mosaic Insights, 2023).



Figure 2-4 Top: The Hawkesbury River at Wisemans Ferry (source Rob van Elven)

Downstream of Wisemans Ferry, the river flows southeast, flanked by the forested foreshores of Dharug and Marramarra National Parks. The Lower Hawkesbury River is notable for its extensive natural vegetation and minimal foreshore development (Alluvium, 2022a).

At the small riverside settlement of Spencer (Figure 2-5), the river receives Mangrove Creek from the north. Around 10 km downstream, it is further joined by Marramarra Creek and Berowra Creek (see Figure 2-7). In the Mooney Mooney–Brooklyn region (see Figure 2-6), the river flows past a series of small settlements, including Bar Point, Milsons Passage, Dangar Island, and Little Wobby. This part of the river is intersected by key transport corridors linking Sydney to the Central Coast, including the M1 Pacific Motorway and the Sydney–[redacted] rail line. From here, the river flows in a generally northerly and then easterly direction to Broken Bay.



Figure 2-5 The Hawkesbury River at Spencer (Left source: Screen NSW, Right source: Susan Oleary)



Figure 2-6 Brooklyn and Sandbrook Inlet (source: Alex Proimos)

Tributaries (listed from upstream down) of the Hawkesbury River include:

- Grose River
- Rickaby's Creek
- South Creek
- Cattai Creek
- Little Cattai Creek
- Colo River
- Webb's Creek
- MacDonald River
- Mangrove Creek
- Marramarra Creek
- Berowra Creek (see Figure 2-7)
- Mooney Mooney Creek
- Mullet Creek
- Cowan Creek

There are 21 islands within the Hawkesbury River estuary, varying in size and ecological significance. Many of these islands provide important habitat for native flora and fauna and contribute to the overall biodiversity of the estuary. Several are afforded some form of ecological protection status.

The six largest islands, listed in downstream order, are:

- Bar Island
- Milson Island
- Peat Island
- Spectacle Island
- Long Island
- Dangar Island.



Figure 2-7 Berowra Creek at Collingridge Point (source: Nathan Tilbury)

2.1.2.2 Brisbane Water

The Brisbane Water estuary is the most downstream northern arm of the Hawkesbury-Nepean River system. It is classified as a wave-dominated barrier estuary with an open entrance (Roy, et al., 2001) and is located on the northern side of Broken Bay. The estuary extends from Gosford in the north to its entrance at Broken Bay, covering approximately 27 km² of largely shallow open water interspersed with small embayments and inlets (Cardno Lawson & Treloar , 2008). It has a catchment area of nearly 15,000 hectares and contains more than 90 km of foreshore habitat (Astles, West, & Creese, 2010).

Land use within the catchment is mixed, with around 50% comprising undeveloped bushland and national park areas, including Brisbane Water National Park. The estuary also contains areas of ecological importance, including extensive seagrass beds, saltmarsh, mangroves, and multiple State Significant Wetlands that provide critical habitat for birdlife and aquatic species.

The remaining catchment supports a number of urban centres such as Gosford, Erina, Kincumber, Saratoga, Davistown, Empire Bay, Woy Woy, Ettalong, and Umina. Many of these townships are situated directly on the estuarine foreshore. As a result, the estuary features a high proportion of privately owned waterfront properties and modified foreshores, including seawalls, jetties, and boat ramps. These urban edges contrast with more natural stretches of foreshore found within national park and wetland areas, highlighting the diversity of land use and shoreline condition across the system.

There are 6 major zones within the Brisbane Water estuary, each representing a distinct geomorphic or hydrological reach of the system:

- The Entrance Reach – extending from the estuary mouth at Half Tide Rocks to The Rip (see Figure 2-8).
- The Central Reach – spanning from The Rip to Pelican Island and incorporating Riley's Island and St Hubert's Island (see Figure 2-9).
- The Woy Woy Reach – encompassing Woy Woy Bay and Woy Woy Inlet.
- Kincumber Broadwater – covering the shallow estuarine waters of Kincumber and Cockle bays.
- The Broadwater – the central estuarine basin extending from Pelican Island upstream to Gosford.
- Fagans Bay – a discrete embayment located adjacent to the Gosford urban area.



Figure 2-8 The Brisbane Water entrance reach (source: DCCEEW)



Figure 2-9 The Brisbane Water central reach (source: DCCEEW), including Pelican Island wetlands

The system receives inflows from several small tributaries, including Narara Creek (entering near Gosford), Erina Creek, Kincumber Creek, Woy Woy Creek, Coorumbine Creek, Ettalong Creek. While these waterways are smaller than the major tributaries of the main Hawkesbury River, they play an important role in shaping local hydrology, water quality, and estuarine ecology of Brisbane Water.

There are 3 large islands within Brisbane Water, along with numerous smaller islets. St Hubert's Island is a developed canal estate constructed in the 1970s, connected to the mainland by a bridge at Daley's Point. In contrast, Pelican Island and Riley's Island remain undeveloped and serve as nature reserves, supporting significant estuarine wetland habitats that contribute to the overall biodiversity and ecological function of the estuary.

2.1.2.3 Pittwater

The Pittwater estuary is located on the southern side of Broken Bay, near the entrance to the Tasman Sea (see Figure 2-10). It is classified as a tide-dominated drowned river valley estuary (Roy, et al., 2001), extending from Newport and Church Point in the south to its mouth at Broken Bay.



Figure 2-10 The Pittwater Estuary (source: DCCEEW)

The estuary covers a water surface area of approximately 17 km² and is bounded by around 52 km of foreshore (Lawson & Treloar, 2003). The system is influenced by complex physical processes governed by its large and open entrance, which allows for significant exchange with ocean waters. The tidal range across Pittwater is generally consistent with that of the open coast (Lawson & Treloar, 2003).

The Pittwater catchment spans approximately 6,000 hectares (60 km²), extending from Mona Vale and Warriewood in the south, up the eastern ridge of the Barrenjoey Peninsula to Palm Beach, and along the western ridge to West Head.

The eastern and southern areas of the catchment are highly urbanised, including suburbs such as Palm Beach, Clareville, Newport, Bay View, and Church Point. These foreshore contain a high proportion of private waterway frontage and modified shorelines, with residential development extending directly to the water's edge. As a result, much of the estuarine fringe is characterised by seawalls and private jetties (see Figure 2-11 and Figure 2-12).



Figure 2-11 The Pittwater Estuary at Clareville (source: *Ellaslist*)



Figure 2-12 The southern arm of Pittwater, which experiences high levels of recreational boating (source: *Sydney.com*)

In contrast, the western catchment is largely natural and forms part of Ku-ring-gai Chase National Park, which protects significant areas of the Pittwater sub-catchment and supports a range of important estuarine and terrestrial ecosystems. The foreshores of Pittwater are lined with secluded bays, beaches, and headlands, contributing to the estuary's scenic and environmental value. The western shore of Pittwater includes a number of communities such as Great Mackerel (see Figure 2-13), Currawong, Elvina Bay, as well as NPWS campground facilities at the Basin (see Figure 2-14).



Figure 2-13 Pittwater at Great Mackerel Beach (source: *escape.com.au*)



Figure 2-14 Pittwater at The Basin (source: Ronan Herlihy)

At the southern end of the estuary lies Scotland Island, situated between Elvina Bay and Clareville (see Figure 2-15). The island is approximately 900 metres in diameter (or 52.5 hectares in area), accessible only by boat, and is home to a small, permanent residential community. Despite habitation, much of the island remains vegetated with Spotted Gum Forest, classified as an Endangered Ecological Community.

There are several minor tributaries to Pittwater including:

- Careel Creek
- Salt Pan Creek
- Mona Vale Main Drain
- Cahill Creek
- McCarr's Creek
- Salvation Creek

Pittwater plays an important local and regional role, valued for its unique environmental setting, delicate estuarine habitats, and its contribution to both the local economy and community well-being (Northern Beaches Council, 2017). The estuary is a major recreational and cultural asset, with high levels of boating and other recreational use, particularly during the summer peak period (see Figure 2-12).



Figure 2-15 Scotland Island (source: Ronan Herlihy)

2.1.2.4 Broken Bay

The Hawkesbury River, Pittwater, and Brisbane Water estuaries all converge at Broken Bay, which serves as the shared marine outlet linking these systems to the Tasman Sea. Broken Bay is bounded by Box Head to the north and Barrenjoey Head to the south, forming a broad and semi-sheltered marine embayment. It is classified as a semi-mature tide-dominated drowned valley estuary (Roy, et al., 2001) and is strongly influenced by coastal processes.

The western side of Broken Bay contains several highly valued beaches (see Figure 2-17 to Figure 2-18), including:

- Ocean / Umina Beach
- Pearl Beach
- Patonga Beach
- Little Patonga Beach

These beaches are regionally important not only for their scenic and ecological values, but also for their role in supporting local recreation, tourism, and coastal culture. Ocean Beach and Umina Beach in particular serve as primary surf and recreation beaches for the Central Coast community and visitors from the broader Sydney basin. The area is home to 2 surf lifesaving clubs and hosts major community and sporting events throughout the year

In addition to its role as a receiving basin for the region's three major estuaries, Broken Bay contains several smaller coastal estuaries, including Patonga Creek, Pearl Beach Lagoon, and Ettalong Creek, each situated adjacent to local coastal communities.

Located near the centre of Broken Bay is Lion Island, a designated nature reserve of high ecological and conservation value. The island provides critical breeding habitat for migratory seabirds and is one of the few

places in the region known to support a population of Little Penguins. It is notably free of introduced predators such as feral cats and foxes, making it an important site for species protection.





Figure 2-16 Ocean / Umina Beach (source: Central Coast Council)



Figure 2-17 Patonga Beach (source: lovecentralcoast.com)



Figure 2-18 Pearl Beach (source: Chris Drummond)

2.1.3 Functional Zones

In addition to identifying the individual estuarine waterbodies of the HNRS, it is useful to understand the system's functional zones, which describe how physical and ecological processes vary spatially. The Stage 2 Physical and Ecological Processes Abridgement Report (Alluvium, 2022a) delineated these zones across the

HNRS to support a management approach that aligns with the prevailing environmental conditions throughout the system.

These functional zones (see Figure 2-19 and Table 2-2) are primarily defined along the freshwater–saltwater continuum, which is influenced by proximity to freshwater inputs and tidal saline inflows. This continuum operates in 3 dimensions (Alluvium, 2022a).:

1. Longitudinally along the mainstem of the Hawkesbury River

2. Laterally up into its tributaries

3. Vertically through the water column due to stratification between fresh and saline layer

Table 2-2 Functional zones of the Hawkesbury-Nepean River Estuary (Alluvium, 2022a)

Functional zone	Description
Contributing catchments	The land area that drains to the tidal waters of the HNRS is inherently connected to the functions, processes and health of the estuaries and coastal zone. Land uses determine the characteristics of the catchment and influence physical and ecological processes.
Freshwater Tidal Pool	The tidally influenced freshwater zone from Yarramundi to Wisemans Ferry. It is characterised by low salinities (though reaching up to 10-12 PSU at Wisemans Ferry), high nutrient and sediment loads, and is at high risk of harmful algal blooms (HABs).
Upper Estuary	The ‘Upper Estuary’ zone of the Hawkesbury extends from Wisemans Ferry to just upstream of Spencer and Mangrove Creek. It is characterised by lower range brackish salinities (10 PSU - 20 PSU, 25 PSU during prolonged drought), tidal resuspension of sediments and benthic sources of nutrients . There are similar ‘Upper Estuary’ functional zones, though less pronounced, in the Hawkesbury tributaries, Brisbane Water and Pittwater.
Middle Estuary	The 'Middle Estuary’ zone of the Hawkesbury extends from Spencer to Brooklyn and has higher salinities (25 PSU and above) due to the stronger influence of marine exchange (Loveless, 2011). Tidal processes are stronger here than in the Upper Estuary, with sediments reworked, or mobilised, by tidal currents in this area. During flood events this area is a significant receiving zone for sediment deposition with substantial nutrient resources in the sediment.
Lower Estuary	The marine-dominated zone including Broken Bay, Pittwater, Cowan Creek and Brisbane Water, where salinities are high and water quality generally good due to strong ocean exchange.

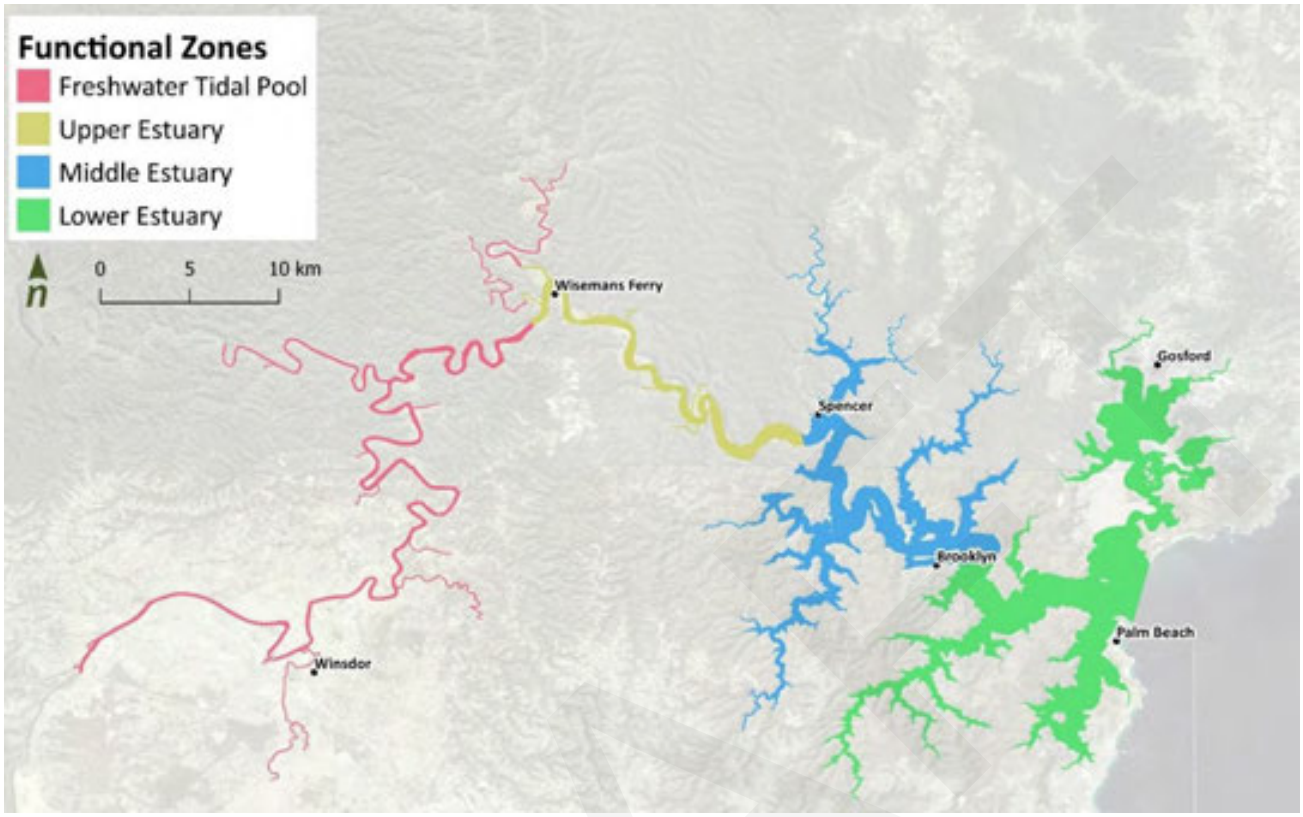


Figure 2-19 The Functional Zones of the HNRS (Alluvium, 2022a)

2.1.4 Sediment Compartment

The Hawkesbury River Estuary is located within the Sydney Primary sediment compartment (Geoscience Australia, 2021). In addition to these primary compartments, Thom et al (2018) also identified secondary compartments that form the basis of Part 1 of Schedule 1 of the CM Act. Of these, the CMP study area lies wholly within the wider *Broken Bay Coastal Sediment Compartment*, which extends from Third Point to Barrenjoey Head. A map of these compartments is provided in Figure 2-20. The following is noted with regards to the sediment compartment:

- The adjacent sediment compartment to the south *Sydney Northern Beaches Sediment Compartment*, is situated entirely within the Northern Beaches LGA
- The adjacent sediment compartment to the north, the *Central Coast Sediment Compartment*, is situated entirely within the Central Coast LGA.

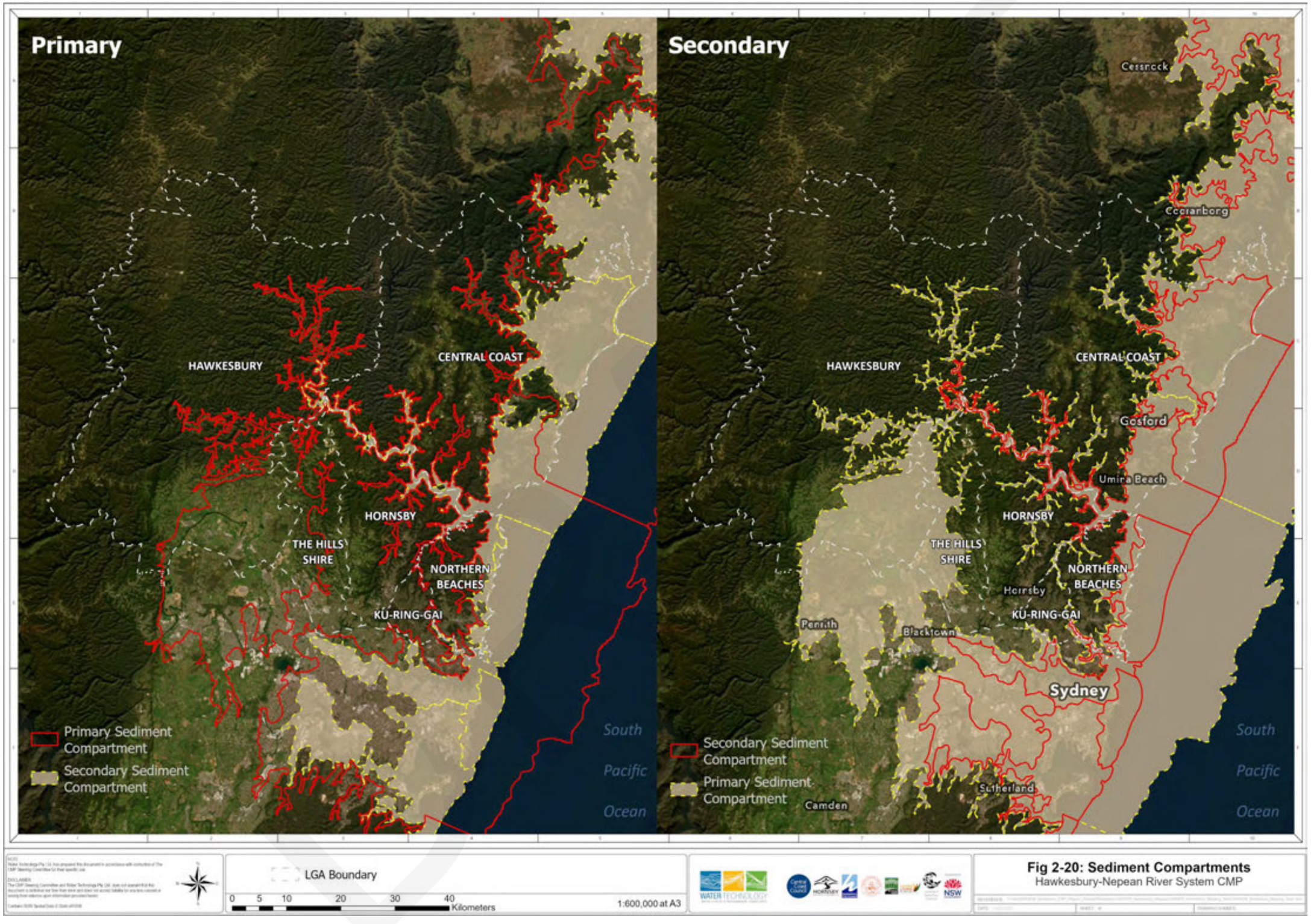


Fig 2-20: Sediment Compartments
Hawkesbury-Nepean River System CMP

2.2 Environmental Significance

The HRNS forms a vital ecological corridor, bridging a diverse range of environments, from freshwater and marine systems to terrestrial and intertidal zones. This complex interface supports a wide array of habitats, including native bushland, freshwater and estuarine wetlands, saltmarshes, mangroves, mudflats, seagrass beds, submerged rock platforms, and estuarine sediments (Water Technology, 2020).

The river system provides critical habitat for numerous terrestrial and aquatic species and supports regionally significant ecological assets, including state-listed wetlands and several National Parks and Nature Reserves (Alluvium, 2022a).

2.2.1 Flora

A broad variety of aquatic and riparian vegetation is distributed across the catchment. Estuary habitat statistics summarised by Roper et al (2011) indicate that the system includes more than 2,500 hectares of coastal wetlands (see Table 2-1).



Figure 2-21 Longneck Lagoon (Source: NPWS)

The freshwater tidal reach of the river, extending from Yarramundi to Wisemans Ferry, features a series of back-swamps and freshwater lagoons scattered across the floodplain. Notable examples include Pitt Town Lagoon and Long Neck Lagoon (Figure 2-21), both of which are listed on the Register of the National Estate (Water Technology, 2020). These lagoon systems are recognised for their high biodiversity value, supporting diverse aquatic plant communities, waterbird populations, and rare wetland-dependent flora.

The transition from freshwater to estuarine wetland systems occurs just downstream of Wisemans Ferry. From this point through the Upper and Middle Estuary functional zones, extensive estuarine wetlands dominate the landscape (Alluvium, 2022a) – see Figure 2-22. Noteworthy areas of saltmarsh and mangrove forest are found between Singletons Mill and Bar Point, particularly around Mangrove Creek and Marramarra Creek, which serve as important nurseries for estuarine fauna.



Figure 2-22 Mangrove forests in the middle estuary (source: Rachel Whiteley)

The Brisbane Water Estuary supports extensive seagrass, mangrove, and saltmarsh habitats. Large, undisturbed mangrove forests occur around Riley's Island and Pelican Island, with additional stands near Erina, Fagans Bay Inlet, and Narara Creek. Saltmarsh communities, often fringed by Estuarine Swamp Forest (dominated by swamp oak with sedge and rush understorey), are common along the major creeks throughout the estuary. Importantly, the waterway also includes over 600 hectares of seagrass meadows, with communities are concentrated in Kincumber, Cockle Bay, Cockle Channel, Riley's Island, and The Broadwater.

Pittwater supports a relatively lower proportion of mangrove forest and saltmarsh communities. This is primarily due to a lack of suitable substrate, reflecting the estuary's steep topography and the limited development of tidal flats along its shoreline. Despite this, the estuary contains over 250 hectares of ecologically significant seagrass beds, which provide critical habitat and support high levels of biodiversity. Particularly important seagrass meadows are located at Palm Beach and Careel Bay, where extensive communities of Strapweed (Posidonia australis) are found – see Figure 2-23. Posidonia australis is listed as an endangered population under the NSW *Fisheries Management Act 1994* due to its sensitivity to physical disturbance and declining distribution across NSW estuaries. Its presence in Pittwater (and Brisbane Water) underscores the ecological importance of the estuary and the need for ongoing protection and management.



Figure 2-23 Posidonia Australis (Source: DPIRD)

Terrestrial vegetation in the contributing catchment plays an important role in the estuary, providing habitats for terrestrial species, underpinning hydrological processes in the catchment, as well as lending to the social amenity of the area. Coastal Swamp Oak Forest is an important terrestrial estuarine ecological community that can be intertidal (though not exclusively) and are important carbon sinks. The large, protected areas of native vegetation throughout the catchment act as natural filters of catchment runoff thus improving water quality in the estuary (Alluvium, 2022a).

2.2.2 Fauna

The HNRS supports an exceptionally diverse range of fauna due to its extensive aquatic, estuarine, and riparian habitats, and the significant proportion of protected lands within the catchment. Over 1,100 native vertebrate species (including more than 160 species of fish), and 1,700 invertebrate species have been recorded in the system (Gerhke & Harris, 1996; WRL, 2003).

Avifauna within the catchment is diverse, though urbanisation has altered bird populations, with smaller bush birds declining and larger, more adaptable species (e.g. Sulphur-crested Cockatoo, Rainbow Lorikeet, Noisy Miner, and Australian White Ibis) becoming more abundant (Recher, 2010). Estuarine zones support iconic waterbirds such as pelicans, cormorants, egrets, eagles (see Figure 2-24) and seagulls, while migratory shorebirds like the Eastern Curlew and Curlew Sandpiper frequent key habitats including Brisbane Water and Lower Hawkesbury mudflats.



Figure 2-24 Wedge-tailed eagle at Brooklyn (source: Ran Fuchs)

The estuarine fish community is highly dependent on access to multiple functional zones of the system. Species exhibit varying migratory patterns, with some (e.g. estuarine residents and marine stragglers) occupying

brackish zones year-round, while others (e.g. migratory species) rely on seasonal or life-stage-based movements between freshwater and marine environments (Lloyd, et al., 2012). Key estuarine and transitional species include Australian Bass, Eels, Dusky Flathead, Yellowfin Bream, and Sand Whiting. Freshwater reaches support species such as Australian Smelt, Gudgeons, and Freshwater Mullet, while the lower estuary is home to important invertebrates like mud crabs, school prawns, and Sydney Rock Oysters (Alluvium, 2022a).

The estuary also hosts populations of marine mammals, including Indo-Pacific bottlenose dolphins, Australian Fur Seals (see Figure 2-26), and seasonal whales such as the Humpback Whale. Reptiles and amphibians such as the Green Turtle and the Green and Golden Bell Frog are also recorded across the catchment.



Figure 2-26 Fur Seals at Barrenjoey Headland (source: Rick Machan)

With extensive urban and agricultural pressures throughout the HNRS and the wider greater Australian eastern seaboard, many ecological communities and native species are listed as endangered or protected under the *Environment Protection and Biodiversity Act (1999) (Cth), NSW Biodiversity Conservation Act 2016, and Fisheries Management Act 1994.*

There are also international agreements that protect migratory birds and their habitat including the Chinese Australian Migratory Bird Agreement (CAMBA), Japanese Australian Migratory Bird Agreement (JAMBA) and Republic of Korea Australian Migratory Bird Agreement (ROKAMBA) (Water Technology, 2020; Alluvium, 2022a).



Figure 2-25 White's Seahorse (*Hippocampus whitei*) - found in Brisbane Water (source: Central Coast Council)

2.3 People, Culture, and the Local Economy

2.3.1 Cultural Heritage

Traditional Custodians

The HNRS is home to a rich and enduring Aboriginal heritage, with cultural connections to Country that stretch back over 50,000 years and continue to this day (Dyarubbin, 2025). Given the scale of the CMP study area and its contributing catchment, multiple Aboriginal groups have longstanding connections to the land and waterways – see Figure 2-27.

Traditionally, the Greater Sydney region is home to several clans of the **Darug** people (alternative spelling Dharug). The Darug inhabited the area between Port Jackson and Botany Bay in the east, the Georges River to the south-west, and the Hawkesbury River in the north-west (GML Heritage, 2021) Across the Upper Hawkesbury River Estuary, the Richmond-Windsor region was inhabited by the people of the Burreberongal, Cattai and Kurrajong Clans which were situated on the south, east and north of the river respectively (Barani , 2025).

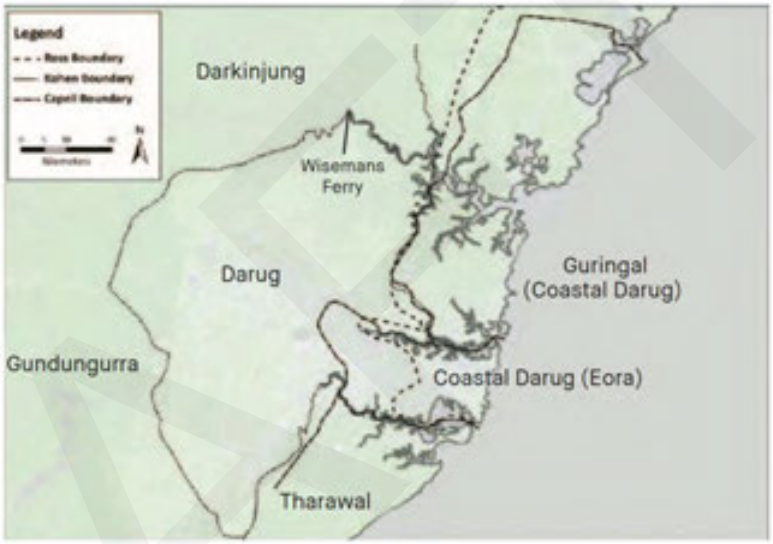


Figure 2-27 Aboriginal cultural boundaries in the Sydney region. (Source: GML, 2021)

North of the Hawkesbury in the Central Coast Region was home to the **Darkinjung** people (alternative spellings Darrkinyung, Darkinjan, Darkinung). The traditional boundaries of Darkinjung land extend from the Hawkesbury River in the south, Lake Macquarie in the north, the McDonald River and Wollombi up to Mt Yengo in the west and the Pacific Ocean in the East (GML Heritage, 2021).

The Lower Hawkesbury area was originally inhabited by the **Guringai** people, who occupy the area across Sydney stretching from Broken Bay (in the north) to Port Jackson (in the south) and the Lane Cove River (in the west). Two groups of the Guringai people occupied the area which is now Ku-ring-gai National Park: the Garigal people and the Darramuragal people (AHO, 2025).

Cultural Heritage Values

This deep history of connection has shaped a cultural landscape rich in both tangible and intangible Aboriginal heritage. Indigenous cultural heritage includes sites, places, objects and stories that hold significance due to traditions, customs, beliefs, and ancestral ties. These values reflect the continuous presence and cultural practices of Aboriginal peoples.

The Hawkesbury River, known to the Darug people as **Dyarubbin** (also spelled Deerubbin), was - and remains - a place of great cultural and ecological importance. It is a significant place in Dreaming stories, rich in resources, and a critical means of transport (GML Heritage, 2021). It provided food (such as fish, eels, mussels, oysters), supported bird life, and was a spiritual and cultural focal point for the community (Dictionary of Sydney, 2021; BMT WBM, 2014a).

Across the HRNS, thousands of Aboriginal cultural heritage sites have been recorded - and many more remain unidentified. These include:

- Tangible sites such as middens, grinding grooves, rock engravings (see Figure 2-28), cave art, stone arrangements, and burials.
- Intangible values including creation stories, place names, ceremonial grounds, and cultural lore associated with specific locations.



Figure 2-28 Engraving of aquatic animal (fish, shark or dolphin) in Parr State Conservation Area. Note: the figure has been enhanced by shading. (source: GML, 2021)

Data from the NSW State Government's Aboriginal Heritage Information Management System (AHIMS) reveals that the Hawkesbury Shelf Marine Bioregion holds the highest number of registered Aboriginal heritage sites of any marine bioregion in NSW - with over 6,500 sites located within or up to 500 m of the NSW Marine Estate. This total equals the number of sites recorded across all other marine bioregions combined (Feary, 2015).

2.3.2 Population and Demographics

The Greater Sydney Region has a total population of 5.3 million persons recorded at the 2021 Australian Census (DPHI, 2025). By 2041, this number is projected to grow by an additional 1.4 million people - representing a compound annual growth rate of approximately 1.2%.

Population projection data sourced from the NSW Government (DPHI, 2025) has been aggregated at the LGA level and is summarised by region in Table 2-3. This table shows expected population growth across the 6 CMP Partner Councils LGAs and those in the broader Hawkesbury–Nepean Catchment, highlighting urbanisation trends and future development pressures that have been considered in the development of this CMP.

Table 2-3 Population growth across the HNRS catchment 2021-2041

Region	2021	2041	Annual Increase
Hawkesbury Estuary Partner Council LGAs	1,150,000	1,420,000	+1.1%
Hawkesbury-Nepean Catchment Councils LGAs	2,000,000	2,720,000	+1.5%
Total Across Partner and Catchment LGAs	***3,150,000***	***4,140,000***	***+1.4%***

More detailed LGA-level projections for the 6 CMP Partner Councils are shown in Table 2-4. While most of these LGAs are expected to experience moderate growth, The Hills LGA stands out with a projected growth rate of 2.7% per annum - driven by major residential developments in Box Hill and Kellyville, both within the North West Growth Area.

Table 2-4 Projected population growth across the Partner Council LGAs: 2021-2041

LGA	2021 Population	2041 Population	Annual Increase
Central Coast	348,500	408,400	+0.8%
Hawkesbury City	67,600	77,200	+0.7%
The Hills Shire	192,700	328,600	+2.7%
Hornsby Shire	152,200	169,800	+0.5%
Ku-ring-gai	124,700	158,300	+1.2%
Northern Beaches	264,600	275,800	+0.2%

Significant growth is also forecast for the Western Parkland City, as outlined in *A Metropolis of Three Cities – The Greater Sydney Region Plan* (Greater Sydney Comission, 2018). This includes a major urban expansion corridor between Campbelltown and Penrith, centred around the emerging Western Sydney Airport Precinct (TfNSW, 2024) - see Section 2.6.2.

As urban development accelerates across the HNRS, associated increases in stormwater runoff and industrial discharges are likely to place growing pressure on the health of the river system. These impacts must be proactively managed through the CMP to support the long-term resilience of the catchment and estuary. The CMP provides an important avenue through which to integrate water-sensitive urban design, green infrastructure, and stronger planning controls into the growth strategy for these rapidly expanding areas.

2.3.3 Community Uses and Values

The HNRS is a nationally significant waterway offering scenic amenity and diverse recreational opportunities to regional population of over 4 million people (see Table 2-3). The river system is deeply woven into the lives of its local communities, offering a unique blend of environmental, cultural, and recreational values. From swimming, fishing, and boating to quiet moments of connection, reflection, and escape - the waterways support physical and mental wellbeing, provide vital links to place and heritage, and underpin local tourism, recreation, and social connection. The river system isn't just a natural asset - it's a shared space where community, culture, and nature come together.

During Stage 2 of the CMP, a detailed study was undertaken to identify and map the community values and uses across the HNRS (Alluvium and Mosaic Insights, 2023):

- A snapshot of the community values across the HNRS is provided in Figure 2-29.
- A snapshot of the community uses across the HNRS is provided in Figure 2-30.

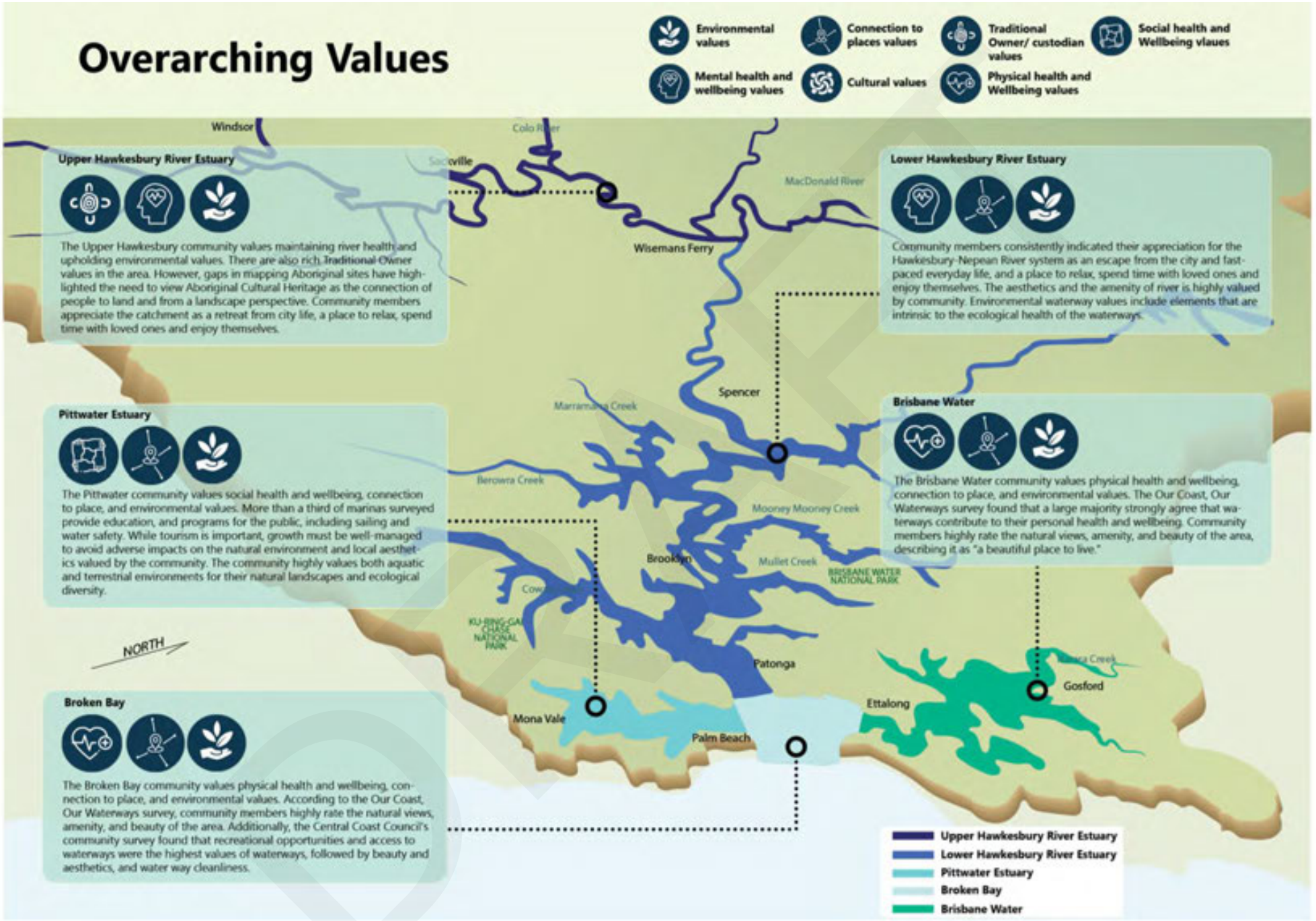


Figure 2-29 Community Values across the HNRS (Alluvium and Mosaic Insights, 2023)

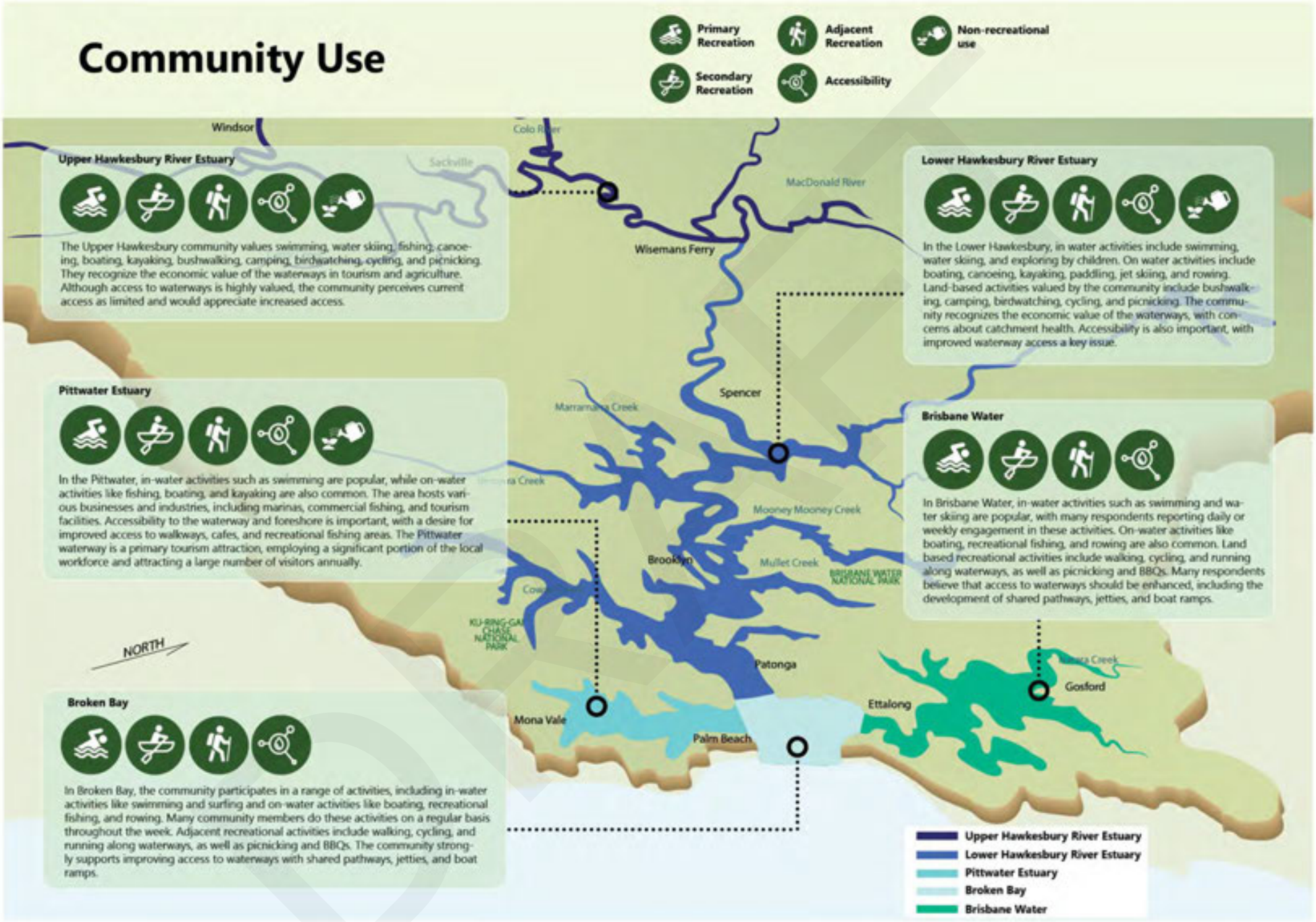


Figure 2-30 Community Uses across the HNRS (Alluvium and Mosaic Insights, 2023)

The Hawkesbury River is an extremely popular, but diverse waterway in terms of its recreational usage. The river is utilised extensively for a range of different activities. Across the upper reaches of the Hawkesbury River between Windsor and Wisemans Ferry, major recreational uses include water skiing and wakeboarding. Non-powered watercraft activities such as kayaking and canoeing are popular in the more natural areas such as the Colo River and Webb's Creek (BMT WBM, 2013b; TfNSW, 2015). The Hawkesbury River also hosts several major local sporting events (sailing, rowing, and water skiing) throughout the year, including the *Bridge 2 Bridge Water Ski Classic* and *The Hawkesbury Canoe Classic*.

Throughout the Lower Hawkesbury recreational fishing is extremely popular with NSW Fisheries estimating there to be 150,000 recreational fishing outings in the Hawkesbury River per year (BMT WBM, 2008). In addition to boat-based fishing, there are a variety of locations from which fishing is permitted from the shore, including Parsley Bay, Cowan Creek and McKell Park (WRL, 2003).

Brisbane Water sees a concentration of boating, fishing, kayaking, and Personal Water Craft (PWC) use, with increased activity in summer. These recreational pursuits contribute significantly to the area's lifestyle appeal, drawing both residents and visitors and supporting the local tourism and hospitality economy.

Pittwater is among the busiest waterways in NSW, featuring large vessels on swing moorings and eight marinas, with usage intensifying on weekends and during holidays (see Figure 2-32). Conflicts occur between sailing, kayaking, fishing, kite-surfing, and other activities (Water Technology, 2020).

Broken Bay's beaches - including Ocean, Umina, Pearl, and Patonga - offer high-value recreational experiences, especially for swimmers, kiteboarders, kitesurfers and surfers (see Figure 2-31).



Figure 2-31 Ocean Beach is a popular recreational destination (source:iCentralCoast.com)

The region supports over 100,000 boating licence holders (about 19% of all NSW licences) and 41,000 registered vessels (17% of the State's total). Recreational infrastructure includes 40 public boat ramps and over 100 public access points such as jetties, wharves, and pontoons (TfNSW, 2015; Rolyat Services, 2013) – see Table 2-1 and Figure 2-32.



Figure 2-32 Left: Boating at Sandbrook Inlet, Brooklyn (source: Corleone Marinas), and Right: Pittwater (source: allboatbrokerage.com).

2.3.4 Economic Values

Commercial Fishing and Aquaculture

The HRNS is a vital natural asset that supports a broad spectrum of economic activities across Greater Sydney and the Central Coast. Its economic contribution spans aquaculture, agriculture, tourism, recreation, and ecosystem services, underlining its importance to the region's "blue economy."

The river has long supported aquaculture and commercial fishing, with the Lower Hawkesbury and Brisbane Water estuaries historically serving as key hubs for oyster farming. While oyster production peaked in 2000–01 at nearly $10 million in value (adjusted to present-day dollars), the industry has since declined due to disease outbreaks, including QX disease in 2004 and Pacific Oyster Mortality Syndrome (POMS) in 2013, which wiped out 90% of stock in some areas (Rubio, Frances, Coad, Stubbs, & Guise, 2013). By 2023-24, the total value of oyster production had recovered to generate around $4.5 million - representing around 6% of the state's total oyster production value (DPIRD, 2025a).



Figure 2-33 Hawkesbury River Aquaculture (Source: Hornsby Shire Council)

The largest sector of commercial fishing in the Hawkesbury estuary is the prawn trawl (EPT) fishery. This involves the harvesting of school prawns, squid and fish (Kimmerikong, 2005). The Hawkesbury River EPT Fishery operates in waters from the ocean entrance, upstream to the vehicular ferry at Lower Portland. The fishery is estimated to generate an annual catch with a monetary value of around $3.5 million (DPI, 2017). Commercial fishing is banned in Brisbane Water but permitted in Broken Bay and offshore (TfNSW, 2015).

Ecosystem Services

As part of the Stage 1 Scoping Study (Water Technology, 2020), a preliminary economic valuation was undertaken of the ecosystem services across the Hawkesbury River Estuary. This assessment used the methodology developed by Costanza et al. (2014), which assigns indicative economic values to different biomes based on their ecological functions and contributions. While not a detailed economic analysis, the intent of this assessment was to provide a high-level estimate to provide an economic basis for investment in environmental asset protection across the HNRS. Ecosystem services such as storm protection, erosion control, carbon storage, and waste treatment were considered, particularly for key biomes like mangroves, saltmarsh, seagrass, and open estuarine waters. The outcomes estimated that the ecosystem services of the estuarine reach of the Hawkesbury River (including Pittwater Estuary and Brisbane Water Estuary) are of the order of $1.4 billion per year in real 2025 terms.

Tourism and Recreation

The Brisbane Water, Pittwater and Hawkesbury River estuaries provide significant economic value to the Greater Sydney and Central Coast regions in the form of tourism. The close proximity to the high-density population bases of Sydney and the Central Coast provide significant opportunities for day trip tourism and domestic and international overnight visitor stays.

Domestic day trip tourism is highly focused on the coastal zone – and the environmental, recreational and aesthetic aspects of the Hawkesbury River act as a strong tourist draw card for activities such as watercraft activities (such as kayaking – see Figure 2-34), fishing, nature observation, recreational and charter boating, and bushwalking through the expanse of national parks of the study area.

The system provides direct economic value through industries that include (but are not limited to) charter boating and day cruises, fishing and whale watching. The majority of these businesses operate out of Brisbane Water, Pittwater and the Lower Hawkesbury River at Brooklyn.



Figure 2-34 Kayaking the Hawkesbury (Source: Destination NSW)

Rolyat Services (2013) estimated that across the activities of sightseeing, camping, swimming, recreational fishing and boating, the Hawkesbury River Estuary receives over 1.3 million annual day visits, with a combined economic value of over $45 million per annum.

2.4 Legislative Context

The legislation and policy governing management of study area is complex and includes acts and policies from all levels of government. A brief overview of the most relevant acts is provided herein for context; however, more information can be found in the Stage 1 Scoping Study (Water Technology, 2020).

Coastal Management Act 2016

The CM Act establishes the framework and sets forth the objectives for coastal management in NSW. The purpose of the CM Act is to manage the use and development of the coastal environment in an ecologically sustainable way, for the social, cultural, and economic well-being of the people of NSW (DPIE, 2019).

The CM Act lists a series of objects that must be considered when developing a CMP (refer to Part 3 of the Act). There are also objectives provided for each of the 4 coastal management areas. The objectives in the CM Act have been considered and addressed in this CMP in the following ways:

- The Vision, and Objectives of this CMP are based on, and consistent with, the objectives set forth in the CM Act.
- Stage 1 of the CMP has considered the State and regional policies and plans prescribed by the Act.
- The studies undertaken in Stage 2 of the CMP have assessed in detail the various coastal zone issues, and hazards outlined in the CM Act and the CM Manual (OEH, 2018c).
- Stage 3 of the CMP (WT 2025) has involved a high level of consultation with the HRNS communities and relevant stakeholders to develop a series of management actions intended to address these issues and risks in an integrated and strategic manner. In doing so, the suite of actions:
  - Promotes the objects of the Act

  - Gives effect to the management objectives for the coastal management areas covered by the program.
- Stage 4 of the CMP has been developed in consistency with the statutory requirements of the Act, and the mandatory requirements set out in NSW Coastal Management Manual (OEH, 2018e).

State Environmental Planning Policy (Resilience and Hazards) 2021

State Environmental Planning Policy (Resilience and Hazards) 2021 updates and consolidates into one integrated policy a series of previously enforced SEPPs, including: SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection), including clause 5.5. of the Standard Instrument – Principal Local Environmental Plan.

The R&H SEPP streamlines coastal development assessment requirements, identifies development controls for consent authorities to apply to each coastal management area to achieve the objectives of the CM Act, and establishes the approval pathway for coastal protection works (DPIE, 2019).

State-wide mapping that accompanies the R&H SEPP is available for the coastal wetlands and littoral rainforest area, the coastal environment area, and the coastal use area. The mapping of coastal vulnerability areas is undertaken as part of CMP development, based on either existing coastal hazard mapping, or mapping to be developed during Stage 2 of the CMP.

Marine Estate Management Act 2014

The *Marine Estate Management Act 2014* (MEM Act) forms part of the NSW Marine Estate Management Framework. The framework comprises statutory instruments, strategies, assessment, plans and policy settings, and is administered under the auspices of the Marine Estate Management Authority (MEMA).

The primary objective of the MEM Act is to enable the strategic and integrated management of the NSW marine estate, which includes marine waters, estuaries, and the coastal zone (MEMA, 2019). The Act aims to maintain a healthy, productive, and biologically diverse marine estate while also supporting its economic, cultural, social, and recreational use. It also facilitates scientific research, education, and the effective management of marine parks.

Key legislative instruments under the MEM Act include:

- Marine Estate Management Regulation 2017
- Marine Estate Management (Management Rules) Regulation 1999.

In addition, the NSW Marine Estate Management Strategy 2018-2028 (MEMA, 2018) was developed to guide coordinated actions over a ten-year period and is discussed further in Section 2.6.

The Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the statutory framework for land use planning and development assessment in NSW. It is a key mechanism for implementing actions identified in Coastal Management Programs (CMPs), as it governs how coastal management objectives and hazard information are integrated into local planning instruments such as Local Environmental Plans (LEPs) and Development Control Plans (DCPs). The EP&A Act also establishes the processes for environmental impact assessment, including under Part 4 (development consent) and Part 5 (activities by public authorities), which may be relevant to the implementation of CMP actions such as coastal protection works or restoration projects.

2.5 Roles and Responsibilities

2.5.1 Overview

The current governance across the coastal zone is multi-layered, with the waterways, foreshore, and catchment of the study area (and associated assets) owned and managed by a number of stakeholders across multiple levels of government. An overview of the roles and responsibilities across the HRNS coastal zone and its broader catchment is provided in Table 2-5.

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Table 2-5 Roles and responsibilities across the HNRS catchment

Details		Governance Responsibilities	Coastal Zone Land Tenure	Coastal Zone Waterway Asset Management
CMP STUDY AREA				
Local Government				
Central Coast Council		✓	✓	✓
Hawkesbury City Council		✓	✓	✓
The Hills Shire Council		✓	✓	✓
Hornsby Shire Council		✓	✓	✓
Ku-ring-gai Council		✓	✓	✓
Northern Beaches Council		✓	✓	✓
State Government				
Department of Climate Change, Energy, the Environment and Water	Conservation Programs, Heritage and Recreation	✓		
	National Parks and Wildlife Services	✓	✓	✓
	Environment Protection Authority	✓		
Department of Planning, Housing and Infrastructure	Crown Lands	✓	✓	✓
	Planning and Assessment	✓		
Department of Primary Industries and Regional Development	Fisheries and Forestry	✓		
	NSW Food Authority	✓		
	Greater Sydney Local Land Services	✓		
Transport for NSW	Maritime	✓		✓
	Maritime Infrastructure Delivery Office	✓		✓
Department of Communities and Justice	NSW State Emergency Service	✓		

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Details		Governance Responsibilities	Coastal Zone Land Tenure	Coastal Zone Waterway Asset Management
Department of Premier and Cabinet	NSW Reconstruction Authority	✓		
State Owned Statutory Corporations	WaterNSW	✓		✓
	Sydney Water	✓		✓
Other	Marine Estate Management Authority	✓		
Local Aboriginal Land Councils (LALCs)				
Darkinjung LALC		✓		
Deerubbin LALC		✓		
Metropolitan LALC		✓		
BROADER HNRS CATCHMENT				
Blacktown City Council		✓		
Blue Mountains City Council		✓		
Camden Council		✓		
Campbelltown City Council		✓		
Cessnock City Council		✓		
Fairfield City Council		✓		
Goulburn Mulwaree Council		✓		
Lithgow City Council		✓		
Liverpool City Council		✓		
Mid-Western Regional Council		✓		
Oberon City Council		✓		
Penrith City Council		✓		

Details	Governance Responsibilities	Coastal Zone Land Tenure	Coastal Zone Waterway Asset Management
Queanbeyan-Palerang Regional Council	✓		
Singleton Council	✓		
Upper Lachlan Shire Council	✓		
Wingecarribee Shire Council	✓		
Wollondilly Shire Council	✓		
Wollongong City Council	✓		

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2.5.2 Local Government

There are six (6) local government areas that border the tidal waterways of the estuary, and an additional eighteen (18) local government areas encompassing the wider Hawkesbury-Nepean River Catchment (either wholly or partly). These are listed in Table 2-5 and depicted in Figure 2-35.

An overview of the range of council roles and responsibilities as they relate to the CMP is provided in Table 2-6 below. These roles broadly fall into three categories: issue management, land and asset management, and planning.

Table 2-6 Local government roles and responsibilities across the coastal zone

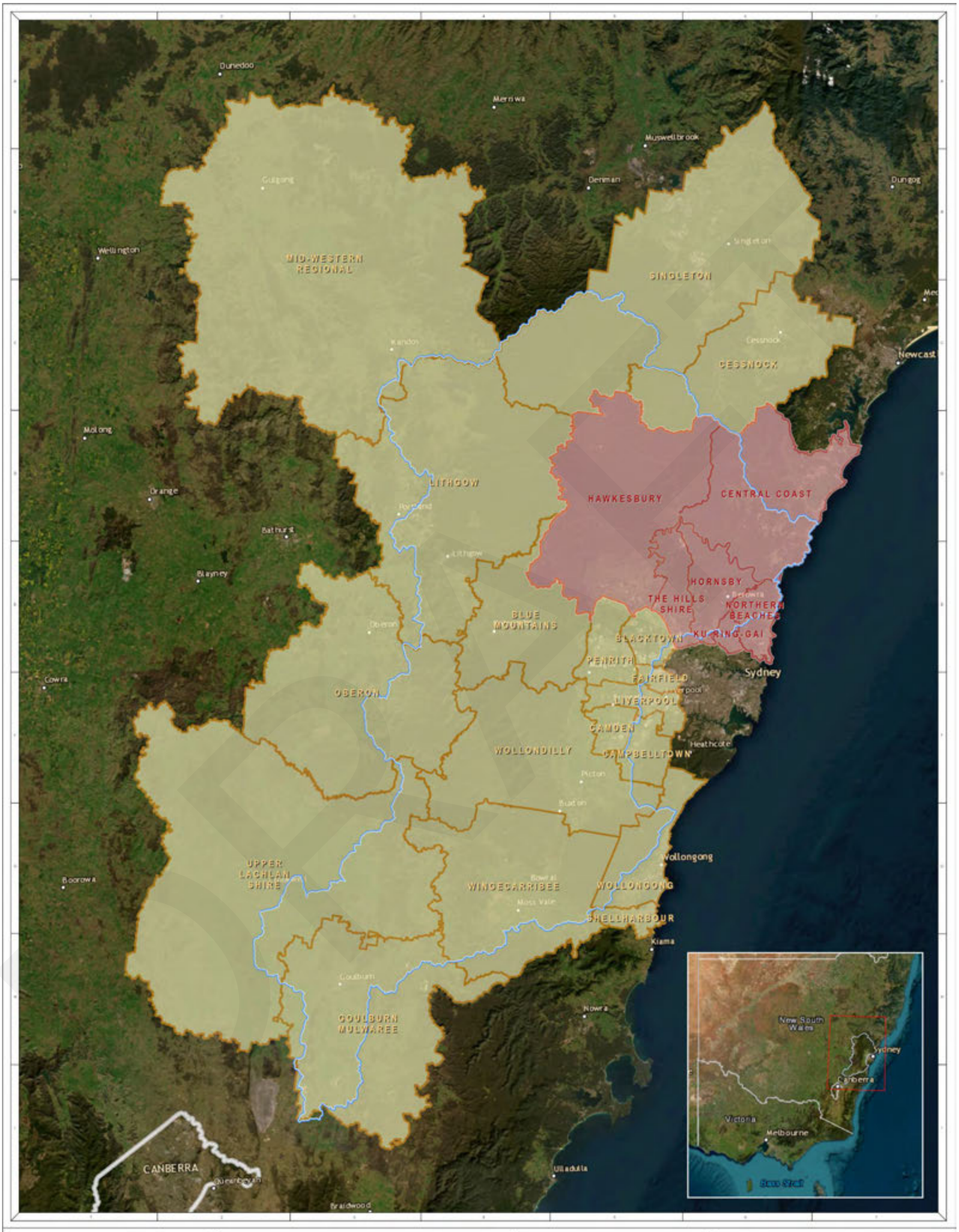
Issue Management	Land and Asset management	Planning
▪ Coastal, estuary and waterway management ▪ Water quality monitoring and research ▪ Floodplain and flood risk management ▪ Vegetation protection and management ▪ Fauna protection and conservation ▪ Catchment management ▪ Community Events ▪ Community consultation, engagement and education ▪ Cultural Heritage ▪ Recreational use of the estuaries and waterways ▪ Compliance and education activities (environmental and development) ▪ Bushfire planning and management	▪ Coastal and estuary infrastructure ▪ Stormwater and drainage infrastructure ▪ Road, traffic and parking infrastructure ▪ Open space and community assets ▪ Management of beaches and beach access ▪ Management of foreshore parks and access (including waterway access) ▪ Management of bushland reserve ▪ Management of WWTPs and in some cases Water Supply	▪ Strategic Planning - including implementation of regional strategies, development of Community Strategic Plans (CSP's) and Local Strategic Planning Statements (LSPS) and other strategies ▪ Development and implementation of planning controls (including LEPs and DCP's) ▪ Implementation of IP&R framework ▪ Development and implementation of CMP's

Councils are key custodians of estuarine and catchment infrastructure such as boat ramps, seawalls, breakwaters, stormwater systems, foreshore access points, and open space assets. In some cases, councils also manage significant water supply infrastructure - for example, Mangrove Creek, Mardi, and Mooney Mooney dams are owned and operated by Central Coast Council.

Beyond physical assets, councils are responsible for a range of issues across the catchment, including cultural heritage, recreational use, community events, estuary and floodplain management, and biodiversity conservation. Many also undertake water quality monitoring, as discussed in Section 9.

In their planning roles, councils regulate land use and development within their LGAs to ensure outcomes that reflect the environmental, social, and economic values of the estuary and its catchment. This includes managing cumulative impacts of development to support long-term sustainability.

For councils in the upper catchment, responsibilities focus on waterway health - including the management of agricultural runoff, stormwater discharges, and industrial waste - all of which contribute to the downstream condition of the estuary.


Dunedoo
Merriwa
Muswellbrook
Denman
Dungog
Singleton
Newcast
Wellington
MID-WESTERN REGIONAL
SINGLETON
Gulgong
Kandos
Cessnock
CESSNOCK
Molong
Orange
Bathurst
LITHGOW
HAWKESBURY
CENTRAL COAST
Blayney
HORNSBY
THE HILLS SHIRE
NORTHERN BEACHES
KU-RING-GAI
BLUE MOUNTAINS
BLACKTOWN
PENRITH
Sydney
Cowra
FAIRFIELD
OBERON
LIVERPOOL
CAMDEN
WOLLONDILLY
CAMPBELLTOWN
Heathcote
Picton
Wollongong
Boorowa
UPPER LACHLAN SHIRE
WINGECARRIBEE
WOLLONGONG
SHELLHARBOUR
Kiama
Goulburn
Nowra
COOLBURN MULWAREE
New South Wales
Sydney
Canberra
Victoria
Melbourne
CANBERRA
Queanbeyan
Ulladulla
Braidwood
LEGEND
Hawkesbury-Nepean River Catchment
LGA Boundaries (Partner Councils)
LGA Boundaries (Non-Partner Councils)
1:1,100,000 at A3
WATER TECHNOLOGY
Fig.2-35 Catchment & LGA Boundaries
Hawkesbury-Nepean River System CMP

2.5.3 State Government

There are over fifteen (15) state government agencies with management roles and responsibilities across the study area that are relevant to the CMP. These agencies are spread across 5 separate state government departments. These agencies and their position within the wider NSW state government organisational structure are identified in Table 2-5. Some of these agencies have a land and asset management role, whilst others are issues based. A brief summary of the roles and responsibilities of the most relevant state government departments and agencies is provided below.

2.5.3.1 The Department of Climate Change, Energy, the Environment, and Water

Conservation Programs, Heritage, and Recreation Group

Many of the CMP stakeholder organisations are positioned within DCCEEW, and their responsibilities across the study area, relate to land and asset management, issues management, and planning and assessment. DCCEEW (CPHR) is responsible for administering the CM Act and provides oversight of the State's coastal management program. Within the DCCEEW (CPHR) organisation structure, the Biodiversity Conservation and Science Directorate provides oversight in the development of each council's CMPs and provides data and technical advice as needed. It also administers the Coastal and Estuary Grants Program that provides funding for councils to prepare and implement their CMPs.

National Parks and Wildlife Service

Within the DCCEEW organisation structure, lies the NSW National Parks and Wildlife Service (NPWS), which is responsible for management under the *National Parks and Wildlife Act 1974* of 23 different reserves and parks that are located either partly or wholly within the CMP study area, including those listed in Table 2-7 and depicted in Figure 2-36. Several of these reserves have extensive water frontages, making NPWS a critical stakeholder in the management and use of the estuary and its surrounding landscapes.

Table 2-7 NSW NPWS land located across the HNRS coastal zone

National Park Estate		
▪ Berowra Valley National Park ▪ Bouddi National Park ▪ Brisbane Water National Park ▪ Cattai National Park ▪ Cockle Bay Nature Reserve ▪ Dharug National Park ▪ Ku-ring-gai Chase National Park ▪ Lion Island Nature Reserve	▪ Long Island Nature Reserve ▪ Maroota Ridge State Conservation Area ▪ Marramarra National Park ▪ Muogamarra Nature Reserve ▪ Parr State Conservation Area ▪ Pelican Island Nature Reserve ▪ Pitt Town Nature Reserve ▪ Popran National Park	▪ Rileys Island Nature Reserve ▪ Saratoga Island Nature Reserve ▪ Scheyville National Park ▪ Spectacle Island Nature Reserve ▪ Wisemans Ferry Historic Site ▪ Wollemi National Park ▪ Yengo National Park

NPWS plays a significant role in the region, with responsibilities including active conservation and habitat protection, fire management, tourism and visitation management, research, education, and the protection of both Aboriginal and European cultural heritage across its estate.

Many of the parks listed in Table 2-7 receive high levels of tourism and recreational use and contain key infrastructure such as boat ramps, walking tracks, and visitor amenities that provide direct access to the river system and its foreshore. While a broad range of waterway infrastructure is located throughout the HNRS, some of the most notable NPWS-managed assets include (but are not limited to):

- The Basin Campground (Pittwater) – A popular site featuring camping and picnic facilities, with supporting permanent infrastructure and direct access to the Pittwater estuary.
- Akuna Bay (Cowan Creek) – Home to recreational boating infrastructure including marina facilities and associated amenities.
- Bobbin Head and Apple Tree Bay (Cowan Creek) – Well-used public spaces that include a marina, boat ramp, public pontoon, picnic facilities, and walking trails, supporting both passive and active recreational use of the estuary.



Figure 2-36 Top Left: Ku-ring-gai National Park. Top Right: Berowra Valley National. Bottom Left: Dharug National Park. Bottom Right: Cattai National Park (NPWS, 2025)



Figure 2-37 Top Left: The Basin Campground. Top Right: Akuna Bay. Bottom Left: Bobbin Head visitor precinct. Bottom Right: Apple Tree Bay (NPWS, 2025)

Environment Protection Authority

The NSW Environment Protection Authority (EPA) is the primary environmental regulator for New South Wales. Councils, Sydney Water and other organisations hold a number of environment protection licences issued by the NSW EPA under the *Protection of the Environment Operations Act 1997*. These licences generally relate to Wastewater Treatment Plants, Landfill Sites and Quarries, and Disused Landfill Sites Under Remediation.

2.5.3.2 The Department of Planning, Housing and Infrastructure

Crown Lands

Within the Department of Planning, Housing and Infrastructure (DPHI), Crown Lands is responsible for the administration and / or management of Crown land under the *Crown Land Management Act 2016*. Crown lands include submerged Crown land, seabed and subsoil to 3 nautical miles from the coastline of NSW that is within the limits of the coastal waters of the State.

Planning and Assessment

DPHI – Planning & Assessment is responsible for assessing and determining development proposals, including State Significant Projects. Its role is to ensure that economic growth and the creation of new jobs are balanced with the needs of local communities and environmental protection, and that major developments, infrastructure, and industrial sites are delivered in accordance with strict planning and environmental conditions.

This group also has responsibilities relating to coastal policy and its implementation. Councils may need to engage with DPHI – Planning & Assessment if they propose to amend any R&H SEPP mapping of Coastal Management Areas through a planning proposal process.

2.5.3.3 The Department of Primary Industries and Regional Development

The Department of Primary Industries and Regional Development – Fisheries and Forestry

The Department of Primary Industries and Regional Development – Fisheries and Forestry (DPIRD Fisheries) is responsible for administering the *Fisheries Management Act 1994* and ensures decisions made about land management and development avoids and minimises impacts on fisheries resources. Its responsibilities also include the licensing of recreational fishers, enforcement of bag limits, and permits for commercial fishing activities. It is responsible for threatened species conservation and marine vegetation protection (including mangroves, saltmarsh and seagrass) across the waterways of the study area. DPIRD Fisheries administer the MEM Act in coordination with the NSW Marine Estate Management Authority (MEMA).

NSW Food Authority

The NSW Food Authority (NSWFA) is responsible for food safety and consumer food protection across the state. It licences approximately 300 businesses in the shellfish sector across the state - made up of around 270 oyster farmers and 30 shellfish wild harvest businesses (NSWFA, 2025). Its other core responsibility in relation to the CMP is the development of harvest area management plans for commercial shellfish cultivation and harvesting.

Greater Sydney Local Land Services

Greater Sydney Local Land Services (GS LLS) was established under the *Local Land Services Act 2013* to provide agricultural production advice, biosecurity, natural resource management and emergency management functions cross the Greater Sydney region (GS LLS, 2023). GS LLS engages in regional and sub-catchment Natural Resource Management (NRM) planning, training and education for the community in areas such as farm management practices, as well as environmental monitoring of horticultural practices. GS LLS also delivers grant and funding programs to support natural resource management and sustainable agriculture activities. The GS LLS region covers approximately 2,300,000 ha and sits within the Sydney Basin bioregion (GS LLS, 2023).

2.5.3.4 Transport for NSW

The Transport for NSW (TfNSW) cluster is comprised of an extended network of agencies. TfNSW sets the strategic direction for transport and works in partnership with government transport operating agencies and private service providers to deliver improved transport outcomes for the community and economy of NSW.

Maritime

Maritime sits within TfNSW as the state's maritime safety regulator for commercial and recreational vessels and their operators. Maritime's role within TfNSW is to promote safe, responsible, and sustainable use of waterways, including but not limited to the enforcement of safe on-water vessel practices, the administration of recreational vessel licenses and vessel registrations, and provision of guidance for safe navigation.

It is also responsible for the direct delivery of a number of maritime infrastructure projects, as well as investment in many others across the state. Other responsibilities include property administration, policy development, strategic planning and infrastructure management related to commercial and recreational boating – including some of the boat ramps and public jetties, wharves and pontoons across the study area (noting that most boat ramps are generally owned and managed by local councils).

The Maritime Infrastructure Delivery Office

The Maritime Infrastructure Delivery Office (MIDO) is a specialist unit within NSW Maritime, established as a joint initiative of the former Roads and Maritime Services and the Department of Industry. Its purpose is to enhance the coordination and delivery of coastal and boating infrastructure projects across New South Wales. MIDO supports a wide range of uses, including recreational boating, fishing, tourism, and commercial maritime activities.



Figure 2-38 Dredging in the Ettalong Channel in 2025 (TfNSW, 2025)

MIDO is responsible for delivering key projects and programs including programs administered by TfNSW for boating infrastructure, the NSW Coastal Infrastructure Program, and the NSW Coastal Dredging Strategy. Under the dredging strategy, the Ettalong Channel has been identified as a priority investment location (see Figure 2-38), with dredging works proposed to maintain safe navigational access, particularly for local ferry services and other marine users (TfNSW, 2025).

2.5.3.5 The Department of Communities and Justice

The NSW State Emergency Service

The NSW State Emergency Service (NSW SES) sits within the Department of Communities and Justice, with the major responsibilities of provision of emergency and rescue during times of natural hazard emergencies and disasters including flooding, storms (including storm tide and severe erosion events). This also includes management of tsunami events as per the NSW State Tsunami Plan (NSW SES , 2023).

2.5.3.6 The Department of Premier and Cabinet

NSW Reconstruction Authority

The NSW Reconstruction Authority (RA) was established under the *NSW Reconstruction Authority Act 2022* to proactively reduce the impact of future disasters across NSW and to help communities recover from them faster. RA is responsible for planning and coordinating NSW's mitigation and risk reduction activities. Core responsibilities include:

- Disaster Adaptation Planning (see Section 2.6), including leading the development of:
  - The NSW State Disaster Mitigation Plan (SDMP) – which sets out the NSW Government's strategy to reduce the impact and cost of natural hazards on people, homes, livelihoods, infrastructure, and communities (NSW RA, 2024a).
  - Place-based Disaster Adaptation Plans (DAPs) – which set out an action plan for government, local communities, and other appropriate organisations to work together to identify and implement the most effective and suitable options for reducing risk. The Hawkesbury-Nepean Valley DAP is the first of its kind in NSW.
- Programs, grants and funding – RA manages many grants and funding programs that support communities in building disaster resilience and reducing the risk to future hazards.

2.5.3.7 State Owned Statutory Corporations

WaterNSW

WaterNSW is a state-owned corporation established under the *Water NSW Act 2014* and operates under an Operating Licence issued and regulated by the Independent Pricing and Regulatory Tribunal (IPART). It plays a key role in the Hawkesbury-Nepean catchment, primarily through its responsibilities for catchment management and the provision of raw drinking water (WaterNSW, 2024).

WaterNSW owns and operates 11 drinking water supply dams in the upper catchment including Warragamba Dam, the primary water source for Greater Sydney. A core function of WaterNSW is to protect and enhance water quality within the catchments of these storages. To support this, WaterNSW operate an extensive water quality and quantity monitoring program to track the raw water quality of both surface and ground water sources. Monitoring includes physical, chemical, biological, radiological, hydrological and meteorological parameters through on-line instruments, field sampling and laboratory analysis (WaterNSW, 2025; WaterNSW, 2024).

WaterNSW also extracts water in accordance with the *Greater Sydney Metropolitan Region Unregulated River Water Sources 2011 Water Sharing Plan*, which requires the release of specified volumes from many of its storages to support environmental flows in the lower catchment.

Sydney Water

Sydney Water is a statutory state-owned corporation (wholly owned by the NSW Government) established under the *Sydney Water Act 1994*, that provides potable water, wastewater, and selected stormwater services to over 5 million people across Greater Sydney, the Illawarra, and the Blue Mountains (Sydney Water, 2023).

Sydney Water operates 15 Water Resource Recovery Facilities (WRRFs) in the greater Hawkesbury-Nepean River catchment (see Figure 2-39). All of the WRRFs, except Brooklyn, discharge to freshwater environments, with Brooklyn discharging to an estuarine environment. Each of these facilities operates under an Environment Protection Licence (EPL) issued by the NSW EPA. These EPLs set out detailed conditions for operation, including limits on discharge volumes, concentrations and loads of pollutants, and monitoring requirements for effluent released from WRRFs to the environment.

In addition to routine wastewater discharge monitoring, each EPL requires Sydney Water to undertake broader environmental monitoring as part of the *Sydney Water Aquatic Monitoring* (SWAM) program (Sydney Water, 2023). Within the broader SWAM, the *HNRS water quality and ecosystem health sub-program* includes monitoring at 42 sites across the HNRS and includes:

- Effluent monitoring – assessing the quantity, quality, and toxicity of WRRF discharges.
- Receiving water monitoring – evaluating the ecological and water quality impacts of effluent on downstream environments.
- Recreational water quality monitoring – including participation in the NSW Beachwatch program to monitor key public swimming sites.

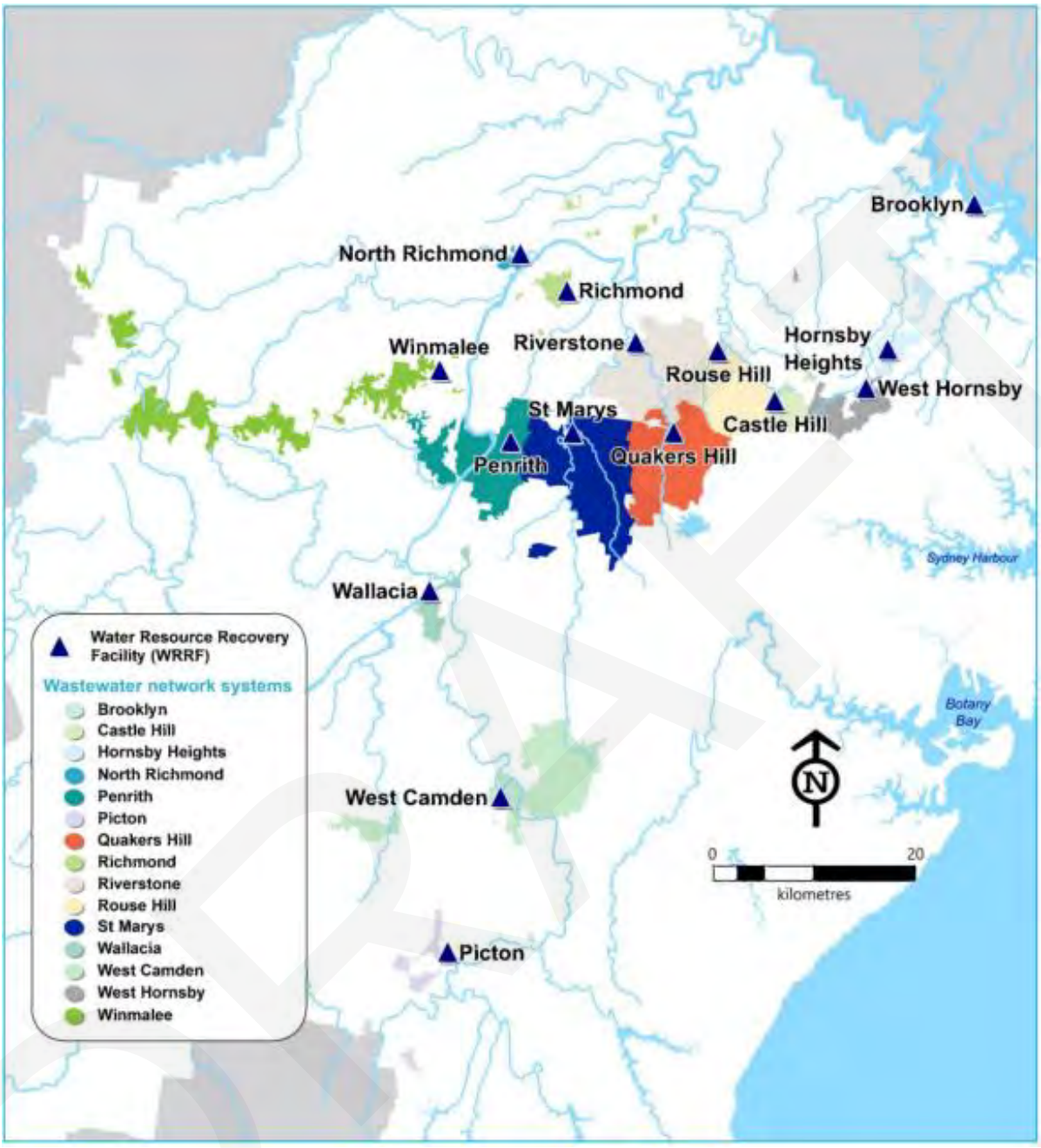


Figure 2-39 Location of WRRFs in the Hawkesbury-Nepean River catchment (Sydney Water, 2023)

2.5.3.8 Other

The Marine Estate Management Authority (MEMA) advises the NSW government on the management of the NSW marine estate, and coordinates policies and programs for maintaining and improving the marine environment. MEMA brings together the heads of the NSW government agencies with key marine estate responsibilities including DCCEEW, DPIRD, DPHI, and Transport for NSW (TfNSW) (MEMA, 2019).

2.5.4 First Nations Groups

There are 3 Local Aboriginal Land Councils (LALCs) that operate within the CMP study area, including:

- Darkinjung LALC

- Deerubbin LALC
- Metropolitan LALC.

The LALCs have a degree of governance and interface with the local councils, as well as the various State and Federal Government bodies. LALCs have a right to be informed in the planning, protection and preservation of cultural sites and areas under the *NSW Aboriginal Land Rights Act 1983* on land within their boundaries. The LALCs aim to achieve long term economic and social solutions for the Aboriginal communities, and preserving connections to Country through culturally informed land management.

Engaging with First Nations communities was a central focus of the CMP process, recognising the deep cultural knowledge, lived experience, and traditional stewardship Aboriginal people bring to land and water management across the catchment.

Engagement was undertaken with a range of groups and representatives, including:

- 3 LALCs
- Advisory or heritage committees from Hornsby and Central Coast Councils
- Darug Custodians Aboriginal Corporation
- Merana Aboriginal Community Association for the Hawkesbury
- Muru Mittigar
- Wannagini and other Central Coast First Nations peoples
- First Nations representatives from Northern Beaches LGA.

2.5.5 Community Groups

There are a number of other non-governmental organisations (NGOs) that operate across the study area. These organisations include educational institutions, industry groups, and community and resident groups and businesses. There are also over 100 active community consultative bodies (CCBs) and community groups across the study area. The Stage 1 Scoping Study provides an overview of these groups (Water Technology, 2020).

2.6 Related Plans and their Linkages to the CMP

It is important to note that there are a range of external (and/or parallel) plans and programs that are relevant to the CMP and these are implemented at a local, state, and federal level. A summary of these plans is outlined in the Stage 1 Scoping Study (Water Technology, 2020). Those of particular relevance to key issues across the study area are summarised below.

2.6.1 State Level Plans

NSW Marine Estate Strategy 2018-2028

The Marine Estate Management Strategy 2018 - 2028 (MEMS) is the overarching framework to coordinate management of the NSW marine estate until 2028. The MEMS outlines the actions needed to manage priority threats to the benefits the community obtains from marine estate (MEMA, 2018). The MEMS sets out 9 management initiatives to support the vision and principles for marine estate management in NSW (see Figure 2-40), with each initiative comprised of numerous actions to help manage priority threats.



Figure 2-40 The nine management initiatives of the MEMS (MEMA, 2025)

This CMP is strongly aligned with improving outcomes for the marine estate. It and considers all these MEMS initiatives and supports the objectives of the MEM Act. This is demonstrated in the fact that:

- The Stage 1 Scoping Study adopted the framework of the MEMS Threat and Risk Assessment (MEMS TARA) (BMT WBM, 2017) to identify and evaluate stressors to estuaries and coastal and marine areas.
- The suite of technical studies undertaken in Stage 2 have included detailed assessment of key stressors identified in the MEMS TARA (see Section 4)
- Actions set out in Stage 4 of this CMP have been aligned with the initiatives and actions in the MEMS (see Section 5).

The progress of the MEMS is monitored through the Marine Integrated Monitoring Program 2018-2028 (Aither, 2019), which has 3 key purposes:

1. Monitor the condition of environmental assets and how the community benefits from the marine estate to inform a mid-term health-check.
2. Evaluate the effectiveness of the Strategy in reducing priority threats.
3. Fill key knowledge gaps that were identified in the Statewide Threat and Risk Assessment.

The Monitoring Program provides the tools and processes to evaluate whether the Strategy is achieving its environmental, social, cultural, and economic goals. It enables the collation and integration of data from a network of organisations including agencies, research providers, universities, local government, and the community.

This information is fed into the adaptive Monitoring and Evaluation Framework and used to improve future threat and risk assessments, evaluations, research projects, and management strategies (Aither, 2019). This framework includes:

- The NSW Community Wellbeing Framework (Gollan & Curley, 2023) provides a consistent and robust approach to monitoring the community benefits of the marine estate, assess threats to these benefits, and address social, cultural, and economic knowledge gaps identified in the MEMS TARA. It addresses the lack of systematic monitoring of the human dimensions of the marine estate, and the resulting lack of social data, which are considered key threats.
- The Environmental Condition Framework (Thornborough, et al., 2023) outlines how the environmental goals of the MEMS will be progressed and evaluated. Monitoring focuses on condition or stressors of the main environmental assets under threat or delivering monitoring projects to specifically address key knowledge gaps identified in the MEMS TARA or other relevant sources.

Both frameworks outline the indicators to be monitored, priorities, methods and timeframes, as well as information for public communication about marine estate monitoring projects

This CMP established linkages from the MEMS Marine Integrated Monitoring Program and the Monitoring, Evaluation and Reporting Program of the CMP (see Section 8).

The NSW Water Quality Objectives

The NSW Water Quality Objectives (WQO) are the long-term goals set for coastal waterways (MEMA, 2025). They are based on the benefits and services provided by healthy waterways that the community values. Originally developed in the NSW Government in late 1990s and early 2000s, these objectives have been recently updated as part of Initiative 1 of the MEMS (MEMA, 2018), in line with the requirements of the National Water Quality Management Strategy (Australian Government, 2018). The update of the WQOs has included the following:

- Updating the community values and uses
- Application of an updated set of Water Quality Objectives to each NSW coastal catchment.
- Nomination of reference sites for catchments and developed guideline values for the *Protection of Aquatic Ecosystems* objective, where data is available

There are 10 NSW WQOs, as depicted in Figure 2-41.

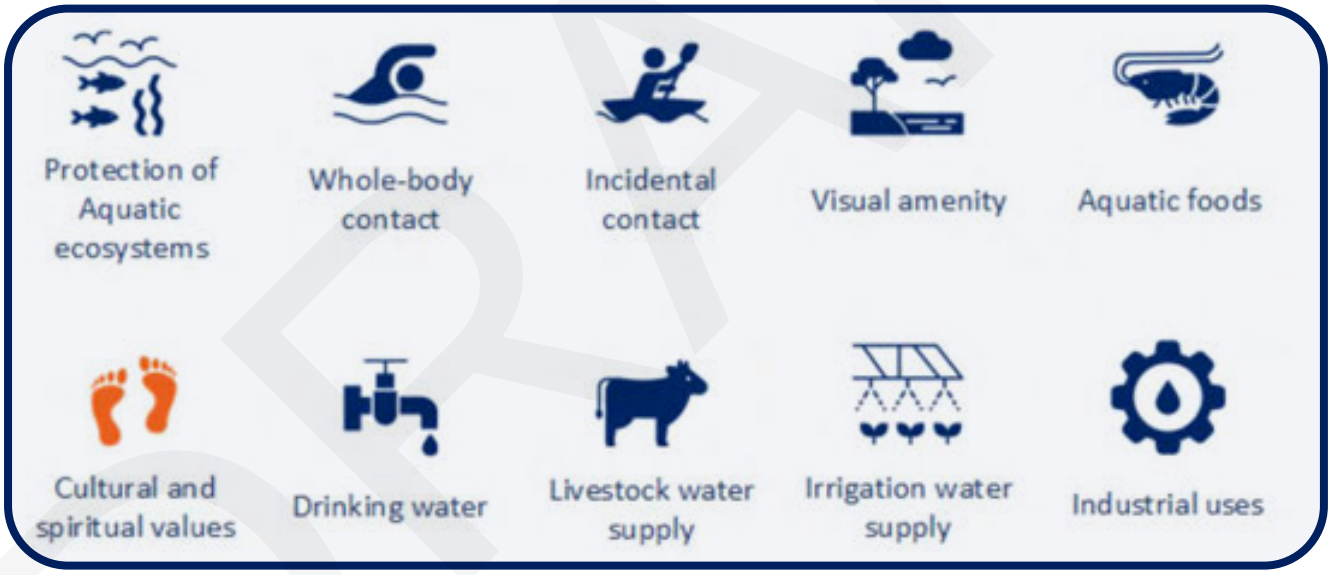


Figure 2-41 The NSW Water Quality Objectives

The NSW Water Quality Governance Roadmap

The NSW Water Quality Governance Roadmap (DCCEEW, 2024) is a strategic document prepared by the NSW DCCEEW to improve the way water quality is managed across the state. It was developed in response to longstanding fragmentation in responsibilities, duplication of effort, and gaps in monitoring and governance. The roadmap provides a coordinated pathway to strengthen governance, clarify roles, and integrate management of water, land, and natural resources to improve waterway health and resilience. The NSW Government is progressing 2 key pathways for improving water quality outcomes across NSW:

- Better integrating management of land, water and natural resources:
  - To address the complexity of the existing fragmentation of water quality management in NSW, the NSW Government is transitioning towards a more “integrated catchment management” (ICM)

approach. The roadmap set out the need to establish a statewide integrated catchment management framework, which recognises the interconnectedness between waterways and land use, at a catchment scale. Future progression towards a statewide ICM approach can and should link with the HNRS CMP through governance, land-use planning, and monitoring and reporting (see below).

- Improving water quality data management and monitoring:
  - Water quality data is collected, stored and used by a range of state government agencies as well as councils. There is also no centralised guidance to specify what good water quality data looks like in relation to NSW's data sharing platforms, to inform what data to collect, store and manage. There are also different approaches and tools used for publication, interpretation and communication of water quality data. The roadmap recognises that while water quality data systems exist, there are opportunities to improve the efficiency and effectiveness of water quality information collection, sharing and use. This includes improving monitoring arrangements to align monitoring programs and fill gaps in data, improving the data collected (including quality assurance processes) and how to store, access, share and interpret the data and monitoring results. The progression of the roadmap should link with the MER of the HNRS CMP.

The NSW State Disaster Mitigation Plan

In February 2024, the NSW Reconstruction Authority (RA) published the State Disaster Mitigation Plan (SDMP) (NSW RA, 2024a).

The NSW SDMP:

- Identifies NSW's exposure to a range of natural hazards, such as bushfires and floods, and assesses how the associated risk changes over time due to population growth and climate change (see Figure 2-42).
- Identifies a toolkit of options to reduce our exposure and vulnerability to natural hazards.
- Provides a comprehensive plan of 37 short to medium term actions to address policy and program gaps that work to reduce the costs and impacts of disasters.
- Supports local disaster adaptation planning.

The SDMP places a strong emphasis on risk reduction through strategic land use planning and integrates a broad spectrum of natural hazards including (but not limited to) all 7 coastal hazards defined in the CM Act (see Figure 2-42).

In doing so, it has clear alignment with the objectives of the CMP and serves as a state-level planning framework that complements and reinforces local CMPs by addressing coastal hazard risk at a broader, strategic scale.

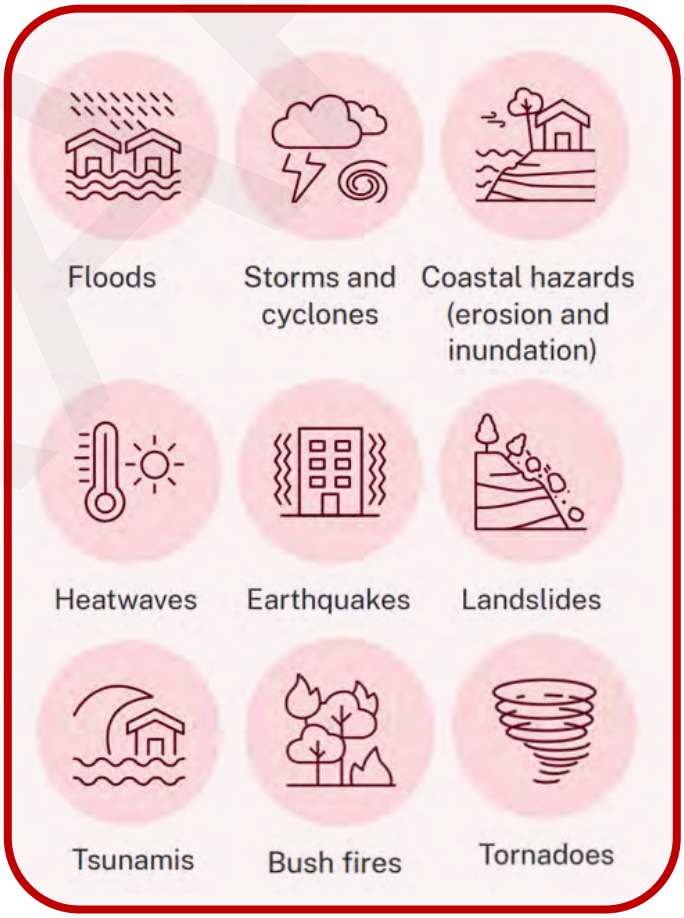


Figure 2-42 Natural Hazards covered by the SDMP

The SDMP serves are a state level planning document to address multi-hazard risk, with clear linkages to the CMP in that through its strategic initiatives to address coastal hazard risk at a state-wide planning scale. It considers risk reduction measures through a similar hierarchy to the CM Manual:

- Managed relocation, such as voluntary buy-back schemes and the coordinated resettlement of at-risk communities.
- Mitigation infrastructure, including seawalls, beach nourishment, and foreshore protection structures.
- Strategic planning controls, such as zoning, development restrictions, and land use exclusions in high-risk areas.
- Early warning systems to improve community response to hazard events.
- Community education and preparedness programs to build resilience at the local level.

In this context, the CMP benefits from the strategic direction set by the SDMP, particularly where it relates to long-term coastal risk reduction, planning reform, and the alignment of local actions with state-wide hazard mitigation priorities

The NSW Boating Infrastructure and Dredging Scheme

In 2025, TfNSW announced the commencement of the NSW Boating Infrastructure and Dredging (BID) Scheme (TfNSW, 2025). The scheme consists of 5 sub-programs:

- Boating Infrastructure for Communities Grants Program – superseding the previous *Boating Now Program*, this program will put greater emphasis on improved access for aging boaters and boaters with disabilities.
- Boating Infrastructure Maintenance Grants Program – providing funding to asset owners across NSW to undertake minor repair and maintenance works on public boating infrastructure.
- Boating Infrastructure Emergency Repair Pool – funding support for owners of public boating infrastructure to repair or replace assets impacted by natural disasters and severe weather events.
- Priority Dredging Program – funding for MIDO to deliver new dredging projects at key priority sites critical to boating and safe waterway navigation.
- Committed Dredging Projects – committed dredging projects at Swansea, Ettalong (see Figure 2-38), Coffs Harbour and Myall River, and the development of 10-year environmental planning approvals to dredge nine high priority areas

The BID Scheme represents a major opportunity to align infrastructure investment with estuary management goals. As such, there is strong potential for synergies between the BID Scheme and the HNRS CMP, particularly where dredging, access improvements, and asset resilience projects help to address sedimentation, enhance waterway connectivity, and support long-term coastal and estuarine health.

2.6.2 Regional and Catchment Level Plans

Hawkesbury-Nepean Valley Disaster Adaptation Plan

Disaster Adaptation Plans (DAPs) are local or regional place-based plans that are intended to assess the specific natural hazard risks for an area now and in the future. They are intended to set out the projects, strategies or actions to be taken to prevent or reduce the risks and the disasters they may cause.

The Hawkesbury-Nepean Valley (HNV) DAP is the first of its kind in NSW and is (initially) solely focusses on catchment flood risk – building on the outcomes of the Hawkesbury-Nepean River Flood Study (NSW RA, 2024b) - and draws on decades of technical analysis and flood risk assessment to better understand the

drivers and consequences of major flood events. It aims to guide coordinated action to reduce risk to life, property, and community resilience in one of the most flood-prone regions in the catchment.

The HNV NDAP serves as a complementary planning document to the CMP, addressing the risks associated with catchment flooding, just as the CMP focuses on coastal hazard risk. Together, they provide a coordinated and system-wide approach to managing natural hazards across both the estuarine and upstream catchment areas.

The Dyarubbin (Hawkesbury River) Cultural Restoration Strategy

The Dyarubbin Cultural Restoration Strategy (CRS) (NSW Government and Water Technology, 2025) has been developed to guide the protection, restoration, and management of Aboriginal cultural landscapes throughout the Hawkesbury River estuary. While the CRS responds directly to the impacts of the 2020–2024 flood events - which caused significant damage to cultural heritage sites - its purpose extends beyond physical restoration. The strategy is also focused on building long-term resilience into both the estuarine landscape and the capacity of Aboriginal communities to manage, protect, and maintain cultural values through self-determined Care for Country practices.

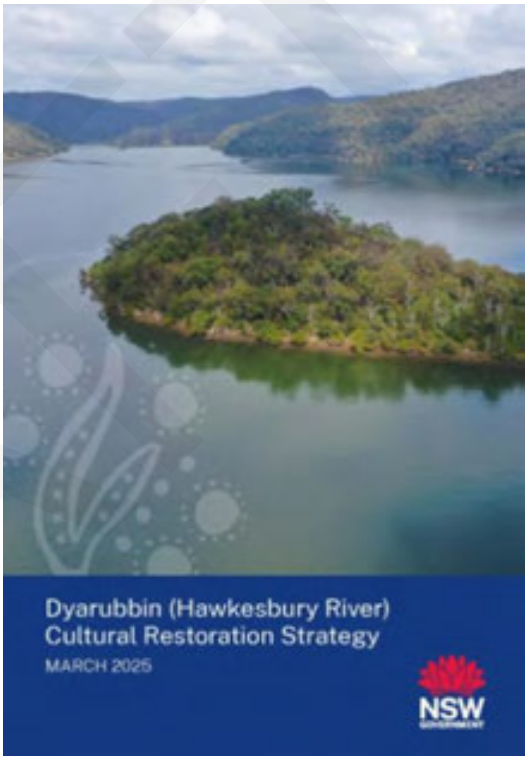


Figure 2-43 The Dyarubbin CRS

There are strong synergies between the CMP's management actions (particularly those outlined in Strategy 8) and the priorities identified in the CRS. Both documents were informed by extensive engagement with First Nations groups along the Hawkesbury River. These shared foundations create a unique opportunity for coordinated delivery. In practical terms, this may mean that some or all of the CMP's culturally focused management actions may be delivered through the CRS, with joint implementation arrangements and funding pathways.

This alignment not only supports the objects of the CM Act and the MEM Act - particularly in recognising Aboriginal cultural values and involving local communities in management - but also strengthens the long-term resilience of both natural and cultural assets across the estuary system.

The Greater Sydney Regional Plan

A Metropolis of Three Cities – the Greater Sydney Region Plan was developed by the Greater Sydney Commission, and outlines the overarching vision for the Greater Sydney Region. The plan sets a 40-year vision (to 2056) and establishes a 20-year plan to manage growth and change for Greater Sydney in the context of social, economic and environmental matters (Greater Sydney Comission, 2018). It sets forth a vision for the region as a metropolis of three unique but connected cities to accommodate population growth with associated planning, land use, transport and infrastructure – see Figure 2-44.

The plan outlines 4 overarching goals of collaboration, liveability, productivity and sustainability with ten directions identified to deliver those goals. This CMP aligns with several of these key directions. The plan includes 5 district plans for the implementation at a district level, and 3 of these districts overlap with the study area catchment – the Western District, the Central District and the Northern District.

Waterways are part of the green infrastructure that support the vision of plan (Greater Sydney Comission, 2018). While two-thirds of Greater Sydney's urban areas are within coastal and harbour catchments, the most significant change in Greater Sydney is set to occur on the Cumberland Plain centred around South Creek which flows north into the Hawkesbury-Nepean River.

The NSW Government is currently investigating different water recycling schemes and applications for both non-potable (for example, irrigation and industrial) and indirect potable (for example, replenishing groundwater systems) water reuse as part of the initiative.



Figure 2-44 A Metropolis of Three Cities – The Greater Sydney Region Plan (Source: GSC, 2018)

The Central Coast Regional Plan 2036

In a similar vein, the Central Coast Regional Plan 2036 (DPE, 2016) sets regional planning priorities for the Central Coast and provides guidance and direction for regional and local planning decisions over a 20-year period to 2036. It provides an overarching framework to guide land use planning, development proposals and infrastructure funding decisions. The plan outlines 4 overarching goals:

- A prosperous Central Coast with more jobs close to home;
- Protect the natural environment and manage the use of agricultural and resource lands
- Well-connected communities and attractive lifestyles
- A variety of housing choice to suit needs and lifestyles.

The NSW Government has established the Central Coast Delivery, Coordination and Monitoring Committee to deliver, coordinate and be accountable for achieving the vision and goals of the Plan (DPE, 2016).

2.6.3 Local Level Plans

As per the requirements of the *Local Government Act 1993*, all NSW local governments are required to prepare a series of strategic plans that conform to the structure of the state Integrated Planning and Reporting (IP&R) Framework. The structure of this framework is depicted in Figure 2-45, and a brief overview of the components is provided below. A summary of relevant planning documents is provided in Table 2-8.

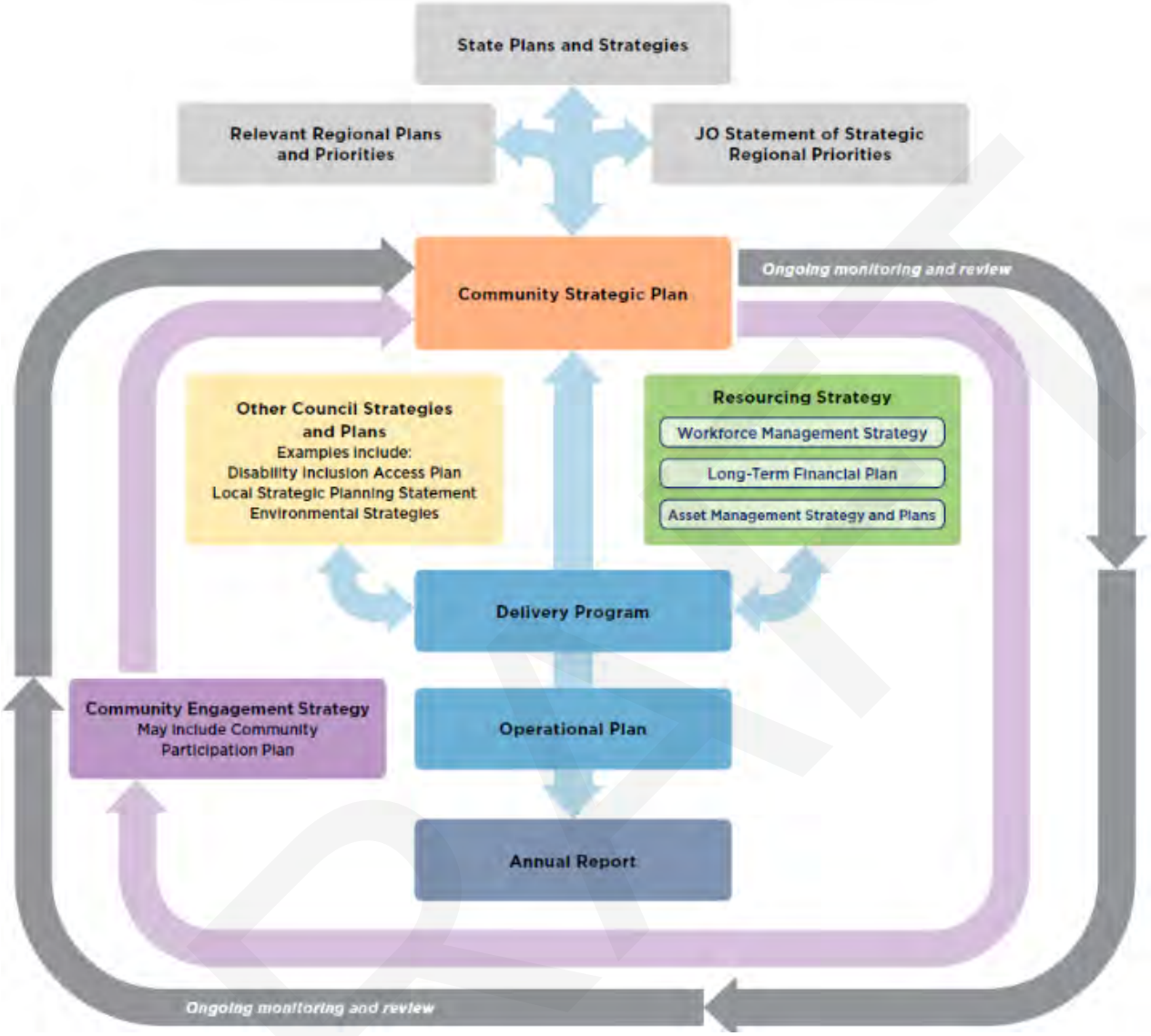


Figure 2-45 Integrated Planning and Reporting Framework (NSW Office of Local Government, 2025)

Community Strategic Plans

The Community Strategic Plan (CSP) is the overarching, visionary document that translates the community's key priorities and aspirations into long-term strategic goals that guide the future direction of the LGA. The Plan represents the highest level of strategic planning undertaken by a local council. A CSP essentially addresses 4 key questions for the community:

- Where are we now?
- Where do we want to be in ten years' time?
- How will we get there?
- How will we know when we have arrived?

All other plans developed by councils in the study area (such as CMPs) must reflect and support implementation of their CSP. In fact, under the CM Act, the objectives and management actions developed as part of CMPs are required to be strategically aligned with the objectives and strategies outlined in each partner

council's CSP. Linkages to the various CSPs of the partner councils are provided in the Stage 1 Scoping Study Document (Water Technology, 2020).

Resourcing Strategy

The Community Strategic Plan provides a vehicle for each community to express its long-term aspirations. However, these aspirations will not be achieved without sufficient resources – time, money, assets and people – to implement them. The Resourcing Strategy is critical link when translating strategic objectives into actions. The Resourcing Strategy consists of three inter-related elements:

- Long-Term Financial Planning
- Asset Management Planning
- Workforce Planning

The Resourcing Strategy makes clear what elements of the CSP the council will take responsibility for. Other levels of government, business, non-government organisations, community groups and individuals will also have a role in achieving the outcomes of the CSP.

As its name suggests, each of the elements of the Resourcing Strategy also play a role in resourcing the achievement of the Delivery Program and Operational Plans, as well as any other strategic plans the council has developed to support the achievement of the CSP (NSW Office of Local Government, 2025).

Resourcing implications of the CMP should be reflected in the Resourcing Strategy and CMP actions relating to Partner Council assets should be considered in the relevant Asset Management Plan.

Delivery Programs and Operation Plans

The Delivery Program (DP) is a 4-year plan that turns the strategic goals found in the CSP into actions. It is the point where a council makes a commitment to the CSP, and act upon those issues that are within its area of responsibility. The DP identifies all of the key activities the council has committed to undertake over its four-year term. All plans, projects, activities and funding allocations of the council must be directly linked to the DP.

The Delivery Program should be reviewed every year as the council prepares the next Operational Plan. If any significant amendments are proposed to the Delivery Program, the council must re-exhibit it, explaining the proposed changes and inviting community comment (NSW Office of Local Government, 2025).

Forthcoming and ongoing CMP actions for the relevant 4-year period must be included in the associated delivery program for each Partner Council.

Operational Plans

The Operational Plan is a one year plan that spells out the detail of the Delivery Program, identifying the individual projects and activities that will be undertaken in a specific financial year to achieve the commitments made in the four year Delivery Program (NSW Office of Local Government, 2025).

The Operational Plan must include the council's detailed annual budget, along with the council's Statement of Revenue Policy, which includes the proposed rates, fees and charges for that financial year. Forthcoming and ongoing CMP actions are scheduled into each years' operational plan.

Local Strategic Planning Statements

Under the EP&A Act there is a requirement for councils to prepare and prepare a Local Strategic Planning Statement (LSPS), which sets out the 20-year vision for land use in the local area, and how change will be managed into the future.

These plans provide a link between the state government's strategic plans and local council's local land use plans and guidelines. The LSPS forms part of a council's IP&R Framework, providing an important link with the CSP.

Local Environment Plans and Development Control Plans

Each Partner Council possesses a Local Environment Plan (LEP), which all NSW local governments are required to prepare under the direction of the state government. The purpose of LEPs is to regulate land use and development. They guide planning decisions for local governments and allow councils to regulate the ways in which all public land may be used and protected through zoning and development controls.

The associated Development Control Plan (DCP) provides detailed planning and design guidelines to support the planning controls in each LEP.

Reporting

Reporting is a key element of the IP&R framework. Councils must prepare an Annual Report that provides information regarding progress and success in implementation of the Operational Plan and Delivery Program.

Other Relevant Local Plans

Local councils also develop and implement a range of other local level plans relevant to the study area. These plans vary from one LGA to the other, but generally include variations of the following to name just a few:

- Floodplain risk management studies and plans for creeks and sub-catchments
- Integrated water management plans and stormwater management plans
- Heritage management plans
- Climate change mitigation and adaptation plans
- Biodiversity, vegetation and pest species management plans
- Plans of Management for crown reserves and community lands
- Housing and land use strategies
- Economic development and tourism strategies
- Waste strategies
- Bushfire risk management plans
- Master planning and public domain projects.

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Table 2-8 Local planning instruments of the Partner Councils

Instrument	Central Coast Council	Northern Beaches Council	Ku-ring-gai Council	Hornsby Shire Council	The Hills Shire Council	Hawkesbury City Council
Community Strategic Plan	▪ One Central Coast: Central Coast, Community Strategic Plan 2018-2028	▪ Northern Beaches Community Strategic Plan 2040	▪ Community Strategic Plan 2035	▪ Hornsby Shire Community Strategic Plan - Your vision | Your future 2035	▪ Towards Hills 2050	▪ Our Hawkesbury 2045 - Community Strategic Plan
Local Strategic Planning Statement	▪ Local Strategic Planning Statement 2020	▪ Towards 2040 - Local Strategic Planning Statement	▪ Ku-ring-gai Local Strategic Planning Statement 2020	▪ Future Hornsby - Local Strategic Planning Statement 2020	▪ Hills Future 2036 - Local Strategic Planning Statement	▪ Hawkesbury Local Strategic Planning Statement 2040
Local Environment Plans	▪ Central Coast LEP 2022	▪ Northern Beaches LEP 2026[#]	▪ Ku-ring-gai LEP 2015	▪ Hornsby LEP 2013	▪ The Hills LEP 2019	▪ Hawkesbury LEP 2012
Development Control Plans	▪ Central Coast DCP 2022	▪ Northern Beaches DCP 2026[#]	▪ Ku-ring-gai DCP 2016	▪ Hornsby DCP 2013	▪ The Hills DCP 2012	▪ Hawkesbury DCP 2023

[#] Note that Northern Beaches Council is currently working to consolidate its existing suite of LEPs and DCPs. This process is expected to be completed by the time the CMP in certified and enacted.

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3 A SNAPSHOT OF THE ISSUES

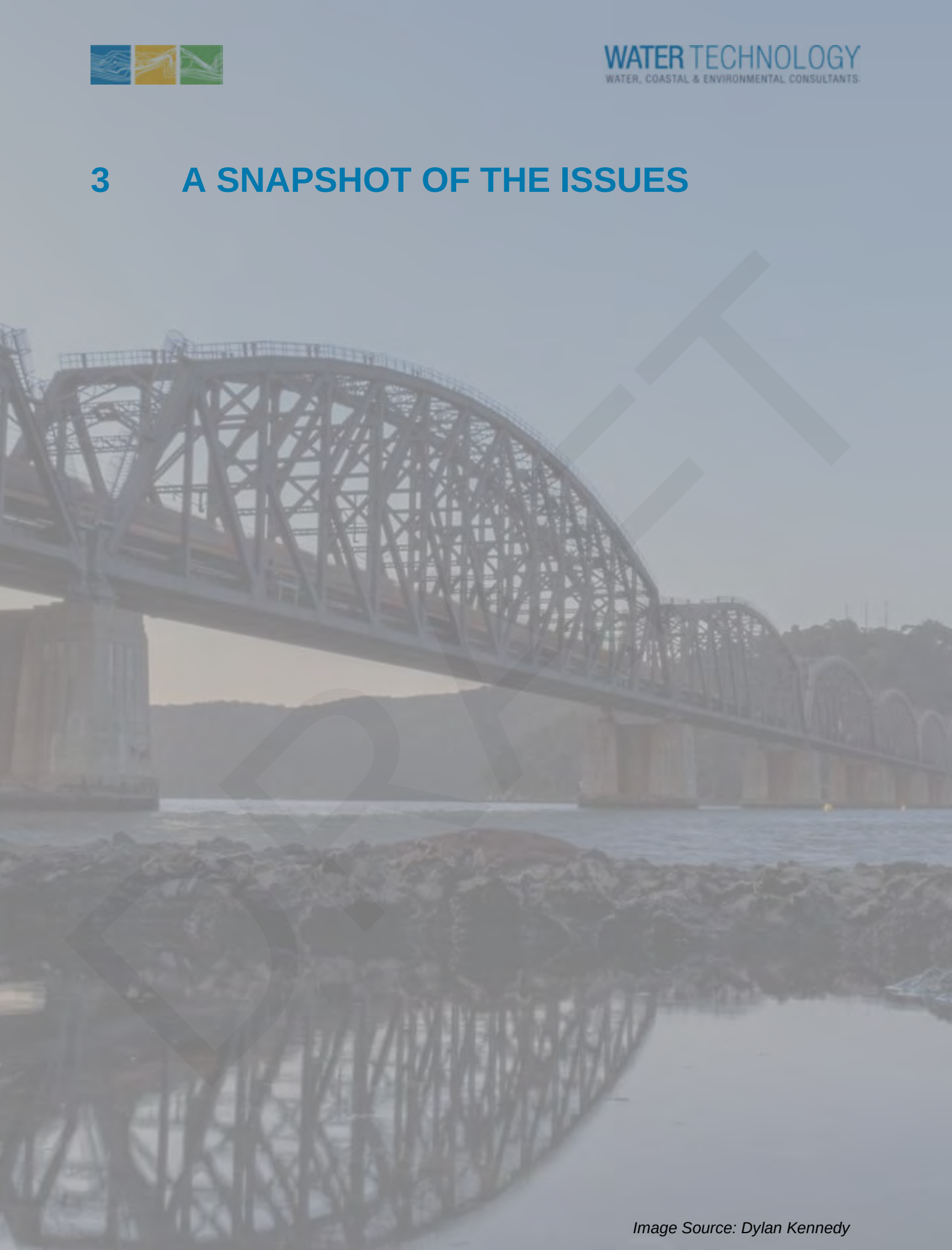


Image Source: Dylan Kennedy

3.1 Overview

Section 21 (3) (b) of the CM Act requires the application of a risk management process when preparing CMPs and identifying where management actions are required (OEH, 2018a). Accordingly, during Stage 1 of the CMP, a first-pass qualitative risk assessment (FPRA) was undertaken in accordance with the following guidance and frameworks:

- The requirements outlined in the NSW Coastal Management Manual (OEH, 2018b).
- The threat and risk assessment framework presented in the *Marine Estate Management Strategy Threat and Risk Assessment* (BMT WBM, 2017)
- The risk management principles and process described in *ISO 31000:2018, Risk management – Principles and guidelines, provides principles, framework and a process for managing risk* (ISO, 2018)

The various threats and stressors associated with the HNRS were identified through stakeholder engagement, review of previous estuary and coastal studies, and reference to the Marine Estate Threat and Risk Assessment (BMT WBM, 2017). Based on this preliminary review, a total of 67 stressors were identified, spanning 5 key threat categories, as illustrated in Figure 3-1.

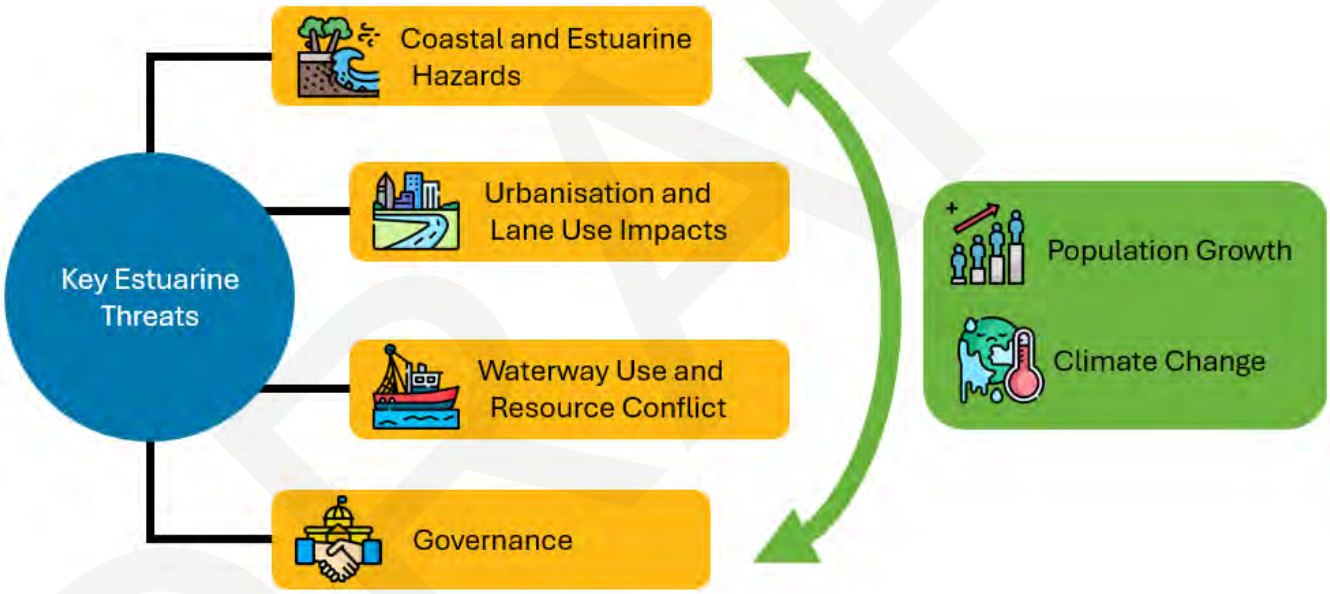


Figure 3-1 Threat Categories across the HNRS

During Stage 2 of the CMP, these stressors were further assessed through a suite of detailed technical studies (see Section 4.3). These studies built on the Stage 1 FPRA and focused on identifying key risks, vulnerabilities, and opportunities across the study area to inform the development and prioritisation of management actions in Stages 3 and 4.

In accordance with the Mandatory Requirements for CMPs (OEH, 2018a), the risk assessment work undertaken in Stages 1 and 2 considered both current and emerging risks over a range of planning horizons - including present-day, 20-year, 50-year, and 100-year timeframes - to account for projected impacts of climate change, population growth, and future development within the coastal zone.

A brief snapshot of these stressors and associated risks is provided in Section 3.2 to 3.5.

3.2 Coastal and Estuarine Hazards

The CMP process facilitates identification of areas impacted by various coastal and estuarine hazards and enables an assessment of the relative risk of each of these hazards. The CM Act recognises 7 coastal hazards within the NSW coastal zone, as summarised in Figure 3-2.

Coastal hazards addressed in this CMP



(1) Beach erosion



(2) Shoreline recession



(3) Coastal lake or watercourse entrance instability



(4) Coastal cliff / slope instability



(5) Coastal inundation



(6) Tidal inundation



(7) Erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters

Figure 3-2 The legally defined coastal hazards set out in the CM Act

Over the coming decades, the impacts of climate change - including sea level rise, increased storm intensity, and altered rainfall and runoff patterns - will be superimposed over these existing hazards, increasing their severity, frequency, and spatial extent. As a result, the management of coastal risks in this CMP has considered forward-looking strategies that account for long-term climate projections and the cumulative impacts on coastal communities, ecosystems, and infrastructure. A brief summary of the key coastal hazard risks is provided below.

3.2.1 Beach Erosion and Long Term Shoreline Recession

The most severe beach erosion events affecting the study area are driven by East Coast Lows (ECLs) - intense, episodic low-pressure systems that develop off the east coast of Australia. These systems are characterised by damaging winds, heavy rainfall, storm surges, and high-energy wave conditions, and are a primary driver of short-term coastal hazards along the NSW coast (DPE, 2023).

The beaches of Broken Bay - including Ocean–Umina Beach, Pearl Beach, and Patonga Beach - are directly exposed to southerly and easterly swell from the Tasman Sea, making them particularly susceptible to storm-induced erosion. Historical erosion has been well documented along these shorelines, placing coastal assets

and infrastructure at significant risk during major storm events. At Ocean–Umina and Ettalong beaches, erosion processes are further influenced by the complex entrance dynamics of the Brisbane Water estuary, where interactions between tidal flows, sediment transport, and wave action create a highly variable and challenging coastal environment (WorleyParsons, 2014).

Some of the most severe coastal hazard events in living memory occurred during the mid-to-late 1970s, when a cluster of ECLs between 1974 and 1978 caused widespread beach erosion and coastal inundation along the NSW coastline, including the Broken Bay and Pittwater regions (WorleyParsons, 2014). More recently, ECL events in 1985, 1986 (see Figure 3-3), 2015 (see Figure 3-4), 2016 and 2020, have continued to cause significant impacts to beaches across the study area.



Figure 3-3 Erosion at Ocean Beach in 1985. Right: Storm Conditions at Pearl Beach, August 1986 (WorleyParsons, 2014)

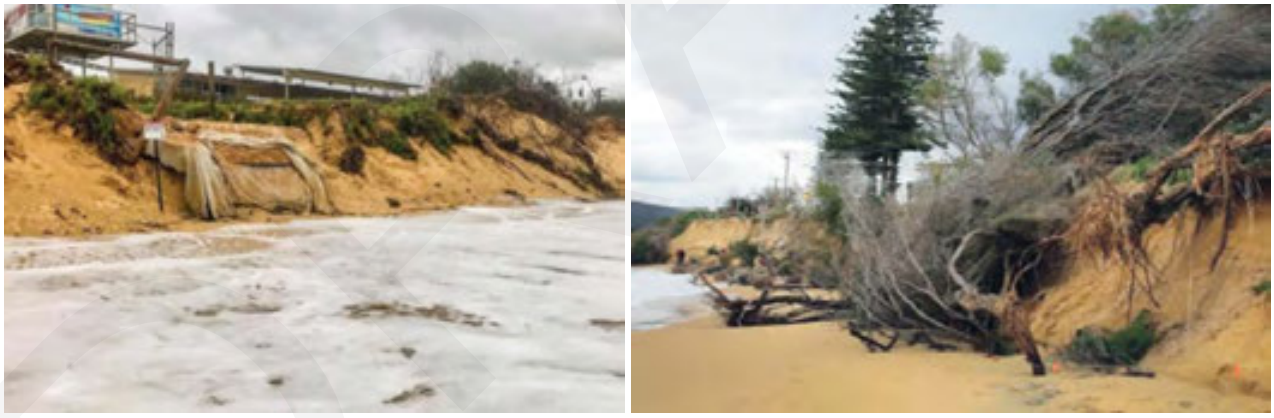


Figure 3-4 Beach erosion at Ocean and Umina Beaches in 2015

In Pittwater, the northern shoreline - including Mackerel Beach on the western side and the eastern shores north of Observation Point - also experiences significant wave exposure during strong southerly and easterly storm events, particularly those associated with ECLs.

3.2.2 Tidal Inundation

Tidal inundation (often referred to as “sunny-day flooding”) refers to periodic inundation of low-lying estuarine foreshores due to astronomical and meteorological processes. There are a number of river riverside communities in the study area that are considered to be at risk of tidal inundation – with this risk to increase over the coming decades with mean sea level rise.

The *NSW Estuary Tidal Inundation Exposure Assessment* (OEH, 2018g) has identified land and infrastructure around the estuaries that are at risk from inundation under a range of sea level rise scenarios. This includes the following hotspot areas:

- Brisbane Water: Ranked as the third most vulnerable estuary system in NSW, with over 200 properties currently exposed to tidal inundation. This number increases to approximately 2,000 properties under a +0.5 m SLR scenario, and over 4,000 properties with +1.0 m SLR. Highly exposed locations include Empire Bay, Davistown, Saratoga, St Huberts Island, Woy Woy, Kincumber, and Green Point (see Figure 3-5).
- Pittwater: Inundation risk increases substantially under future sea level rise, particularly in low-lying areas such as Great Mackerel Beach and the Basin Campground, which are increasingly exposed under a +1.0 m SLR scenario.
- Lower to Middle Estuary: Periodic tidal inundation is already observed in Brooklyn, Dangar Island, Milsons Passage, and Bobbin Head, with risk escalating under future conditions.
- Upper Estuary: ringing wetlands and low-lying agricultural areas around Webbs Creek, Wisemans Ferry, Gunderman, Laughtondale, and Spencer are exposed to present-day inundation, and will face increased isolation and access issues with projected sea level rise. Notably, Wisemans Ferry Road becomes vulnerable to overtopping under future conditions.

Tidal inundation represents a major long-term challenge for many waterfront townships across the HNRS. Unlike other coastal hazards that may occur episodically, the effects of sea level rise on tidal inundation will be progressive, ongoing, and effectively irreversible on human timescales. As sea levels rise, inundation will become more frequent, more severe, and ultimately permanent in some locations posing significant implications for land use planning, infrastructure, emergency access, and community resilience in the decades ahead – see Section 3.2.6.

DRAFT



Figure 3-5 Top: Woy Woy tidal inundation in 2018. Middle: Spencer in 2025. Bottom: Bobbin Head NPWS facilities in 2017 (source: Central Coast News)

3.2.3 Coastal Inundation

Coastal storm tide inundation occurs when elevated ocean water levels - driven by a combination of storm surge, wave setup, and astronomical tides - flood low-lying coastal and estuarine land. These events are typically associated with ECLs and other intense coastal storms, and while infrequent, they can result in rapid-onset flooding, damage to property and infrastructure, and pose risks to public safety.

Unlike tidal inundation, which occurs predictably and incrementally, storm tide inundation is often sudden and short-lived, but far more destructive, particularly when it coincides with high astronomical tides or catchment flooding. These events can temporarily raise water up to half a metre or more, leading to widespread flooding of estuarine foreshores, roads, and built assets - especially in areas already vulnerable to tidal inundation.

In Stage 2 of the CMP, the Hawkesbury River Estuary Coastal Inundation Study (Rhelm and Baird, 2023) utilised hydrodynamic modelling to assess coastal inundation risk across the lower estuary under a range of current and future sea level scenarios. Coastal inundation mapping generated in this study indicated that many low-lying waterfront communities throughout the HNRS - including key townships, estuarine margins, and transport routes - are exposed to this hazard. The compounding effects of storm surge, waves, and river flooding make it particularly difficult to manage, especially in narrow estuaries or those with constricted entrances.

In the main Hawkesbury River, the influence of coastal storm tide inundation generally extends up to the reach between Brooklyn and Spencer (CSS and Rhelm, 2024)

3.2.4 Combined Coastal and Catchment Flooding

The HNRS has one of the most significant flood risk exposures in NSW (CSS and Rhelm, 2024). It has a long and well-documented history of flooding, with records dating back to 1789 - the longest continuous flood record in Australia. More than 130 moderate to major floods have occurred since that time, including recent major events in 2020, 2021, and 2022 (NSW RA, 2024b)(see Figure 3-6).



Figure 3-6 Flooding at Wisemans Ferry (left) and Lower Portland (right) in 2022 (source: NSW RA, 2024)

These investigations indicate that the joint occurrence of coastal and catchment flooding is considered unlikely in the Upper Hawkesbury, due to the slow catchment response time. Typically, peak flood flows reach the estuarine reaches of the river several days after the storm systems that generate coastal flooding (NSW RA, 2024b; CSS and Rhelm, 2024).

In contrast, the upper reaches of the Brisbane Water Estuary are more susceptible to combined catchment and coastal flooding, particularly in constrained or low-lying sub-catchments. Locations known to be at risk include (but are not limited to) Fagans Bay, Narara Creek, Erina Creek, Kincumber Creek, and the Woy Woy Inlet.

It is important to note that this CMP does not address catchment flood risk within the broader Hawkesbury–Nepean Valley - this risk is addressed under the Hawkesbury–Nepean Valley Disaster Adaptation Plan (HNV DAP) and the State Disaster Mitigation Plan (SDMP) led by NSW Reconstruction Authority (NSW RA, 2024a).

However, the CMP does consider the broader environmental, ecological, and residual risks posed by the interaction of catchment and coastal flooding, particularly in estuarine systems and the marine estate - where these processes may overlap (see Figure 3-7).



Figure 3-7 The impacts of catchment flooding on the marine estate in March 2022 (source: Sentinel)

3.2.5 Bank Erosion

Bank erosion is a widespread issue across the tidal waterways of the study area. As part of Stage 2 of the CMP, the *Hawkesbury–Nepean River System Estuary Bank Erosion Assessment and Options Report* (Alluvium, 2022b).

The study mapped erosion across 76 sites and identified several erosion hotspots, including five locations classified as having 'extreme erosion risk'. These include:

- Pittwater: Sand Point Beach and Great Mackerel Beach
- Freshwater Tidal Pool reach: Argyle Bailey Reserve (see Figure 3-8), Churchills Wharf Reserve, and The Terrace, Windsor

The study also identified a number of sites as having "high" risk, including:

- Broken Bay: Patonga Creek
- Freshwater Tidal Pool reach: Cumberland Reach (see Figure 3-9)

The study found that found that key factors contributing to bank and foreshore erosion include:

- Altered flow regimes due to catchment clearing and urban/rural development

- High-velocity flood flows, particularly on the outer bends of river meanders, increasing shear stress and bank instability
- Post-flood bank saturation, leading to failure from internal seepage and lack of root reinforcement
- Boat wash, which generates persistent wave energy causing localised erosion
- Tidal currents and fluctuations, which transport sediment and increase wave action at variable heights - a process expected to worsen with sea level rise
- Wind waves, amplified in areas with reduced riparian vegetation and increased fetch.



Figure 3-8 Bank erosion at Argyle Bailey Reserve, Windsor



Figure 3-9 Bank erosion at Cumberland Reach (Alluvium, 2022b)

3.2.6 Climate Change Impacts

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) opens with a stark and unequivocal conclusion

"It is unequivocal that human influence has warmed the atmosphere, ocean and land. Widespread and rapid changes in the atmosphere, ocean cryosphere and biosphere have occurred" (IPCC, 2021).

This statement confirms that climate change is already underway and will continue to shape the environment for decades to come. As such, it is essential to consider the potential impacts of climate change on local coastal processes and hazards, particularly in vulnerable estuarine systems like the HNRS.

Sea Level Rise

AR6 confirms that thermal expansion of the oceans and melting of glaciers and ice sheets have been the dominant contributors to global mean sea level rise throughout the 20th century - a trend that is expected to continue. Between 1901 and 2018, global sea level rose by approximately 0.20 metres, with the rate of rise accelerating over time:

- 1.3 mm/year between 1901–1971
- 1.9 mm/year between 1971–2006
- 3.7 mm/year between 2006–2018

To assess future sea level rise, AR6 introduces a suite of Shared Socioeconomic Pathways (SSPs) - global scenarios that consider different greenhouse gas emission trajectories based on a range of assumptions about population growth, technological development, land use, and climate policy. These include:

- Low-emission scenarios (e.g. SSP1-1.9), assuming rapid decarbonisation and sustainability
- Intermediate scenarios (e.g. SSP2-4.5), assuming moderate mitigation
- High Emissions scenarios (e.g. SSP3-7.0), assuming limited international cooperation, slow economic development, weak environmental policy
- High-emission scenarios (e.g. SSP5-8.5), assuming continued fossil fuel use and limited climate action

Sea level rise projections under these scenarios suggest that, by 2100, mean sea level could rise between 0.4 and 1.4 metres relative to the 1990–2014 baseline (see Figure 3-10), depending on the global emissions pathway.

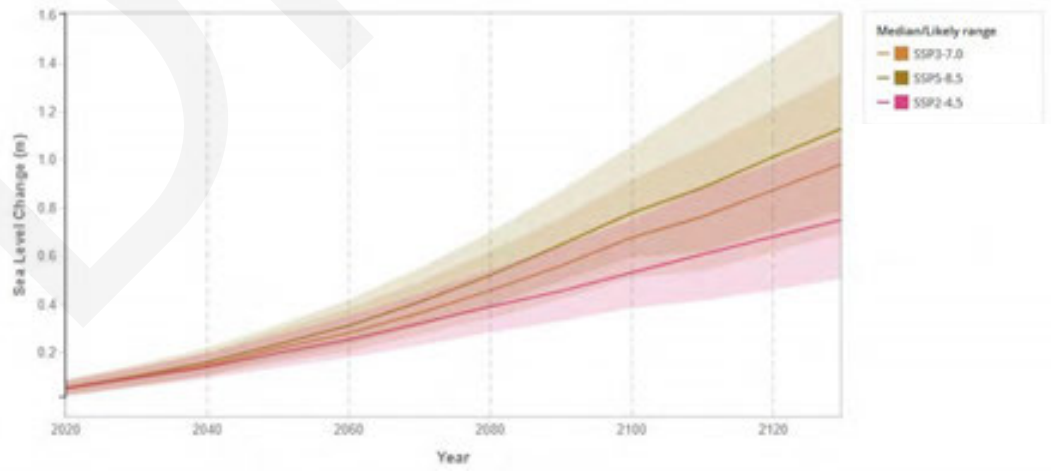


Figure 3-10 Projected SLR for the Sydney Region over the next century (source: NASA 6AR Projection Tool)

The impacts of SLR will manifest as they exacerbate each of the coastal hazards that impacts the study area:

- Long-term shoreline recession is expected to intensify as sea levels rise, leading to the progressive inland movement of coastlines and loss of coastal land.
- Coastal estuary entrance instability will be impacted by SLR as it can alter the equilibrium of tidal flows and affect the stability of estuary entrances.
- SLR will increase the risk of coastal cliff and slope instability as rising water levels can undermine the stability of coastal cliffs and slopes an increase the wave energy that coastal cliffs are exposed to.
- Storm tide inundation will become more severe with SLR, leading to higher water levels during storms and increased frequency and severity of coastal inundation.
- Tidal inundation, which includes both nuisance flooding and saltwater intrusion, will become more frequent and extensive as sea levels continue to rise, affecting low-lying coastal areas.

Broader Climate Change Impacts

The estuaries will also come under increasing pressure over the coming decades from a range of projected climate change impacts. These are detailed in the various Stage 1 and Stage 2 reports and include:

- *Ocean (and estuarine) temperature increase:* Estuaries are impacted by both changes in local coastal catchment conditions, as well as ocean warming. Scanes et al. (2020) found that estuary temperatures in South-Eastern Australia have increased by an average of ~2.1°C between 2007 and 2019, with higher rates of warming in shallow lagoons and rivers compared to deeper lakes and waterways. Ecological systems are threatened by sustained high temperatures that exceed the thermal thresholds of their species (Verges, et al., 2014).
- *Ocean acidification:* Ocean acidification has various impacts on the different components of estuarine ecosystems. It may cause dissolution of shells and other calcareous structures and has the potential to disrupt marine food chains by disrupting phytoplankton communities. In addition to the ecological impacts, increased acidity may affect physical and chemical estuarine processes by altering metal solubility and thus water chemistry.
- *Altered storm frequency and severity:* In general, both the frequency and severity of damaging storms is predicted to increase under climate change conditions. This could result in increased risk to coastal development and ecosystems through increased storm surge height and wave conditions.
- *Altered hydrologic and hydrodynamic regimes:* The predicted reduction in total rainfall, combined with an increase in evaporation, is likely to result in an altered balance between the marine and freshwater distribution across the estuary (Alluvium, 2022a).
- *Habitat migration and 'squeeze':* Landward migration of low-lying intertidal habitats such as mangroves, saltmarshes, mudflats, sand banks, and rocky shorelines will occur in response to rising sea levels (Glamore, Rayner, & Rahman, 2016). However, existing and future coastal development will form a barrier to wetland migration in some areas, resulting in habitat squeeze (Oppenheimer, et al., 2019). This will have significant repercussions for estuarine ecology, most notably fringing wetlands and saltmarsh communities (Haines & Thom, 2007).

3.3 Urbanisation and Land Use Impacts

3.3.1 Water Quality and Estuary Health

The HNRS and its connected estuaries are shaped by the combined influence of catchment land uses, pollutant sources, hydrodynamic processes, and in-system cycling. As the final receiving environment for the entire catchment, the estuary integrates the cumulative impacts of upstream activities and is especially sensitive to inputs from urban stormwater, agricultural runoff, wastewater discharges, and disturbed sediments.

Decades of human activity have altered the timing, magnitude, and composition of these inputs, reducing the system's resilience and increasing the risk of algal blooms, sediment contamination, and habitat loss.

While significant gains have been made through improved point-source controls and particularly wastewater treatment, these have been offset by ongoing pressures from diffuse pollution, urbanisation, agricultural intensification, and legacy contamination. Some reaches of the Hawkesbury River now consistently achieve good to excellent water quality; however, others remain prone to degradation, particularly after heavy rainfall when pollutant loads and turbidity rise sharply. Without continued investment in both catchment-scale management and targeted in-estuary protection, these pressures are likely to intensify under the combined influence of population growth, land use change, and climate variability.

DCCEEW Estuary Health Report Cards provide an annual high-level grade for each of the 3 main waterways of the HNRS. Grades are based on two nationally agreed water quality indicators - turbidity and chlorophyll-a - assessed against trigger values from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000). These indicators capture both water clarity and algal abundance, allowing for a consistent assessment of estuary condition. Grades range from A (excellent) to E (very poor)

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

The grades for each of the waterways is provided in Table 3-1.

Table 3-1 DPE estuary health report card grades (Alluvium, 2022a) between 2010 and 2021

Year	Upper Hawkesbury	Lower Hawkesbury	Brisbane Water	Pittwater
2010-11	D	-	A	-
2013-14	C	-	A	-
2016-17	C	-	A	-
2017-18	-	C	A	A
2018-19	-	C	A	A
2019-20	-	D	B	A
2020-21	C	C	B	A

Conceptual diagrams of key estuary health stressors across the HNRS and its contributing catchment are provided in Figure 3-11 to Figure 3-13, as developed during the Stage 2 Abridgement Report (Alluvium, 2022a).



Figure 3-11 Key estuary health stressors across the HNRS catchment (Alluvium, 2022a)

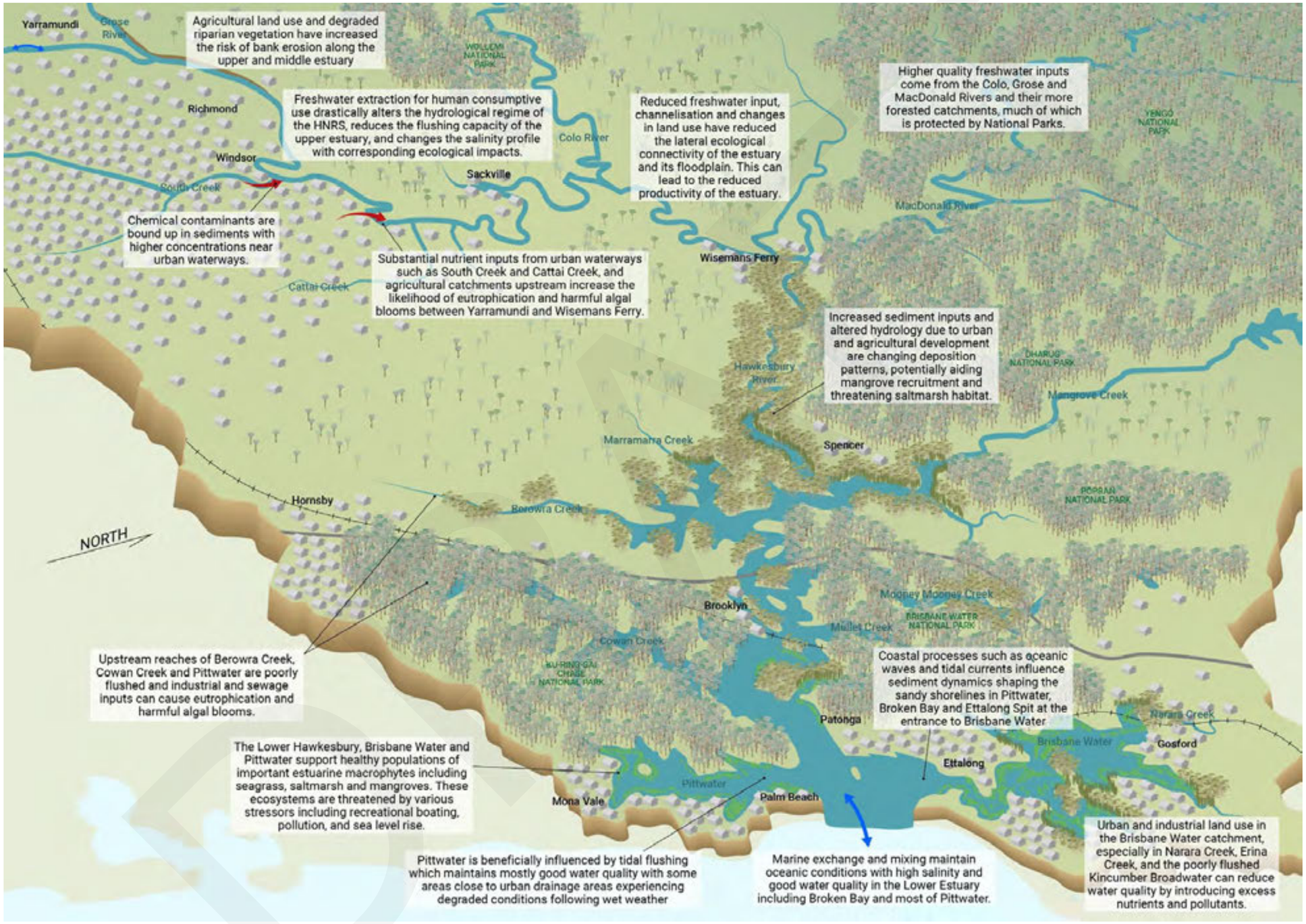


Figure 3-12 Key estuary health stressors across the HNRS estuary (Alluvium, 2022a)

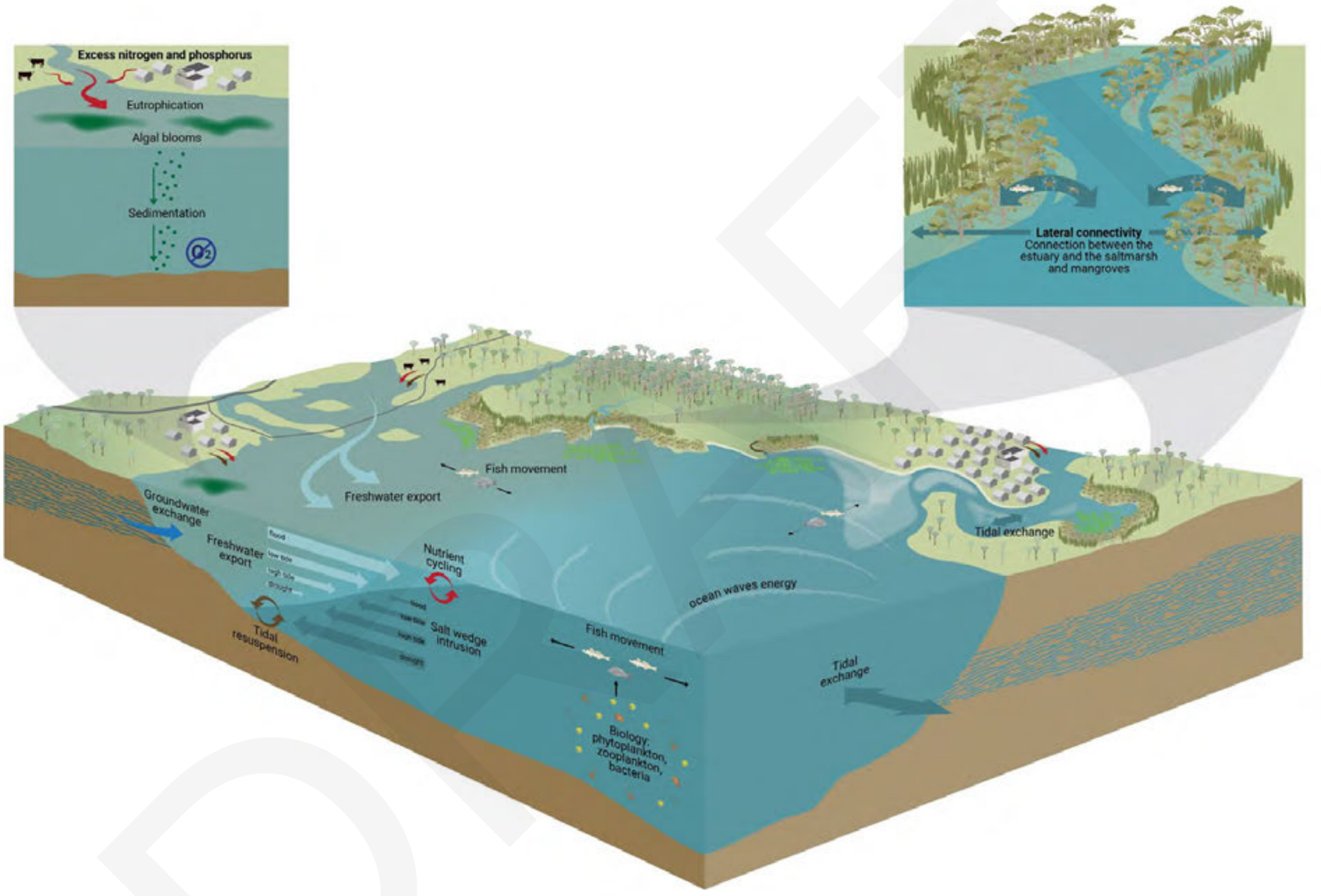


Figure 3-13 Conceptual model of critical processes operating HNRS estuary

Urban Stormwater and Agricultural Runoff

The HNRS catchment supports a wide variety of land uses, including national parks and bushland, agriculture, rural residential areas, and dense urban development. While each of these land uses can contribute pollutants to waterways, the most significant and persistent impacts on water quality are typically associated with urbanised and industrial catchments.

Subsequently, urban stormwater is one of the most significant and widespread contributors to water quality decline in the HNRS, particularly in sub-catchments with high density urban and suburban land usage (see Figure 3-14). During rainfall events, these hard surfaces rapidly shed water, carrying with it a complex mixture of contaminants including sediments, nutrients, heavy metals, hydrocarbons, pesticides, and gross pollutants. Without infiltration or treatment, these pollutants are washed directly into stormwater drains and waterways. The impact is particularly severe in areas with limited tidal flushing, where contaminants can accumulate in the water column and sediments rather than being dispersed to open coastal waters (Alluvium, 2022a; Water Technology, 2020).



Figure 3-14 Industrial land usage at Narara Creek, Gosford (source: TfNSW)

In the Upper Hawkesbury, the most prominent stormwater-affected hotspots occur at the confluences of South Creek and Cattai Creek, with water quality generally poorer between Windsor and Sackville (BMT WBM, 2013a). These reaches receive high nutrient and sediment loads, compounded by restricted flushing during low-flow conditions. In the Lower Hawkesbury, the upper reaches of Berowra Creek are particularly affected, with limited circulation, elevated pollutant loads, and long residence times combining to create persistent water quality issues (BMT WBM, 2008). Across Brisbane Water, urbanised catchments such as Narara, Erina, and Kincumber Creeks are well-established sources of degraded water quality (see Figure 3-14), with sharp increases in turbidity and pollutant concentrations following rainfall (Cardno Lawson & Treloar , 2008).

Agricultural runoff is another major source of pollutant loads, particularly nutrients and sediments (BMT WBM, 2013a). Runoff from rural properties can contain fertilisers, pesticides, hydrocarbons, and animal wastes, all of which are mobilised during wet weather.

Intensive agricultural zones between Windsor and the Lower Hawkesbury (see Figure 3-15)



Figure 3-15 Extensive agricultural land use at Freeman Reach

are especially significant contributors, with South Creek and Currency Creek identified as major sources of nitrogen and phosphorus (Alluvium, 2022a). These discharges are closely linked to the proliferation of algal blooms and aquatic weeds in affected reaches (BMT WBM, 2008).

The combined influence of urban stormwater and agricultural runoff is well illustrated by pollutant load modelling and monitoring data. Figure 3-16 and Figure 3-17, present an overview of pollutant loads entering the HNRS catchment, based on the NSW Estuary Health Risk Dataset (DPIE, 2019b).

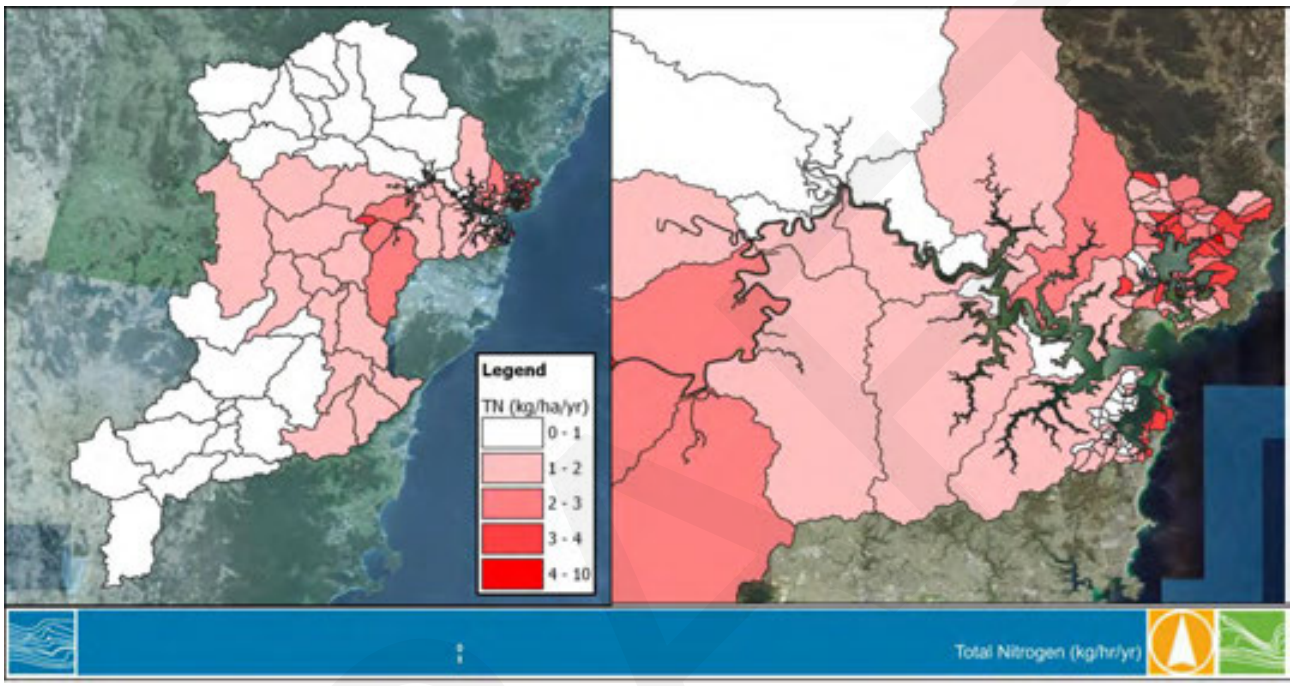


Figure 3-16 Total Nitrogen Load (kg/ha/year) across the HNRS catchment

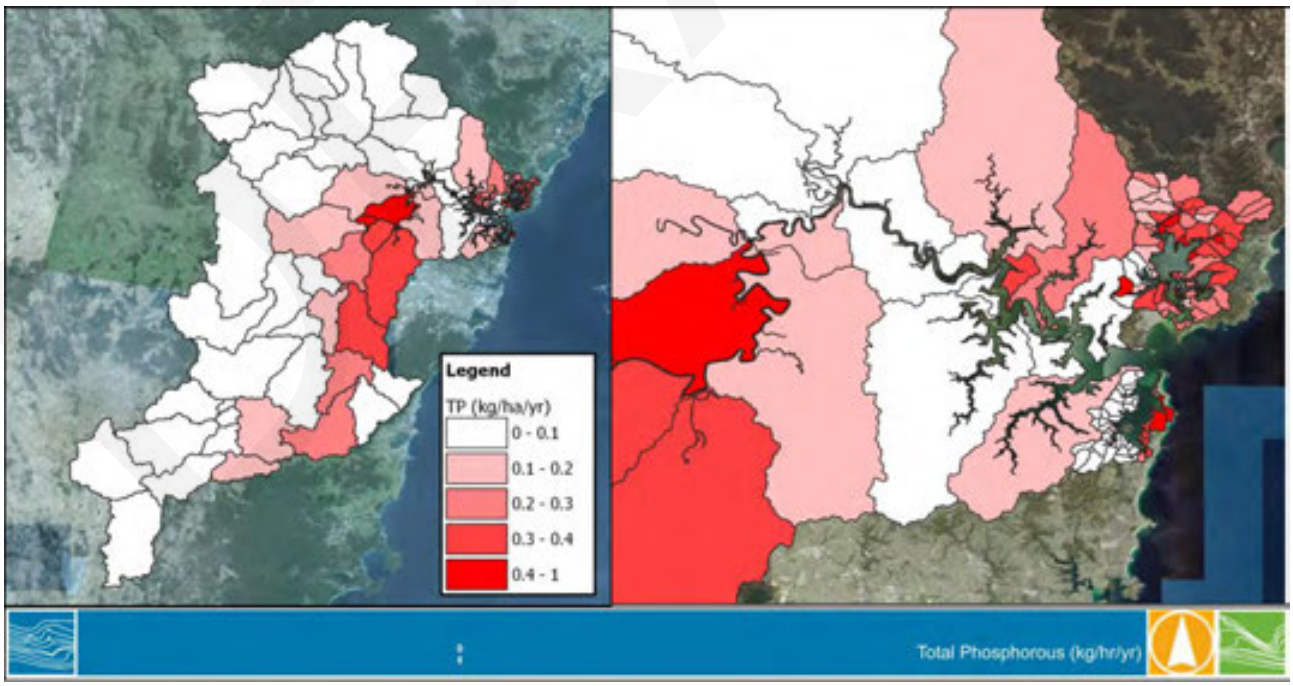


Figure 3-17 Total Phosphorus Load (kg/ha/year) across the HNRS catchment

These datasets show that heavily urbanised and intensively farmed sub-catchments consistently deliver the highest loads of nutrients, sediments, and contaminants. While wastewater treatment upgrades have significantly reduced point-source discharges, diffuse catchment sources remain the dominant driver of water quality decline, particularly following high-intensity rainfall events that generate rapid and largely untreated runoff to the estuary.

Wastewater Discharges

Water Resource Recovery Facilities (WRRFs) have historically been a major nutrient source to the estuary. Although Sydney Water's Priority Sewerage Program and subsequent upgrades have significantly reduced the number of discharging plants and improved effluent quality, there remain at least 12 facilities discharging more than 1.2 megalitres per day into the Hawkesbury–Nepean system (see Figure 2-39).

The largest of these are at Penrith, Quakers Hill, Riverstone, Rouse Hill, and St Marys (Figure 3-18). Even with tertiary treatment, these discharges contribute nutrients that, in combination with other sources, can fuel eutrophication.



Figure 3-18 St Marys WWRF (source: Sydney Water)

On-site sewage management systems at rural and foreshore properties present an additional risk, as many are not designed for high intensity use such as holiday rentals, leading to nutrient and pathogen leakage into waterways.

Boating activities add a further layer of impact, particularly in marinas and yacht clubs where fuel residues, anti-fouling paint particles, and contaminated bilge water can enter the estuary.

Sediment Contamination

Sediment contamination is a significant issue in certain locations, particularly near boating facilities and industrial discharge points. In the Upper Hawkesbury, sediment contamination is largely associated with urban stormwater and agricultural inputs between Windsor and Cattai (BMT WBM, 2013a). In the Lower Hawkesbury, Pittwater, and Brisbane Water, sediments near marinas, boatyards, and mooring areas have elevated concentrations of copper, mercury, lead, tributyltin, and other pollutants (Water Technology, 2020; BMT WBM, 2008). In Brisbane Water, contamination is also linked to urban runoff from Erina and Narara Creeks (Cardno Lawson & Treloar , 2008). Once bound to sediments, these contaminants can persist for decades, periodically re-entering the water column through disturbance by waves, currents, dredging, or bioturbation.

Eutrophication and Harmful Algal Blooms

Eutrophication and harmful algal blooms (HABs) remain an ongoing concern in the HNRS, particularly in areas with high nutrient loads and conditions that promote water column stratification. particularly in locations with high nutrient loads and conditions that favour water column stratification. Elevated concentrations of nitrogen and phosphorus stimulate excessive algal growth, which reduces water clarity, depletes dissolved oxygen, and in some cases, produces toxins that pose risks to human health, aquaculture, and ecosystem stability (Alluvium, 2022a).

In the upper estuary, nutrient pulses from inflow events can rapidly trigger blooms, while in the lower estuary, stratified waters with limited vertical mixing create conditions that allow blooms to persist (BMT WBM, 2008; Alluvium, 2022a). Toxic dinoflagellate blooms, especially in Berowra Creek, are linked to shifts in nutrient ratios and both natural and human drivers (Hornsby Shire Council, 2025) – see Figure 3-19.

Although wastewater treatment upgrades since the early 2000s have reduced nitrogen loads and chlorophyll-a concentrations, nutrients from sediments can still fuel blooms when resuspended by storms or boating. HABs can cause oyster harvest closures, degrade recreational amenity, and shift ecosystem composition. Managing the risk requires tackling both catchment nutrient sources and in-estuary processes, reducing external inputs while also limiting internal nutrient release and improving flushing in vulnerable areas.



Figure 3-19 Algal blooms at Berowra Creek in the Lower Hawkesbury (MHL, 2025)

3.3.2 Habitat Disturbance and Loss of Biodiversity

Clearing and Disturbance of Riparian and Aquatic Habitats

Loss and degradation of riparian and aquatic habitats is a widespread and ongoing issue across the HNRS, reducing ecosystem resilience and habitat diversity.

The historical studies of the freshwater tidal pool and upper estuary have identified disturbance and clearing of riparian vegetation as a priority concern (BMT WBM, 2013a). Key causes include illegal vegetation clearing by landowners to improve views or access, unregulated or ad hoc bank stabilisation works that disturb soils and vegetation, stock access that damages banks and tramples native vegetation, and the encroachment of private development onto public riparian land. These activities can destabilise banks, increase erosion, and reduce shading and habitat complexity (Water Technology, 2020).

Across the Lower Hawkesbury, a long history of agricultural expansion and urban development has resulted in the widespread removal of riparian vegetation and the degradation of adjoining terrestrial habitats (WRL, 2003; BMT WBM, 2008). This has reduced the buffering capacity of riparian zones, allowing more sediment, nutrients, and pollutants to reach the waterway.

Pittwater and Brisbane Water feature long stretches of urbanised shoreline, where foreshore development and seawalls have replaced complex natural edges with simplified structures that support fewer species. Erina and Narara Creeks, in particular, have experienced substantial loss of riparian vegetation in their middle and upper reaches, reducing bank stability and contributing to sedimentation (Cardno Lawson & Treloar , 2008).

Foreshore infrastructure such as jetties, pontoons, and seawalls further exacerbate impacts by shading the seabed, reducing seagrass growth, and altering benthic fauna communities. Increased development also brings more visitation, pollution, trampling of vegetation, and disturbance to wildlife. Where erosion or flooding

threatens built assets, the response is often hardening the foreshore, further simplifying habitat and reducing suitability for intertidal and shallow-water species. While sensitive design can reduce these effects, it is not always incorporated into development approvals (Alluvium, 2022a).

Invasive Species

The HNRS is affected by a range of invasive species - both flora and fauna - that threaten biodiversity, alter ecosystem processes, and in some cases, directly impact commercial and recreational use of the waterways.

Invasive fauna include both aquatic and terrestrial pests. Oyster aquaculture has suffered significant losses from disease outbreaks such as Pacific Oyster Mortality Syndrome (POMS) and QX disease, which can decimate stock within weeks and take years to recover (DPI, 2021).

Feral Pacific Oysters have also established on foreshores and maritime infrastructure, displacing native species and altering intertidal habitat structure. In freshwater environments, introduced fish such as the common carp (*Cyprinus carpio*) disturb sediments during feeding, increasing turbidity, releasing nutrients, and reducing habitat quality for native fish – see Figure 3-20. Other pest fish, including mosquitofish (*Gambusia affinis*), prey on or outcompete native species (DPI , 2010).



Figure 3-20 The common carp Cyprinus carpio (DPI , 2010)

Terrestrial pests are common in surrounding national parks and reserves, with cats, dogs, foxes, rabbits, and European honeybees preying on native fauna, competing for nesting sites, and altering vegetation communities (BMT WBM, 2008; BMT WBM, 2013a). Emerging pest animal species reported in the Hawkesbury–Nepean region by Livestock Health and Pest Authorities include feral horses (*Equus caballus*), and feral and wild deer (*Dama, Cervus, Axis spp*) (DPI , 2010).

Invasive flora is also widespread along riparian margins and foreshores. The aquatic weed *Leafy elodea (Egeria densa)* proliferates through much of the Upper Hawkesbury, forming dense mats that restrict water flow, reduce light penetration, and alter oxygen levels (BMT WBM, 2013a). In the Lower Hawkesbury and Pittwater, the noxious macroalga *Caulerpa taxifolia* colonises estuarine sediments, outcompeting seagrasses and modifying fish and invertebrate habitats (Water Technology, 2020) – see Figure 3-21. The invasive rush *Juncus acutus* is also present, replacing native saltmarsh in many areas and changing intertidal plant community composition.



Figure 3-21 Caulerpa taxifolia (Caulerpa). (DPIRD, 2025c)

Foreshore development amplifies invasive species pressures by clearing or degrading critical habitats such as saltmarsh, mangroves, and riparian woodland. This not only fragments ecological corridors but also increases human-driven disturbance. Added nutrient inputs, physical damage, and sediment resuspension from boating further erode habitat quality, tipping conditions in favour of invasive species and accelerating their spread (Alluvium, 2022a).

3.3.3 Hydrological Modifications

Modified Surface and Groundwater Regime

The HNRS supplies the majority of drinking water to Greater Sydney, making it one of the most regulated river systems in Australia. Large-scale water extraction, dams, and flow regulation have significantly altered natural freshwater and groundwater regimes (Warner, 2014), with direct consequences for estuarine ecology, fish assemblages, and habitat condition (Alluvium, 2022a).

Freshwater inflows are now a fraction of natural levels, with current environmental releases estimated at just 3% of the long-term average - significantly below ~80% recommended for effective ecological maintenance (Warner, 2014). This reduction has weakened the estuary's natural flushing capacity, allowing pollutants and sediments to accumulate. Seasonal flow patterns and key components such as "freshes" have been lost, disrupting environmental cues that trigger fish migration, spawning, and other biological processes. Prolonged low-flow conditions increase water column stratification, reduce oxygenation, and favour marine and invasive species over estuarine specialists. The Hawkesbury River estuary has therefore shifted irreversibly to a new, regulated freshwater regime. In contrast, Brisbane Water and Pittwater are not subject to the same level of extraction and retain relatively natural flow patterns.

Maintaining environmental flows from Greater Sydney's water storages to protect, maintain, and enhance river health is a key priority in the NSW Government's Greater Sydney Water Strategy. Subsequently, WaterNSW is progressing the Warragamba Dam Environmental Flows Project, which aims to modify the dam to enable controlled, variable environmental releases that mimic natural patterns, supporting river health without compromising flood management, emergency response, water security, or water quality – see Figure 3-22 (WaterNSW, 2025).



Figure 3-22 Warragamba Dam Environmental Flows Project

Groundwater extraction and reduced recharge have further altered hydrology, affecting the local groundwater-dependent ecosystems and weakening connections between surface and subsurface flows. These changes influence destratification, wetland hydrology, and the persistence of baseflows in tributaries (Water Technology, 2020).

Ecological Impacts

Freshwater inflow and sediment delivery play a key role in forming and maintaining intertidal habitats. Reductions in flow, combined with anthropogenic land use change, have contributed to altered sedimentation patterns, including seaward expansion of mangroves and encroachment into saltmarsh areas (Saintilan & Hashimoto, 1999). While increased mangrove cover can provide benefits such as carbon sequestration and shoreline protection, it often comes at the expense of saltmarsh, which is critical for nutrient cycling, energetic subsidies to estuarine food webs, and habitat provision .

Hydrological structures such as dams and weirs are widespread across the HNRS (see Figure 2-1), disrupting longitudinal connectivity by blocking fish passage and migration (see Figure 3-23). Reduced overbank flows, compounded by floodplain development, further constrain lateral connectivity, leading to wetland loss and a decline in habitat diversity and complexity (Alluvium, 2022a).

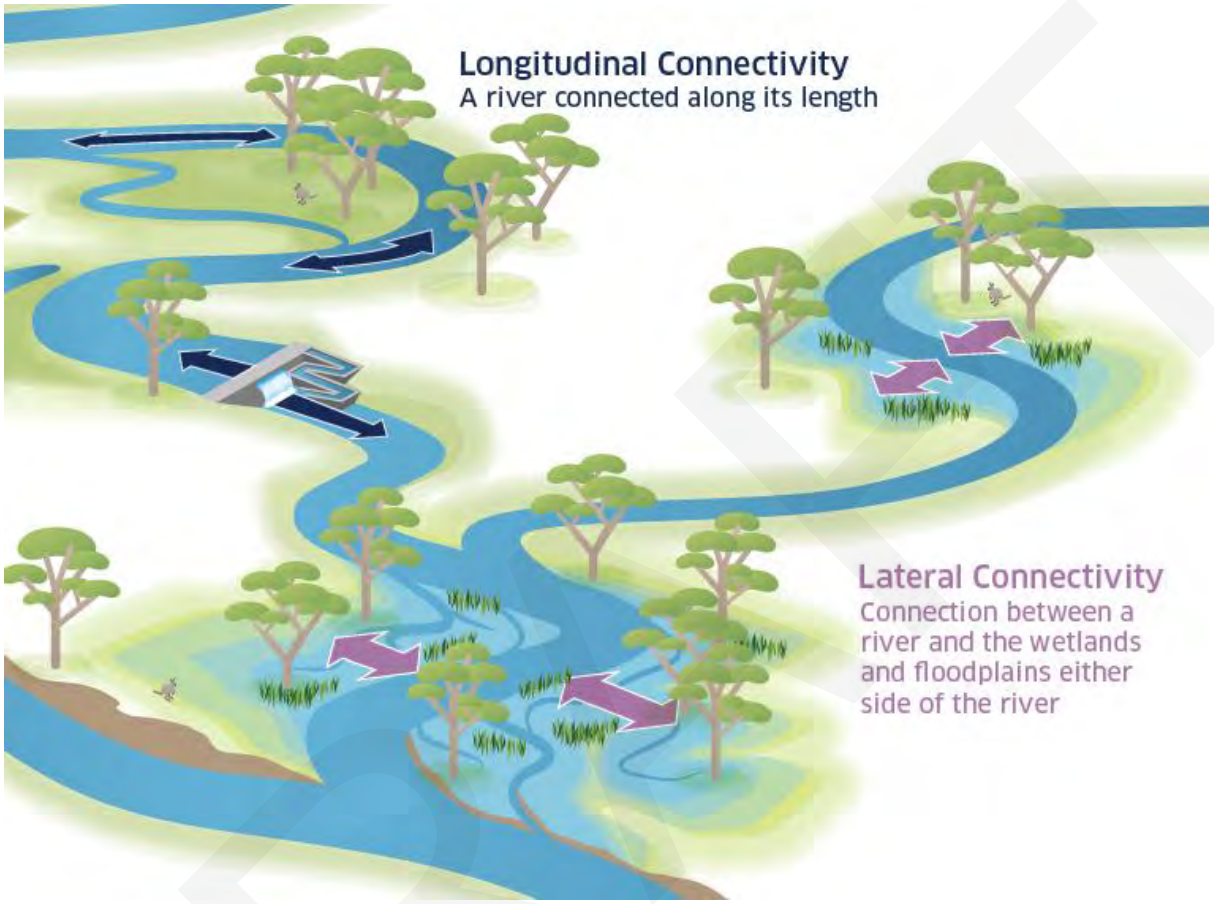


Figure 3-23 Longitudinal and lateral connectivity within a riverine/estuarine system (CEWO Flow-MER., 2022)

3.4 Waterway Use and Resource Conflict

The HNRS supports a wide range of commercial and recreational activities, which, while highly regulated, place cumulative pressures on estuarine habitats and ecological processes.

Commercial fishing remains an important industry in the middle and lower estuary, but harvesting biomass alters food web dynamics and can reduce the abundance of targeted species. Lost or discarded fishing gear can damage benthic habitats, entangle wildlife, and degrade waterway aesthetics (Alluvium, 2022a) .

Recreational fishing is widespread across the freshwater tidal pool, upper, middle, and lower estuary. Similar to commercial fishing, it removes biomass from the system and can introduce waste products such as lines, hooks, and bait packaging. Shore-based fishing can also disturb intertidal habitats, which provide feeding and refuge areas for birds, fish, and invertebrates (Water Technology, 2020; Alluvium, 2022a).

Boating is a major use of the HNRS, ranging from active water sports to passive cruising. Powered boats and water skiing generate wake waves that erode and destabilise banks, increasing turbidity and sedimentation. Anchoring and mooring in sensitive areas can damage seagrass beds and benthic habitats, while vessel groundings can scar shallow-water environments.

Boat moorings have historically caused chronic “scouring” of the seabed, removing seagrass beds - a critical fish habitat - and altering shallow-water environments (Lawson & Treloar, 2003) – see Figure 3-24. In addition, vessel operations can introduce pollutants such as fuel, oil, antifouling agents, and litter into the waterway (Water Technology, 2020).

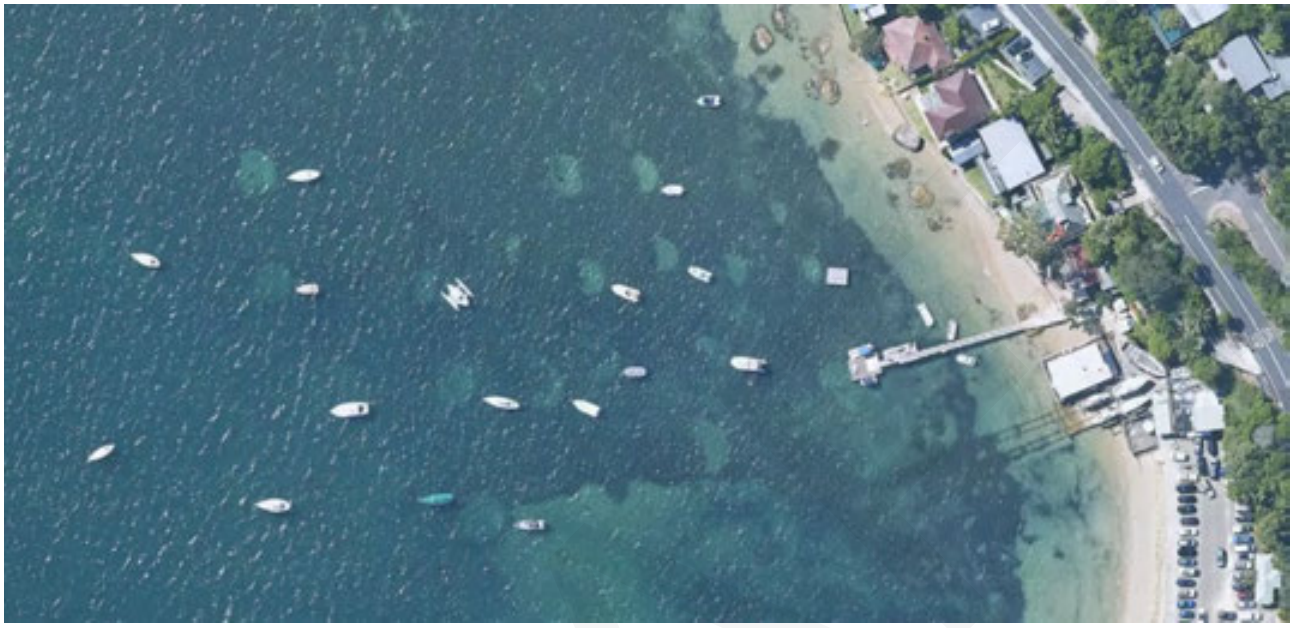


Figure 3-24 Example of seagrass scarring from chain mooring at Palm Beach Wharf

3.5 Planning and Governance

The Stage 1 Scoping Study (Water Technology, 2020) identified that the long-term health of the HNRS has been historically hindered by governance and funding challenges. A lack of coordination between estuary councils, catchment councils, and relevant state agencies has limited the ability to address system-wide issues and manage cumulative impacts effectively. Without a clear framework for collaboration, opportunities for integrated, efficient management - such as a coordinated water quality monitoring program - are often missed.

Funding limitations compound these governance gaps. Stakeholder engagement undertaken through Stages 1 to 3 of the CMP have identified that both local and state government entities consistently identify inadequate resourcing as a barrier to effective estuary and catchment management. Insufficient funding restricts councils’ capacity to:

- Collect essential data and commission technical studies to identify key threats and evaluate management options
- Deliver and maintain management actions, including both capital works and ongoing maintenance
- Monitor environmental outcomes and regulate compliance consistently across the river system and its catchment.

These constraints reduce the ability to implement proactive, evidence-based management, leaving the system vulnerable to ongoing degradation and limiting progress toward long-term restoration goals. The CMP therefore represents an opportunity to establish stronger governance arrangements, secure sustainable funding streams, and implement a coordinated, system-wide approach to estuary and catchment management that addresses cumulative impacts and delivers long-term environmental, social, and economic benefits.

4 THE DEVELOPMENT OF THIS CMP

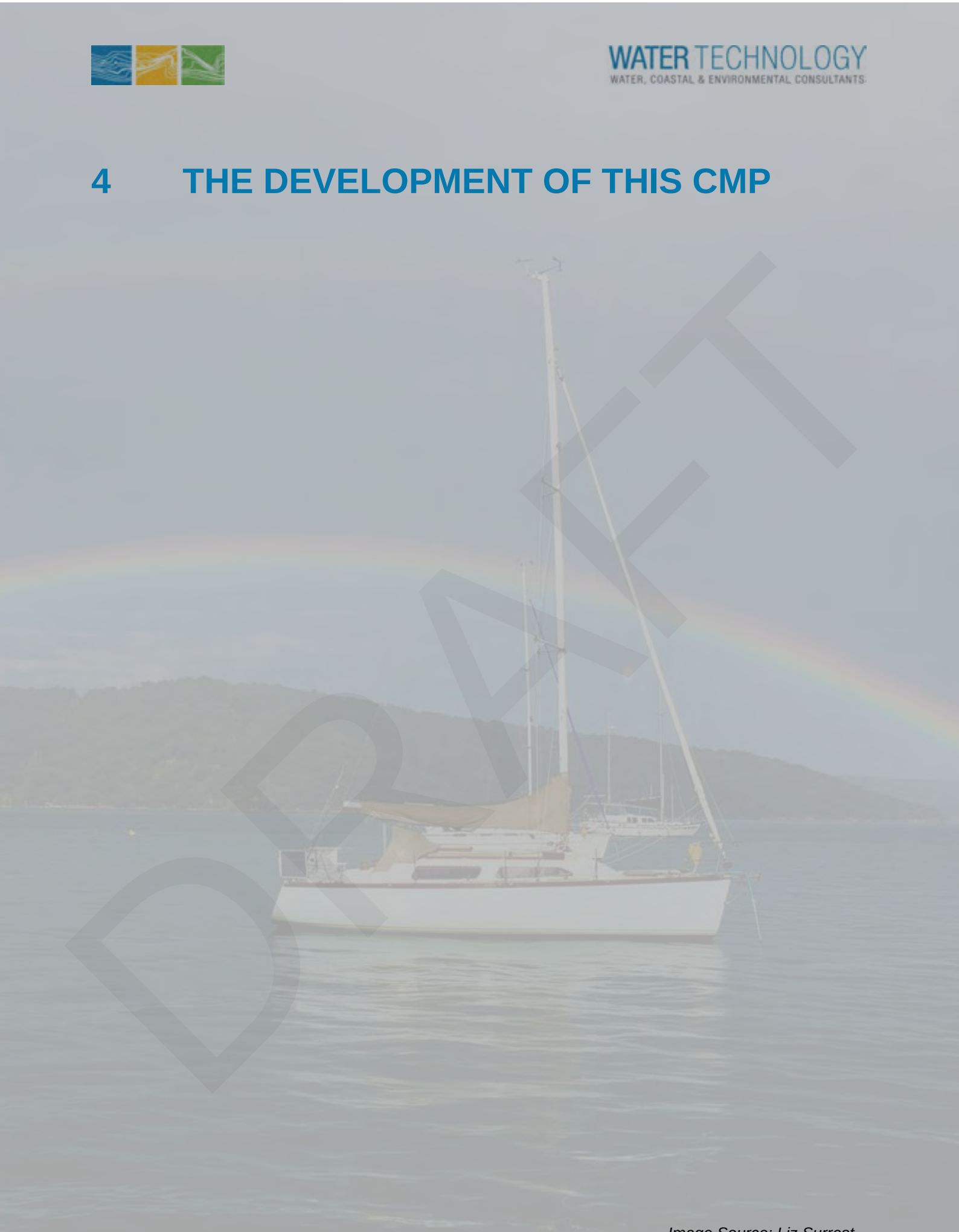


Image Source: Liz Surrest

4.1 Overview

The HNRS CMP has been prepared in alignment with the mandatory requirements of the NSW Coastal Management Manual (OEH, 2018a). As outlined in Section 1.4, the CMP has been delivered through the prescribed 5-stage risk-based management framework, consistent with guidance provided in the supporting Coastal Management Manual components (OEH, 2018b; OEH, 2018c; OEH, 2018d; OEH, 2018e; OEH, 2018f). This staged approach ensures that the CMP is evidence-based, strategically focused, and aligned with the objectives of the CM Act.

The following sections provide an overview of each stage of the CMP process, including the key investigations, engagement activities, and outcomes that have informed the development of coastal management actions for this CMP.

4.2 Stage 1

Stage 1 of the CMP was undertaken between September 2019 and April 2020. The Scoping Study (Water Technology, 2020) formalised a strategic, system-wide approach to the CMP, to be delivered through a coordinated partnership between six local councils. This stage laid the foundation for all subsequent work and established the CMP as a “whole-of-system” program focused on the interconnected HRNS.

Key activities completed during Stage 1 included:

- A review of relevant background information – including over 230 relevant informational studies, management plans, and additional datasets.
- Detailed stakeholder analysis and engagement strategy - identifying key stakeholder groups and their roles, interests, and influence.
- A first pass risk assessment - used to prioritise major threats and identify those requiring further investigation in future stages of the CMP.
- A critical data gap analysis – highlighting missing or outdated information and forming the basis for targeted technical studies in Stage 2.
- Development of a forward program, outlining indicative timing, costs, and responsibilities for key tasks and partner contributions across the CMP process.

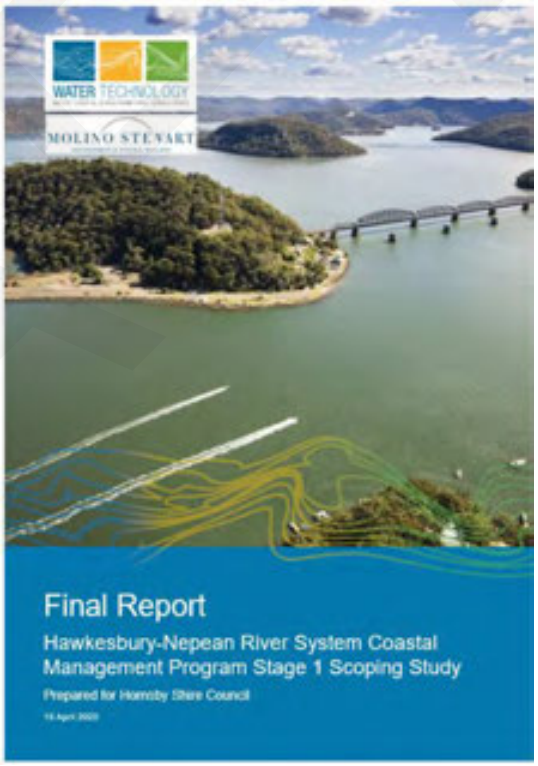


Figure 4-1 Stage 1 Scoping Study (Water Technology, 2020)

4.3 Stage 2

Stage 2 was delivered between 2020 and 2023. This stage was focused on addressing the critical data gaps and priority risks identified in Stage 1, with the overarching goal of strengthening the scientific and technical foundation for subsequent decision-making and action planning.

Stage 2 involved the commissioning and completion of 5 targeted technical studies. Together, these studies aimed to improve understanding of the threats and risks to the environmental, social, and economic values of the HNRS, and to ensure that future management responses are both evidence-based and appropriately scaled to the complexity of the system. The technical studies completed under Stage 2 are listed in Table 4-1.

Table 4-1 HNRS CMP Stage 2 studies

Study and Reference		Summary
	**The Hawkesbury-Nepean River System Physical and Ecological Processes Abridgement Report** (Alluvium, 2022a).	This study synthesised existing scientific knowledge to provide a system-wide summary of key physical and ecological processes that shape and influence the estuary and riverine environments across the CMP area. It presented a unified conceptual model of how the system functions, supporting consistent interpretation of data and risk assessments across councils and management areas.
	**The Hawkesbury-Nepean River System Community Values and Uses Report** (Alluvium and Mosaic Insights, 2023).	This study identified, mapped, and analysed how local communities use, value, and interact with the river system. Through a combination of spatial analysis, surveys, and community input, the report helped to identify key social and cultural values and provided a framework for embedding these values into future CMP actions and priorities.
	**The Hawkesbury-Nepean River System Estuary Bank Erosion Assessment and Options Report** (Alluvium, 2022b)	This study evaluated the extent, severity, and underlying causes of bank erosion within the estuarine sections of the river system. It identified erosion hotspots, assessed potential risks to infrastructure and ecological assets, and presented a suite of management options aimed at reducing the impacts of erosion while improving estuary health.
	**The Hawkesbury River Estuary Coastal Inundation Study** (Rhelm and Baird, 2023)	This study utilised hydrodynamic modelling to assess coastal inundation risk across the lower estuary under a range of current and future sea level scenarios. The modelling incorporated tidal hydrodynamics, storm surge events, and projected sea level rise based on updated climate change scenarios. The outputs of the study included spatially explicit inundation mapping.
	**Pittwater Beach Erosion and Shoreline Recession Assessment** (WRL, 2023)	This study evaluated the vulnerability of Pittwater's beaches to coastal erosion and long-term shoreline recession over a 100-year planning timeframe. Using a combination of historical shoreline data, wave climate analysis, sediment dynamics, and sea level rise projections, the assessment identified key erosion hotspots and forecasted potential recession lines for both open coast and estuarine beach environments.

Together, the outputs of these 5 studies provide a robust technical foundation to guide the development, assessment, and prioritisation of management options in Stage 3. The studies were designed to be complementary, with findings integrated across ecological, social, and hazard-related domains to support a whole-of-system understanding and response.

In addition to the core Stage 2 studies developed as part of the formal CMP process, an additional technical study was developed by NPWS in the form of a riverbank and riparian condition assessment – which was funded by the DPIRD NSW Estuary Asset Program (NEAP). The NEAP assessment (Alluvium, 2025) used spatial data to identify potential erosion likelihood before undertaking field assessment of 188km of shoreline. Bank and riparian condition was assessed, including the severity of any potential erosion. A multi-criteria analysis (MCA) was used to score and rank the top eroding sites to prioritise sites for works. The MCA considered risk to recreation, built, natural and cultural assets as well as potential for natural recovery and constructability. Concept designs were prepared for the 11 highest priority sites, with 6 priority sites included for work in this CMP. These works are outlined in Action S6.NPW.E – and cover NPWS foreshore at Coasters Retreat, Marramarra Creek, Cowan Creek, Gentlemans Halt, Berowra Creek, and Mooney Mooney Creek.

4.4 Stage 3

4.4.1 Overview

Stage 3 of the CMP process involved the development of management actions to address the risks and issues identified in Stage 2. A key objective of the CMP is to utilise a strategic and practical approach to developing management actions. Management actions included in the program have been rationalised and prioritised by a robust, and comprehensive decision-making framework. The framework adopted in the CMP was developed in order to make sound comparisons between each option and to rank options in a transparent and unbiased manner to identify those that have the greatest overall benefit for management of the coastal zone. The approach to the identification and assessment of options is provided in Figure 4-2.



Figure 4-2 Four steps in action identification and evaluation (adapted from the CM Manual)

4.4.2 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. For the HRNS, this strategic direction is articulated through a shared vision and a set of local coastal management objectives (see Section 1.3), developed in alignment with the CM Act and endorsed by the Partner Councils.

Given the size, scale, and complexity of the HNRS CMP, spanning multiple councils, estuarine systems, and overlapping values and risks, a Strategic Direction Workshop was convened with Steering Committee members on 5 December 2023 (see Figure 4-3). The workshop played a critical role in shaping the CMP by facilitating collective decision-making on key strategic matters, including the CMP vision, priorities, delivery structure, and the proposed approach to addressing catchment based stressors emanating from outside of the legally defined coastal zone. The outcomes of this session, including key decisions and agreed directions, are documented in the Strategic Direction Document (Water Technology, 2023a).



Figure 4-3 Strategic Direction Workshop

4.4.3 Identifying Options

Once the strategic direction for the CMP was confirmed, the next step in the assessment process was to develop a suite of potential management options aimed at addressing the key risks identified in Stage 2 and delivering on the objectives of the CMP.

To do this, a broad “long list” of potential options was compiled through the process summarised in Figure 4-4 and in line with the guidance provided in the NSW Coastal Management Manual (OEH, 2018d). This process drew on a range of inputs, including a review of prior works such as historical Coastal Zone Management Plans (CZMPs), Estuary Management Plans (EMPs), and other legacy studies. It also incorporated insights from community and stakeholder engagement activities, as well as a risk-based analysis of key environmental datasets relevant to the HRNS.

Based on this process, a preliminary long list of over 800 potential management actions was developed. Before detailed assessment, a preliminary screening process was carried out through workshops and consultation with Partner Councils and key stakeholders. This included:

- Auditing legacy CZMPs and EMPs to remove completed or outdated actions
- Consolidating duplicate or overlapping actions
- Reviewing community suggestions and excluding those inconsistent with policy or legislation
- Removing routine operational tasks or actions already covered by existing management plans.

This process refined the list to a more strategic and manageable list of 195 potential management actions. The list represented a wide range of possible actions - from site-specific works to system-scale policy and planning initiatives - and served as the foundation for further refinement and prioritisation during Stage 3.

The full set of options assessed as part of the CMP, along with the detailed methodology used to identify and evaluate them, is documented in the Stage 3 Report (Water Technology, 2025).



Figure 4-4 Identification of potential management options

4.4.4 Assessment of Options

Once the long list of management options was developed, the next step was to assess and prioritise these options. To ensure the Stage 4 program of management options are appropriate, are able to be implemented, and meet the objectives the CM Act, Stage 3 of the CMP employed a robust multi-criteria decision-making framework. Full details of the options assessment process are provided in the Stage 3 report (Water Technology, 2025), however a brief summary has been provided below.

The options assessment followed a 3-step process, as outlined in the CM Manual (OEH, 2018d), and summarised in Figure 4-5 below. The process involves evaluating the **feasibility**, **viability**, and **acceptability** of each potential option.

The purpose of this approach was to evaluate and choose among alternatives based on multiple criteria through a systematic analysis that used stakeholder participation to inform economic, social, and environmental criteria. This provided a tool that enabled different stakeholders' perspectives and values to be explicitly included in the analysis. This process was used as a transparent tool to help determine which options may progress to Stage 4 of the CMP.

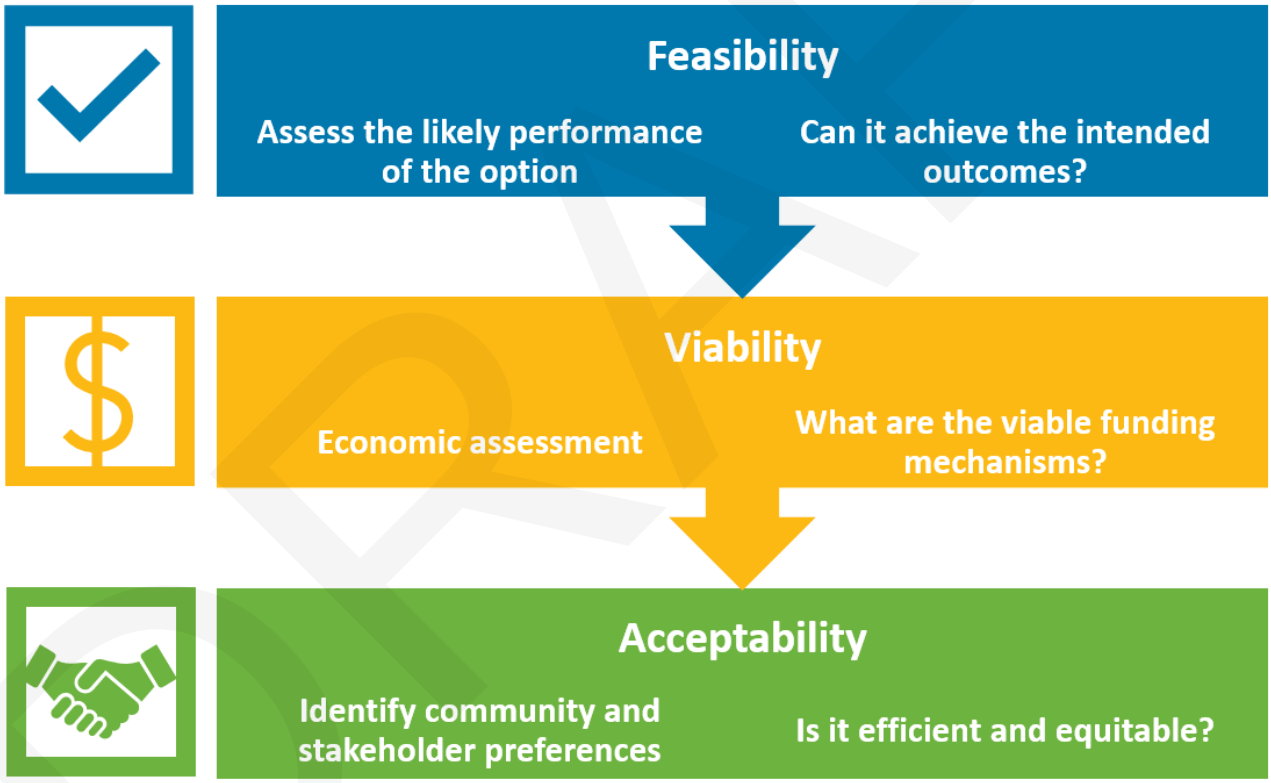


Figure 4-5 The Stage 3 options assessment process (adapted from the CM Manual)

Feasibility Assessment

Each management option was assessed for feasibility based on criteria from the NSW *Coastal Management Manual*. This included alignment with the objectives of the *Coastal Management Act 2016*, risk mitigation effectiveness, environmental and social impacts, practical deliverability, policy consistency, and adaptability.

A high-level, semi-quantitative multi-criteria analysis (MCA) was used to score each option against key factors such as:

- The level and type of risk it addresses

- Its effectiveness in mitigating risk
- Potential impacts (positive or negative) on environmental, social, and cultural values
- Alignment with statutory requirements.

Under this approach, each option was scored against a set of feasibility criteria using a numerical scale from -4 to +4 - where +4 indicated strong positive benefits (e.g. high risk reduction or strong environmental outcomes), 0 indicated a neutral or negligible effect, and -4 indicated significant negative impacts or poor feasibility. Based on this, each option received a **Total Feasibility Score**. Options receiving strongly negative scores in key areas were deemed unfeasible.

To recognise the broader value of system-wide initiatives, a scaling factor was applied to options with benefits extending across the full study area. The total feasibility score for each option was used to help identify a coordinated and achievable program of actions.

Viability Assessment

The viability assessment considered whether each management option is financially practical and deliverable. This included:

- Estimating the cost of each option (capital, operational, and maintenance)
- Identifying the distribution of coasts and benefits amongst relevant stakeholders and delivery partners
- Considering potential funding sources and (where applicable) cost-sharing arrangements
- Assessing whether options are affordable and viable for implementation in Stage 5.

Stage 3 included an economic assessment of all long-listed options. Two levels of assessment were applied, depending on the scale and complexity of each option:

- Detailed Cost-Benefit Analysis (CBA): For five (5) high-impact options where economic benefits and costs could be reliably estimated, a full probabilistic CBA was undertaken to calculate a Benefit-Cost Ratio (BCR). This followed NSW Government guidance in:
  - NSW Guide to Cost-Benefit Analysis (NSW Treasury, 2023)
  - DPE Guidelines for using Cost-Benefit Analysis to Assess Coastal Management Projects (DPE, 2020).
- Preliminary Economic Assessment: For all other options, a simplified approach was used to estimate 10-year net present value (NPV) costs, drawing on council records, industry standards (e.g. Rawlinsons, 2023), stakeholder input, and the project team's engineering expertise.

Each option was then assigned a **Viability Score** based on the order of magnitude of its estimated cost, using a logarithmic scale. Lower-cost options received higher viability scores, reflecting greater affordability. These scores were incorporated into the overall multi-criteria analysis (MCA) to support option prioritisation.

Acceptability Assessment

In addition to technical feasibility, the CMP also considered how acceptable each management option was to key stakeholder groups. This assessment focused on three distinct groups:

- Local communities across the HRNS
- Local First Nations stakeholders (as identified in the Community & Stakeholder Engagement Plan)
- Relevant public authorities, including State Government agencies.

To inform this assessment, a robust stakeholder and community engagement program was undertaken during Stage 3. This process gave participants the opportunity to provide feedback on the proposed options and suggest additional actions. Engagement outcomes are summarised in Section 4.5.

Each option was assigned an Acceptability Score, calculated using input from each of the three stakeholder groups. Equal weighting was applied across the groups, and scores were normalised to a scale between 0 and 1. For example:

- Full support from a group scored **1**
- Conditional or partial support scored **0.5**
- Non-support scored **0**, with some exclusions applied (e.g. State Government opposition automatically excluded the option)

If an option was introduced after the engagement period, or where no opposition was received, a default score of **1** was applied, with further engagement scheduled in Stage 4 (including public exhibition).

The final **Total Acceptability Score** for each option was calculated as the product of the three component scores, providing a clear measure of broad stakeholder support. Detailed scoring and results are provided in the Stage 3 Report (Water Technology, 2025).

Options Assessment Outcomes

The output of the three-phase assessment described was the calculation of an **Options Ranking Score**, which was the arithmetic combination of the **Feasibility Score**, the **Viability Score**, and the **Acceptability Score**, as demonstrated in Figure 4-6.



Figure 4-6 Calculation of the options ranking score

Each component of the Options Ranking Score provided a distinct perspective on the performance of an option:

- The **Total Feasibility Score** assessed the extent to which an option addressed the various risks across the study area - either directly or indirectly - and considered its social and environmental impacts.
- The **Acceptability Score** reflected the level of support for each option among local community members and key project stakeholders.
- The **Viability Score** captured the full life-cycle cost of each option and provided an indication of economic viability and value for money.

The Options Ranking Score provided a numerical measure of the overall value of each option, offering a clear and transparent way to assess their relative benefits. This scoring formed the final step in the three-phase assessment process and was used to inform which options from the long list should progress to Stage 4 of the CMP.

However, while the Options Ranking Score served as a useful decision-support tool, it was not applied as a rigid or definitive metric. It is acknowledged that the scoring process carries inherent subjectivity and uncertainty, and that some options may offer important strategic, political, cultural, or community benefits that are not easily captured through numerical or heuristic evaluation alone.

As such, the Options Ranking Score was treated as a starting point for informed discussion with Partner Council staff and delivery partners. Final decisions about which options would proceed to Stage 4 were guided not only by the score but also by each Council's local knowledge and understanding of environmental priorities, social context, and resource constraints.

Based on the process described herein, a total of 141 options progressed through to Stage 4 of the CMP, with an additional 9 actions progressing through to the associated catchment companion.

4.5 Community and Stakeholder Engagement

4.5.1 Overview

Community and Stakeholder Engagement Strategy

During Stage 1 of the CMP, a comprehensive Stakeholder and Community Engagement Strategy was prepared (Water Technology, 2020). Developed in line with the NSW CMP Engagement Guidelines (OEH, 2018h) and the International Association for Public Participation (IAP2) framework, the strategy set out clear objectives, timing, content, and engagement methods tailored to the needs of the HNRS.

The strategy has been applied consistently throughout the CMP's development, embedding stakeholder and community engagement into every stage of the process. Given the scale of the river system and the diversity of interested parties, the HNRS CMP has delivered one of the most extensive engagement programs undertaken for any CMP in NSW, ensuring broad representation and input from government agencies, industry, community groups, and the wider public.

A summary of the engagement process for the CMP is depicted in Figure 4-7 and described in the following sections.

Project Communications

The primary (centralised) online presence for the project was hosted at the project website: https://hawkesburynepeancmp.org/. Throughout Stages 1 and 3 the project website served as a vital information hub for the project, and included the following information:

- **Background:** An overarching description of the project, and background to the CMP process – including the intent of the CMP, who is involved, and how it is developed. This has also been provided in the form of project summary videos, to clearly explain the project to the community.
- **Updates:** Updates on project progress as each stage of the CMP has evolved. This has been in the form of periodic project bulletins.
- **Key project deliverables:** including publishing the Stage 1, Stage 2, and Stage 3 reports for public consumption.
- **Engagement facilitation:** Information pertaining to community consultation events, and avenues for engagement – including links to the online survey facilitated during Stage 3 community consultation.
- **Explainer videos:** A video library that provides the community with short, clear video packages explaining the project and the CMP process.

In addition to the website, Partner Councils issued CMP Newsletters 2 to 4 times per year during Stages 2 to 4, distributed via a voluntary subscription email list. These updates have kept subscribers informed of progress, milestones, and opportunities to get involved.

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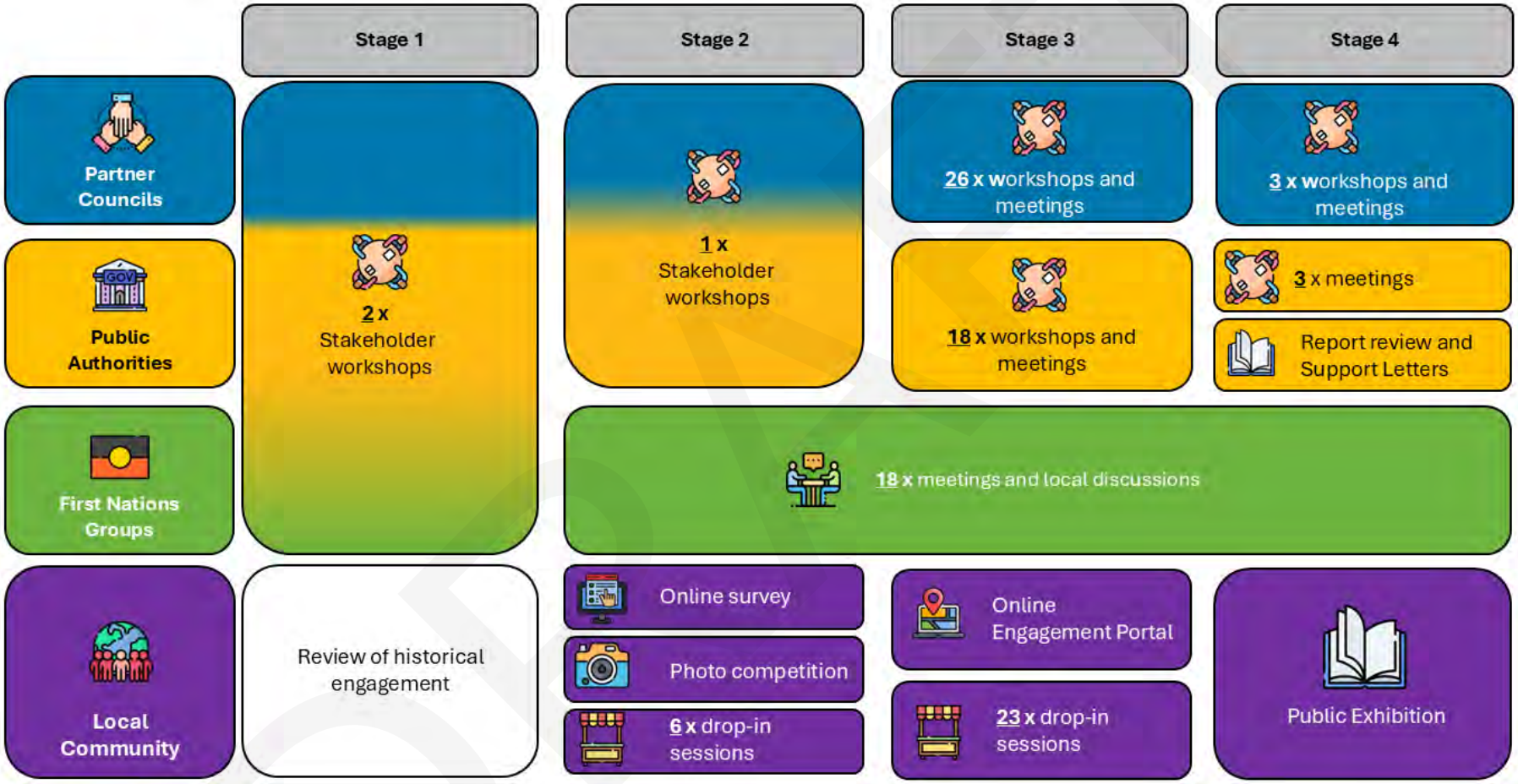


Figure 4-7 Stakeholder and community engagement snapshot

4.5.2 Stage 1

Stakeholder Engagement

The main stakeholder engagement activities undertaken during Stage 1 comprised the holding of 2 workshops, which were attended by the Partner Councils, numerous State Government Agencies, Local Aboriginal Land Councils, and other local councils from the wider Hawkesbury-Nepean Catchment.

- **Workshop #1 - Project Scoping:** Attended by 20 representatives from councils and state agencies, this session provided background on the CMP, confirmed management roles, and identified key values, threats, and risks across the river system (see Figure 4-8).
- **Workshop #2: Stakeholder Engagement Strategy Development:** Brought together at least 2 staff from each Partner Council to co-design the CMP Stakeholder and Community Engagement Strategy, focusing on tailored messages, engagement methods, and logistics. It began with a context-setting briefing, followed by “world café” sessions to capture local expertise and ideas for a bespoke engagement plan.

Further detail of this engagement is provided in the Stage 1 Scoping Study (Water Technology, 2020).

Local councils from the upper catchment (see Section 2.5.2) were advised of the project commencement and invited to participate in the CMP process. These councils were also provided a copy of the Draft Scoping Study Report for review and comment.



Figure 4-8 Stage 1 stakeholder workshop

Community Engagement

The Partner Councils chose not to undertake direct community engagement during Stage 1, deferring detailed community engagement on issues and values to Stage 2. This decision aimed to:

- Align community engagement with Stage 2 studies, ensuring findings could be effectively integrated into technical investigations.
- Reduce engagement fatigue within communities, noting that the Brisbane Water, Pittwater, and Hawkesbury River estuaries – and their catchments – had already undergone significant consultation over the past 10–15 years. This included engagement for 5 separate coastal and estuary management plans, along with numerous other relevant strategies.

To streamline planning, outcomes from previous engagement activities were reviewed and consolidated to inform the CMP's approach.

4.5.3 Stage 2

Stakeholder Engagement

As part of Stage 2, a full-day stakeholder workshop was convened to bring government agencies up to date on the progress of the CMP and to strengthen inter-agency collaboration. This built on the strong relationships and shared understanding established during Stage 1 workshops, ensuring that momentum and commitment carried forward into the next stage.



Figure 4-9 Stage 2 stakeholder workshop

The session was attended by representatives from a wide range of state and local government agencies operating within the HNRS, including those responsible for environmental management, planning, infrastructure, and community engagement (see Figure 4-9).

The workshop provided an opportunity for agencies to:

- Share updates on their current and planned initiatives within the river system.
- Exchange knowledge and technical insights to ensure alignment between complementary projects.
- Reaffirm their commitment to working together to address shared challenges and achieve the CMP's long-term objectives.

The workshop reinforced the value of a coordinated, system-wide approach, with participants recognising that collective effort is essential to managing the complex, interconnected issues facing the HNRS.

Community Engagement

Stage 2 placed a stronger focus on broad community involvement, using a range of tools and activities to capture local knowledge, perspectives, and priorities for the HNRS.

- **Photo Competition - "Our Hawkesbury River":** In September 2021, to coincide with World Rivers Day, Partner Councils launched the Our Hawkesbury River photo competition. The aim was to celebrate the river's environmental, cultural, and social values while encouraging community connection to the CMP process. The competition attracted an overwhelming response, with more than 360 entries showcasing the beauty, diversity, and significance of the river system – see Figure 4-10. Many of these images have been featured throughout this CMP document, providing a strong visual link between community perspectives and the planning process.
- **Community Survey:** Between late 2022 and early 2023, an online community survey was conducted to build a clearer understanding of how the local communities and users of the HNRS perceive threats to the river system and where they see management priorities. The survey comprised 10 targeted questions designed to tap into local knowledge and highlight the threats and pressures most in need of attention in future stages of the CMP. Responses provided valuable insight into community priorities, helping to ensure the CMP reflects local concerns alongside technical assessments.
- **Interactive Mapping:** To complement the survey, an interactive web-based mapping tool was deployed, allowing participants to pinpoint locations they considered to be high-priority for management or protection

- see Figure 4-11. This spatial input has helped identify hotspots for action and provided context for how community priorities align with scientific and technical findings.

- **Community Drop-in Sessions:** The HNRS CMP project team engaged with over 300 people while hosting drop-in sessions at several community events organised within the Partner Council LGAs over the duration of Stage 2, including those listed in Table 4-2.

Through this multi-modal engagement program, Stage 2 created opportunities for the local community and river users to contribute meaningfully to the CMP, blending qualitative stories, visual records, and geospatial data into a richer understanding of the river system.

Table 4-2 Stage 2 community drop-in sessions

Date	Event	Location
9 June 2022	Let's Talk Woy Woy	Woy Woy
31 October 2022	Woytopia	Woy Woy
18 February 2023	Taste of Seafood Festival	Wisemans Ferry
22 February 2023	Tide2Tip	Mooney Mooney
25 to 27 February 2023	Annual fishing festival Fishfest	Penrith
30 March 2023	Let's Talk Gosford	Gosford

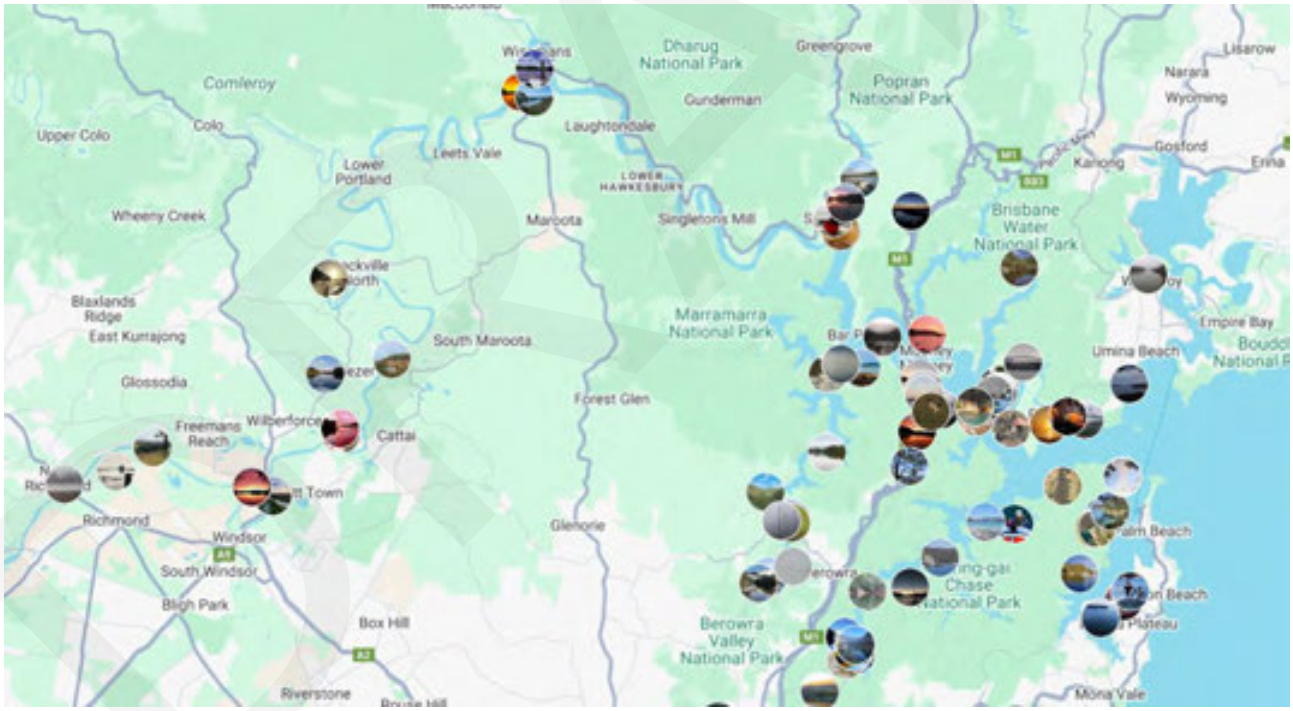


Figure 4-10 "Our Hawkesbury River" photo competition entries

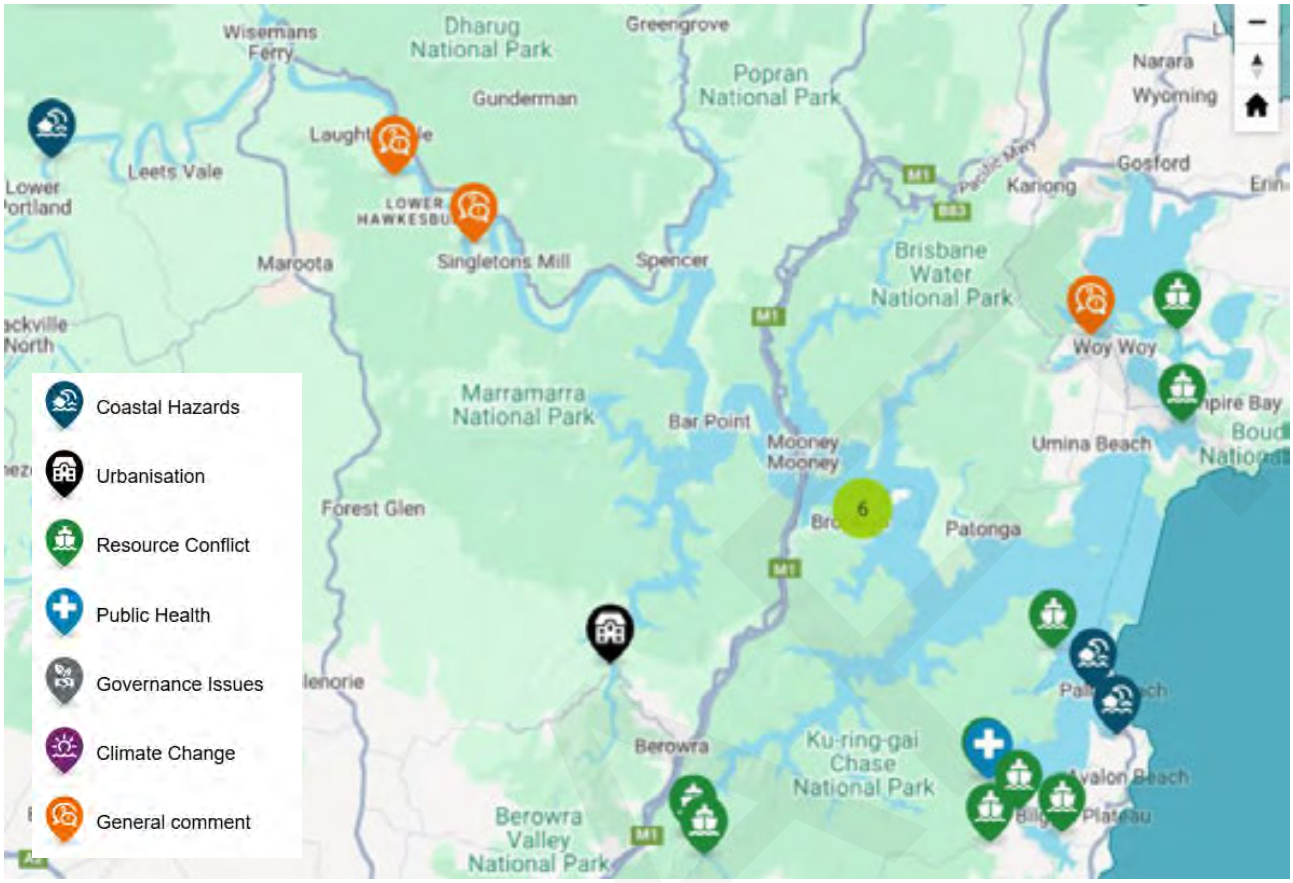


Figure 4-11 Interactive mapping dashboard used as part of community engagement in Stage 2 of the CMP

4.5.4 Stage 3

Given the nature of Stage 3 – focused on identifying, assessing, and refining management options – this phase of the CMP required an intensive and wide-ranging program of community and stakeholder engagement. Engagement was deliberately designed to be multi-modal, ensuring that all sectors of the community, industry, and government could participate in ways that suited their needs and capacity.

Activities combined in-person and online formats, including drop-in information sessions, targeted stakeholder workshops, interactive mapping tools, online surveys, and direct liaison with key interest groups. This approach allowed the CMP team to reach a broad cross-section of stakeholders – from state agencies, partner councils, Local Aboriginal Land Councils, and industry groups, through to residents, recreational users, environmental organisations, and local businesses.

Stakeholder Engagement Overview

Table 4-3 provides a summary of the stakeholder engagement activities conducted throughout the Stage 3 program, categorised by stakeholder group. It details the mode of engagement, number of sessions, and estimated total hours of interaction.

Table 4-3 Stage 3 stakeholder workshops and meetings

Category	Stakeholders	Mode	Quantity	Total Hours
Internal Partner Council Engagement	Northern Beaches Council	Workshops	5	11
	Ku-ring-gai Council	Workshops	1	2
	Hornsby Shire Council	Workshops	6	12
	Hills Shire Council	Workshops	2	4
	Hawkesbury City Council	Workshops	3	7
	Central Coast Council	Workshops	5	14
	Collaborative Partner Council Workshops (including DCCEEW-BCS)	Workshops	4	10
State Government Agencies	DCCEEW - MCEF	Workshops	1	2
	Dept of Education	Meeting	1	1
	DPHI - Crown Lands	Workshops	1	2
	DPHI - Planning & Assessment	Workshops	1	2
	DPIRD - Biosecurity & Food Safety	Workshops	1	1
	DPIRD - Fisheries	Workshops	1	2
	Greater Sydney Local Land Services	Workshops	1	2
	NSW National Parks and Wildlife Service	Workshops	2	4
	NSW Reconstruction Authority / Infrastructure NSW	Workshops	1	1
	NSW SES	Workshops	1	1
	Sydney Water	Workshops	1	2
	TfNSW - MIDO	Workshops	2	5
	Water NSW	Workshops	2	1
Upper Catchment Councils	Upper Catchment Council Group	Briefing	1	1
	Blue Mountains City Council, Blacktown City Council, Camden Council, Liverpool Council, Penrith City Council, Wollondilly Council, Wollongong Council	Workshops	1	2
First Nations Representatives	Darkinjung LALC	Meeting	4	8
	Deerubbin LALC	Meeting	2	2
	Muru Mittigar	Meeting	4	10
	CCC Heritage Committee	Meeting	1	1
	Merana Aboriginal Community Association for the Hawkesbury	Meeting	2	4
	Darug Custodians Aboriginal Corporation	Meeting	2	4
	Hornsby Council Aboriginal & Torres Strait Islander Advisory Committee (HATSIC)	Meeting	1	1

Category	Stakeholders	Mode	Quantity	Total Hours
	Central Coast First Nations Groups including Wannangini	Meeting	4	8
	Northern Beaches First Nations Group	Meeting	1	2
		Total	**65**	**127**

Internal (Partner Council) Engagement

Internal stakeholders are those who are part of the project steering committee (the Partner Councils). During Stage 3, a series of workshops were held with Partner Council representatives in:

- Environmental management.
- Planning and development.
- Roads & drainage.
- Utilities, such as water & wastewater and Sections.
- Open space & recreation.
- Communications/engagement.

Workshops were facilitated through a series of in-person and virtual workshop for the purposes of:

- Management Option Identification
- Management Option Refinement
- Management Option Assessment and Identification.

Engaging internal stakeholders across a broad range of disciplines provided critical insight into local conditions, operational constraints, and community priorities. Involving council staff from several sections and disciplines was not only technically sound but also aligned with local policy frameworks, existing strategies and plans, service delivery capabilities, and community expectations. The structured workshops during Stage 3 created a space for collaboration, knowledge sharing, and joint problem-solving, which improved the quality and practicality of the proposed management options.

A summary of the Partner Council workshops is provided in Table 4-3.

Public Authority Engagement

A summary of the engagement undertaken with State Government Agencies and Upper Catchment Councils workshops is provided in Table 4-3.

A targeted and coordinated engagement program was undertaken with a range of NSW Government departments, agencies, and entities to ensure the CMP is strongly aligned with relevant legislation, policy frameworks, and current state-led initiatives. Key agencies were engaged through a series of structured workshops and meetings, involving representatives from DCCEEW, Department of Planning, Housing and Infrastructure (Crown Lands and Planning & Assessment), Department of Primary Industries (Biosecurity and Fisheries), Greater Sydney Local Land Services, NSW State Emergency Service (NSW SES), Transport for NSW (MIDO), Water NSW, and others.

These engagements provided a platform for two-way dialogue - enabling the project team to present emerging findings and management options while gaining valuable insights into agency priorities, statutory roles, and technical requirements. This collaborative approach helped to ensure the CMP is not only informed by the latest state policy directions but also responsive to operational realities and interagency dependencies. This

engagement also ensures the CMP is both strategically aligned with state and regional planning instruments and practically integrated with existing and future agency-led projects.

The workshops served as a key touch point for discussion with the agencies regarding potential management options for the CMP. The aims of the workshops were to:

- Provide project background - including a summary of project progress to date, and a summary of the key risks and opportunities identified in Stage 2.
- Commence initial discussions of potential management options where inter-agency coordination and/or agreement could be required.
- Undertake a 'whiteboarding' session to identify stakeholder ideas for potential management options, and linkages to existing state agency initiatives and actions

Engagement with Upper Catchment Councils included an initial briefing to the Upper Catchment Council Group (comprising the entire HNRS catchment council collective), as well as a follow up workshop with the Greater Sydney Area councils to help identify and refine management actions for the CMP.

First Nations Groups

A summary of the engagement undertaken with local representatives is provided in Table 4-3.

Engagement with First Nations representatives was a key component of the CMP process, recognising the deep cultural connections and traditional knowledge Aboriginal communities hold in relation to land and water management across the catchment. All LALCs in the study area were asked to provide input to the identification of possible CMP management options. Meetings were held with a range of groups and representatives, including Muru Mittigar, the Merana Aboriginal Community Association for the Hawkesbury, Darug Custodians Aboriginal Corporation, Darkinjung LALC, Deerubbin LALC, Wannagini and other Central Coast First Nations peoples, First Nations peoples from Northern Beaches LGA, and advisory or heritage committees from Hornsby and Central Coast Councils.

These engagements provided valuable opportunities to listen to Country-based perspectives, cultural values, and site-specific knowledge that might otherwise be overlooked in conventional planning processes. This input informed the development of management options and ensured that cultural heritage considerations were embedded throughout the CMP. By building respectful relationships and providing space for genuine dialogue, the CMP is better placed to reflect shared stewardship principles, acknowledge cultural heritage, and support alignment with the NSW Government's commitments to working in partnership with Aboriginal communities.

Engagement with these stakeholders directly led to the development of a number of CMP Actions as specified in the Stage 3 Summary Report (Water Technology, 2025).

Community Engagement

During Stage 3, a comprehensive program of community engagement was delivered with 2 primary objectives:

- Gauge community support for the potential management options identified in the Stage 3 long list.
- Capture new ideas and suggestions from the community for consideration in the final management actions.

The engagement period lasted for 10 weeks, from Monday 16 September 2024 to Sunday 24 November 2024 (inclusive). This extended timeframe was deliberately chosen to accommodate the large and diverse geographic area covered by the project, and to provide ample opportunity for communities across the HNRS to engage meaningfully with the CMP process.

A longer engagement window also enabled a more sustainable and manageable delivery of over 20 drop-in sessions, ensuring that Partner Council resources could be allocated effectively across multiple locations and dates. Spreading the sessions over several weeks allowed project staff to maintain a consistent and high-quality presence at each event, support meaningful interactions with community members, and respond to local needs and interests as they emerged throughout the engagement period.

Community Drop-In Sessions

To support those community members who preferred face-to-face engagement, a series of community drop-in sessions were held to gather input for the Stage 3 options identification and assessment process.

Each session was open for 2 to 4 hours, allowing community members to attend at a time convenient for them. This flexible format helped reduce overcrowding and enabled more relaxed, personalised conversations between attendees and project staff.

Community members were encouraged to drop in at any time during the session window. The sessions were designed to:

- Provide clear and accessible information about the project.
- Explain the proposed Stage 3 Management Options
- Direct community members to the online engagement portal so that they could review and add to the long list of possible management options that could be included in the CMP.

Participants could provide both verbal and written feedback on the proposed management options, as well as the project more broadly. They were also invited to suggest additional options, informed by their local knowledge, values, and aspirations for the coastal zone.

Engagement was robust and constructive, with many in-depth discussions between community members and representatives from the Partner Councils and Water Technology.

In total, 23 drop-in sessions were held across the community engagement period, spanning 18 separate locations throughout the HNRS study area. Table 4-4 provides session details, including estimated attendance. Across all sessions, approximately 600 community members were engaged. A selection of photographs from the sessions is presented in Figure 4-12 to Figure 4-14.

Most sessions were strategically located at estuary foreshore areas - such as parks and boat ramps - to engage directly with estuary users and others with a vested interest in the system's health. In addition, several sessions were delivered as pop-up stalls at existing community events, helping to broaden awareness and participation. These included the Hornsby Organic Food Market, Hornsby Second-Hand Markets, Woytopia (Woy Woy), Sustainable Futures Day (Turramurra), Umina Beachside Markets, Brisbane Water Oyster Festival (Woy Woy), and the Central Coast Lakes Festival 2024 (Gosford).

This approach enabled access to a broad and diverse cross-section of the community, providing an inclusive opportunity to share project information and invite feedback.

Table 4-4 Stage 3 community drop-in sessions

Date	Time	Address	Suburb	Host Council	Approx. Attendance
Saturday, 21 September 2024	10am - 1pm	58 Araluen Dr, Hardys Bay	Hardys Bay	Central Coast	55
Thursday, 26 September 2024	8am - 4pm	Hornsby Organic Food Market, Hornsby Mall	Hornsby	Hornsby	15

Date	Time	Address	Suburb	Host Council	Approx. Attendance
Friday, 27 September 2024	2pm - 4pm	Church Point Square, 2105 Pittwater Rd, Church Point	Church Point	Northern Beaches	20
Sunday, 29 September 2024	9am - 1pm	Second-Hand Hornsby Market, Jersey Lane, Hornsby	Hornsby	Hornsby	15
Thursday, 3 October 2024	9am - 2pm	Wisemans Ferry Boat Ramp, Old Northern Road, Wisemans Ferry	Wisemans Ferry	Central Coast, Hornsby, Hawkesbury, Hills	20
Friday, 4 October 2024	9am - 1pm	Parsley Bay Boat Ramp, 25 Karoola St, Brooklyn	Brooklyn	Hornsby	40
Friday, 4 October 2024	2pm - 5pm	The Cottage, 10 Dangar Rd, Brooklyn	Brooklyn	Hornsby	15
Saturday, 5 October 2024	9am - 11am	Bayview Dog Park, 1670 Pittwater Rd, Bayview	Bayview	Northern Beaches	30
Wednesday, 9 October 2024	12pm - 5pm	Berowra Waters Marina, 199 Bay Rd, Berowra Waters	Berowra Waters	Hornsby	10
Friday, 11 October 2024	3pm - 6pm	Dunkirk Hotel, 4666 Wisemans Ferry Rd, Spencer	Spencer	Central Coast	20
Sunday, 13 October 2024	9am - 4pm	Woytopia @ Woy Woy South School, 14 Waterloo Ave, Woy Woy	Woy Woy	Central Coast	50
Saturday, 19 October 2024	10am-3pm	Sustainable Futures Day, Cameron Park, 5 Eastern Rd, Turramurra	Turramurra	Ku-ring-gai	35
Saturday, 19 October 2024	9am - 11am	Palm Beach Wharf, 1149 Barrenjoey Rd, Palm Beach	Palm Beach	Northern Beaches	10
Sunday, 20 October 2024	9am - 2pm	Umina Beachside Markets, Sydney Ave, Umina	Umina	Central Coast	40
Thursday, 24 October 2024	10am – 12pm	Cromer Admin Building, 55 Middleton Rd, Cromer	Cromer	Northern Beaches	25
Thursday, 24 October 2024	9am - 9pm	Erina Fair, outside Shaver Shop, 620 Terrigal Dr, Erina	Erina	Central Coast	30
Saturday, 26 October 2024	9am – 12pm	The Bays RFS Brigade, 17 Wattle Cres, Phegans Bay	Phegans Bay	Central Coast	30
Saturday, 2 November 2024	9am - 12pm	Patonga Wharf (Blues across the Bay), 12 Patonga Drive, Patonga	Patonga	Central Coast	40

Date	Time	Address	Suburb	Host Council	Approx. Attendance
Sunday, 10 November 2024	10am - 4pm	Brisbane Water Oyster Festival, Lions Park, 2 N Burge Rd, Woy Woy	Woy Woy	Central Coast	50
Tuesday, 12 November 2024	9am - 1pm	Lakes Festival Cleanaway Pop-up, Kibble Park, 118 Donnison St, Gosford	Gosford	Central Coast	20
Saturday, 16 November 2024	4 pm - 10pm	Lakes Festival Gather & Groove, Lions Park, 2 N Burge Rd, Woy Woy	Woy Woy	Central Coast	30
Sunday, 24 November 2024	9am – 12pm	Lions Park, 10 Masons Parade, Gosford	Gosford	Central Coast	40
				Total	**640**



Figure 4-12 Left: Drop-in Session at the Woytopia Event on Sunday, 13 October 2024. Right: At the Brisbane Water Oyster Festival on Sunday, 10 November 2024.



Figure 4-13 Left: Drop-in Session at Parsley Bay on Friday, 4 October 2024. Right: At Berowra Waters on Wednesday, 9 October 2024.



Figure 4-14 Drop-in Session at the Wisemans Ferry Boat Ramp on Thursday, 3 October 2024

Online Engagement

To support and enhance Stage 3 community engagement, a dedicated *Online Engagement Portal* was developed and made available via the project website. The web-based mapping portal included 2 key interactive tools designed to collect feedback and ideas from the community and stakeholders.

- **A Feedback Portal:** This web-based mapping tool enabled users to review and comment on the Stage 3 long list of proposed local area options. Each option was represented by a geolocated pin on the map. By clicking a pin, users could view a brief description of the option and provide feedback in 2 ways:
  - An indication of support from a drop-down list, with choices of: '**Support**', 'or '**Do Not Support**'.
  - A free text response where more detailed comments and feedback could be provided.
- **A Suggestion Portal:** This complementary tool allowed users to propose additional local area management options. Suggestions were submitted by placing a pin on the relevant area of the map and entering a short description or comment to explain the idea.

A snapshot of the Online Engagement Portal is provided in Figure 4-15 and Figure 4-16.

The online engagement portal received a strong response from local communities, demonstrating active interest and participation in the CMP process – as summarised in Table 4-5. The Feedback Portal received strong community engagement, with a total of 4,029 Action Votes cast across the Stage 3 long list of proposed management options. On average, each option received 32 responses (median: 16 responses), with individual options receiving as many as 211 votes and as few as 2 votes. Community sentiment was overwhelmingly positive, with an average support rate of 97%. Even the least supported action still received 75% support, highlighting a high level of overall endorsement for the proposed local management options.

Importantly, this community input informed the subsequent assessment of potential management options, in line with the approach set out in the NSW Coastal Management Manual. Feedback was used to generate quantitative indicators of community and stakeholder support, helping to identify which actions were broadly acceptable and where concerns or opposition might exist. These insights were considered alongside other key assessment criteria, including technical feasibility and economic viability.

The Suggestion Portal allowed community members to provide their own comments and suggestions using "pinpoints" that they could place on the Suggestion Portal map. In total, 162 comments were recorded in the mapping.

Further details regarding the Stage 3 community engagement outcomes are provided in the Stage 3 Summary Report (Water Technology, 2025).

Table 4-5 Online Feedback Portal engagement metrics

Feedback Portal Metrics	Value
Total Action Responses on Proposed Actions	4,029
Average (and median) number of responses received on each option	32 (16)
Highest Total Responses Received on an Action	211
Fewest Total Responses Received on an Action	2
Average (and median) % Support for each Action	97% (100%)
Highest % Support for an Action	100%
Lowest % Support for an Action	75%



Figure 4-15 Example Screenshot from the Feedback Portal



Figure 4-16 Example Screenshot from the Suggestion Portal

4.5.5 Stage 4 (to be completed)

Council and DCCEEW (CPHR) Review

The first step in the Stage 4 submission process involves circulating the First Draft CMP to the Partner Councils and to the DCCEEW (CPHR) team for detailed review and comment. This review phase ensures the draft aligns with partner priorities, legislative requirements, and technical expectations before moving into the broader consultation process.

Public Exhibition

Under the requirements of the CM Act, a draft CMP must be placed on public exhibition for a minimum of 28 calendar days. During this period, the broader community is invited to review the document and provide feedback. The Partner Councils, in collaboration with Water Technology, will review all submissions received, carefully consider the issues and suggestions raised, and prepare a comprehensive reply-to-submissions report. This process ensures transparency, encourages broad participation, and allows the CMP to be refined in response to community and stakeholder input before finalisation.

Agency Letters of Support

Following distribution of the First Draft CMP, all agencies with assigned actions will receive a formal request to provide written confirmation of their support for those actions. This step formalises commitments and builds on the strong foundation of collaboration established during Stages 1 to 3, ensuring that responsibilities are clearly acknowledged and endorsed ahead of finalisation.

5 ACTIONS TO BE IMPLEMENTED BY THE PARTNER COUNCILS OR BY PUBLIC AUTHORITIES

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Image Source: Thomas Banner

5.1 CMP Structure

5.1.1 CMP Structure and Delivery Framework

The Challenge for the CMP

The HNRS is one of the largest river systems in NSW, and its waterways and catchments span across a range of range of different local government areas. This scale creates key challenges for both the practical implementation and formal certification of the CMP:

Scale of Application



The CMP must address interconnected issues at a system-wide level, including estuary health, water quality, ecological risks, coastal hazards, and development pressures. This requires a coordinated and integrated approach that operates seamlessly across the entire catchment, its waterways, and foreshore areas.



At the same time, the CMP must retain sufficient granularity and focus to respond to the wide range of localised issues, risks, and opportunities that exist across such a large and diverse study area, ensuring management actions remain practical and place specific.



The CMP must also enable a collaborative approach to management among all stakeholders - particularly Partner Councils - while providing a transparent understanding of each party's financial responsibilities and resourcing commitments

Certification Requirements



A key objective of the CMP is to address estuary health risks that require a catchment-management approach. However, under Section 13(2) of the CM Act, there is no provision actions to be included in a certified CMP, where those actions reside outside the legally defined coastal zone - which represents only 2% of the total HNRS catchment area (see Section 1.2.3).

Structure of the CMP

To respond to these challenges, a Strategic Direction Workshop was convened with CMP Steering Committee at the outset of Stage 3 (see Section 4.4.2). This workshop resulted in a codesign process that developed the delivery structure of the CMP. A summary of this structure is provided in Figure 5-1, and includes:

- **Nine (9) overarching strategies** that provide the CMP with strategic direction. These include:
  - Strategy 1: Governance and Program Delivery
  - Strategy 2: Monitoring, Evaluation, and Reporting
  - Strategy 3: Resilience, Planning, and Adaptation
  - Strategy 4: Community & Stakeholder Engagement
  - Strategy 5: Estuary & Waterway Health
  - Strategy 6: Coastal Hazard Resilience
  - Strategy 7: Social and Recreational Amenity
  - Strategy 8: Cultural Heritage Protection
  - Strategy 9: Research and Knowledge Sharing

- **Eight (8) Implementation Plans** that provide the CMP with specific focus, including:
  - *A Collaborative System Implement Plan* to facilitate a large scale, coordinated approach to coastal zone and estuary management. Actions in the plan are delivered by multiple Councils through coordinated delivery partnerships. These Actions are detailed in Section 5.3.
  - *6 LGA-Based Implementation Plans* that provide granularity at a local level for each of the Partner Councils These plans are also intended to assist in the integration of the CMP actions into each Partners Councils' IP&R Framework (see Section 2.5.2). These Actions are detailed in Sections 5.4 to 5.9.
  - *An NPWS Implementation Plan* that provides specific focus for actions located within NPWS land tenure. These Actions are detailed in Section 5.10.
- **A Catchment Companion** which is external to the certifiable CMP and contains actions that are located outside of the coastal zone in the broader HNRS catchment.
  - While clearly marked as non-certifiable under the CM Act, these actions are included within the CMP document to maintain integration with coastal zone actions and to support holistic estuary management.
  - This approach aligns with the NSW Government's guidance on *Coastal Management Programs and Integration with Catchment Management* (DPE, 2022). The guidance notes that actions within the companion section may still be eligible for funding under the Coastal and Estuary Grants Program, provided they meet all 3 of the following criteria:
    - Significantly benefit the coastal zone and is a critical factor in estuary health.
    - Give effect to the management objectives for the coastal management areas and the objects of the CM Act.
    - Assist in addressing a key coastal management issue affecting the areas to which a certified applies.
  - The management actions to be implemented in the *catchment companion* to this CMP are outlined in Section 5.11. *Note that this catchment companion is separate and external to the certifiable CMP*.

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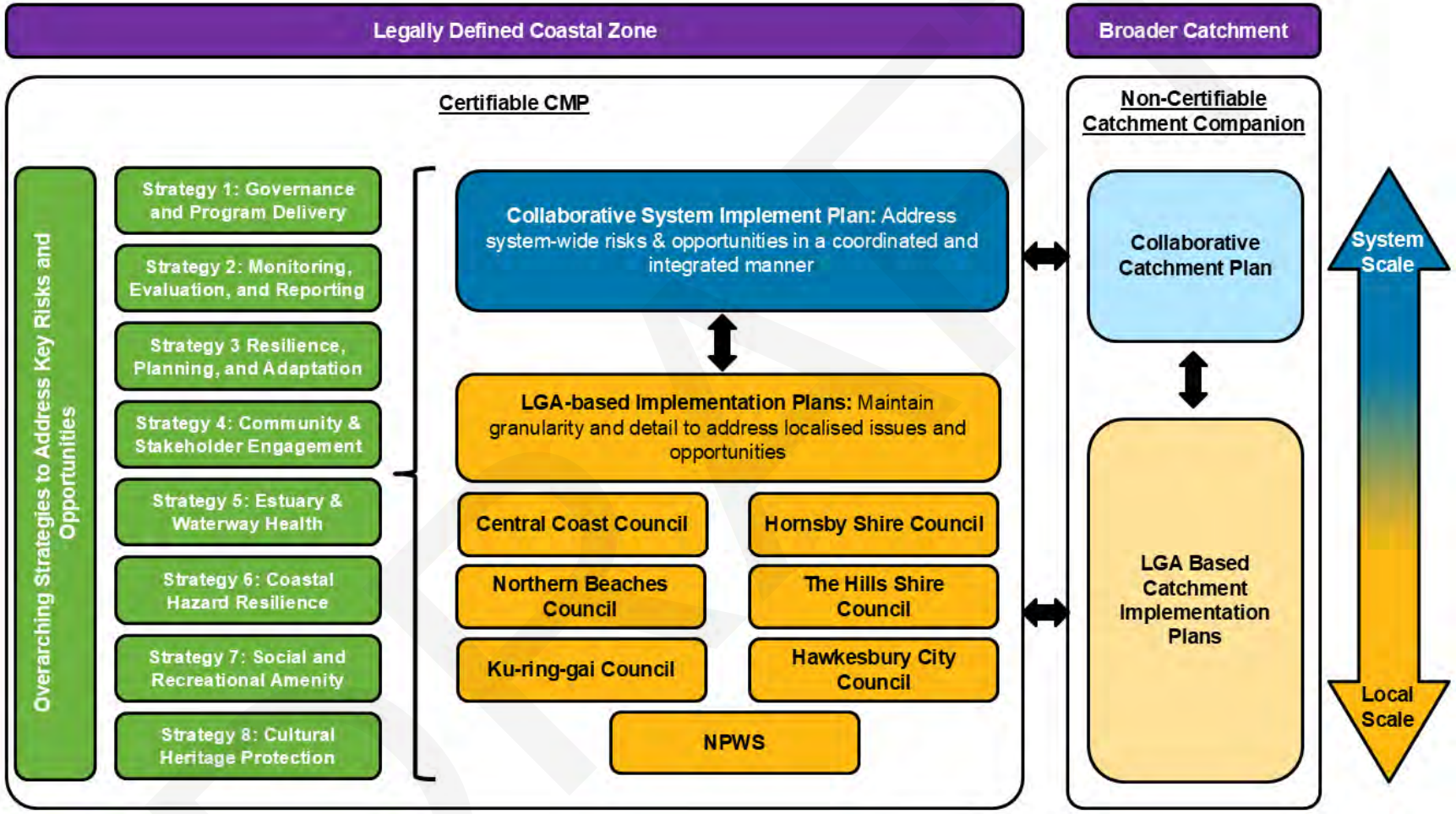


Figure 5-1 HNRS CMP delivery structure

5.1.2 Action Information Provided in the CMP

Action Descriptions

The management actions identified for implementation under this CMP are detailed in Sections 5.3 to 5.10. Each section provides a concise yet comprehensive description of the actions, structured to support transparency and ease of reference. For every action, the following information is presented:

- Strategic alignment – the overarching Strategy that the action contributes to.
- Action ID – a unique identifier that enables cross-referencing across this CMP and supporting documents.
- Location and scale – including the functional zone of the estuary within which the action will occur.
- Action name and description – summarising the scope, intent, and key features of the action.
- Implementation responsibility – identifying the lead organisation responsible for delivery, along with supporting agencies and partners. Shorthand is applied in this table for Central Coast Council (CCC), Hawkesbury City Council (HCC), Hornsby Shire Council (HSC), Ku-ring-gai Council (KC), Northern Beaches Council (NBC), and The Hills Shire Council (THSC).
- Priority and indicative timing – categorised to reflect the relative importance and the proposed sequencing of delivery (see Section 5.1.3).

This structure provides clarity for decision-makers and stakeholders, ensuring each action can be readily understood in terms of purpose, accountability, and timing

Action Mapping

Mapping of actions with a geographically specific focus (for example, on-ground works, site-based investigations, or foreshore projects) is provided in Appendix B to highlight the spatial context of proposed works and initiatives. These maps are intended to give a clear visual representation of where actions will be implemented and to support place-based engagement and delivery planning. References to the relevant Appendix B action map are provided within each action description.

Conversely, actions that are programmatic, system-wide, or broadly applicable across the estuary (for example, policy development or education programs) are not mapped but remain fully described in the action tables.

An Important note on Coastal Protection Works and Environmental Protection Works

There are two categories of actions in this CMP that have specific statutory definitions under NSW legislation and planning instruments:

- Coastal Protection Works (CPW):
  - These are defined in the CM Act as:
    - "*(a) beach nourishment activities or works, and*
    - *(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*".
  - It is recommended that the CPW identified in this CMP - to the greatest extent practical – designed and implemented in consistency with the NSW Coastal Design Guidelines (DPE, 2023a), and the NSW Coastal Crown Guidelines (DPE, 2023b).
  - Appendix C provides an overview of concept designs for actions in the CMP that are designated as designated as CPW. The purpose of these concept designs is to provide sufficient technical detail on the nature and scope of proposed CPW to enable determining authorities to consistently interpret the

actions and apply streamlined approval pathways as relevant. References to the relevant concept design(s) are provided within each action description.

- Environmental Protection Works (EPW): These are defined in the Standard Instrument - Principal Local Environmental Plan (2006 EPI 155a) as:
  - *"works associated with the rehabilitation of land towards its natural state or any work to protect land from environmental degradation, and includes bush regeneration works, wetland protection works, erosion protection works, dune restoration works and the like, but does not include coastal protection works*".

For land use planning purposes, the application of a planning pathway is guided by the definition and particular purpose of the proposed development, activity, or work (NSW Government, 2021). Accordingly, the action descriptions in this CMP explicitly identify, where relevant, whether a proposed activity qualifies as CPW or EPW. This approach provides consistency with the R&H SEPP and underpins the implementation of a streamlined planning approvals pathway under Section 2.16 of the SEPP.

5.1.3 Prioritisation of Actions

Given the limited funding and resources of the Partner Councils, a key element of CMP implementation is the prioritisation and rationalisation of management actions. With this in mind, this CMP has established a framework for prioritisation of management actions – based on a logical Action Priority Matrix. This considers both the importance and the urgency of each individual action in order to develop a coherent plan for prioritisation.

For this task, the "Importance" of each action has been assigned a score out of 10 based on how critical implementing that action is towards achieving the overall goals of the CMP:

- **Critical (8-10)**: Those that are critical for addressing key risks and the long-term effective management of the estuaries. These actions are critical for successful implementation of the CMP.
- **High (5-7)**: Those considered of high importance, or high impact, in addressing risks and opportunities.
- **Medium (1-4)**: Those that whilst still important, are considered to be moderately effective or impactful in terms of addressing risks and opportunities.

The second consideration is the "Urgency" of the various actions. This consideration acknowledges that whilst some actions may be highly important to success of the CMP, they may not need to be (or perhaps are not able to be) implemented immediately. This could be due to budget or resourcing limitations, or the need to schedule some actions first in order to allow others to proceed effectively. The urgency of the actions has been assigned a score out of 3 based on the following criteria:

- **Pressing (3)**: Actions that require immediate attention and implementation, or actions that affect the critical path of other actions (i.e., are a prerequisite for other actions) and therefore need to be implemented in the short term.
- **Moderate / Dependant (2)**: Actions that are of moderate urgency or are dependent on the implementation of other actions before they can commence.
- **Opportunistic (1)**: Actions that do not have an immediately pressing timeframe for implementation but rather can be implemented opportunistically as resources and funding become available.

The Action Priority Matrix is provided in Table 5-1. It outlines a process to generate a Priority Score for each action. The Priority Score can be banded to outline an approximate timeframe for implementation and alignment with the City's 4-year Delivery Program (DP) under the NSW IP&R Framework:

- **High Priority** (score of 24-30): To be implemented in the short term - within 1-4 years
- **Medium Priority** (score of 8-23): To be implemented in the medium term - within 4-8 years

- **Low Priority** (score of 1-8): To be implemented in the long term - within 8-10 years

It should be noted that this process is intended to provide a broad indication of action priority. However, it is acknowledged that this may not marry with the "on the ground" reality over the forward CMP timeframe, and a flexible approach to undertaking works should be adopted as grants and funding opportunities arise from time to time that may allow some options to be progressed ahead of others.

While some actions may be identified as a priority for implementation in the CMP, it is recognised that the Plan needs to retain sufficient flexibility such that the Partner Councils (or other responsible agencies) may implement any of the management actions at any time on an opportunistic basis, regardless of their priority. Such an opportunity may arise where, for example, funding becomes available through a specific grant or funding program.

It should also be acknowledged that some of the actions whose urgency is listed as "Opportunistic" may provide an opportunity for "quick, easy wins" throughout the process, particularly those that require minimal cost or effort to implement. Therefore, the delivery partners of the CMP should remain vigilant for opportunities to implement these actions as they may arise.

Table 5-1 The action priority matrix

Priority			Urgency		
			Pressing	Medium / Dependant	Opportunistic
			3	2	1
Importance	Critical	10	30	20	10
		9	27 High Priority	18	9
		8	24	16	8
	High	7	21	14 Medium Priority	7
		6	18	12	6
		5	15	10	5
	Medium	4	12	8	4
		3	9	6	3 Low Priority
		2	6	4	2
		1	3	2	1

5.2 CMP Governance Structure

5.2.1 Importance of Governance

The scale and complexity of the HNRS CMP demands a governance framework that is clear, durable, and capable of coordinating action across multiple councils, agencies, and stakeholders. Effective governance provides:

- Authority and advocacy – to keep the CMP visible and relevant within council priorities.
- Coordination – to align delivery across a large and diverse river system.
- Capacity – to manage grants, reporting, and engagement.
- Flexibility – to adapt as circumstances change and lessons are learned during implementation.

5.2.2 Governance Structure Development

The governance model for the delivery of Stage 5 of the CMP was co-designed with input from Partner Councils, DCCEEW, and other stakeholders through a staged workshop process. This ensured the structure was grounded in best practice, equitable, and tailored to the unique needs of the HNRS.

Through a series of dedicated workshops, stakeholders were able to examine contemporary models, identify guiding principles, and collaboratively refine the governance structure. This iterative approach provided the necessary depth of analysis and broad ownership to give the final framework both equity and practical utility.

- **Workshop #1: Best practice fact-finding:** The first workshop focussed on building an evidence base from comparable multi-council estuary partnerships across NSW. Attendees included representatives from the Hunter Estuary Alliance (HEAL), the Parramatta River Catchment Group (PRCG), the Cooks River Alliance (CRA), and the Georges Riverkeeper (GRK). The session centred on distilling lessons from each group around:
  - The *WHERE* – their geographical scope of operations
  - The *WHY* – their core purpose and role within catchment or estuary management
  - The *WHAT* – their organisational structures and membership models
  - The *HOW* – funding approaches and the nature of formal agreements (e.g., Constitutions, Terms of Reference, and/or Memoranda of Understanding)
  - Incorporation of Indigenous custodianship and cultural perspectives
  - Model refinement – identifying what works well and where improvements could be made.
- **Workshop #2: Objectives and governance structure design:** Building on these insights, the second workshop brought together representatives from the Partner Councils and DCCEEW. The objective was to establish the overarching principles of governance for the HNRS CMP, agree on the desired outcomes of the structure, and co-design the framework that would balance governance oversight with operational delivery. This process ensured that the governance model was not only technically robust but also practical, equitable, and responsive to the needs of the Partner Councils.
- **Workshop #3: Development of key details and determination of the way forward:** The third workshop refined the draft governance model into a workable framework, resolving critical design elements such as the composition and roles of governance bodies, the frequency and format of meetings, and the integration of technical and cultural advice. It also confirmed the commitment of Partner Councils to progress the model, providing a clear mandate to finalise terms of reference, nominate representatives, and establish the governance structure in practice.

Informed by this process, the following section outlines the agreed governance structure for the HNRS CMP, including the roles, responsibilities, and interactions of its key components.

5.2.3 Governance Structure Principals

The governance structure has been established to provide effective oversight, ensure accountability, and facilitate coordination across multiple councils, agencies, and stakeholders. At its core, the governance structure rests on 3 guiding principles:

- **Purpose**: The primary purpose of the governance structure is to oversee and drive the delivery of CMP actions. It is not intended as a broader management group with wider roles and responsibilities. A purposeful decision was made to maintain a specific focus on CMP delivery – to ensure that governance adds demonstrable value by maintaining focus on outcomes and supporting the long-term objectives of the CMP.

- **Form**: The three-tiered structure (Executive Group, Steering Committee, Project Delivery Groups) is supported by a dedicated Project Coordinator. Formal agreements such as Memoranda of Understanding or constitutions give the framework durability and legitimacy.
- **Function**: The governance framework is to be supported by clearly defined Terms of Reference for each body, setting out roles, responsibilities, membership, and decision-making processes. Membership is structured to achieve equity of representation across Partner Councils and State Agencies, while also ensuring that cultural knowledge and community perspectives are embedded. Formal arrangements such as Memoranda of Understanding or Constitutions provide a durable basis for collaboration and accountability.

5.2.4 Overview

The adopted governance framework is tiered, inclusive, and action oriented. It balances strategic oversight with operational capacity, ensuring actions are coordinated across the catchment while still reflecting local needs. The governance structure for the CMP is summarised in Figure 5-2 with the respective elements described in Table 5-2.

- The Executive Group provides strategic leadership and advocacy, raising the profile of the CMP and integrating actions into Council programs.
- The Steering Committee acts as the coordinating hub, aligning delivery across councils, overseeing progress, and guiding project delivery groups.
- Project-based Delivery Groups, responsible for targeted implementation of actions.
  - Multi-council and non-council projects group councils, agencies, and technical experts to deliver collaborative initiatives.
  - Individual council projects are led internally, with support from technical partners as required
  - Dedicated First Nations Action Group - established to guide delivery of collaborative actions under Strategy 8. This group provides a transparent, culturally appropriate, and accountable forum to administer funds, assess project submissions, and oversee implementation. By creating a dedicated group, the governance framework ensures that First Nations knowledge, priorities, and perspectives are meaningfully embedded in CMP delivery.
- A central feature is the appointment of a dedicated Project Coordinator, employed on a 0.6 - 1.0 FTE basis. Partner Councils agreed unanimously that this role is fundamental to success, given the breadth and scale of the CMP. The Coordinator provides continuity, integration across councils, and the capacity to manage grants, reporting, and stakeholder engagement – functions that cannot be effectively delivered on a part-time or ad-hoc basis by existing council staff.

Together, these elements create a governance model that is inclusive, transparent, and action oriented. By combining strong oversight with operational flexibility, the structure provides a robust platform for the delivery of CMP actions. Importantly, the governance structure is intended to be adaptive. As the CMP progresses through its implementation phases, the structure may evolve to reflect emerging priorities, changing stakeholder needs, or lessons learned, ensuring that it remains both flexible and effective over the long term.

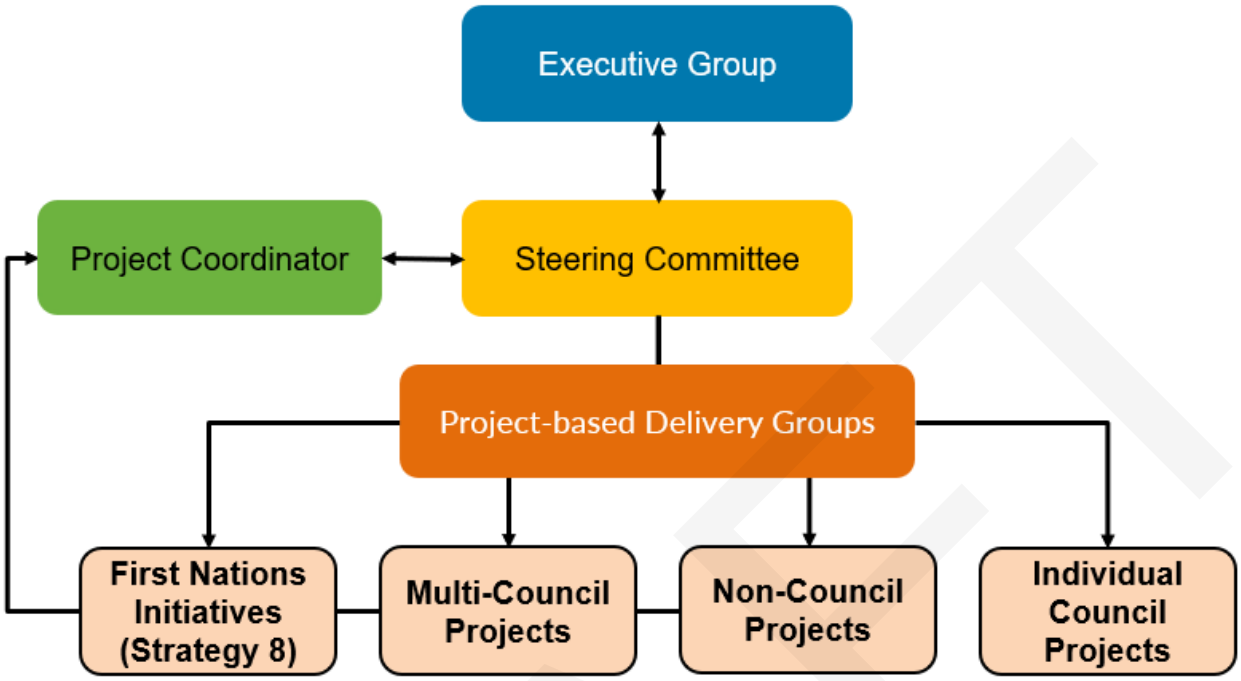


Figure 5-2 HNRS CMP governance structure

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Table 5-2 HNRS CMP governance structure

Element	Function and Scope	Representation	Operational Considerations
Executive Group	▪ Provide high-level advocacy and visibility for the CMP ▪ Support integration of CMP actions into each Council's Delivery Program and IP&R ▪ Advocate for CMP implementation in the face of competing Council priorities	▪ 1 x Director or Senior Manager from each Partner Council (or delegate)	▪ The EG could be provided with quarterly / semi-annual / annual updates by the Steering Committee
Steering Committee	▪ Coordinate delivery of CMP actions across LGAs in line with the CMP strategic priorities and forward program ▪ Promote system-wide actions in the Collaborative Implementation Plan, including those not led by Partner Councils ▪ Guide and support project delivery groups	▪ 1-2 x representatives from each Partner Council – typically coastal/estuary officers but others can be included in an as needed basis ▪ 1-2 x representatives from DCCEEW ▪ Leadership is reinforced through the appointment of strong chairs to provide authority, continuity, and impartial guidance ▪ State Agency representation may be most efficiently garnered through the Project Delivery Groups – so that it is focussed on CMP action delivery	▪ Scheduled Meeting Frequency: Approx. Quarterly ▪ Meeting Location: Rotate across Partner Council locations
Project Coordinator	▪ Project coordination and administration of actions in the Collaborative System Implement Plan ▪ Grant management and coordination ▪ Monitoring, evaluation, and reporting on CMP implementation status ▪ Design and execution of both internal and external engagement (Council, stakeholder, and community)	▪ 1 x Project Coordinator, employed in a 0.6 to 1.0 FTE role	▪ Salary to be co-funded through CMP Business Plan (see Action S1.CMP.A) ▪ Employment Status: There are 4 potential options: 1. Directly employment by one of the Partner Councils 2. Sourced externally (through a consultancy or contract arrangement) 3. A practical combination of (1) and (2) above 4. Develop an incorporated body and deliver Project Management for the CMP through that entity (employment of the PM and any required assets)

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Element	Function and Scope	Representation	Operational Considerations
Project Delivery Groups (Multi-Council Projects and Non-Council Lead Projects)	▪ Delivery of specific CMP actions that sit within the "Collaborative System Implement Plan". That is, any action that is "multi-Council" in delivery ▪ Similar Actions can be grouped together for coordinated delivery – so that we don't need a "group" for every action. For instance, multiple actions within a particular strategy can use a common project delivery group. ▪ Groups would be sunset upon delivery of that (those) Action(s)	▪ Representatives from any organisation listed in the CMP Delivery Plan as either: – Lead Organisation – Support Organisation ▪ Technical Support to assist in delivery of the action(s) – including representatives from industry, academia, and First Nations Groups	▪ Reports to: Steering Committee ▪ Meeting Frequency: As required ▪ Project Coordination: Nominated by Steering Committee
Project Delivery Groups (Individual Council Lead Projects)	▪ Delivery of specific CMP actions that sit within the "Implementation Plan" of an individual council. ▪ Can be one "group" for all actions in Councils implementation plan	▪ Council officers from relevant departments (environmental services, planning, open space, engagement, assets and infrastructure etc): ▪ Technical Support to assist in delivery of the Action(s) - including representatives from any "Supporting Partners" listed in the delivery plan	▪ Reports to: Steering Committee - to keep the broader group updated. ▪ Meeting Frequency: As required ▪ Project Coordination: Nominated by Council officer.
First Nations Initiatives (Strategy 8)	▪ Provide a culturally appropriate and transparent forum to lead, fund, and oversee First Nations–related actions under Strategy 8. ▪ The group ensures that First Nations knowledge and priorities are embedded in delivery, strengthens trust and accountability, and builds enduring partnerships between councils, LALCs, and custodians.	▪ Chairperson (1): A Traditional Owner with recognised cultural ties and knowledge across the Hawkesbury River. ▪ Traditional Owner Representatives (6): 6 seats reserved for representatives with ancestral connection to distinct geographic regions of the HNRS. ▪ Local Council Representation: 6 Partner Councils (individually or collectively). ▪ LALC Representation: The 3 LALCs (Darkinjung, Deerubbin, and Metro) (individually or collectively). NOTE – the above will be further developed through discussions with First Nations Groups along the HNRS	▪ Fund Administration: Manage allocation and oversight of Strategy 8 funds with transparent, accountable processes. ▪ Assessment of Submissions: Apply culturally appropriate criteria to review and select projects proposed by Traditional Owner groups, LALCs, and Aboriginal organisations. ▪ Project Oversight and Monitoring: Track delivery of funded initiatives to ensure timely, high-quality outcomes. ▪ Reporting and Accountability: Provide progress reports to the CMP governance bodies and stakeholders. ▪ Dispute Resolution: Act as a culturally informed mediator for any disputes during implementation.

5.3 Collaborative System Implement Plan

A summary of the actions within the Collaborative System Implement Plan are provided in Table 5-3. Maps depicting relevant actions are provided in Appendix B.

Table 5-3 Action Table - Collaborative System Implement Plan

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 1: Governance and Program Delivery	S1.CMP.A	Entire HNRS	Estuary-Wide	Implement the CMPs formal governance partnership for the river system	This will involve the implementation of a new partnership for the governance of the Hawkesbury-Nepean River and its catchment. The partnership will be tasked with the implementation of the CMP, and the broader management of the river system. The aim of the partnership will be to: > Ensure collaboration and coordination between local councils, the state government and other stakeholders > Define the roles and responsibilities of all stakeholders > Ensure dedicated resourcing for river management This Action will also include the employment of a permanent project coordinator for the CMP - as per the Project Governance Structure discussed in Section 5.2.	CCC, NBC, HSC, KC, THSC, HCC	DCCEEW, NPWS, Sydney Water, DPIRD-Fisheries, DPHI-Crown Lands, TfNSW,	High (30)	Within 1-4 years	Governance group established and operating, with a coordinator role maintained for the CMP's duration.
Strategy 1: Governance and Program Delivery	S1.CMP.B	Entire HNRS	Estuary-Wide	Develop and execute a communications plan for Stage 5 of the CMP	Develop a communications plan for the 10 year implementation phase of the CMP. This will include maintenance of the CMP Website and other associated Partner Council information pages. The purpose of the plan should be to provide the community with the following information: > The purpose of the CMP. > The CMP background, and an overview of the NSW Coastal Management Framework. > Key CMP information, including reports available for public consumption. > The Status of CMP actions, with details of the actions and recent updates/progress. > Information pertaining to upcoming community consultation or education events, and avenues for engagement; and > Links to relevant materials such as The NSW Coastal Management Framework, and the Marine Estate Management Strategy. This may also include the ongoing social media presence, mailing lists and newsletters publishing.	CCC, NBC, HSC, KC, THSC, HCC	DCCEEW	High (24)	Within 1-4 years	Plan developed and implemented. Improved community understanding of CMP goals, priorities, and implementation status.
Strategy 2: Monitoring, Evaluation, and Reporting	S2.CMP.A	Entire HNRS	Estuary-Wide	HNRS Water Quality Monitoring - Data Aggregation and Reporting	Water quality across the Hawkesbury-Nepean River System (HNRS) is currently monitored by a range of stakeholders, including partner councils, other catchment councils, the NSW Government (Department of Climate Change, Energy, the Environment and Water – DCCEEW), and Sydney Water. While these programs generate valuable data, they operate independently, resulting in inefficiencies and data gaps that hinder system-wide understanding and management. This action would therefore involve focuses on the aggregation, management, and communication of water quality data across the HNRS. A well-structured reporting and data management framework will enhance transparency, promote shared understanding, and support evidence-based decision-making by councils, agencies, and the community. This action would therefore include: <u>Data Management and Coordination:</u> > Create a centralised database to store, manage, and share water quality data collected by all stakeholders. > Implement robust data entry, validation, and analysis processes to ensure data accuracy and reliability. <u>Reporting:</u> > Develop a user-friendly, public-facing platform to share water quality information > Support community awareness and engagement by making key findings, trends, and alerts easily accessible and understandable.	DCCEEW, CCC, NBC, HSC, KC, THSC, HCC	Sydney Water	High (30)	Within 1-4 years	Centralised database established. Collected data is of tangible benefit from a research and management perspective.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 2: Monitoring, Evaluation, and Reporting	S2.CMP.B	Entire HNRS	Estuary-Wide	HNRS Water Quality Monitoring - Implement a Coordinated Monitoring Program	Design and implement a coordinated water quality monitoring program across the HNRS coastal zone. The Action would be led by the DCCEEW Science Unit, and would include the following steps: 1. <u>Program Review and Standardisation:</u> > Map existing water quality sampling programs across the HNRS to identify potential gaps and redundancies. > Develop standardised protocols for sampling frequency, locations, parameters tested, and analytical methods across the HNRS. <u>2. Resource Coordination and Capacity Building:</u> > Identify opportunities for resource sharing (e.g. equipment, laboratory services, field teams) between councils and agencies to reduce duplication and costs. > Build technical capacity through workshops, training, and exchange programs to support consistent, high-quality data collection and interpretation. <u>3. Implement coordinated monitoring program:</u> > Roll out the coordinated monitoring program in alignment with agreed protocols and schedules. > Ensure ongoing collaboration between councils, DCCEEW, and other agencies to deliver consistent, high-quality data collection. > Establish a governance framework to oversee program delivery, quality assurance, and adaptive management. > Periodically review and refine the program based on monitoring outcomes, emerging issues, and stakeholder feedback	DCCEEW, CCC, NBC, HSC, KC, THSC, HCC	N/A	High (30)	Within 1-4 years	Plan developed and implemented. Reporting mechanism established and executed.
Strategy 2: Monitoring, Evaluation, and Reporting	S2.CMP.C	Entire HNRS	Estuary-Wide	Implement a bank stability and condition monitoring program across the estuary foreshores	Systematically monitor and assess bank stability and geomorphic conditions in the Hawkesbury River Estuary to identify erosion risks and support effective riverbank management. While monitoring is currently conducted by individual Partner Councils, an integrated and coordinated program would enable a more comprehensive estuary-wide assessment, facilitate resource sharing, and improve cost efficiencies. This program will be designed to be cost-effective, replicable, and adaptable over time, ensuring consistent data collection and long-term riverbank health management.	CCC, NBC, HSC, THSC, HCC	DCCEEW, NPWS	High (24)	Within 1-4 years	Monitoring undertaken and recorded. Collected data is of tangible benefit from a risk and asset management perspective.
Strategy 3: Resilience, Planning, and Adaptation	S3.CMP.A	Entire HNRS	Estuary-Wide	Review and update Partner Council planning instruments for alignment of a consistent best practice approach to managing stormwater and downstream estuarine water quality	The objective of this action is to establish a consistent and best-practice approach to development controls that enhance estuary health, by reviewing and updating the Development Control Plans (DCPs) and Local Environment Plan (LEP) initiatives of the six Partner Councils. This action will also set pollution reduction targets to ensure measurable improvements in estuarine environments. This action would include: > Target setting: Determination of a consistent set of targets for relating to water quality and quantity that are consistent with the Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning and the NSW Water Quality Objectives . > Policy review : Conducting a detailed review of the existing DCPs and LEPs across the six Partner Councils - in relation to how they address stormwater management, sediment and erosion management, and water sensitive urban design (WSUD) applications and requirements. > Gap analysis: Identification of gaps, inconsistencies, and areas needing improvement in the current DCPs and LEPs, particularly those affecting estuary health. > Planning proposals and amendments: Preparing planning proposals to implement the required amendments to LEPs, and drafting updates to DCPs, to embed best-practice stormwater and water quality provisions and achieve greater consistency across the catchment wherever practical. This Action should use the Parramatta River Catchment Groups "Standardise the standards" initiative as an example of contemporary good practice. As supporting agencies, Sydney Water and DPHI can provide technical assistance as required.	CCC, NBC, HSC, KC, THSC, HCC	DPHI-Planning and Assessment, Sydney Water	High (30)	Within 1-4 years	Review completed, and planning controls updated in a consistent manner.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 3: Resilience, Planning, and Adaptation	S3.CMP.B	Entire HNRS	Estuary-Wide	Review and update Partner Council planning instruments for coastal hazard risk planning controls every 10 years	The objective of this action is to establish a consistent and best-practice approach to development controls that manage coastal and estuarine hazard risk, by reviewing and updating as relevant the following planning instruments of the six Partner Councils: > Development Control Plans (DCPs) > Local Environment Plans (LEPs) > R&H SEPP Coastal Management Areas - including the Coastal Vulnerability Area Each Partner Council should review their relevant planning controls at least every 10 years, in order to ensure that these controls are based on contemporary climate change projections, consider observed coastal hazard impacts, and are consistent with state government policies. Where necessary, preparing planning proposals to implement the required amendments to LEPs and Coastal Management Areas may be required to embed best-practice.	CCC, NBC, HSC, KC, THSC, HCC	DPHI-Planning and Assessment	Low (7)	Opportunistic, within 8-10 Years	Review completed. Updated applied as necessary.
Strategy 3: Resilience, Planning, and Adaptation	S3.CMP.C	Entire HNRS	Estuary-Wide	Encourage eco-friendly features in seawall development applications	Partner Councils are to review and update their DCPs to encourage development applications for private seawalls to include eco-friendly features - such as installing 3D-printed habitat panels, increasing surface texture, and planting estuarine vegetation around the structures. This could also include: > Ensuring that all relevant Conditions of Consent include reference to the Environmentally Friendly Seawall Design > Providing educational material to foreshore residents promoting eco-friendly features and the ecological value they provide. > Providing access to suppliers and contractors to help install ecofriendly features. Any review an implementation should be consistent with the NSW Coastal Design Guidelines 2023, and the Coastal Crown Lands Guidelines 2023.	CCC, NBC, HSC, KC, THSC, HCC	DCCEEW, DPIRD-Fisheries	Medium (12)	Within 4-8 years	Review completed.
Strategy 3: Resilience, Planning, and Adaptation	S3.CMP.D	Entire HNRS	Estuary-Wide	Develop Intertidal Marine Vegetation Strategy for Hawkesbury River estuary	Intertidal Marine Vegetation Strategies developed as part of the MEMS program use evidence-based methods to coordinate protection and build resilience of intertidal wetlands now and into the future. The IMVS [Hawkesbury River estuary] would contain detailed information on recommended responses to the key threats and risks to saltmarsh and mangrove communities in the Hawkesbury River estuary. It would include management actions categorised under Hydrology, Sediments, Vegetation and, People and Planning. The IMVS would consider, with an estuary-wide perspective, the benefits of undertaking adaption actions informed by current and projected SLR. Development of such approaches is important because not acting on sea level rise, or, attempting to isolate ecological communities from their changing environmental settings ultimately reduce the time available for ecosystems to adapt or migrate, consequently increasing their vulnerability and diminishes the valuable services they provide to residence and visitors using the estuary. IMVS actions can be delivered with suitable partnership and funding opportunities. For example, this could include: > projects identified in approved Coastal Management Programs > projects aligned with environmentally focused Non-Government Organisation or community groups > Aboriginal land managers who are looking to deliver projects that involve working on and restoring culturally significant areas or habitats > major developers that are required to offset unavoidable impacts on mangrove or saltmarsh habitat with an identified action under Section 220 of the NSW Fisheries Management Act 1994 > a court ordered directive for environmental rehabilitation > collaborative projects between local government and NSW Government through opportunities such as the Recreational Fishing Trust Flagship or Habitat Action Grant Programs > private land conservation agreements under the Biodiversity Conservation Trust that facilitate the redistribution of intertidal and adjacent habitats that is underway with sea level rise > enforceable undertakings under Environment Protection Authority for the purpose of s 253a Protection of Environment Operations Act 1997 > opportunities to participate in the emerging nature repair market.	DPIRD-Fisheries	DCCEEW, NPWS, CCC, NBC, HSC, KC, THSC, HCC	High (32)	Within 1-4 years	Strategy completed and adopted to guide management of saltmarsh and mangroves.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 3: Resilience, Planning, and Adaptation	S3.CMP.E	Entire HNRS	Estuary-Wide	Develop Foreshore Stabilisation and Rehabilitation Guidelines for the HNRS	Develop comprehensive Foreshore Stabilisation and Rehabilitation Guidelines to provide clear, consistent guidance for landowners and managers on best practices for stabilizing and restoring foreshore areas. These guidelines will help balance environmental sustainability, erosion control, and land use requirements, ensuring that foreshore management aligns with ecological and planning objectives. The guidelines will outline appropriate stabilisation treatments and construction techniques suited to different site conditions, promote nature-based solutions where feasible, and support ecological function while mitigating erosion risks. They will also serve as a supporting document to each Council's Development Control Plan (DCP) for foreshore and waterway development, ensuring consistent advice for development proponents across the Hawkesbury-Nepean River System (HNRS). This approach builds on successful models, such as the Lake Macquarie City Council's foreshore management framework, which can serve as a reference point for guideline development. The guidelines should be consistent with the NSW Coastal Design Guidelines 2023, and the NSW Environmentally Friendly Seawalls guidelines (2009).	CCC, NBC, HSC, KC, THSC, HCC	DCCEEW, DPIRD-Fisheries, DPHI-Crown Lands	Medium (14)	Within 4-8 years	Guidelines prepared and endorsed, providing consistent advice across councils.
Strategy 3: Resilience, Planning, and Adaptation	S3.CMP.G	Entire HNRS	Lower Estuary, Broken Bay, Pittwater	Undertake a Planning Proposal to adopt a CVA	Mapping for the Coastal Vulnerability Area (CVA) has not been provided from the RH SEPP, and no such CVA map yet exists for the HNRS. Subsequently, it is the intent of the three Partner Councils who are significantly impacted by coastal hazards (Central Coast Council, Northern Beaches Council, Hornsby Council) to propose, by way of a planning proposal, the adoption of a map indicating a CVA – which may be comprised of a combination of the following hazards across the study area, which are identified in the CM Act: > Beach erosion. > Shoreline recession. > Estuary entrance instability. > Coastal cliff and slope instability. > Coastal inundation. > 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. It should be noted that the CM Act requires the consideration of a 100 year planning horizon (considering future climate change impacts). As such, all extents used in defining the CVA should be based on a suitable forward planning horizon, which incorporates the projected effects sea level rise on coastal hazards. The Partner Council's existing coastal hazard mapping and controls within the LEP and DCP will be required to be updated to reflect, and be supplementary to, the proposed CVA mapping.	CCC, NBC, HSC	NPWS, DPHI-Planning and Assessment	High (24)	Within 1-4 years	Planning proposal lodged and mapping incorporated into statutory controls.
Strategy 3: Resilience, Planning, and Adaptation	S3.CMP.H	Entire HNRS	Estuary-Wide	Collaborate with local universities and research institutions to establish a list of research priorities for the Hawkesbury-Nepean River System	This Action would include the Partner Councils collaborating to determine a list of priorities for research project across the Hawkesbury-Nepean River System - and establishing formal connections with local universities and research institutions in order to facilitate research projects.	CCC, NBC, HSC, KC, THSC, HCC	GS LLS	Medium (8)	Within 4-8 years	research priorities identified and partnerships established. Research output is of tangible benefit from a management perspective.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 4: Community & Stakeholder Engagement	S4.CMP.A	Entire HNRS	Estuary-Wide	Design and Implement a Community Engagement and Education Program to support the vision and objectives of the CMP	The action includes the design and implementation of a Community Engagement and Education Program to support the vision and objectives of the CMP. The purpose of the program would be to educate the community regarding the keys threats and risks facing the estuary system, and how they can actively contribute to mitigating these risks and improving the resilience of the coastal zone. It would include the following components, or themes: > Water quality and marine litter > Riparian zone and foreshore management (focusing on foreshore residents) > Ecosystems of the estuary and biodiversity > Aboriginal and European cultural heritage values of the estuary > Coastal hazard risk (focusing on residents impacted by such hazards) > Recreational use impacts (including boating) The program can leverage off the existing community education material developed by the state government (DPIRD-Fisheries, DCCEEW, NPWS, TfNSW) and be implemented across the Hawkesbury River System by the Partner Councils in a strategic and integrated manner.	CCC, NBC, HSC, KC, THSC, HCC	NPWS, TfNSW, GS LLS	High (24)	Within 1-4 years	Program developed, materials produced, and implementation commenced. Improved community awareness of program subject matter.
Strategy 4: Community & Stakeholder Engagement	S4.CMP.B	Entire HNRS	Estuary-Wide	Community education and outreach program for estuary frontage communities	This Action would be a specalised extension of the broader community and stakeholder education program (S4.CMP.01). The purpose of this action is to undertaken targeted engagement with private landowners in the Coastal Zone (particularly those with river frontage), in order to help increase their awareness of estuary management issues riverfront residents would be provided with information on best practice for management of the foreshore within their property boundaries – including recommended riparian species, weed identification and management. The program material should leverage off information set out in the NSW Coastal Design Guidelines, and the NSW Coastal Crown Land Guidelines.	CCC, NBC, HSC, THSC, HCC	DCCEEW, GS LLS	High (24)	Within 1-4 years	Program and materials created, and program implemented. Improved community awareness of program subject matter.
Strategy 4: Community & Stakeholder Engagement	S4.CMP.D	Freshwater Tidal Pool	Upper Estuary	Implementing a community-based carp fishing initiative	European Carp pose a serious threat to local ecosystems, degrading water quality and displacing native species. This Action involves implementing a community-based carp fishing initiative - an effective and engaging way to control invasive carp populations in the freshwater sections of the Hawkesbury River System. Such activities not only contribute to the management of this invasive species but also raise public awareness and foster ongoing community involvement in environmental conservation. This could be similar to the "Catch a Carp Day" programs in other estuaries, or even could be modelled on the "Carp to Croc" program implemented by Central Coast Council	CCC, HCC, THSC, HSC	N/A	Low (6)	Opportunistic, within 8-10 Years	Program and materials created, and program implemented.
Strategy 4: Community & Stakeholder Engagement	S4.CMP.E	Entire HNRS	Estuary-Wide	Hawkesbury River Marine Compliance & Education Campaign	A targeted compliance and education campaign will be conducted across the Hawkesbury River to promote best practices within the marine industry and improve estuary health outcomes. This initiative will focus on raising awareness of environmental regulations, sustainable operational practices, and the impacts of pollution, sediment runoff, and habitat disturbance. The campaign will combine proactive education with compliance monitoring, engaging key industry stakeholders such as commercial fishers, boat operators, marina managers, and waterfront businesses. Outreach efforts will include workshops, on-site visits, digital resources, and enforcement where necessary to ensure adherence to environmental guidelines. By fostering industry-wide accountability and knowledge-sharing, the campaign aims to reduce harmful impacts on water quality, aquatic habitats, and biodiversity within the estuary. This will also include the development of a strategy for managing vessel pumpouts across the Hawkesbury River System. This will aim to improve water quality and protect marine ecosystems by planning new pumpout facilities, incentivising oil-absorbent device use and routine pumpout services, and regularly reviewing spill management plans to ensure effective and sustainable boating practices	NBC, CCC, HSC	TfNSW, NSW EPA	Medium (18)	Within 4-8 years	Program and materials created, and program implemented.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 5: Estuary & Waterway Health	S5.CMP.A	Entire HNRS	Estuary-Wide	Undertake a coordinated riparian rehabilitation works program across the River System	Implement a targeted riparian rehabilitation program to improve the condition of riparian vegetation and manage the spread and introduction of weeds across the coastal zone. These activities are considered 'Environmental protection works' (EPW) for mapped coastal wetlands and littoral rainforest in accordance with the R&H SEPP, and the Standard Instrument - Principal Local Environmental Plan (2006 EPI 155a). Figure B-1 provides an overview of the potential works areas as identified by the Partner Councils. Figures B-2 onwards provides more local, site specific mapping. These maps include overlays of R&H SEPP Coastal Wetlands and Littoral Rainforest layers, so that areas subject to EPWs are clearly identified. Priority will be given to high-value riparian areas where weed infestations overlap with Threatened Ecological Communities (TECs), as identified using the most current and relevant Plant Community Type (PCT) mapping. The program will adopt a multi-species control strategy, supported by follow-up treatment and revegetation with native species suited to each PCT. Activities will include wetland restoration, weed suppression, and the establishment of resilient native vegetation communities. This program will be coordinated with relevant agencies, including NPWS, to leverage existing systems, datasets, and operational capacity. The approach will focus on achieving resource efficiencies through collaborative planning, shared funding opportunities, and integration with existing on-ground works programs.	CCC, NBC, HSC, HCC	DCCEEW, DPHI-Planning and Assessment, GS LLS, NPWS, KC, THSC,	High (30)	Within 1-4 years	Restoration works successfully implemented.
Strategy 5: Estuary & Waterway Health	S5.CMP.B	Entire HNRS	Estuary-Wide	Continue to support landcare networks across the river system	Landcare groups play a vital role in improving the health of waterways and foreshore environments through volunteer-driven activities. The activities range from litter collection and weed removal through to native planting and surveys of local wildlife. Support for these programs from the participating Partner Council's would in the form of: > Financial and logistical support for Floating Landcare Activities - including the allocation of agreed-upon funding pipelines > Technical support and identification of priority sites and activities > Promotion of Floating Landcare through Council communications channels > Utilising Council networks with existing businesses and chambers of commerce to actively promote Floating Landcare corporate volunteering events and donations	CCC, NBC, HSC, HCC	GS LLS, KC, THSC,	High (24)	Within 1-4 years	Support provided - and associated works undertaken and monitored.
Strategy 5: Estuary & Waterway Health	S5.CMP.C	Middle Estuary	Estuary-Wide	Fencing of riparian foreshores on high risk agricultural lands	Conduct a comprehensive audit of high-risk agricultural locations to identify areas where livestock access to estuaries is prevalent. Develop and implement a targeted program to undertake fencing installation and stabilisation in these critical riparian zones. It would include: > Identify High-Risk Areas: Conduct field surveys and use geographic information systems (GIS) to map high-risk agricultural areas where livestock frequently access riparian zones. > Evaluate Impact: Assess the extent of damage caused by livestock and prioritize sites based on the severity of impact and potential for recovery. > Engage Landowners: Work collaboratively with landowners and stakeholders to secure permissions and support for the fencing installations. > Install Fencing: Carry out the installation of fences in the identified high-risk areas, ensuring minimal disruption to the environment. Sydney Water can provide technical assistance as required.	GS LLS	CCC, HCC, THSC	High (24)	Within 1-4 years	Works undertaken. LLS monitoring of works indicates reduced livestock impacts on waterways at nominated locations.
Strategy 6: Coastal Hazard Resilience	S6.CMP.A	Broken Bay Pittwater	Broken Bay Pittwater	Activate the "Coastal Hazard Emergency Action Sub-Plans" (CZEAS) for each beach as required after storm events	Undertake planning, engagement and emergency works, if appropriate, to manage beach erosion before, during and after storm events in accordance with the Coastal Zone Emergency Action Subplans for the CMP.	CCC, NBC, HSC, NPWS	DCCEEW, NSW SES	High (30)	Within 1-4 years	Plans activated and implemented in a timely manner when needed.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 6: Coastal Hazard Resilience	S6.CMP.B	Entire HNRS	Estuary-Wide	Develop a Tide Alert Calendar Tool for the low lying communities of the river system to encourage citizen science in monitoring tidal inundation	There are numerous areas across the river system that are exposed to a high level of tidal inundation risk (sunny day flooding), with increasing vulnerability to this risk over time due to future sea level rise. As the tides can be predicted many years in advance, this action involves development of a "Tide Alert" Calendar, and a public engagement program. It specifically includes: A) The creation of a Tide Alert Calendar: This would be a simple and practical tool that clearly communicates dates of higher-than-normal high tides to indicate when low-lying land is particularly vulnerable to tidal inundation and coastal flooding. Red-alert tide calendars are highly visual and easily interpreted, and do not require technical expertise or interpretation of large amounts of data or text. B) Public awareness and citizen science: This initiative would focus on public engagement and awareness around the highest red-alert days each year, encouraging citizens to "snap the coast" at the designated time of the high tide and upload the photograph to Councils social media channels or a Council web repository. This kind of public engagement initiative allows both Council and the local community to utilize these red-alert tide days and visualize the impacts rising sea levels may have on their communities in the future.	CCC, NBC, HSC,	DCCEEW	Medium (12)	Within 4-8 years	Calendar developed, and communication system implemented - and considered to be of value by the Partner Councils and key impacted communities.
Strategy 7: Social and Recreational Amenity	S7.CMP.A	Entire HNRS	Estuary-Wide	Prepare and implement an Environmental Tourism Strategy for the Hawkesbury River System	Prepare and implement a regional environmental tourism strategy and plan for the Hawkesbury River System. The strategy should promote sustainable tourism experiences that showcase the region's rich cultural heritage, ecological values, and natural landscapes. This would include: > Stakeholder Engagement: Meetings, workshops with relevant state government agencies, and First nations Groups > Review of Existing Programs: Desktop review, site visits, analysis of current tourism and heritage activities > Market & Opportunity Assessment: Identification of new tourism opportunities, market demand, regional gaps > Strategy & Plan Development: Drafting the strategy, incorporating feedback, producing final deliverables	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	NPWS First Nations Groups	Low (5)	Opportunistic, within 8-10 Years	Strategy completed, and implementation commenced.
Strategy 8: Cultural Heritage Protection	S8.CMP.A	Entire HNRS	Estuary-Wide	Engage First Nations teams where appropriate to undertake bush regeneration works including weeding and revegetation	To enhance the involvement of First Nations peoples in the stewardship and management of the estuary system and its catchment by building strong, collaborative partnerships with First Nations Ranger Groups and Bush Regeneration Teams. This approach aims to integrate traditional knowledge and contemporary conservation practices for sustainable environmental management. This would include: > Identify key First Nations Ranger Groups and Bush Regeneration Teams that are active in the region. Initiate dialogues to understand their perspectives, goals, and areas of expertise. > Engage teams where appropriate to undertake bush regeneration works including weeding and revegetation > Provide training and capacity-building opportunities to First Nations Rangers and community members. This can include workshops on estuary management, ecological monitoring, and restoration techniques.	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	GS LLS, NPWS	High (24)	Within 1-4 years	Quantifiably increased role for FN Groups in coastal management across the LGA
Strategy 8: Cultural Heritage Protection	S8.CMP.B	Entire HNRS	Estuary-Wide	Further develop and implement community education programs for awareness and appreciation of Indigenous cultural heritage	Develop and implement a program of Indigenous cultural education activities along the HNRS. The objective is to increase community awareness and appreciation of the Indigenous cultural heritage values of the estuary and Indigenous management practices along the Hawkesbury River. This Action would be a specalised extension of the broader community and stakeholder education program (S4.CMP.01).	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	GS LLS, NPWS	High (24)	Within 1-4 years	Program and materials created, and program implemented.
Strategy 8: Cultural Heritage Protection	S8.CMP.C	Entire HNRS	Estuary-Wide	Support cultural education and awareness of estuary health issues for First Nations Groups	Provide funding and technical support for the development of a coordinated program of cultural education activities that are designed to enable local First Nations groups to further their understanding and awareness of key estuary health issues and associated management approaches. The objective of these activates are to increase First Nations participation in catchment and estuary management.	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	GS LLS, NPWS	High (24)	Within 1-4 years	Support provided and considered to be of tangible benefit to FN Groups

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 8: Cultural Heritage Protection	S8.CMP.D	Entire HNRS	Estuary-Wide	Develop a Hawkesbury heritage central display	Develop a mobile exhibition for the display of artefacts, models, and other items that educates the community and tourists about the maritime heritage of the river. The exhibition will be designed to travel between locations for public display. The mobile format will enable the exhibition to be hosted at a variety of venues — such as community centres, libraries, schools, and local events — increasing its accessibility and reach. It will allow for seasonal or themed displays, incorporate interactive elements, and be adaptable to different audiences. This approach will maximise opportunities for community engagement, foster pride in local heritage, and promote the river's historical significance to both residents and visitors	CCC, NBC, HSC, THSC, HCC	First Nations Groups, KC,	Low (5)	Opportunistic, within 8-10 Years	Display developed.
Strategy 8: Cultural Heritage Protection	S8.CMP.E	Entire HNRS	Estuary-Wide	Identify opportunities for, and undertake cultural land management practices, including cultural burning	The Partner Council's should engage with local First Nations groups to identify opportunities for, and undertake cultural practices (including cultural burning) across the river catchment. This would involve the Partner Councils working closely with local First Nations Groups to develop and implement appropriately. This action can link with existing technical resources regarding cultural land management practices currently used by NPWS, NWS RFS, and GS LLS - and liaising with these agencies to technical advice communications regarding activities.	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	NPWS, RFS, GS LLS,	Medium (10)	Within 4-8 years	Quantifiably increased role for FN Groups in coastal management across the LGA
Strategy 8: Cultural Heritage Protection	S8.CMP.F	Entire HNRS	Estuary-Wide	Engage with local First Nations Groups to protect and preserve cultural heritage items across the coastal zone	This action involves engaging with the relevant First Nations Groups to protect and preserve Aboriginal Cultural Heritage (ACH) items across the Hawkesbury River System. It is anticipated that there would be four main tasks for this action: > Consultation with the relevant First Nations Groups. > A literature review of existing ACH databases (such as AHIMS) and existing cultural heritage plans > An Aboriginal cultural heritage survey of the legally defined coastal zone, which should include field work, and recording of cultural heritage sites (such as middens sites) and detailed documentation of findings. > The development and prioritisation of local, site specific management plans for protection and preservation of sites exposed to coastal hazard risk.	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	NPWS	High (30)	Within 1-4 years	Local protection actions identified and implemented.
Strategy 8: Cultural Heritage Protection	S8.CMP.G	Entire HNRS	Estuary-Wide	Identify locations for cultural connections across the HNRS	Identify, map, and promote key locations across the HNRS that support cultural connections – including opportunities for gathering, knowledge sharing, and strengthening the interrelationship of ideas, people, and Country. This may include locations of cultural significance aligned with known songlines or other important cultural pathways. Key elements include: > Engage with Traditional Custodians to identify culturally significant places, especially those already mapped or emerging from projects such as the Wisemans Ferry cultural mapping initiative. > Focus on public land where opportunities exist for culturally respectful access and use – including Council-managed Crown Land subject to Plans of Management (PoMs). > Explore the use of these locations for cultural gathering places, yarning circles, interpretive signage, art installations, or ceremonial activities, where appropriate.	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	NPWS	High (24)	Within 1-4 years	Connection areas identified and implemented.

5.4 Local Implementation Plan: Hawkesbury City Council LGA

A summary of the actions within the Hawkesbury City Council Local Implementation Plan are provided in Table 5-4. Maps depicting relevant actions are provided in Appendix B.

Table 5-4 Action Table - Hawkesbury City Council Local Implementation Plan

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 3: Resilience, Planning, and Adaptation	S3.HCC.A	Freshwater Tidal Pool	LGA Wide	Write a specific WSUD chapter in Hawkesbury City Council DCP	Water Sensitive Urban Design (WSUD) is an approach to urban planning that integrates land and water planning and management into urban design. WSUD is based on the premise that urban development and redevelopment must address the sustainability of water. WSUD s one of the key management measures that can control pollutants, such as nutrients, sediments, pathogens and gross pollutants, being exported into the estuary from urban lands. It is recommended that Council specifies and applies pollution reduction targets within their Development Control Plan. Council should accompany this with a WSUD policy, which advocates WSUD as a means to help achieve proposed pollution reduction and improve the quality of inflows entering the Hawkesbury River and the broader Estuary (especially nitrogen, phosphorus and suspended sediments).	HCC	N/A	High (30)	Within 1-4 years	DCP updated.
Strategy 3: Resilience, Planning, and Adaptation	S3.HCC.B	Freshwater Tidal Pool	LGA Wide	Environmental Conservation zoning for coastal wetland areas	Analysis undertaken in the CMP has identified a number of locations around the Upper Estuary foreshore and waterways where land containing important coastal wetlands mapped under the NSW Hazards and Resilience State Environmental Planning Policy (RH SEPP) is currently not zoned as a "'conservation zones" in the Local Environment Plan. This action would therefore involve Council investigating land use planning options for improved coastal and environmental management – including potential rezoning of RHSEPP Mapped coast wetland areas from to a C2 (Environmental Conservation). The purpose of a LEP zoning amendment would be to protect and preserve its environmental values of these wetlands for future generations, and to help enhance the resilience of these wetlands to future sea level rise by allowing for upslope migration pathways.	HCC	DPHI-Planning and Assessment	Medium (12)	Within 4-8 years	LEP Zoning Amendment completed.
Strategy 4: Community & Stakeholder Engagement	S4.HCC.A	Freshwater Tidal Pool	LGA Wide	Establish an environmental program for Agricultural Operators across the Hawkesbury LGA	The Action would involve developing an environmental program for Agricultural Operators across the LGA through targeted extension, technical assistance and grants to improve on-farm management practices, and in doing so, reduce the impacts of horticulture on downstream estuary health. This would include providing education regarding: > The importance of native and healthy riparian vegetation in stabilising riverbanks and providing key fish habitat > On-site management drainage and water quality The program can utilise existing education materials from GS LLS and the DPIRD Fisheries "fish-friendly farms" initiative. The program can also provide technical assistance for operators by providing information regarding available State Government grants and other funding mechanisms to help implement adopt enhanced land management practices – with a focus on improving downstream estuary health outcomes.	HCC	WSU, GS LLS, Sydney Water	High (27)	Within 1-4 years	Program successfully implemented over CMP 10 year lifecycle.
Strategy 4: Community & Stakeholder Engagement	S5.HCC.A	Freshwater Tidal Pool	LGA Wide	Supporting private landowners to undertake best practice management of their riparian zones	Incentivizing private landowners to undertake best practice management of their riparian zones involves implementing strategies that encourage and support sustainable and environmentally friendly practices along waterways on private lands. This would include providing education regarding the importance of native and healthy riparian vegetation in stabilising riverbanks and providing key fish habitat. It would also provide assistance private land owners by providing information regarding available State Government grants and other funding mechanisms to help implement adopt enhanced land management practices such as: > revegetation of riverbanks > fencing of riverbanks for stock exclusion > weed control > erosion control and bank stability enhancement It could also provide access to Councils nursery to promote planting of native riparian vegetation.	HCC	GS LLS	Medium (21)	Within 4-8 years	Program successfully implemented over CMP 10 year lifecycle.
Strategy 5: Estuary & Waterway Health	S5.HCC.B	Freshwater Tidal Pool	LGA Wide	Continue Council's Yabby Trap Round-Up Program	Opera House yabby traps are illegal in NSW and no longer permitted to be used as they have been implicated in the drowning of air breathing fauna such as platypus, turtles, and water rats. This program involves using the CMP to fund the continued implementation of Councils Yabby Trap Round-Up program. The program allows community members to drop off their Opera House yabby traps at designed locations so that they can be recycled into useful products for fishers, with the proceeds funding habitat restoration.	HCC	N/A	Low (6)	Opportunistic, within 8-10 Years	Program successfully implemented over CMP 10 year lifecycle.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 6: Coastal Hazard Resilience	S6.HCC.A	Freshwater Tidal Pool	Cumberl and Reach	Coastal Protection Works at Holmes Drive Reserve	In Stage 2 of the CMP, the bank erosion at Holmes Drive Reserve was investigated - referred to as Site HCC27 in the Stage 2 Report (Alluvium, 2022b). Based on the outcomes of the MCA, the recommended stabilisation option for management is "Bank reprofiling, large wood installation and revegetation". As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. > Bank reprofiling to a slope of 1V:3H to aid in vegetation establishment and improve slope stability to reduce the risk of mass failure > Establishment of riparian vegetation along the reprofiled bank and overbank zone (≈ 5 m). This will increase the root network at the top of the bank providing a greater degree of reinforcement and decreasing the level of bank saturation by intercepting precipitation and by transpiration >Large wood installed at the toe of the bank will provide structural protection to dissipate the wave energy and protect the bank from wave action and fluvial scour. Each log will be secured by a timber pile at each end lashed together with stainless steel cable > Stormwater outflow upgrade to include scour protection (e.g. piped outlet with rock protection) > Fish habitat features such as concrete habitat reefs could also be incorporated below low tide level on the subtidal bench (Optional) >Formalised access such as aluminium stairs should be installed to provide safe public access to the beach area. References: > Figure B-6 provides the location and indicative extent of the proposed CPW. > Figure C-4 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	HCC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.HCC.B	Freshwater Tidal Pool	Sackville	Coastal Protection Works at Churchills Wharf Reserve	In Stage 2 of the CMP, the bank erosion at Churchills Wharf Reserve was investigated - referred to as Site HCC26 in the Stage 2 Report (Alluvium, 2022b). The site is approximately 25 m in length and is located on the left bank (looking downstream) of the Hawkesbury River at the beginning of the outside of a tight meander, encompassing the Churchills Wharf Reserve (Sackville Ferry). There has been significant bank retreat of up to 5 m between 2010 and April 2022, and without management intervention ongoing erosion and bank retreat will likely place the car park and amenities block at risk. Bank reprofiling and construction of a rock toe are recommended at this site. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. > Reprofiling of the steep upper bank to a more stable gradient - This will reduce the likelihood of further slumping or large-scale failures by creating a more geotechnically stable slope profile. > Revegetation of the upper bank - Native riparian vegetation will be planted to provide long-term surface stabilisation, improve habitat values, and reduce erosive forces from rainfall and runoff. > Construction of a rock toe - A robust rock toe will be installed at the base of the bank to provide structural support, protect against ongoing fluvial scour, and anchor the reprofiled slope. References: > Figure B-5 provides the location and indicative extent of the proposed CPW. > Figure C-10 provides a concept design cross-section. Note that key design parameters would be	HCC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.					
Strategy 6: Coastal Hazard Resilience	S6.HCC.C	Freshwater Tidal Pool	Ebenezer	Provide technical advice to utilities providers regarding infrastructure risk at Argyle Bailey Memorial Reserve	In Stage 2 of the CMP, the bank erosion at Argyle Bailey Memorial Reserve was investigated (referred to as Site HCC25b). The site is approximately 160 m in length and is located on the left bank on a meander of the Hawkesbury River adjacent to Argyle Bailey Reserve at Ebenezer. The erosion is currently placing at risk a number of utilities assets, including three power poles and associated transmission lines owned by Endeavour Energy. These assets are located on Council Managed Crown Land (Lot No: 556/-/DP704504). Analysis in Stages 2 and 3 of the CMP indicate that landward relocation of the assets represents the most cost effective solution. This Action involves Council formally advising Endeavour Energy of the current and projected erosion risk to their infrastructure located within the reserve. While Council does not own the assets, it has a duty to highlight the public safety risk associated with the ongoing erosion. It is expected that Endeavour Energy will consider this advice in determining appropriate asset relocation measures.	HCC	N/A	Medium (18)	Within 4-8 years	Advice provided.
Strategy 6: Coastal Hazard Resilience	S6.HCC.D	Freshwater Tidal Pool	Windsor	Coastal Protection Works Investigation and Design: The Terrace, Windsor	In Stage 2 of the CMP, the bank erosion at The Terrace (Windsor) was investigated (referred to as Site HCC24). The site is approximately 340 m in length and is located on the right bank of the Hawkesbury River immediately adjacent to The Terrace at Windsor. The 2022 flood events had a significant impact on the site. Across the extent of the site, there has been stripping of understory vegetation (primarily weeds) which has left the bank surface exposed. Major erosion has occurred at two locations resulting in significant damage to the public pedestrian path and loss of the upper bank gabion wall in both locations. The Stage 2 Study noted that more detailed investigations are required to determine the nature and extent of the required coastal protection works. Given the height and steepness of the bank, limited or no setback available at the top of the bank, and lack of intertidal bench the management options will likely largely be limited to a 'hard' engineering approach. For example, this may require the construction of a retaining wall structure at the toe of the bank to enable infill of the upper bank with some combination of rock and suitable compacted soil, followed by revegetation. However, significant geotechnical investigations and design will be required to determine the appropriate extent of works, slope stability, type of works, and construction methodology. Figure B-3 provides the location of the design investigation.	HCC	DCCEEW	High (27)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.HCC.E	Freshwater Tidal Pool	Windsor	Coastal Protection Works at Governor Phillip Park	The foreshore at Governor Phillip Park experienced a bank erosion and landslip event following flooding in 2022. This erosion has impacted the public walkway, and the erosion scarp is within a 10 m proximity to the Upper Hawkesbury Power Boat Club building. Reprofiling and revegetation of the bank are proposed at this site. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be "activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters". These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Flattening the slope of the landslip area to a more stable slope (1V:3H) > Planting of native riparian vegetation across the foreshore of Governor Phillip Park in order to increase erosion resilience - with an emphasis on low height vegetation in order to maintain safe sightlines to the river for recreational boating and water sports. > Realignment of the public walkway > Frequent monitoring of the foreshore References: > Figure B-3 provides the location and indicative extent of the proposed CPW. > Figure C-5 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	HCC	DCCEEW	Medium (14)	Within 4-8 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 7: Social and Recreational Amenity	S7.HCC.A	Freshwater Tidal Pool	Pitt Town	Punt Road Public Boat Ramp - Upgrade Feasibility Study	The boat ramp at Punt Road Pitt Town (and the access road leading to it) are in relatively poor condition and currently presents challenges for safe launching and retrieval, particularly due to shallow water depths. These constraints limit usability and pose safety risks. This Action involves investigation into the feasibility of upgrading the boat ramp and access road to improve safety and usability for both powered and non-powered vessels. The feasibility assessment will consider: > The dynamic nature of the foreshore > The need for all-tide or partial-tide access > The ramp gradient and depth requirements to avoid vehicles entering excessive distances into the river > Compliance with the TfNSW Boat Ramp Facility Guidelines Subject to the outcomes of the investigation, detailed design and resurfacing works may be undertaken. This action may be eligible for external funding under Transport for NSW boating infrastructure programs.	HCC	N/A	Medium (12)	Within 4-8 years	Study completed.

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5.5 Local Implementation Plan: The Hills Shire Council LGA

A summary of the actions within The Hills Shire Council Local Implementation Plan are provided in Table 5-5. Maps depicting relevant actions are provided in Appendix B.

Table 5-5 Action Table – The Hills Shire Council Local Implementation Plan

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 6: Coastal Hazard Resilience	S6.THC.A	Freshwater Tidal Pool	Lower Portland	Implement the outcomes of the Blundells Swamp Inundation Mitigation Study	River Road frequently experiences inundation at Blundells Swamp due to the combined effects of coastal and catchment flooding. This persistent issue poses challenges for infrastructure resilience, access, and safety. To address these concerns, a comprehensive investigation will be undertaken to assess potential options for reducing inundation risk. THSC has recently completed an options assessment to identify an optimised solution to mitigate inundation risk while preserving the sensitive environmental values of the lagoon. This Action therefore includes undertaking a detailed environmental assessment technical study. Blundells Swamp is mapped as a coastal wetland under the Resilience and Hazards State Environmental Planning Policy (RHSEPP) and serves as a locally significant wildlife refuge. The lagoon system provides important habitat for native flora and fauna, including species reliant on wetland ecosystems. Changes to hydrology, drainage, or land use would be thoroughly evaluated to prevent unintended ecological impacts. A robust environmental assessment is essential to safeguarding the long-term health of the wetland ecosystem while developing solutions that enhance the resilience of River Road.	THSC	DCCEEW	High (24)	Within 1-4 years	Study completed.
Strategy 6: Coastal Hazard Resilience	S6.THC.B	Upper Estuary	Wisemans Ferry	Coastal Protection Works at Wisemans Ferry	In Stage 2 of the CMP, the bank erosion at Wisemans Ferry was investigated (referred to as Site HSC45b in the Stage 2 Report (Alluvium, 2022b). The site is approximately 50 m in length and is located on the right bank on the inside of a tight meander. The erosion is within 18 m of public assets including a car park and recreational infrastructure (picnic benches). The Stage 2 Report recommended a seawall constructed of geotextile sand containers (GSCs). As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: It is anticipated that over time the natural replenishment observed at the downstream extent will continue upstream, however the following works should be implemented as an interim measure in order to reduce public safety risk: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. > Installation of sand-filled geobags at the upstream extent to approximately 0.5 m above high tide level - in accordance with the approved detailed design, including site preparation, placement of GSCs to specified alignment and levels, and completion of ancillary works such as reinstatement of adjoining foreshore areas and access paths. > Reprofiling of steeper upper bank (backfill to geobag toe to a gentle slope i.e. min 1V:3H) > Formalised access installation such as a rollout composite boardwalk > Establishment of riparian vegetation along the reprofiled bank and overbank zone (≈ 5 m). > Ongoing monitoring of the site References: > Figure B-9 provides the location and indicative extent of the proposed CPW. > Figure C-1 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	THSC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.THC.C	Upper Estuary	Wisemans Ferry	Coastal Protection Works at Webbs Creek Ferry Foreshore	Severe bank erosion is occurring over a 100 m stretch of foreshore immediately south of the Webbs Creek Ferry. Erosion is impacting an amenities block, which has now been closed and demolished in order to reduce public safety risk. The erosion is within 5 m of River Road in some locations. A bank remediation design should be developed and implemented that includes reprofiling, vegetation, and the installation of woody debris.	THSC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: The remediation design should incorporate sustainable and resilient solutions to stabilize the foreshore while considering environmental impacts, hydrodynamic conditions, and long-term maintenance requirements. The proposed works include: > Bank reprofiling to a slope of 1V:3H to aid in vegetation establishment and improve slope stability to reduce risk of mass failure > Establishment of riparian vegetation along the reprofiled bank and overbank zone (≈ 5 m) > Large wood installation to provide structural toe protection References: > Figure B-9 provides the location and indicative extent of the proposed CPW. > Figure C-4 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.					
Strategy 6: Coastal Hazard Resilience	S6.THC.D	Freshwater Tidal Pool	Leets Vale	Erosion investigation and design at River Road, Leets Vale	In Stage 2 of the CMP, the bank erosion at Leets Vale was investigated - referred to as Site HSC41 and HSC 42 in the Stage 2 Report (Alluvium, 2022b). The foreshore at these two sites comprise a mix of exposed bedrock, rock rubble and rock revetment at water level that are protecting road infrastructure. Some sections are new and engineered, others older and in need of maintenance. Sections of old rock revetment in variable condition that may require structural assessment and redesigns or infill/top up of existing material. There is insufficient information to develop and assess discrete options that account for the variability in conditions across the sites. It is recommended more detailed investigations are undertaken including geotechnical design/condition assessment, and survey including bathymetry to develop and assess appropriate management options at the site. While the erosion rate appears to be low, ongoing monitoring is recommended given the proximity to road infrastructure. Ultimately management options are likely going to be limited to hard engineering approaches such as rock revetment due to the limited set back and proximity to road assets. Figure B-8 provides the location and indicative extent of the proposed study area.	THSC	DCCEEW	Medium (21)	Within 4-8 years	Study completed.
Strategy 6: Coastal Hazard Resilience	S6.THC.E	Freshwater Tidal Pool	Lower Portland	Coastal Protection Works at River Road, Lower Portland	In Stage 2 of the CMP, the bank erosion at Lower Portland was investigated - referred to as Site HSC34 in the Stage 2 Report (Alluvium, 2022b). The site is approximately 20 m in length and is located on the right bank on an outside meander of the Hawkesbury River. River Road is between 5 – 10 m from the top of the bank, and the identified management approach for the site includes bank reprofiling, revegetation, and monitoring. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: Erosion remediation at this site would include: > Bank reprofiling to a slope of 1V:3H to aid in vegetation establishment and improve slope stability to reduce the risk of mass failure > Establishment of riparian vegetation along the reprofiled bank and overbank zone (≈ 5 m). This will increase the root network at the top of the bank providing a greater degree of reinforcement and decreasing the level of bank saturation by intercepting precipitation and by transpiration. > Ongoing monitoring and evaluation of the site should be undertaken every ~2 years. References: > Figure B-7 provides the location and indicative extent of the proposed CPW. > Figure C-5 provides a concept design cross-section. Note that key design parameters would	THSC	DCCEEW	Medium (10)	Within 4-8 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.					

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5.6 Local Implementation Plan: Hornsby Shire Council LGA

A summary of the actions within the Hornsby Shire Council Local Implementation Plan are provided in Table 5-5. Maps depicting relevant actions are provided in Appendix B.

Table 5-6 Action Table – The Hornsby Shire Council Local Implementation Plan

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 5: Estuary & Waterway Health	S5.HSC.A	Middle Estuary	Parsley Bay	Installation of Stormwater Quality Improvement Devices at Parsley Bay	The project involves the installation of a vortex-style gross pollutant trap and a biofilter to treat the runoff from a 10-hectare catchment area flowing into the bay. The biofilter, which is subject to design, could consist of a series of stepped salt marsh areas leading into Parsley Bay from the stormwater outlet. This innovative approach aims to remove up to 1.5 tonnes of pollution annually from entering Parsley Bay, significantly improving the water quality and overall health of the bay's ecosystem	HSC	DCCEEW	High (24)	Within 1-4 years	Works completed.
Strategy 5: Estuary & Waterway Health	S5.HSC.B	Middle Estuary	Brooklyn	Installation of Stormwater Quality Improvement Devices at The Gateway	The project involves the installation of a vortex-style gross pollutant trap on Dangar Road, situated between the Brooklyn Leisure Centre and the bay. This system will treat runoff from a 13-hectare catchment area. By implementing this solution, the project aims to remove 1.2 tonnes of pollution annually from entering the Brooklyn Wharf area, thereby enhancing the water quality and overall environmental health of the region.	HSC	DCCEEW	High (24)	Within 1-4 years	Works completed.
Strategy 5: Estuary & Waterway Health	S5.HSC.C	Middle Estuary	Brooklyn	Installation and upgrade of Stormwater Quality Improvement Devices at Brooklyn Park	The project involves the installation of an appropriate gross pollutant trap and the upgrading of the existing wetland at Brooklyn Park. This initiative aims to mitigate the impact of the urban catchment on the estuary at this location. By implementing these measures, the project is expected to remove 5 tonnes of gross pollution and nutrient pollution annually, thereby significantly improving the water quality and ecological health of the estuary.	HSC	DCCEEW	High (24)	Within 1-4 years	Works completed.
Strategy 6: Coastal Hazard Resilience	S6.HSC.A	Lower Estuary	Parsley Bay	Repair and Renewal of the Parsley Bay Breakwater (Coastal Protection Works)	Asset condition inspections by Hornsby Shire Council have indicated that the Parsley Bay rock-armoured breakwater structure is in a relatively poor structural condition. The breakwater provides an important function to the safe operability of the Parsley Bay boat ramp by providing protection from south-easterly waves. A repair and renewal project will be undertaken to maintain the function of the structure, extend the functional life, and adapt it for future sea level rise impacts. The objective of this repair would be to return the structure to a “make safe” condition, and extend the life of the structure by another 50+ years. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Scope of Works: Repair and renewal works would likely comprise the placement of additional rock armour units and repacking of units to increase interlocking and hydraulic stability. It would also include raising the crest level to mitigate future SLR impacts – however this would be subject to a detailed design process. Specific works for this project would therefore include: > Structure Survey and coastal engineering condition inspection: To survey the structure and identify the exact nature of the required repair and renewal works - including the required quantity of rock armour material. > Breakwater repair and renewal design: To prepare a specific repair design detailing the sizing and quantity of the required rock armour, and specifying the required grades and levels. > Repair and renewal works: Implementation of the repair design, including a safety in design assessment, construction of the works and development of As-Constructed certification from an suitably qualified engineer for Council records. The repair design should also include provision of safe waterway access ramp for non-powered craft (kayaks, sailing boats) at the south-eastern trunk of the breakwater. References: > Figure B-14 provides the location and indicative extent of the proposed CPW. > Figure C-10 provides a reference concept for the repair works. Note that key design parameters would be refined as part of detailed design investigations.	HSC	DCCEEW	Medium (12)	Within 4-8 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.					
Strategy 6: Coastal Hazard Resilience	S6.HSC.B	Lower Estuary	Parsley Bay	Repair and renewal of the Loading Dock Access Road Coastal Protection Works	This work will focus on reinforcing the seawall's structural stability to prevent erosion and maintain the integrity of the access road. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Scope of Works: > Structure Survey and coastal engineering condition inspection: To survey the structure and identify the nature of the required repair and renewal works > Repair and renewal design: To prepare a specific repair design detailing the sizing and quantity of the required armour, and specifying the required grades and levels. > Repair and renewal works: Implementation of the repair design, including a safety in design assessment, construction of the works and development of As-Constructed certification from a suitably qualified engineer for Council records. The works will comprise the repair of the structure of a make-safe / functional condition - through the placement of additional rock armour units on the structure in locations where it has experienced significant armour unit loss, core exposure, and loss of crest height and width. The objective would be to extend the life of the structure by another 50+ years. The renewal will ensure long-term protection against coastal hazards and improve the overall safety and resilience of the infrastructure. References: > Figure B-14 provides the location and indicative extent of the proposed CPW. > Figure C-10 provides a reference concept for the repair works. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	HSC	DCCEEW	Medium (16)	Within 4-8 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.HSC.C	Middle Estuary	Brooklyn	Brooklyn Road Sea Level Rise Adaptation Planning	Inspection of topographic road survey and future sea level rise projections has indicated that up to 200 m of Brooklyn Road will be impacted by sunny day tidal inundation under a +0.5 m sea level rise (SLR) scenario, with up to 1 km impacted under a +1.0 m SLR scenario. Therefore, road raising will be required in order to maintain safe all-tide vehicle access in the future. This Actions covers planning and design work for the eventual upgrade. It does not include delivery of the physical road upgrade or construction works. Works in the Action will include: >Topographic/detail survey: Collection of accurate elevation and alignment data to inform design layouts. > Geotechnical and pavement testing: Assessment of subgrade conditions and pavement strength to guide design of suitable raising treatments. > Hydraulic and climate resilience assessment: Analysis of SLR and drainage conditions to develop resilient road profiles. > Concept design and options report: Preparation of design scenarios, staging options, and costed concept layouts. The eventual implementation (which is not included in this CMP) may be initiated through one of two pathways: > Trigger Based: Implementation once sea levels reach a defined threshold (+0.5 m SLR). > Opportunistic: Integration with future road renewal programs or as funding opportunities arise.	HSC	DCCEEW	Low (7)	Opportunistic, within 8-10 Years	Design prepared.
Strategy 6: Coastal Hazard Resilience	S6.HSC.D	Middle Estuary	Brooklyn	Coastal Protection Works at Wharf Street	Foreshore improvement works at the end of Wharf Street will focus on renewal of the existing seawall (which is in poor structural condition) and providing safe recreational access to the waterway for passive recreation. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or	HSC	DCCEEW	Medium (18)	Within 4-8 years	Design prepared and works completed. Improved foreshore

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					works to reduce the impact of coastal hazards on land adjacent to tidal waters". These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. > Renewal of the existing seawall to provide long-term protection for Wharf Street and associated public infrastructure against coastal hazards. The renewal works will include replacement of the existing structure with a stepped sandstone blockwork seawall. > Incorporation of waterway access for non-powered vessels into the renewal design > Stormwater management at the end of Wharf Street to prevent overland flows damaging the structure from behind. References: > Figure B-13 provides the location and indicative extent of the proposed CPW. > Figure C-9 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.					resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.HSC.E	Middle Estuary	Bar Island	Repair and renewal of the Bar Island jetty Coastal Protection Works	This work will focus on reinforcing the seawall's structural stability to prevent erosion and maintain the integrity of the access jetty. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be "activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters". These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Scope of Works: > Structure Survey and coastal engineering condition inspection: To survey the structure and identify the nature of the required repair and renewal works > Repair and renewal design: To prepare a specific repair design detailing the sizing and quantity of the required armour, and specifying the required grades and levels. > Repair and renewal works: Implementation of the repair design, including a safety in design assessment, construction of the works and development of As-Constructed certification from a suitably qualified engineer for Council records. The works will comprise the repair of the structure of a make-safe / functional condition - through the placement of additional rock armour units on the structure in locations where it has experienced significant armour unit loss, core exposure, and loss of crest height and width. The objective would be to extend the life of the structure by another 50+ years. The renewal will ensure long-term protection against coastal hazards and improve the overall safety and resilience of the infrastructure. References: > Figure B-12 provides the location and indicative extent of the proposed CPW. > Figure C-10 provides a reference concept for the repair works. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	HSC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.HSC.F	Middle Estuary	Dangar Island	Bradleys Beach Coastal Protection Works	Foreshore Restoration Works at Bradelys Beach would address beach erosion issues and enhance the natural resilience of the foreshore to coastal hazards. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be "activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters". These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access.	HSC	DCCEEW	Medium (14)	Within 4-8 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					Scope of Works: Works would cover a 300 m long stretch of the beach and would involve: > Beach scraping works to increase the volume of sand on the upper beach profile. Sand would be scraped from the intertidal zone to an approximate depth of 0.2 metres to win a total volume of around 700m3 of sand. >Sand redistribution works on the upper beach profile as part of a small foredune building process > Planting appropriate native foredune species along the foredune to promote natural dune building and recovery > Construction of a small swale running behind the foreshore to prevent overland flow exacerbating the current erosion issues Works would be undertaken as part of an ongoing program of beach grooming and sand distribution, with works triggered based on observed erosion risk along the foreshore - estimated to be every 4 years on average. References: > Figure B-15 provides the location and indicative extent of the proposed CPW. > Figure C-8 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.					
Strategy 6: Coastal Hazard Resilience	S6.HSC.G	Middle Estuary	Dangar Island	Repair and renewal of Coastal Protection Works from Brooklyn to Parsley Bay	This work will focus on reinforcing the seawall's structural stability to prevent erosion and maintain the integrity of the coastal shared path. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Structure Survey and coastal engineering condition inspection: To survey the structure and identify the nature of the required repair and renewal works > Repair and renewal design: To prepare a specific repair design detailing the sizing and quantity of the required armour, and specifying the required grades and levels. > Repair and renewal works: Implementation of the repair design, including a safety in design assessment, construction of the works and development of As-Constructed certification from a suitably qualified engineer for Council records. The works will comprise the repair of the structure of a make-safe / functional condition - through the placement of additional rock armour units on the structure in locations where it has experienced significant armour unit loss, core exposure, and loss of crest height and width. The objective would be to extend the life of the structure by another 50+ years. The renewal will ensure long-term protection against coastal hazards and improve the overall safety and resilience of the infrastructure. References: > Figure B-14 provides the location and indicative extent of the proposed CPW. > Figure C-10 provides a reference concept for the repair works. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	HSC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 7: Social and Recreational Amenity	S7.HSC.A	Lower Estuary	Parsley Bay	Parsley Bay Loading Dock Upgrade	The Parsley Bay loading dock, which is currently in moderate to poor condition, is a vital infrastructure component for servicing the remote river settlements of the Lower Hawkesbury. This project involves undertaking comprehensive repairs and upgrades to ensure the dock's safety, functionality, and longevity, thereby supporting the communities that rely on it for transport and logistics.	HSC	N/A	High (27)	Within 1-4 years	Works completed.
Strategy 7: Social and Recreational Amenity	S7.HSC.B	Lower Estuary	Parsley Bay	Upgrade of public pontoons at Parsley Bay	The two public pontoons at Parsley Bay, situated on the eastern and western sides, require upgrades to enhance safety, accessibility, and durability. The planned improvements will address structural wear and ensure the pontoons can better	HSC	N/A	High (24)	Within 1-4 years	Works completed.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					accommodate community use, supporting boating activities and providing safer access for all users.					
Strategy 7: Social and Recreational Amenity	S7.HSC.C	Middle Estuary	Brooklyn	Upgrade of McKell Park Tidal Pool	The project will involve the repair and upgrade of the McKell Park Tidal Pool. The scope of work will be determined by a thorough condition assessment to identify necessary improvements. The upgrade plan will be developed based on available funding and resources, ensuring that the pool meets safety standards and enhances the overall user experience.	HSC	N/A	Low (7)	Opportunistic, within 8-10 Years	Works completed.
Strategy 7: Social and Recreational Amenity	S7.HSC.D	Middle Estuary	Brooklyn	Design and install boardwalk from Brooklyn Public Wharf to Lower McKell Park	The project involves the construction of a boardwalk/path from Brooklyn Public Wharf to Lower McKell Park. This initiative has been identified by the community and staff as the 'missing link' needed to complete the foreshore walk around to Parsley Bay from the Brooklyn Public Ferry Wharf. The boardwalk/path will provide a continuous and scenic route for pedestrians, enhancing the accessibility and enjoyment of the foreshore area. Some sections of the boardwalk/path will be accommodated on land, while others will need to be constructed over water to ensure a seamless connection. This project aims to improve the overall experience for residents and visitors, promoting outdoor activities and fostering a stronger connection with the natural environment	HSC	DCCEEW	Medium (12)	Within 4-8 years	Works completed.
Strategy 7: Social and Recreational Amenity	S7.HSC.E	Middle Estuary	Brooklyn	Bayden Powell Avenue Dinghy and Foreshore Access improvement	This action involves enhancing dinghy storage and improving foreshore access at the end of Bayden Powell Avenue to support safe and sustainable waterway use. The project will focus on providing designated and orderly dinghy storage to reduce clutter, minimize environmental impact, and improve accessibility for boat users. Additionally, improvements to foreshore access will ensure safer and more convenient launching and retrieval of small watercraft, benefiting both recreational and commercial users. Works may include installing secure storage racks, upgrading pathways, stabilising the shoreline to prevent erosion, and enhancing accessibility features. These upgrades will help protect the surrounding environment, improve user experience, and support responsible waterway management.	HSC	N/A	Medium (12)	Within 4-8 years	Works completed.
Strategy 7: Social and Recreational Amenity	S7.HSC.F	Middle Estuary	Brooklyn	Cost-Benefit Assessment of Kangaroo Point Pumpout Pontoon	Undertake a cost-benefit assessment of upgrading the Kangaroo Point Pumpout Pontoon and associated landside facilities, focusing on the long-term operational, environmental, and community benefits. > Evaluate current system performance, maintenance costs, and user demand. > Prepare a comparison table of sewage pump-out facilities across the Hawkesbury River, showing their location, access type, cost, and suitability for large vessels, > Assess potential improvements in functionality, durability, and environmental compliance. > Compare upgrade and operational costs against projected benefits, including reduced pollution, improved user experience, and alignment with waterway health objectives. > Use findings to inform the scope, design, and delivery of the upgrade project.	HSC	N/A	High (24)	Within 1-4 years	Study completed.
Strategy 7: Social and Recreational Amenity	S7.HSC.G	Lower Estuary	Dangar Island	Dangar Island Loading Dock Upgrade	The project will involve upgrading the Dangar Island loading dock. This upgrade will enhance the dock's structural integrity, safety, and accessibility, ensuring it can maintain a continued level of service for the community.	HSC	N/A	High (27)	Within 1-4 years	Works completed.
Strategy 7: Social and Recreational Amenity	S7.HSC.H	Upper Estuary	Wisemans Ferry	Upgrade of the Wisemans Ferry old public wharf	The public wharf at Wisemans Ferry will require upgrades to enhance safety, accessibility, and durability. The planned improvements will address structural wear and ensure the pontoons can better accommodate community use, supporting boating activities and providing safer access for all users.	HSC	N/A	Medium (12)	Within 4-8 years	Works completed.

5.7 Local Implementation Plan: Ku-ring-gai Council LGA

Due to the geographic position of the Ku-ring-gai Council Local LGA, the majority of waterway and foreshore environments within its boundaries are situated outside of the legally defined HNRS coastal zone. Accordingly, all actions for Ku-ring-gai Council are captured under the Catchment Companion – see Section 5.11. These actions primarily address land-based pressures that influence waterway health and estuarine condition, such as stormwater management, water quality improvement, and riparian corridor protection. While they may not involve direct on-ground works along the estuary foreshore, they form a critical contribution to the overall management of the HNRS by addressing upstream drivers of change. Ku-ring-gai Council will therefore play an important supporting role in catchment-scale initiatives, working alongside partner councils and State agencies to ensure that actions upstream are effectively coordinated and deliver tangible benefits downstream.

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5.8 Local Implementation Plan: Central Coast Council LGA

A summary of the actions within the Central Coast Council Local Implementation Plan are provided in Table 5-7. Maps depicting relevant actions are provided in Appendix B.

Table 5-7 Action Table – The Central Coast Council Local Implementation Plan

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 2: Monitoring, Evaluation, and Reporting	S2.CCC.A	Broken Bay	Broken Bay Beaches	Develop and implement a Broken Bay Coastal Monitoring Program	The coastal monitoring program would use progressive monitoring techniques to collect essential information about coastal processes and hazards to improve the management of our beaches. It would include beach surveys to monitor changes in sand volumes, risk exposure, dune condition and beach amenity. The data collected would allow annual Beach Health Reports to be developed and better inform future coastal hazard studies and investigations. Beach usage should be included in the monitoring to better understand current demand and locations requiring further investment in the future.	CCC	DCCEEW	High (30)	Within 1-4 years	Monitoring undertaken and recorded. Collected data is of tangible benefit from a risk and asset management perspective.
Strategy 2: Monitoring, Evaluation, and Reporting	S2.CCC.B	Broken Bay Brisbane Water	Broken Bay Brisbane Water	Develop and implement a program for regular and ongoing monitoring of public coastal assets and infrastructure	This action involves the development and implementation of a monitoring program designed to assess and track the condition of various coastal assets and infrastructure, including: > Coastal protection structures (revetments, seawalls, training walls) > Recreational assets including viewing platforms & coastal access tracks > Stormwater outlets. > Sewer and water infrastructure The program should be integrated into Councils broader asset management program - and should be consistent with the asset monitoring undertaken as part of the Open Coast Beaches CMP.	CCC	N/A	High (24)	Within 1-4 years	Monitoring undertaken and recorded. Collected data is of tangible benefit from a risk and asset management perspective.
Strategy 2: Monitoring, Evaluation, and Reporting	S2.CCC.C	Broken Bay Brisbane Water	Green Point Creek Ettalong Creek Pearl Beach Lagoon	Install permanent water level gauges at key locations within Brisbane Water and Broken Bay	There is currently no permanent water level gauge at a number of key locations within Brisbane Water and Broken Bay. This has resulted in an absence of recorded water level data that can assist in understanding localised impacts of coastal and catchment flooding on the numerous foreshore communities across the waterways and their catchment. This information will be particular important over future time frames as the impacts of Sea Level Rise become more severe. This action therefore involves the installation of a permanent water level gauges at the following locations: > Green Point Creek > Ettalong Creek > Pearl Beach Lagoon The exact positions of the gauges should be determined in consultation with the State Government, based on an assessment of strategic locations that can achieve the objectives outlined above, whilst maintaining a practical location for installation and maintenance. Furthermore, water level data can be transmitted and published through the MHL web page, and this will help to manage and mitigate estuarine flood risk by providing publicly available water levels in real time.	CCC	DCCEEW	Medium (10)	Within 4-8 years	Gauge implemented and maintained, and data considered to be of tangible benefit for coastal management by Council.
Strategy 3: Resilience, Planning, and Adaptation	S3.CCC.A	Brisbane Water	Brisbane Water	Environmental Conservation zoning for coastal wetland areas	Analysis undertaken in the CMP has identified a number of locations around the Brisbane Water foreshore and waterways where land containing important coastal wetlands mapped under the NSW Hazards and Resilience State Environmental Planning Policy (RH SEPP) is currently not zoned as a '"conservation zones" in the Local Environment Plan. This action would therefore involve Council investigating land use planning options for improved coastal and environmental management – including potential rezoning of RHSEPP Mapped coast wetland areas to a C2 (Environmental Conservation). The purpose of a LEP zoning amendment would be to protect and preserve the environmental values of these wetlands for future generations, and to help enhance the resilience of these wetlands to future sea level rise by allowing for upslope migration pathways. The scope of this undertaking should consider the findings of the Central Coast Council Wetland Refugia Study (WRL, 2023)	CCC	DPHI-Planning and Assessment	Medium (8)	Within 4-8 years	LEP Zoning Amendment completed.
Strategy 3: Resilience, Planning, and Adaptation	S3.CCC.B	Brisbane Water	Hardys Bay	Implement the Hardys Bay Foreshore Master Plan	Implement the Foreshore Master Plan (FMP) for Hardys Bay. The FMP would include the following elements: > Provision of recreational amenity and foreshore access > Drainage upgrades > Landscaping and green space design > Habitat restoration and vegetation plans	CCC	N/A	High (24)	Within 1-4 years	Masterplan designed and implemented. Improved recreational amenity, environmental values,

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					> Protection of Indigenous cultural heritage > Addressing siltation issues at the at the boat ramp, and the potential relocation of the Pretty Beach pool such that it will be suitable for swimming under all tidal conditions and is not subject to sediment build-up. Note that erosion control and shoreline stabilization measures for Hardy Bay and Pretty Beach foreshore areas are described by, and covered in CMP Actions S6.CCC.G, S6.CCC.I, and S6.CCC.J - and those actions will integrate with this Master Plan.					and foreshore resilience.
Strategy 3: Resilience, Planning, and Adaptation	S3.CCC.C	Brisbane Water	Phegans Bay	Implement the Phegans Bay Waterfront Foreshore Master Plan	Council was approached by the Phegans Bay community with concerns that the condition of the foreshore was deteriorating and that if not addressed infrastructure, including Phegans Bay Road, would be compromised. The site was subsequently assessed as a high priority for investigation and a commitment was made to work with the community to develop a masterplan outlining upgrades required to improve the amenity, access, safety and environmental integrity of the site. The FMP would include the following elements: > Provision of recreational amenity and foreshore access > Landscaping and green space design > Habitat restoration and vegetation plans > Protection of Indigenous cultural heritage Council is currently preparing the draft masterplan, and it will be place it on public exhibition for further feedback before finalising it for Council adoption. Note that erosion control and shoreline stabilization measures for Phegans Bay are described by, and covered in CMP Actions S6.CCC.E - and that action will integrate with this Master Plan.	CCC	N/A	High (24)	Within 1-4 years	Masterplan designed and implemented. Improved recreational amenity, environmental values, and foreshore resilience.
Strategy 3: Resilience, Planning, and Adaptation	S3.CCC.D	Brisbane Water	Brisbane Water	Undertake a Planning Proposal to update RH SEPP Coastal Wetlands Mapping for Brisbane Water	Undertake a planning proposal to update the Coastal Wetland Mapping for Brisbane Water in the NSW Resilience and Hazards State Environmental Planning Policy (RH SEPP). This update would be based on the mapping provided in the Brisbane Waters Coastal Wetland Mapping study (ELA, 2022). The Planning Proposal may be submitted in conjunction with the planning proposal for the CVA (see Action S3.CMP.01), and/or it may be submitted in conjunction with a proposal for updates to CMA mapping for areas within the Central Coast LGA subject to a CMP.	CCC	DPHI-Planning and Assessment	High (27)	Within 1-4 years	Planning Proposal completed and RH SEPP Mapping Updated
Strategy 3: Resilience, Planning, and Adaptation	S3.CCC.E	Brisbane Water	LGA Wide	Review and update Council's Development Control Plan	Review and update Councils DCP to maintain consistency with the goals and objectives of the CMP. This would include review and update of: > Chapter 2.12 Waterfront Structures > Chapter 2.17 Character and Scenic Quality > 3.1 Floodplain Management and Water Cycle Management > 3.2 Coastal Hazard Management > 3.3 On-Site Sewage Management > 3.4 Water Catchment Areas > 3.5 Tree and Vegetation Management > 3.6 Heritage Conservation > 3.7 Geotechnical Requirements	CCC	DPHI-Planning and Assessment	High (24)	Within 1-4 years	DCP updated.
Strategy 3: Resilience, Planning, and Adaptation	S3.CCC.F	Entire HNRS	LGA Wide	Compliance auditing of private development encroachment onto public land	Initiate a thorough compliance auditing process to address the issue of private development encroachment onto public land along the Brisbane Water, Lower Hawkesbury River and Broken Bay foreshores. This auditing will encompass a range of activities, including detailed desktop assessments utilizing aerial imagery to identify instances of encroachment. The aim is to ensure that all private developments adhere to established regulations and do not unlawfully extend onto public land. This process will involve cross-referencing current property boundaries with historical records and conducting on-site inspections where necessary. By undertaking this comprehensive audit, we aim to safeguard public spaces, protect natural resources, and uphold the integrity of our coastal environments for the benefit of the community.	CCC	N/A	Low (7)	Opportunistic, within 8-10 Years	Auditing undertaken over CMP 10 year lifecycle.
Strategy 3: Resilience, Planning, and Adaptation	S3.CCC.G	Entire HNRS	LGA Wide	Investigate opportunities to purchase saltmarsh areas for incorporation into Council's reserve system.	The purpose of this action is investigate opportunities for acquiring saltmarsh areas to integrate into Council's reserve system - thereby enhancing environmental protection, biodiversity conservation, and providing a future adaptation pathway for these wetland ecosystems to mitigate sea level rise impacts. This would be in alignment with Councils Wetland Management Policy, specifically > Policy 5.1 Council will investigate options for protecting or acquiring wetlands on private land. > Policy 5.2 Where possible Council will acquire wetlands in accordance with a priority	CCC	N/A	Low (6)	Opportunistic, within 8-10 Years	Study completed.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					program. Acquisition of wetlands would be in accordance with Council Policy A5.02 Land and Property Transactions.					
Strategy 5: Estuary & Waterway Health	S5.CCC.A	Brisbane Water	Brisbane Water	Water Quality Improvement Plan for Brisbane Water	The Water Quality Improvement Plan (WQIP) for Brisbane Water aims to enhance and protect the water quality of the Brisbane Water estuary and its catchment areas. The plan will outline the actions, responsibilities, and timelines for achieving sustainable water quality improvements. The WQIP will include: > Collation and review of existing water quality data, details on current point source loads to the estuaries, catchment land use data and existing environmental values/water quality objectives > Identify opportunities to collaborate with key stakeholders including the oyster industry and commercial & tourism operators > Catchment Audits: Undertake detailed audits of each sub-catchment across Brisbane Water > Water Quality Assessment and Modelling: Comparisons to be made between actual water quality across Brisbane Water and the identified waterway objectives by way of an effects-based assessment. Where modelling tools are available, these tools will be applied at this stage to enhance the rigour of the assessments. > Management Options: Development of a suite of potential management responses, and evaluate the options based on cost effectiveness and risk treatment. This includes investigation of the use of constructed wetlands, sediment, and detention basins and other WSUD options to minimise the effect of freshwater and sediment inflows, with particular reference to areas of high biodiversity value around entrances to creeks. Consideration should be given to both current and future meteorological conditions. > Action Plan: Define the roles and responsibilities, costs, and timeframes for implementation of the action plan.	CCC	DCCEEW	High (30)	Within 1-4 years	Study completed.
Strategy 5: Estuary & Waterway Health	S5.CCC.B	Brisbane Water	Woy Woy	Investigate the feasibility of Naturalisation of the Austin Butler Drainage Channel	Undertake a feasibility study into the naturalisation the Concrete Drain section of Austin Butler Drainage Channel. The naturalisation project would involve: > Replacing the concrete banks with native wetland vegetation - thereby increasing the number and diversity of native plants and vegetation > Expanding the salt marsh around the creek and creating intertidal rock pools within the channel where possible. The project would improve waterway health through the creation of a wetland to naturally treat and remove pollutants from the water before it enters Brisbane Water The feasibility study would consider: > Impacts of naturalisation on local flood levels. > Impacts of naturalisation on serviceability of drainage infrastructure > Costs/benefits of naturalisation The feasibility study should also investigate other options to improve water quality outcomes from the Austin Butler drain network. This could include installing, biofiltration/sediment/gross pollutant infrastructure where appropriate.	CCC	DCCEEW	Low (5)	Opportunistic, within 8-10 Years	Study completed.
Strategy 5: Estuary & Waterway Health	S5.CCC.C	Entire HNRS	Estuary-Wide	Implement a wetland monitoring, management and restoration program	This would include the development of an LGA wide wetland management strategy for Central Coast Council. This initiative aims to enhance ecosystem health, improve biodiversity, and bolster the resilience of the region's wetlands in the face of climate change and urbanisation. Upon completion of the strategy, this action would include implementation of wetland restoration works in priority locations across the CMP study area. These activities are considered 'Environmental protection works' (EPW) for mapped coastal wetlands and littoral rainforest in accordance with the R&H SEPP, and the Standard Instrument - Principal Local Environmental Plan (2006 EPI 155a). Note that the "works" component of this Action links would be implemented through Action S5.CMP.A. Figure B-1 provides an overview of the potential works areas as identified by the Partner Councils. Figures B-2 onwards provides more local, site specific mapping. These maps include overlays of R&H SEPP Coastal Wetlands and Littoral Rainforest layers, so that areas subject to EPWs are clearly identified. An important component of the wetland management strategy is monitoring. The monitoring program would utilise both physical on-ground monitoring techniques such as floristic surveys as well as remote sensing techniques looking at changes in the wetlands over time in response to climate change.	CCC	DCCEEW	High (27)	Within 1-4 years	Program designed. Restoration works successfully implemented. Monitoring undertaken and show improvement in riparian condition over time.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 5: Estuary & Waterway Health	S5.CCC.D	Brisbane Water	Davistown	Green and Golden Bell Frog Key Population Management Plan	The objective of this action is to protect and enhance the Green and Golden Bell Frog (GGBF) populations within the coastal management zones of the Hawkesbury CMP (Davistown), ensuring their long-term viability in the face of estuarine dynamics, human activities, and climate change impacts such as sea level rise. The plan will: > Assess current population health, habitat condition, and key threats. > Identify priority areas for habitat protection, restoration, and connectivity. > Develop adaptive management strategies to mitigate the impacts of estuarine change and sea level rise. > Provide recommendations for water quality management, habitat enhancement, and invasive species control. > Establish monitoring protocols to track population trends and habitat changes over time. > Engage with relevant stakeholders, including local councils, research institutions, environmental groups, and government agencies, to coordinate conservation efforts.	CCC	DCCEEW	High (24)	Within 1-4 years	Plan developed.
Strategy 6: Coastal Hazard Resilience	S6.CCC.A	Brisbane Water	Green Point	Coastal Protection Works at Bayside Drive Reserve	The Brisbane Water Foreshore Prioritisation Tool helps plan and prioritize restoration and stabilisation work along the foreshore. It is regularly updated as conditions and priorities change. In this location, the tool recommends stabilisation using low height native vegetation and ecofeatures to create a 'living foreshore' across key area of the Bayside Drive Reserve Foreshore. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. > This living shoreline would include a step-type rock bench structure that incorporates a bench of estuarine vegetation such as salt marsh or mangroves. This may be similar to what has been recently constructed at Davistown Rd, Yattalunga. References: > Figure B-23 provides the location and indicative extent of the proposed CPW. > Figure C-3 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	CCC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.CCC.B	Brisbane Water	Green Point	Coastal Protection Works at Edgewater Avenue Reserve	The Brisbane Water Foreshore Prioritisation Tool helps plan and prioritize restoration and stabilisation work along the foreshore. It is regularly updated as conditions and priorities change. In this location, the tool recommends stabilisation using geotextile sand containers (GSC). As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. > Construction of GSC protection works in accordance with the approved detailed design, including site preparation, placement of GSCs to specified alignment and levels, and completion of ancillary works such as reinstatement of adjoining foreshore areas and access paths. References: > Figure B-23 provides the location and indicative extent of the proposed CPW. > Figure C-1 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway:	CCC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.					
Strategy 6: Coastal Hazard Resilience	S6.CCC.C	Brisbane Water	Davistown	Coastal Protection Works at Illoura Reserve	The Brisbane Water Foreshore Prioritisation Tool helps plan and prioritize restoration and stabilisation work along the foreshore. It is regularly updated as conditions and priorities change. In this location (from Lintern Street to Pyang Avenue), the tool recommends stabilisation using a geotextile sand container structure. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. > Construction of GSC protection works in accordance with the approved detailed design, including site preparation, placement of GSCs to specified alignment and levels, and completion of ancillary works such as reinstatement of adjoining foreshore areas and access paths. References: > Figure B-21 provides the location and indicative extent of the proposed CPW. > Figure C-1 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	CCC	DCCEEW	Medium (12)	Within 4-8 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.CCC.D	Brisbane Water	Koolewong	Coastal Protection Works at Lara Street	The Brisbane Water Foreshore Prioritisation Tool helps plan and prioritize restoration and stabilisation work along the foreshore. It is regularly updated as conditions and priorities change. In this location, the tool recommends stabilisation through repair and renewal of the existing rock armoured seawall and inclusion of "living shoreline" elements which could include inter-tidal/sub-tidal oyster reefs and planting of mangroves where appropriate. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering repair design report and detailed design by suitably qualified engineers – specifying key design parameters. > The works will comprise the repair of the structure of a make-safe / functional condition - through the placement of additional rock armour units on the structure in locations where it has experienced significant armour unit loss, core exposure, and loss of crest height and width. The objective would be to extend the life of the structure by another 50+ years. The renewal will ensure long-term protection against coastal hazards and improve the overall safety and resilience of the infrastructure. References: > Figure B-22 provides the location and indicative extent of the proposed CPW. > Figure C-10 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	CCC	DCCEEW	Medium (16)	Within 4-8 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal	S6.CCC.E	Broken Bay	Phegans Bay	Coastal Protection Works at Phegans Bay Road	The Brisbane Water Foreshore Prioritisation Tool helps plan and prioritize restoration and stabilisation work along the foreshore. It is regularly updated as conditions and priorities change. In this location, the tool recommends the implementation of a "living shoreline" across	CCC	DCCEEW, DPHI-Crown Lands,	Medium (12)	Within 4-8 years	Design prepared and works completed. Improved foreshore

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Hazard Resilience					the 380 m stretch of foreshore located west of the Phegans Bay Road. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. > This living shoreline would include a step-type rock bench structure that incorporates a bench of estuarine vegetation such as salt marsh or mangroves. This may be similar to what has been constructed at Davistown Rd, Yattalunga. References: > Figure B-22 provides the location and indicative extent of the proposed CPW. > Figure C-3 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation. This area is covered by the Phegans Bay Foreshore Masterplan and the objectives of that plan should also be considered in the restoration if this foreshore (see Action S3.CC.C).					resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.CCC.F	Brisbane Water	Booker Bay	Coastal Protection Works at Rip Road Reserve	Rip Road Reserve was identified as a high priority site for foreshore stabilisation due to significant active erosion and the presence of important Aboriginal cultural heritage items. Detailed site investigations and designs of the foreshore stabilisation works have been prepared (RHDHV, 2020) for composite seawall structure. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Construction of the approved design, as per RHDHV (2020). The design includes two components: A sandstone block seawall to protect the Aboriginal shell midden, and a sloped revetment to protect the foreshore of the reserve further to the west. References: > Figure B-21 provides the location and indicative extent of the proposed CPW. > Figure C-13 provides a concept design cross-section from RHDHV (2020). Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	CCC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.CCC.G	Brisbane Water	Hardys Bay	Coastal Protection Works at the Hardys Bay extension wharf	Erosion along the foreshore near the Hardys Bay extension wharf (at 25-19 Hardys Bay Pde) is putting key infrastructure at risk, including Hardys Bay Parade, which in some areas is less than one metre from the eroded scarp. The Brisbane Water Foreshore Prioritisation Tool helps plan and prioritize restoration and stabilisation work along the foreshore. It is regularly updated as conditions and priorities change. In this location, the tool recommends stabilisation through repair and renewal of the existing rip rap seawall - focussing on the stretch approximately 50 metres on either side of the wharf. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering repair design report and detailed design by suitably qualified	CCC	DCCEEW	Medium (21)	Within 4-8 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					engineers – specifying key design parameters. > Repairs work will comprise the placement of additional rock armour units, and the repacking of existing rock armour units to improve interlocking and stability, and to stabilise existing areas of core/backfill exposure. References: > Figure B-19 provides the location and indicative extent of the proposed CPW. > Figure C-11 provides a repair concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation. This area is covered by the Hardys Bay Foreshore Masterplan and the objectives of that plan should also be considered in the restoration if this foreshore (see Action S3.CC.B).					
Strategy 6: Coastal Hazard Resilience	S6.CCC.H	Brisbane Water	Hardys Bay	Investigate the potential inclusion of RSL Creek and Mudflat Creek in the Central Coast Council Priority Creek Program	As part of the Central Coast Council's Priority Creek Program, high-priority creeks across the LGA are actively managed to help maintain adopted flood planning levels and reduce the risk of flooding to nearby developments. This work includes creek stabilisation, repair projects, and the ongoing management of sediment, debris, and vegetation build-up. This action proposes an initial investigation to assess whether RSL Creek and Mudflat Creek should be added to the program. The investigation would consider flood risk, environmental health, maintenance needs, and alignment with program objectives. Recommendations would inform future decisions regarding the inclusion of these creeks in the program.	CCC	N/A	Medium (14)	Within 4-8 years	Study completed.
Strategy 6: Coastal Hazard Resilience	S6.CCC.I	Brisbane Water	Hardys Bay	Coastal Protection Works at Araluen Drive Reserve	The Brisbane Water Foreshore Prioritisation Tool helps plan and prioritize restoration and stabilisation work along the foreshore. It is regularly updated as conditions and priorities change. In this location, the tool recommends the implementation of a "living shoreline" across the 360 m stretch of foreshore located west of the Hardys Bay public wharf. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be "activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters". These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. > This living shoreline would include a step-type rock bench structure that incorporates a bench of estuarine vegetation such as salt marsh or mangroves. This may be similar to what has been constructed at Davistown Rd, Yattalunga. References: > Figure B-19 provides the location and indicative extent of the proposed CPW. > Figure C-3 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation. This area is covered by the Hardys Bay Foreshore Masterplan and the objectives of that plan should also be considered in the restoration if this foreshore (see Action S3.CC.02).	CCC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.CCC.J	Brisbane Water	Pretty Beach	Coastal Protection Works at Pretty Beach Road	The Brisbane Water Foreshore Prioritisation Tool helps plan and prioritize restoration and stabilisation work along the foreshore. It is regularly updated as conditions and priorities change. In this location, the tool recommends stabilisation through the implementation of a "living shoreline" across the 620-metre stretch of foreshore along Pretty Beach Road. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be "activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters". These coastal protection works form part of a strategic program to enhance the	CCC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. > This living shoreline would include a step-type rock bench structure that incorporates a bench of estuarine vegetation such as salt marsh or mangroves. This may be similar to what has been constructed at Davistown Rd, Yattalunga. References: > Figure B-19 provides the location and indicative extent of the proposed CPW. > Figure C-3 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation. This area is covered by the Hardys Bay Foreshore Masterplan (S3.CCC.B) and the objectives of that plan should also be considered in the restoration if this foreshore - along with flood mitigation (inundation and overland flooding), which is key considerations in the design process.					
Strategy 6: Coastal Hazard Resilience	S6.CCC.K	Brisbane Water	Wagstaffe	Coastal Protection Works at Wagstaffe Wharf	The Brisbane Water Foreshore Prioritisation Tool helps plan and prioritize restoration and stabilisation work along the foreshore. It is regularly updated as conditions and priorities change. In this location (at the end of Mulhall Street), the tool recommends stabilisation works to protect the wastewater pump station south of the wharf - using a geotextile sand container structure. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. > Construction of GSC protection works in accordance with the approved detailed design, including site preparation, placement of GSCs to specified alignment and levels, and completion of ancillary works such as reinstatement of adjoining foreshore areas and access paths. References: > Figure B-19 provides the location and indicative extent of the proposed CPW. > Figure C-1 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	CCC	DCCEEW	Medium (14)	Within 4-8 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.CCC.L	Brisbane Water	Ettalong	Repair and renewal of the Lance Webb Reserve Coastal Protection Works	Asset condition inspections by Central Coast Council have indicated that the Lance Webb Reserve Seawall is in a relatively poor structural condition. A repair and renewal project will be undertaken to maintain the function of the structure, extend the functional life, and adapt it for future sea level rise impacts. The objective of this repair would be to return the structure to a “make safe” condition, and extend the life of the structure by another 50+ years. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works:	CCC	DCCEEW	High (27)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					> Structure Survey and coastal engineering condition inspection: To survey the structure and identify the nature of the required repair and renewal works > Repair and renewal design: To prepare a specific repair design detailing the sizing and quantity of the required armour, and specifying the required grades and levels. > Repair and renewal works: Implementation of the repair design, including a safety in design assessment, construction of the works and development of As-Constructed certification from a suitably qualified engineer for Council records. The works will comprise the repair of the structure of a make-safe / functional condition - through the placement of additional rock armour units on the structure in locations where it has experienced significant armour unit loss, core exposure, and loss of crest height and width. The objective would be to extend the life of the structure by another 50+ years. The renewal will ensure long-term protection against coastal hazards and improve the overall safety and resilience of the infrastructure. References: > Figure B-19 provides the location and indicative extent of the proposed CPW. > Figure C-11 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.					
Strategy 6: Coastal Hazard Resilience	S6.CCC.M	Broken Bay	Ettalong	Ettalong Beach Foreshore Stabilisation Investigation	Ettalong Beach has experienced chronic erosion since the 1940s, with ongoing shoreline recession affecting both recreational use and coastal infrastructure. The foreshore is currently protected by the Lance Webb Reserve seawall, which is in poor structural condition (see Action S6.CCC.10), and is periodically nourished through the entrance dredging program. However, the highly dynamic coastal processes at Ettalong Beach have resulted in rapid loss of nourished sand, often leaving the beach in an eroded state. This not only reduces recreational amenity for locals and visitors but also increases the risk of undermining the seawall foundations. This study will investigate long-term stabilisation strategies to maintain a sandy beach state at Ettalong Beach, including: >Assessment of Local Coastal Processes – Development of a morphological conceptual model. > Numerical Modelling of Existing Conditions – Establishing a base case scenario. > Modelling of Potential Stabilisation Options – Testing nourishment volumes and potential groyne field configurations to improve sand retention (including consideration of the existing groynes along Ettalong Beach). > Identification of potential adverse impacts on coastal processes and ecology > Recommendations for Long-Term Foreshore Management – Providing strategic guidance for inclusion in future CMP revisions.	CCC	DCCEEW, DPHI-Crown Lands,	Medium (12)	Within 4-8 years	Study completed.
Strategy 6: Coastal Hazard Resilience	S6.CCC.N	Broken Bay	Umina Beach	Prepare and Implement a Broken Bay Beach Nourishment Framework	Coastal erosion poses a persistent risk to infrastructure, public access, and recreational amenity across the beaches of Broken Bay. While natural sand movement plays a significant role in shaping these beaches, targeted sand nourishment can be a valuable management tool to help maintain beach volume and reduce erosion risk - and is considered to be the preferred form of Coastal Protection Works along Ocean-Umina Beach. At the same time, the NSW Government periodically undertakes dredging works in the Ettalong Channel - generating sand that can be beneficially reused for beach nourishment. However, in the absence of a clear local framework, decisions about where to place dredged sand are often made without full consideration of local erosion risks, beach conditions, or community priorities. This action aims to develop a Beach Nourishment Framework that enables Council to proactively plan, prioritise, and coordinate sand placement across Pearl, Ocean, Umina, and Ettalong Beaches. It would guide local decision-making, support more effective collaboration with State Government agencies, and help maximise the community and environmental benefits of available sand resources.	CCC	DCCEEW, TfNSW	High (24)	Within 1-4 years	Framework prepared.
Strategy 6: Coastal Hazard Resilience	S6.CCC.O	Broken Bay	Umina Beach	Implement the Umina-Ocean Beach Erosion	The Umina-Ocean Beach Erosion Management Strategy (RHDHV, 2019) provides a detailed framework for managing coastal erosion at Umina-Ocean Beach over the long term. This strategy was developed based on extensive technical studies of the complex coastal dynamics of Broken Bay and involved collaboration with State Government Agencies.	CCC	DCCEEW	Medium (10)	As determined by Trigger thresholds	Design prepared and works completed in a timely manner if trigger(s) reached.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
				Management Strategy	The preferred approach to managing coastal erosion risk at Umina-Ocean Beach is through beach nourishment – as developed through the Broken Bay Beach Nourishment Framework (see Action S6.CCC.N). However, Erosion Management Strategy also includes provision for the future construction of a terminal protection structure (TPS) - if coastal erosion reaches a trigger point where it significantly threatens critical infrastructure along the Esplanade. The strategy outlines a concept design for coastal protection, which features: > A rock-armoured revetment stretching from Kourung Street Boat Ramp to Ocean Beach SLSC and > A stepped concrete seawall in front of the Ocean Beach SLSC (RHDHV, 2019). As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be "activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters". These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Development of a trigger for installation of coastal protection works. This should be based on the proximity of observed (or predicted) coastal erosion to key assets and infrastructure – to a point where erosion is believed to place key assets and infrastructure at risk. It is Council's strong preference to maintain a natural dune profile in front of Ocean Beach SLSC for as long as this remains feasible. Council would endeavour to maintain and enhance the existing dune buffer by a combination of vegetation planting and maintenance, beach scraping to enhance beach recovery following storm erosion, and opportunistic beach nourishment campaigns using sand sourced from entrance maintenance dredging. As such, the installation of a TPS in the form of a stepped concrete seawall would only be considered as a last resort option if progressive erosion results in the complete loss of the foredune (RHDHV, 2020). The trigger to undertake the CPWs should also include any major upgrades of The Esplanade and associated foreshore amenities. > Preparation of a detailed engineering design report and detailed design by suitably qualified engineers – specifying key design parameters. Additionally, there will be community engagement to ensure public input and feedback are incorporated into the final design, promoting transparency and local support for the project. > Implementation of the Coastal Monitoring Program (see Action S2.CCC.A) – to determine when triggers for implementation may be reached. This action therefore includes the ongoing implementation of this strategy, which includes developing detailed designs for the coastal protection works – so that the works can be implemented if/when erosion triggers are reached at some point in the future. References: > Figure B-18 provides the location and indicative extent of the proposed CPW. > Figure C-14 and 15 provides a concept design cross-sections for the rock armoured revetment and the stepped concrete seawall respectively. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.					
Strategy 6: Coastal Hazard Resilience	S6.CCC.P	Broken Bay	Umina Beach	Monitoring and improvement of coastal stormwater outlets	The inspection of all coastal stormwater outlets to identify those at risk from coastal hazards and opportunities where upgrades can be implemented or retrofitted in order to protect assets, reduce erosion from stormwater scour and/or improve public safety. These locations would also be regularly monitored to assess performance and improvements.	CCC	N/A	Medium (14)	Within 4-8 years	Program for inspection of stormwater outlets developed, inspections undertaken and concept designs developed Improved public safety, water quality and amenity Reduced erosion at stormwater outlets

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
										and reduced impact on surrounding assets
Strategy 6: Coastal Hazard Resilience	S6.CCC.Q	Broken Bay	Pearl Beach	Coastal Protection Works at Pearl Beach	This action involves beach nourishment and the restoration and revegetation of 200 m of foreshore along Pearl Beach - from Emerald Ave to Tourmaline Ave. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be "activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters". These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Foreshore survey (if/where required) > Preparation of an engineering design report and detailed nourishment design by suitably qualified engineers – specifying key design parameters. > An ongoing program of beach scraping / beach nourishment to surcharge the upper beach profile and the foredune with additional sand > Revegetation and restoration works to extend the vegetated foredune areas landwards by around 10 m. These works would be intended to increase the natural resilience of the foreshore to coastal erosion and inundation. References: > Figure B-17 provides the location and indicative extent of the proposed CPW. > Figure C-8 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	CCC	DCCEEW, DPHI-Crown Lands,	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.CCC.R	Broken Bay	Patonga	Repair and renewal of Patonga Coastal Protection Works	Undertake the repair and renewal of the Patonga Seawall at the Boat Ramp Reserve - to ensure it effectively protects the coastline, surrounding infrastructure, and community from coastal erosion, storm surges, and rising sea levels. This initiative will address current structural deficiencies and future-proof the seawall to meet the challenges of a changing climate. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be "activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters". These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Structure Survey and coastal engineering condition inspection: To survey the structure and identify the nature of the required repair and renewal works > Repair and renewal design: To prepare a specific repair design - including the required armour materials, grades and levels. > Repair and renewal works: Implementation of the repair design, including a safety in design assessment, construction of the works and development of As-Constructed certification from a suitably qualified engineer for Council records. The works will likely comprise the installation of a filter layer and repacking of re-placement of sandstone block units. The renewal will ensure long-term protection against coastal hazards and improve the overall safety and resilience of the infrastructure. References: > Figure B-16 provides the location and indicative extent of the proposed CPW. > Figure C-9 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	CCC	DCCEEW	High (30)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal	S6.CCC.S	Broken Bay	Patonga	Patonga Sand Management Plan	Investigate and design a sand management plan for Patonga Beach and Patonga Creek. The action would contain the following key elements: > A detailed investigation of the local sediment transport processes. A key outcome of this	CCC	DCCEEW	Medium (12)	Within 4-8 years	Study completed.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Hazard Resilience					model would be an enhanced understanding of the local sediment dynamics - including a quantified sediment budget that includes sediment exchange between the creek and beach. This would include investigation erosive process currently occurring in the creek such as along Larkins Flat. > Development of a sand redistribution program to improve the coastal hazard resilience of key foreshore assets and infrastructure. This would involve an ongoing program of the redistribution of sand sourced from western beach and creek entrance shoals to be placed in front of Patonga Drive to provide a buffer against storm erosion. > This should also investigate opportunities for periodic maintenance dredging of sand from the creek entrance providing a viable source of sand.					
Strategy 6: Coastal Hazard Resilience	S6.CCC.T	Broken Bay	Patonga	Repair and renewal of the Patonga Creek Coastal Protection Works	The Patonga Creek foreshore protection works, which are constructed of stepped sandstone blocks, is in need of repair. It is recommended that a repair and renewal project is undertaken to maintain the function of the structure, extend the functional life, and adapt it for future sea level rise impacts. Repair and renewal works would likely comprise the re-packing of displaced or unstable sandstone block units, and the placement of additional sandstone block units to increase interlocking and hydraulic stability. It may also include incorporation of improved access arrangements for small watercraft – however this would be subject to a design process. Scope of Works: > Structure Survey and coastal engineering condition inspection: To survey the structure and identify the nature of the required repair and renewal works > Repair and renewal design: To prepare a specific repair design - including the required armour materials, grades and levels. > Repair and renewal works: Implementation of the repair design, including a safety in design assessment, construction of the works and development of As-Constructed certification from a suitably qualified engineer for Council records. The works will likely comprise the installation of a filter layer and repacking of re-placement of sandstone block units. The renewal will ensure long-term protection against coastal hazards and improve the overall safety and resilience of the infrastructure. References: > Figure B-16 provides the location and indicative extent of the proposed CPW. > Figure C-9 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	CCC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.CCC.U	Broken Bay	Patonga	Patonga Levee Feasibility Investigation and Design	Sea Level Rise (SLR) inundation mapping indicates that under a +0.5 m SLR scenario, some areas of Patonga will be exposed to sunny day king tide inundation. Under a future +1.0 m SLR scenario the potentially impacted areas increases significantly. Subsequently, Council should undertake a feasibility investigation of implementing a vegetated earthen levee along the western foreshore of Patonga, adjacent to Patonga Creek. The levee would be located on public reserve and would extend from approximately from Meroo Avenue to Jacaranda Avenue. The feasibility study would include: > Problem Definition and Objectives > Site Assessment (survey geotechnical assessment, hydrology, land ownership, and utilities) > Concept Design Options and Associated Cost Estimates > Environmental and Planning Constraints > Social and Community Considerations > Recommendations	CCC	DCCEEW	Medium (9)	Within 4-8 years	Study completed.
Strategy 6: Coastal Hazard Resilience	S6.CCC.V	Broken Bay	Broken Bay Beaches	Review and implement updated Beach Maintenance Program	Council's Beach Maintenance Program would be reviewed and implemented to improve public beach access, amenity and safety. The action would include prioritisation and upgrades to beach accessways in line with the Recreational Use Study and Council's Disability Inclusion Action Plan. The program would outline the management of post-storm beach access and safety, where small scale works such as beach scraping for amenity purposes may be undertaken and beach and dune fencing. It will also include an audit on beach maintenance operations to maximise inhouse efficiencies to ensure that the necessary plant and equipment is available to effectively implement the program.	CCC	DCCEEW	High (30)	Within 1-4 years	Beach Maintenance Program reviewed, updated and implemented in conjunction with Council's beach maintenance crews. Improved beach access, safety and

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
										amenity, improved dune environment
Strategy 6: Coastal Hazard Resilience	S6.CCC.W	Broken Bay	Broken Bay Beaches	Develop and implement a coastal vegetation and dune management strategy	This action would involve surveying coastal and dune vegetation to inform the development of a Coastal Vegetation Strategy aimed at supporting and enhancing coastal resilience, ecosystem integrity, beach amenity and conservation outcomes. The strategy will guide the on-ground management to achieve these outcomes and involve elements such as the management of priority weed species, dune stabilisation and planting, tree restoration and succession planting, education opportunities for the public and community groups and remediation actions required in instances of illegal clearing.	CCC	DCCEEW	High (27)	Within 1-4 years	Strategy developed, published and implemented
Strategy 6: Coastal Hazard Resilience	S6.CCC.X	Broken Bay	Broken Bay	Implement recommendations from Gosford Lagoons & Creek Entrance Management Review (Salients 2017) for Green Point Creek, Pearl Beach Lagoon and Ettalong Creek.	This action would include updating the Opening of Coastal Lagoons policy to include recommendations of the Gosford Lagoon and Creek Entrance Management Review (Salients 2017). These recommendations relate to Green Point Creek, Pearl Beach Lagoon and Ettalong Creek, and include the identification of triggers for entrance management intervention to mitigate flood impacts in low lying areas.	CCC	DCCEEW	High (27)	Within 1-4 years	Works implemented.
Strategy 7: Social and Recreational Amenity	S7.CCC.A	Broken Bay	Gosford	Support the Gosford Foreshore Masterplan	This action would seek to identify and support components of the Gosford Foreshore Masterplan that relate to estuary management. The intention of this action would be to embed the consideration of water quality outcomes and improvement to estuarine habitat as part of any future detailed design processes. This would also include embedding coastal hazard resilience into the development design (especially coastal inundation).	CCC	DCCEEW, Hunter Central Coast Development Corporation (HCCDC)	Medium (8)	Within 4-8 years	Masterplan design appropriately embeds water quality outcomes in design.
Strategy 7: Social and Recreational Amenity	S7.CCC.B	Broken Bay	Ocean Beach	Construction of an all-abilities beach access point at Ocean Beach SLSC	The project involves the construction of a dedicated all-abilities beach access point at Ocean Beach Surf Life Saving Club (SLSC). This initiative aims to enhance beach accessibility, ensuring that all members of the community, regardless of their physical abilities, can enjoy the beach and its amenities. This action is consistent with Council's Disability Inclusion Action Plan (Central Coast Council 2021) which has four focus areas, one of which is "2: Making the Central Coast more accessible, inclusive and liveable", and one of the objectives is "We will make it easier to access the places we love on the Central Coast – the beaches, waterways and bushland". It is also consistent with the Central Coast Recreational Use Study Stage 1: Open Coast and Coastal Lagoons - Improving and increasing disabled access with states that "Council should work with SLS clubs to ensure that they all have either beach access wheelchairs or beach mats".	CCC	N/A	Medium (9)	Within 4-8 years	Increased accessibility at Ocean Beach.
Strategy 7: Social and Recreational Amenity	S7.CCC.C	Broken Bay	Patonga	Develop and implement a foreshore masterplan for Patonga Creek	This master planning process would provide an holistic vision for the Patonga Creek foreshore. Key elements of the plan would include: > Parking and amenities > Safe and equitable foreshore access > Riparian vegetation management > Dingy/water craft storage > Road drainage and management of overland flow The master plan will be developed through stakeholder engagement, site analysis, and alignment with relevant coastal management policies. The outcome will be a clear, actionable strategy to ensure the long-term sustainability and enjoyment of the Patonga Creek foreshore.	CCC	N/A	Medium (16)	Within 4-8 years	Masterplan designed and implemented. Improved recreational amenity, environmental values, and foreshore resilience.
Strategy 7: Social and Recreational Amenity	S7.CCC.D	Broken Bay	Pearl Beach	Feasibility Investigation: Ambulant Access at Pearl Beach Rock Pool Access	This feasibility investigation will assess options for a low-impact handrail to assist ambulant access from the sand at Pearl Beach to the rock pool platform. The study will consider the environmental, structural, and accessibility requirements for a minimal-intervention solution that enhances safety while preserving the natural character of the area. Key elements of the investigation will include site assessments, design feasibility, regulatory considerations, and potential impacts on coastal processes.	CCC	N/A	Medium (12)	Within 4-8 years	Study completed.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					Community consultation will form an essential part of the study, ensuring that a range of viewpoints are considered in selecting the most suitable option. This will involve engaging local stakeholders to explore preferences for materials, positioning, and design. The investigation will result in a summary report outlining feasible design options, estimated costs, and implementation considerations for Council's review.					
Strategy 7: Social and Recreational Amenity	S7.CCC.E	Broken Bay	Broken Bay Beaches	Prioritise and upgrade beach life guard patrol towers and ancillary structures	This action would involve undertaking an audit of beach life guard patrol towers and ancillary structures to ensure their adequacy, performance and safety from coastal hazards. Necessary upgrades and improvements required would be prioritised and implemented to ensure required functions continue to be performed.	CCC	N/A	Low (7)	Opportunistic, within 8-10 Years	Vulnerable life guard patrol towers identified and improvements/upgrades implemented
Strategy 7: Social and Recreational Amenity	S7.CCC.F	Broken Bay	Broken Bay Beaches	Review waste collection assets and servicing in coastal public spaces	Work with internal business units and service providers to review the adequacy of waste collection assets and servicing along the coast. The review would be focused on ensuring that infrastructure and assets are sufficient to meet current demands, seasonal and event variations and opportunities for improvement to reduce the environmental and amenity impacts from marine litter and debris. This action should also include the management of post-storm and flood debris.	CCC	N/A	Medium (10)	Within 4-8 years	Waste collection assets identified and upgraded. Management plan for removal of post storm debris developed and implemented.
Strategy 7: Social and Recreational Amenity	S7.CCC.G	LGA Wide	LGA Wide	Prepare Central Coast Council Dinghy Management Plan	Dinghies and other small watercraft are a popular way to access the public foreshores across Council's waterways. However, better management is needed to balance accessibility with environmental protection and community use of foreshore reserves. A Strategic Dinghy Management Plan would guide the responsible storage and use of dinghies on public land, ensuring they are kept in designated areas and do not obstruct shared spaces. The goal of the plan would be to: > Establish and maintain designated dinghy storage facilities to support authorised vessels while aligning with Council's open space objectives. > Maintain high-quality foreshore reserves for the enjoyment of the whole community. > Minimise environmental impacts, safety hazards, and obstructions caused by unattended watercraft. > Provide a framework for the removal of unclaimed or improperly stored dinghies from public land. The development of the plan should consider alignment with the Central Coast Watercraft Storage on Public Land Policy (CCC086)	CCC	N/A	Medium (16)	Within 4-8 years	Plan developed.
Strategy 7: Social and Recreational Amenity	S7.CCC.H	Middle Estuary	Spencer	Develop and implement a foreshore masterplan for Spencer	This master planning process would provide a strategic and holistic vision for the Spencer foreshore - extending from the boat ramp in the south to the public swimming enclosure in the north. Key elements of the plan would include: > Parking and amenities > Safe vessel access to the waterway > Pedestrian access and safety > Renewal of the Spencer swimming enclosure > Riparian vegetation management > Road drainage and management of overland flow. The master plan will be developed through stakeholder engagement, site analysis, and alignment with relevant coastal management policies. The outcome will be a clear, actionable strategy to ensure the long-term sustainability and enjoyment of the Spencer foreshore.	CCC	N/A	Medium (14)	Within 4-8 years	Masterplan designed and implemented. Improved recreational amenity, environmental values, and foreshore resilience.
Strategy 7: Social and Recreational Amenity	S7.CCC.I	Brisbane Water	Estuary-Wide	Undertake strategic upgrades of Council owned boat ramps in Brisbane Water	This would include implementing boat ramp upgrades identified by Councils boat ramp action plan. Works may include improvements to ramp structures, associated car and trailer parking, lighting, signage, and accessibility features, ensuring facilities meet contemporary safety, usability, and environmental standards. Upgrades will be staged and prioritised to align with community demand, asset condition, and available funding.	CCC	TfNSW	Low (7)	Opportunistic, within 8-10 Years	Review completed. Priority upgrades established and implemented.
Strategy 7: Social and Recreational Amenity	S7.CCC.J	Brisbane Water	Estuary-Wide	Implement the St Huberts Island Canals maintenance program	The purpose of the St Huberts Island Canals maintenance program is to enable residents and Council to conduct maintenance and improvement activities within the St Huberts Island Drainage Reserves (canals) in an informed and consistent manner. The Guideline provides advice and direction for the undertaking of activities to protect and restore foreshores, seawalls and canal depths in a manner that minimises impacts on the hydraulic, sedimentary or ecological processes occurring within the canals, foreshores and surrounding water body (Brisbane Water).	CCC	N/A	Low (5)	Opportunistic, within 8-10 Years	Survey undertaken. Monitoring completed. Feasibility study completed.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					Whilst the program predominantly includes provision of guidelines for waterfront residents, there are a number of actions for Council, including the following: > Undertaking hydrographic surveying of the canals every 10 years > In conjunction with the surveying and monitoring of sedimentation program, a program of visual monitoring for foreshore management should be undertaken. Similarly, this should be undertaken every three to five years > Preparation of a dredging and disposal feasibility assessment & strategy. The strategy should be developed following consideration of the required dredging volume. This also includes a review available funds to determine whether dredging works are economically feasible					
Strategy 8: Cultural Heritage Protection	S8.CCC.A	Broken Bay	Entrance channel	Identify the location and condition of ship wrecks near the old bar via a maritime archaeological survey.	The project involves conducting a comprehensive maritime archaeological survey to identify the likely location and assess the condition of shipwrecks near the Old Bar. This initiative aims to uncover historical maritime artifacts, preserve cultural heritage, and contribute to the understanding of the region's maritime history.	CCC		Low (5)	Opportunistic, within 8-10 Years	Survey completed.

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5.9 Local Implementation Plan: Northern Beaches Council LGA

A summary of the actions within the Northern Beaches Council Local Implementation Plan are provided in Table 5-8. Maps depicting relevant actions are provided in Appendix B.

Table 5-8 Action Table – The Northern Beaches Council Local Implementation Plan

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 2: Monitoring, Evaluation, and Reporting	S2.NBC.A	Pittwater	Pittwater-wide	Install a CoastSnap Camera Cradles at strategic locations across the LGA foreshore	Install CoastSnap Camera Cradles at strategic locations across the foreshores of Pittwater. CoastSnap is a global citizen science project to capture our changing coastlines. It allows citizens to capture and upload photos of their beaches in order to improve our scientific understanding of erosion and coastal shoreline change. These camera cradles are a low cost resource that enables citizen science to monitor the movement of the shoreline over time, and to identify when erosion at the reserve may represent an increased risk to land and infrastructure. Locations within Pittwater that may be suitable include: > Station Beach > Sandy Beach > Currawong Beach > Great Mackerel Council can liaise with CoastSnap to identify opportunities to install camera cradles at additional locations as funding and resourcing allow.	NBC	DCCEEW	Low (5)	Opportunistic, within 8-10 Years	Cradles installed, and data considered to be beneficial for coastal risk management and planning, and community engagement.
Strategy 2: Monitoring, Evaluation, and Reporting	S2.NBC.B	Pittwater	Pittwater-wide	Develop and Implement a Pittwater Beach Monitoring Program	Implement a foreshore monitoring program for the swell exposed beaches of Pittwater. These sites could include beach surveys of: > Great Mackerel Beach > Currawong Beach > Station Beach > Snapperman Beach > Sandy Beach > Paradise Beach > Additional beaches maybe be included in the monitoring over time as necessary These beach surveys are essential for improving our understanding of coastal erosion and shoreline changes. A critical aspect of this monitoring program is the calculation of the Beach Volume Index (BVI). The BVI is a key metric that quantifies the amount of sand and sediment on the beach.	NBC	DCCEEW, NPWS	High (24)	Within 1-4 years	Monitoring undertaken and recorded. Collected data is of tangible benefit from a risk and asset management perspective.
Strategy 2: Monitoring, Evaluation, and Reporting	S2.NBC.C	Entire HNRS	Pittwater, Cottage Point	Install permanent tide gauges at strategic locations around the waterway	Whilst there are a number of tide gauges located throughout the river system, there are still some locations where there is an absence of local tide recorded tide data that can assist to understanding localised impacts of tidal inundation, and the impacts of combined coastal and catchment flooding. This information will be particular important over future time frames as the impacts of Sea Level Rise become more severe. This action therefore involves the installation of a new tide gauges at strategic locations across the waterway, including: > The southern area of Pittwater > Cottage Point This list is not exhaustive, and additional gauges may be installed as deemed necessary by Council and the State Government.	NBC	DCCEEW	Medium (12)	Within 4-8 years	Gauge implemented and maintained, and data considered to be of tangible benefit for coastal management by Council.
Strategy 2: Monitoring, Evaluation, and Reporting	S2.NBC.D	Pittwater	Pittwater-wide	Develop and implement a program for regular and ongoing monitoring of public coastal assets and infrastructure	This action involves the development and implementation of a monitoring program designed to assess and track the condition of various public coastal assets and infrastructure, including: > Public coastal protection structures (revetments, seawalls, training walls) > Recreational assets including viewing platforms & coastal access tracks > Stormwater outlets. > Sewer and water infrastructure The program should be integrated into Councils broader asset management program	NBC	N/A	Medium (21)	Within 4-8 years	Monitoring undertaken and recorded. Collected data is of tangible benefit from a risk and asset management perspective.
Strategy 3: Resilience, Planning, and Adaptation	S3.NBC.A	Pittwater	Pittwater-wide	Develop and update coastal hazard information	Develop and update coastal hazard information including coastal erosion and coastal inundation considering climate change and sea level rise	NBC	N/A	Medium (9)	Within 4-8 years	Studies completed.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 3: Resilience, Planning, and Adaptation	S3.NBC.B	Pittwater	Pittwater-wide	Update planning certificates with coastal hazard information	Update coastal hazard information on 10.7 Planning Certificates including coastal erosion and estuarine inundation	NBC	DPHI-Planning and Assessment	High (27)	Within 1-4 years	Planning Certificates updated.
Strategy 3: Resilience, Planning, and Adaptation	S3.NBC.C	Pittwater	Pittwater-wide	Develop planning controls to ensure buildings are sited and designed to consider coastal hazard information including coastal erosion and estuarine inundation.	Undertake regular reviews and updates of existing planning controls in LEP, DCP and Policy's / Guidelines to ensure the controls are consistent with current best practice and consider contemporary information regarding climate change and sea level rise, and reflect best practice hazard and environmental management	NBC	DPHI-Planning and Assessment	Medium (8)	Within 4-8 years	Review completed. Planning controls updates as necessary.
Strategy 3: Resilience, Planning, and Adaptation	S3.NBC.D	Pittwater	Pittwater-wide	Long Term Adaptation Plan for Coastal Assets and Infrastructure	A comprehensive audit of coastal assets and infrastructure will be undertaken to assess their current condition, vulnerability to coastal hazards, and future adaptation needs. This audit will inform a structured approach to managing coastal infrastructure over the next 50–100 years, ensuring resilience to sea level rise, erosion, and extreme weather events. key components of this action include: > Auditing Coastal Assets: Conducting a detailed assessment of key coastal infrastructure, including seawalls, stormwater outlets, walkways, and public amenities. This will document asset condition, maintenance requirements, and exposure to coastal hazards. > Determining Adaptation Triggers: Identifying environmental and structural thresholds (e.g., erosion rates, inundation levels, structural degradation) that will signal when adaptation or intervention is required. These triggers will be based on climate change projections, historical trends, and asset vulnerability. > Developing a Long-Term Response Framework: Establishing a strategic framework for asset adaptation, including short-, medium-, and long-term management options such as maintenance, reinforcement, managed retreat, or realignment. > Prioritising Works: Developing a prioritised list of coastal asset management and adaptation works based on risk, urgency, and cost-effectiveness. These works will be incorporated into future Coastal Management Programs (CMPs) to ensure funding and implementation align with broader coastal planning objectives.	NBC	N/A	Medium (20)	Within 4-8 years	Plan developed.
Strategy 5: Estuary & Waterway Health	S5.NBC.A	Pittwater	Careel Bay	Naturalisation of Careel Creek: Design and Implementation	This naturalisation project aims to restore ecological function, improve waterway health, and enhance public access and amenity, while recognising the need to maintain flood conveyance capacity in the existing concrete-lined section. The project will include: Design Study: Assess technical, environmental, cultural, and community considerations to inform design options, staging, and investment priorities. Implementation: >Access Improvements: Enhance pedestrian access to improve safety and connectivity along the creek corridor. > Habitat Enhancement with Native Vegetation: Introduce and expand native wetland vegetation in suitable areas to increase biodiversity and habitat value. Extend salt marsh areas to support aquatic life and improve ecological resilience. These works would be considered 'Environmental protection works' (EPW) for mapped coastal wetlands and littoral rainforest in accordance with the R&H SEPP, and the Standard Instrument - Principal Local Environmental Plan (2006 EPI 155a). > Concrete Channel Improvements: Where the detailed design study indicates, implement opportunities to soften the channel environment (e.g., retrofitting with habitat features, planting in margins, or using textured surfaces) to improve ecological function while retaining flood conveyance > Installation of Water Quality Improvement Devices and WSUD: Integrate water-sensitive urban design (WSUD) elements such as biofiltration systems, sediment traps, and constructed	NBC	DCCEEW	Medium (10)	Within 4-8 years	Design and implementation completed. Increase in local extent of coastal wetlands and enhanced biodiversity values. No significant loss of flood conveyance.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					wetlands to naturally treat stormwater and reduce pollutant loads entering the creek and Pittwater. Outcomes: This action will improve flood resilience, support biodiversity, and enhance water quality through the creation of a functional wetland system that naturally treats pollutants before they reach downstream environments, while also maximising ecological and community benefits within the constraints of the existing channel.					
Strategy 5: Estuary & Waterway Health	S5.NBC.B	Pittwater	Careel Bay	Upgrade the Careel Bay litter trap	Upgrade the Careel Creek baramy trap to a more modern design that incorporates advanced technology for improved waste capture and environmental sustainability. This will involve adoption of a modern litter trap/boom design, ensuring minimal impact on local ecosystems, and implementing ongoing maintenance to keep the system operating efficiently.	NBC	N/A	High (24)	Within 1-4 years	Works completed.
Strategy 6: Coastal Hazard Resilience	S6.NBC.A	Pittwater	Station Beach	Coastal Protection Works at Station Beach	Undertake foreshore restoration and naturalisation works across Station Beach in order to improve erosion resilience and ecological values. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: The works would include: > Planting appropriate native foredune species along the foredune to promote natural foreshore building and recovery. > Formalisation of beach access points to protect dune vegetation The initial priority for the works would be the area of foreshore directly in front of the Car Park - but works could also extent to other areas across the Station Beach foreshore as needed. References: > Figure B-25 provides the location and indicative extent of the proposed CPW. > Figure C-7 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	NBC	DCCEEW	High (27)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.NBC.B	Pittwater	Sand Point Beach	Coastal Protection Works at the western end of Sand Point Beach	Undertake a program of beach scraping at the north-western end of Sand Point Beach. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: The works would include sand scraping and redistribution - sourcing sand from lower on the beach profile - to provide additional sand to the upper beach profile, and subsequently enhance the local dune system, offset the ongoing erosion / recession. The requirements and beach profile design for this work were assessed as part of a 2019 study (WRL, 2019). It is recommended that these works are undertaken as part of a monitored trial. References: > Figure B-26 provides the location and indicative extent of the proposed CPW. > Figure C-12 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	NBC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.NBC.C	Pittwater	Sand Point Beach	Coastal Protection Works along Sand Point Beach	Undertake foreshore restoration and naturalisation works across Station Beach (east of the boat ramp)in order to improve erosion resilience and ecological values. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and	NBC	DCCEEW	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Planting appropriate native foredune species along the foredune to promote natural foreshore building and recovery. > Formalisation of beach access points to protect dune vegetation References: > Figure B-26 provides the location and indicative extent of the proposed CPW. > Figure C-7 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.					
Strategy 6: Coastal Hazard Resilience	S6.NBC.D	Pittwater	Careel Bay	Investigate the feasibility of channel maintenance works within Careel Bay and Careel Creek	Investigate the feasibility of channel maintenance works within Careel Creek and Careel Bay to maintain effective drainage and reduce the risk of flooding in the surrounding areas. The investigation will assess the potential for removal of accumulated sediment, debris, and vegetation that may obstruct water flow and contribute to inundation during combined coastal and catchment flooding events. The study would consider environmental constraints and the requirements of relevant permits and approvals. If feasible, this action would also include the delivery of the works. The study area for in investigation is provided in Figure B-27.	NBC	DCCEEW	Medium (16)	Within 4-8 years	Study completed.
Strategy 6: Coastal Hazard Resilience	S6.NBC.E	Pittwater	Clareville Beach	Coastal Protection Works at Clareville Beach Reserve	Undertake foreshore restoration and naturalisation works along the foreshore south of Delecta Ave, in order to enhance erosion resilience and ecological values. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Planting appropriate native foredune species along the foredune to promote natural foreshore building and recovery. > Formalisation of beach access points to protect dune vegetation. References: > Figure B-27 provides the location and indicative extent of the proposed CPW. > Figure C-7 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	NBC	DCCEEW	Medium (14)	Within 4-8 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.NBC.F	Pittwater	Bayview	Coastal Protection Works at Bayview Park foreshore	Undertake foreshore restoration and naturalisation works across the eastern side of the Bayview Dog Park foreshore, in order to enhance erosion resilience and ecological values. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Planting appropriate native foredune species along the foredune to promote natural foreshore building and recovery. > Implementation of formalised access points to the beach from the park. References: > Figure B-28 provides the location and indicative extent of the proposed CPW. > Figure C-7 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	NBC	DCCEEW	Low (6)	Opportunistic, within 8-10 Years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 6: Coastal Hazard Resilience	S6.NBC.G	Pittwater	Currawong Beach	Coastal Protection Works at Currawong Beach	Undertake foreshore restoration and naturalisation works along Currawong Beach in order to enhance erosion resilience and ecological values. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Planting appropriate native foredune species along the foredune to promote nature dune building and recovery > Construction of a small swale running behind the foreshore to prevent overland flow exacerbating the current erosion issues. References: > Figure B-26 provides the location and indicative extent of the proposed CPW. > Figure C-7 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	NBC	DCCEEW	Medium (14)	Within 4-8 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.
Strategy 6: Coastal Hazard Resilience	S6.NBC.H	Pittwater	Great Mackerel Beach	Great Mackerel Beach Foreshore Master Plan	The Foreshore Masterplan for Great Mackerel Beach aims to provide a strategic framework for the sustainable management, enhancement, and protection of the foreshore area. The masterplan will address environmental, social, and recreational values while considering the unique constraints and opportunities of the site. The master plan will include key components these works would be classified as Coastal Protection Works (CPW) under the CM Act, as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: > Beach Nourishment and Foredune Building: Targeted sand replenishment will strengthen the upper beach and improve coastal resilience. This will involve small-scale beach scraping combined with beach nourishment using sand sourced from the flood tide delta at the northern end of the beach. Similar works carried out in 1989 and 1990 remained stable until the June 2016 storm event. The project will also include constructing a low foredune crest and swale to mitigate overland flow, which is contributing to ongoing erosion. > Foreshore Naturalisation: Strengthening the natural dune system by planting native foredune species to promote dune formation and stability. Protective fencing will be installed to support vegetation colonization and long-term dune recovery. > Formalisation of pedestrian access and connectivity: Establishing designated beach access points at regular intervals to reduce dune trampling and erosion. A shared pathway behind the dune crest will enhance connectivity while protecting sensitive coastal areas. > Dinghy Storage: Installing structured dinghy racks to eliminate on-ground storage, which currently contributes to localized erosion. This will provide a designated, organized solution that preserves the foreshore while maintaining access for boat users. Community engagement will be a key part of the process, ensuring local input shapes the plan and that proposed actions align with community values and priorities. References: > Figure B-25 and Figure B-26 provides the location and indicative extent of the proposed CPW. > Figure C-8 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	NBC	DCCEEW	High (30)	Within 1-4 years	Design prepared and works completed.
Strategy 6: Coastal	S6.NBC.I	Pittwater	Pittwater	Provide coastal hazard risk information to	This action involves Council sharing relevant coastal hazard information - such as technical studies, monitoring data, and hazard mapping - with public asset owners as new information becomes available. The aim is to improve awareness of current and future coastal hazard risks,	NBC	NPWS	High (24)	Within 1-4 years	Information provided and considered to be of tangible benefit to

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Hazard Resilience				public asset owners	and to support longer-term planning and risk management by asset owners. Where relevant, Council may also provide examples of potential adaptation responses - including nature-based solutions, coastal protection works, or asset relocation - to assist asset owners in understanding possible management pathways. Final decisions and implementation of any specific response remain the responsibility of the asset owner.					relevant asset owners for planning and decision making purposes.
Strategy 6: Coastal Hazard Resilience	S6.NBC.J	Pittwater	Pittwater	Pittwater dredging and beach nourishment feasibility investigation	This would include a detailed study investigating the feasibility of dredging and beach nourishment as a long term strategy for managing coastal hazard risk at key high risk beaches across the estuary. It would include: > A sand source investigation - identifying quantity and quality of suitable sources of sand within the estuary > Technical feasibility: An assessment of potential dredging methods (and equipment) and beach nourishment methods, volumes, and placement designs > Environmental impacts: An assessment of potential environmental impacts and associated environmental planning and approvals requirements > Economic feasibility: An economic assessment of potential costs associated with an ongoing program	NBC	DCCEW, NPWS	High (27)	Within 1-4 years	Study completed.
Strategy 6: Coastal Hazard Resilience	S6.NBC.K	Pittwater	Northern Estuary	Pittwater Wave Climate Study	A coastal engineering investigation should be undertaken to investigate the propagation of offshore swell energy into the Pittwater Estuary. The Stage 2 Coastal Hazard Study for Pittwater identified that there is currently very little information available to properly quantify this process with little recorded wave data and the most recent modelling studies very 20 years old. This currently represents a major data gap and has flow-on effects in terms of being able to prepare for coastal storm events, to adequately design coastal infrastructure to resist swell energy, and to understand sediment transport processes inside the estuary. The Stage 2 hazard study recommended that a comprehensive wave climate study be undertaken for the Pittwater Estuary. It would include the following elements: > Data Collection: Collection of wave data through the installation of field instrumentation (pressure transducers, ADCP, wave buoys) at various points within and outside the estuary to measure wave height, period, and direction. > Numerical modelling: Development wave models to simulate wave propagation into the estuary, using the wave buoy data to calibrate and validate the modelling. > Analysis and Reporting: Determination of design & operational wave conditions around the estuary, including an improved understanding of the penetration of swell wave energy into the estuary.	NBC	DCCEEW	Medium (14)	Within 4-8 years	Study completed.
Strategy 7: Social and Recreational Amenity	S7.NBC.A	Pittwater	Pittwater	Upgrade and repair of waterway access points	Undertake maintenance, repairs and upgrade works at public wharfs across Pittwater Estuary. Relevant wharfs and ramps may include: > Great Mackerel Beach > Currawong > Coasters Retreat (Bonnie Doon) > Lovett Bay > Church Point > Scotland Island (4 x wharfs) > Careel Bay Additional wharfs may be included as required. This Action will be delivered and funded through Northern Beaches Council's business-as-usual (BAU) asset management and delivery program, forming part of the ongoing renewal and upkeep of public maritime infrastructure	NBC	N/A	High (27)	Within 1-4 years	Assets maintain appropriate engineering and safety standards.
Strategy 7: Social and Recreational Amenity	S7.NBC.B	Pittwater	Sand Point	Boat Ramp Upgrade	The existing boat ramp at Sandy Point Lane is in need of significant upgrades due to ongoing structural deterioration. The ramp surface has developed visible cracking, which may be indicative of underlying structural weaknesses. Additionally, scour and undermining at the base of the ramp are compromising its stability, potentially creating safety hazards for users and increasing maintenance requirements. Upgrade work will consist of ramp resurfacing with the inclusion of appropriate engineering works for the ramp foundation. This Action will be delivered and funded through Northern Beaches Council's business-as-usual (BAU) asset management and delivery program, forming part of the ongoing renewal and upkeep of public maritime infrastructure.	NBC	TfNSW	High (24)	Within 1-4 years	Works completed.

5.10 Local Implementation Plan: NPWS

A summary of the actions within the NPWS Implementation Plan are provided in Table 5-9. Maps depicting relevant actions are provided in Appendix B.

Table 5-9 Action Table – The NPWS Implementation Plan

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 6: Coastal Hazard Resilience	S6.NPW.A	Pittwater	Station Beach	North Station Beach Coastal Protection Works - Sand Redistribution and Dune Building	Stage 2 coastal hazard mapping has indicated that key NPWS Assets at Station Beach are likely to be vulnerable to severe storm erosion over the coming decades - and 3 options have been considered and assessed as part of the Stage 3 Analysis. The preferred option involves the restoration and revegetation of 80m of foreshore in front of the assets. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be "activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters". These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: Subject to actual erosion/recession rates observed, detailed design, environmental assessments and approvals, the works would include: > An ongoing program of beach scraping and dune building. As the longshore sediment transport at the sites moves from North to South (as identified in the Stage 2 Hazard Study), this action would include a beach scraping process to move sand from farther south along Station Beach - returning it northwards to build the beach and increase the dune buffer in front of the at-risk assets. > The dune building and buffer in front of the assets is expected to provide a buffer from a 100-year ARI storm event, providing an additional ~18m3/m of sand in front of the assets. > Sand could be won from a 250 m long stretch of foreshore located to the south of the assets. This would involve a shallow scraping of ~0.2 m of surface sand from the intertidal zone across the borrow area. > Revegetation and restoration works could be undertaken to help build the local dune and trap the nourished sand in place. > Ongoing program of works, likely required around every 5 years given the relatively low rate of longshore drift. > Monitoring of the beach profile and sand movement to inform the required frequency of scraping events. References: > Figure B-25 provides the location and indicative extent of the proposed CPW. > Figure C-8 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	NPWS	NBC, DPHI-Crown Lands	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 6: Coastal Hazard Resilience	S6.NPW.B	Pittwater	The Basin	The Basin Coastal Protection Works - Sand Redistribution Program	Erosion along the western foreshore of The Basin impacting safe recreational and emergency access and placing heritage assets at risk. This action involves undertaking periodic sand redistribution program - transferring sand from the Basin sand delta to the upper beach profile to stabilise the foreshore. This could include the formation of a dune and swale in order to mitigate impacts of overland flow on foreshore erosion. As per the CM Act, these works would be classified as Coastal Protection Works (CPW), as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These coastal protection works form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: Subject to actual erosion/recession rates observed, detailed design, environmental assessments and approvals, including any required licences, the works would include: > A coastal process study and nourishment design - to confirm sediment transport dynamics, erosion rates, assess the suitability and sustainability of the sand source area, and determine optimal placement volumes and profile. > An ongoing program of sand redistribution - required a total volume of around 1,800m3 of sand to be sourced from the adjacent sand delta, and placed along the 180 m of foreshore to create an additional sand buffer-(10m3/m) along the foreshore to provide safe access and protection of trees. This would provide a 5 m width of dry beach sand at the current erosion scarp at high tide. Sand would be placed to match the existing foreshore slope for stability. > Ongoing works every 2-5 years. > A monitoring plan for the site to monitor beach profile, sand movement and existing seawall condition. Monitoring results will help inform the required frequency of scraping events, as well as assess the existing walls structural integrity and identify any areas requiring maintenance. > Revegetation and restoration works to help build the local dune and trap the nourished sand in place. References: > Figure B-25 provides the location and indicative extent of the proposed CPW. > Figure C-28 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	NPWS	DPHI-Crown Lands	Medium (21)	Within 4-8 years	Study completed, design prepared and works completed. Improved foreshore resilience to coastal hazards.

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CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 6: Coastal Hazard Resilience	S6.NPW.C	Lower Estuary	Bobbin Head	Bobbin Head Foreshore Sea Level Rise Adaptation Study	Several low-lying areas around the Bobbin Head foreshore — including Orchard Park, Gibberagong Park, and the Wharf Area — are currently exposed to tidal inundation (commonly referred to as “sunny day flooding”). This issue was recognised in the Bobbin Head Masterplan (NPWS, 2006), which highlighted the negative impacts of saltwater inundation on the park’s aesthetic, recreational, and environmental values. The NSW Tidal Inundation Exposure Assessment (OEH, 2018g) also projects that the frequency and severity of tidal inundation will increase over time due to sea level rise. This action involves undertaking a detailed SLR adaptation options assessment followed by detailed investigations and design for key NPWS assets at Bobbin Head. This will include: 1. Detailed options assessment of potential sea level rise adaptation and coastal protection work options to replace the failing seawalls and investigate the need for raising the parkland, wharf area and seawalls to prevent continued inundation. This will recommend a preferred long-term solution, and be informed by: > Cowan Creek geomorphic and hydrodynamic assessment (Action S6.SGA.06) to inform hydrologic and geomorphic changes to the system with increased sedimentation and sea level rise. > Establish the rate of subsidence for the site through LiDAR and geotechnical assessments > Condition assessment of existing seawalls 2. Investigation and design for the preferred adaptation solution, including: > Concept design > Environmental assessments > Cultural and historic heritage assessments > Detailed design The investigation would build on and reassess concepts previously proposed in the Bobbin Head Masterplan (NPWS, 2006) in light of updated sea level rise projections, current infrastructure condition, and visitor use patterns. Outcomes will inform the prioritisation and planning of any future adaptation works.	NPWS	N/A	Medium (10)	Within 4-8 years	Study completed.
Strategy 6: Coastal Hazard Resilience	S6.NPW.D	Lower Estuary	Bobbin Head	Bobbin Head hydrodynamic assessment	The Cowan Creek system is experiencing ongoing direct, indirect, and cumulative impacts from riverine processes, flooding, bed and bank erosion, and geomorphological, hydrological, and hydraulic change – including the effects of sea level rise. An integrated assessment is required to better understand these processes and support effective precinct planning and adaptation responses. It would include the following: > Hydrodynamic modelling to simulate current and future flood behaviour under a range of climate and sea level rise scenarios. > Assessment of land raising and dredging options, including how these would affect flood storage, tidal exchange, and flow conveyance in the estuary. > Evaluation of sediment transport and erosion dynamics, including bank stability and the implications of any intervention on downstream or adjacent areas. > Assessment of cumulative impacts from past and potential future modifications (e.g. urban development, previous dredging, reclamation works). If feasible, this action could be undertaken in concurrently with Action S5.KRG.01 (Cowan Creek Catchment Study)	NPWS	KC	Medium (16)	Within 4-8 years	Study completed.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 6: Coastal Hazard Resilience	S6.NPW.E	Lower Estuary	Apple Tree Bay	Repair and renewal of the Bobbin Head Coastal Protection Works	The Bobbin Head foreshore is almost entirely flanked by seawalls, many of which are heritage-listed and dating from the original parkland in the early 1900s. Ongoing impacts from tidal inundation and flooding have resulted in numerous sections of the walls failing. These sections are posing a safety risk at the high visitation precinct with temporary fencing placed around the affected areas. NPWS will maintain and repair seawalls on a regular basis throughout the life of the CMP to maintain safety and functionality. Approximately 300m of the seawall requires immediate repair/replacement that is scoped in this Action, split into two separate repair design types: > 250 m of sandstone block work seawall requires repair. This is located along the immediate east and south of the creek bridge and comprises repacking/replacement of sandstone blockwork, with the additional of an aggregate filter layer, drainage features and geotextile underlay. This also include the raising of the crest level to mitigate tidal inundation impacts both under present day conditions and future SLR. > On the south-western bank of Cockle Creek, a section of cement grouted rock wall is failing, placing a footpath and carpark at risk. The proposed works include restoration of the existing rock protection and revegetation of planting new mangroves in the tidal flat in front of the structure. Scope of Works: > Structure Survey and coastal engineering condition inspection: To survey the structure and identify the nature of the required repair and renewal works > Repair and renewal design: To prepare a specific repair design - including the required armour materials, grades and levels. > Repair and renewal works: Implementation of the repair design, including a safety in design assessment, construction of the works and development of As-Constructed certification from a suitably qualified engineer for Council records. The works will likely comprise the installation of a filter layer and repacking of re-placement of sandstone block units. The renewal will ensure long-term protection against coastal hazards and improve the overall safety and resilience of the infrastructure. References for Sandstone Blockwork Upgrade: > Figure B-29 provides the location and indicative extent of the proposed CPW. > Figure C-29 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. References for Rockwall Upgrade: > Figure B-29 provides the location and indicative extent of the proposed CPW. > Figure C-30 provides a concept design cross-section. Note that key design parameters would be refined as part of detailed design investigations. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.	NPWS	N/A	High (24)	Within 1-4 years	Works completed.
Strategy 6: Coastal Hazard Resilience	S6.NPW.F	Lower Estuary	Coasters Retreat, Marramarra Creek, Cowan Creek, Gentlemans Halt, Berowra Creek, Mooney Mooney	Coastal Protection works for NPWS Bank Erosion Hotspot Sites	This Action involves implementing the finding of the NPWS Riverbank and Riparian Condition Assessment and Options Report (Alluvium, 2025). This erosion and bank condition assessment was undertaken across NPWS estate in the HNRS to identify erosion hotspots that are placing assets and infrastructure at risk, and to manage bank health. The NPWS assets at risk include a mix of walking tracks, cultural sites, heritage sites, campground infrastructure and mapped coastal wetlands. A total of 11 priority sites were identified for bank stabilisation works – of which 6 specific sites haven been selected for short term implementation through the CMP. Works at these sites are classified as Coastal Protection Works (CPW) under the CM Act, as they are considered to be “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters”. These CPW form part of a strategic program to enhance the resilience and accessibility across the HNRS public foreshore. Beyond stabilising the site, they advance CMP objectives by protecting public assets, safeguarding public open space, and maintaining sustainable waterfront access. Scope of Works: The selected CPW are to be undertaken at the following locations: > Cowan Creek: Two approaches have been developed that each cover different	NPWS	DPHI-Crown Lands	High (24)	Within 1-4 years	Design prepared and works completed. Improved foreshore resilience to coastal hazards.

CMP Strategy	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
					areas of the NPWS foreshore. This includes a combination of (a) the re-construction of the existing walking track using sandstone blocks to create a new walking surface and sandstone retaining wall, and (b) the construction of a rock revetment to protect the bank from further erosion caused by tidal flows and wave action. Figure B-33 provides the location and indicative extent of the proposed CPW. Figures C-16 and C-17 provide associated concept designs. > Coasters Retreat: Works at this site comprises stabilising the segments of eroding shoreline threatening the track using riprap rock protection, combined with rebuilding failing portions of the track, incorporating drainage where any flow path crosses the track. Figure B-26 provides the location and indicative extent of the proposed CPW. Figures C-18 and C-19 provide associated concept designs. > Mooney Mooney Creek: This design involves two processes, one aimed at stabilising the existing creek bank and protecting nearby assets, and the other at realigning the Hawkesbury Track to move it away from the high-risk area and protecting it with a larger “buffer” zone between it and the waterway. Stabilisation and protection of the banks will involve the placement of two rows of rock parallel to the bank and approximately 3 m apart. On either end of the site, additional rock walls perpendicular to the bank will connect the longer rows, thereby creating a rectangular “box” structure. The area within this box will then be graded back up to create a gently sloping bank. This will be revegetated with mangroves, creating a mangrove bar that will act to dissipate energy coming in from tides or boat wash, and stabilise the sediments to prevent further erosion. Figure B-30 provides the location and indicative extent of the proposed CPW. Figures C-20 and C-21 provide associated concept designs. > Berowra Creek: Rock armoured CPW are to be constructed across a 100 m stretch of foreshore. The rocks should be placed in front of the existing trees to provide them with protection. The rock protection should be 2 m wide and 1 m high and follow the contour of the bank around the entire site; however, it should be noted that care needs to be taken not to disturb the historic boat foundations. It is recommended that rock protection is placed around the outside of this asset. Figure B-31 provides the location and indicative extent of the proposed CPW. Figures C-22 and C-23 provide associated concept designs. > Marramarra Creek: The design presented for the site includes a mix of three approaches: revegetation, coir logs and a riprap toe. These are to be applied throughout the site according to the needs and constraints at the time of construction. Figure B-32 provides the location and indicative extent of the proposed CPW. Figures C-24 and C-25 provide associated concept designs - including a concept reference of where each solution is most applicable, noting the high value toilet asset that needs protecting, and the beach access that need maintaining. > Gentlemans Halt: CPW at this location consists of a rock revetment being constructed on either side of the existing wharf structure. The rock material being used for this should be placed along both the upstream and downstream sides of the wharf where the existing protection is failing. Figure B-11 provides the location and indicative extent of the proposed CPW. Figures C-26 and C-27 provide associated concept designs. Approvals Pathway: The foreshore works are categorised as CPW and will be undertaken using the streamlined approval pathways under Section 2.16(2)(a) of the R&H SEPP during action implementation.					

5.11 HNRS Catchment Companion

The process of developing this CMP has included the identification of a number of actions located across the broader HNRS catchment area. Although these actions sit outside the legally defined coastal zone (see Section 1.2.3) and are therefore not part of the certifiable CMP, they are nonetheless integral to achieving the overarching objectives of estuary health and resilience. Many of the pressures that shape estuarine condition originate upstream in the catchment, through processes such as stormwater inflows, sediment delivery, riparian degradation, and nutrient loading. Addressing these drivers is essential if improvements within the coastal zone are to be sustained over the long term.

For this reason, the HNRS Catchment Companion has been retained in this document as a distinct but complementary set of actions. While delivery will occur outside the formal CMP certification framework, including these actions within this document ensures that critical system linkages are not lost, and that councils, agencies, and stakeholders are provided with a clear picture of the broader management context. By documenting the Catchment Companion within the CMP, this Plan recognises that estuary management cannot be isolated from its catchment context. Although not certifiable, these actions remain critical to the integrated management of the HNRS and to the long-term achievement of the CMP's strategic objectives. This approach aligns with the NSW Government's guidance on *Coastal Management Programs and Integration with Catchment Management* (DPE, 2022).

A summary of the actions within the Catchment Companion are provided in Table 5-10. Maps depicting relevant actions are provided in Appendix B.

Table 5-10 Action Table – The Catchment Companion

CMP Strategy	Implementation Plan	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 2: Monitoring, Evaluation, and Reporting	Collaborative System Implement Plan	S2.CMP.D	Entire HNRS	Upper catchments	Implement a bank stability and condition monitoring program across the creeks and waterways of the catchment	The objective of this action would be to collate and integrate existing bank stability and geomorphic condition monitoring information collected by the Partner Councils across the Hawkesbury River Estuary catchment. Rather than duplicating efforts, this action would focus on bringing together the existing datasets at a system-wide scale to better understand erosion patterns, riverbank health, and key risks across the entire estuary. The collation process would include use of the NSW SEED Portal as a central platform for data sharing and access. By adopting an integrated and coordinated approach, Partner Councils would gain a more holistic understanding of estuary health, identify system-wide priorities, and unlock opportunities for resource sharing and cost efficiencies	CCC, NBC, HSC, KC, THSC, HCC	DCCEEW, NPWS	High (24)	Within 1-4 years	Monitoring undertaken and recorded. Collected data is of tangible benefit from a risk and asset management perspective.
Strategy 3: Resilience, Planning, and Adaptation	Collaborative System Implement Plan	S3.CMP.F	Lower Estuary	Ku-ring-gai Chase National Park	Support the proposal for the development of the Ku-ring-gai GeoRegion	In October 2018, Friends of Ku-ring-gai Environment (FOKE) resolved to initiate a campaign advocating for the UNESCO World Heritage listing of Ku-ring-gai Chase National Park (KCNP). This campaign has since focussed on the development of a designated 'GeoRegion,' which will include the creation of geotrails, signage, and efforts to promote the region's geological significance. The proposal aims to leverage the area's existing recognised values, which include its biodiversity, natural and cultural heritage, as well as its exceptional geological and geomorphological features. These elements have shaped the landscape and created the distinctive traits that make the region globally significant. Once agreed upon by stakeholders, a defined area within the 'Ku-ring-gai GeoRegion' could be put forward for submission as an Aspiring UNESCO Global Geopark. Establishing this GeoRegion and pursuing UNESCO Global Geopark status will provide significant environmental benefits, particularly for downstream estuary health. By preserving and enhancing the region's geological and ecological integrity, the project will support the natural hydrological processes that flow downstream, ensuring better water quality and habitat conditions for estuaries. The protection of this vital landscape will help mitigate erosion, reduce sediment runoff, and preserve natural buffers, all of which contribute to healthier estuarine ecosystems and improve the overall resilience of coastal environments. Relevant stakeholders can offer continued support for the proposal through the provision of technical advice and political support. Note to reword, awaiting NPWS advice - might split into 2 actions?	KC, HSC, NBC	N/A	Low (5)	Opportunistic, within 8-10 Years	Proposal submission advanced with supporting technical and political advocacy.

CMP Strategy	Implementation Plan	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 4: Community & Stakeholder Engagement	Collaborative System Implement Plan	S4.CMP.C	Entire HNRS	Estuary-Wide	Develop and implement a Hawkesbury River school environmental education program focused on water quality, estuary health, and coastal hazards	This Action would be a specalised extension of the broader community and stakeholder education program (S4.CMP.01). It would involve the development and implementation of a coordinated school education program across the HNRS catchment that educates the local school students regarding the unique values of the river system and current and emerging stressors and risks. The program would focus on water quality, estuary health, and coastal hazards. The program may include a curriculum-based program, and/or excursion based learning modules - and could make of the existing environmental education centres that are active across the HNRS catchment.	NSW Department of Education	CCC, NBC, Hornsby Council, KC, THSC, HCC, First Nations Groups, GS LLS	High (24)	Within 1-4 years	Program and materials created, and program implemented.
Strategy 5: Estuary & Waterway Health	Collaborative System Implement Plan	S5.CMP.D	Entire HNRS	Estuary-Wide	Undertake a coordinated creek rehabilitation works program across the Partner Council's upper catchment waterways	This action includes the implementation of a targeted creek rehabilitation works program – with the aim of managing both the spread and introduction of weeds across the foreshore of the four estuaries, and improve the condition of riparian vegetation across the coastal zone. The works program would use this mapping and prioritise weed control in high value riparian areas - prioritising high value riparian areas, particularly those that overlay the presence of weeds with Threatened Ecological Communities (TEC's) using the most relevant Plant Community Type (PCT) mapping available at the time. This will require a "targeting multi-species" approach, along with both follow up control and planting of native vegetation suited to that PCT.	CCC, NBC, HSC, KC, THSC, HCC	DPHI-Planning and Assessment, GS LLS	High (24)	Within 1-4 years	Restoration works successfully implemented.
Strategy 5: Estuary & Waterway Health	Local Implementation Plan: Hawkesbury City Council	S5.HCC.C	Freshwater Tidal Pool	Richmond	Implement the recommendations of the Hawkesbury Floodplain Drainage Review	In 2023, a review was undertaken into the drainage network across the Hawkesbury River floodplains, within the Hawkesbury LGA boundary from Yarramundi bridge in the west down to Pitt Town in the east. The purpose of the study was to identify locations where drainage was inhibited and provide recommendations on site specific solutions for each drainage channel. The broader conclusion is that the condition of the drainage channels has deteriorated over time, resulting in poor drainage and giving rise to further damage to the area in flood events. The deterioration is partly due to failure by landowners or Council to maintain flood mitigation and drainage infrastructure, and partly due to farm works or practices which have changed the topography of the area. The review identified a number of specific Actions for Council to improve drainage across the floodplain. These Actions include: > Action 6: Investigate whether drainage improvements can be made upstream of Pughs Lagoon. > Action 7: Keep pipes clear of debris at Pughs Lagoon > Action 10: Repair or replace floodgates at Cooley Creek > Action 14: Investigate whether drainage improvements can be made at Cooleys Creek and Bakers Lagoon > Action 21: Replace floodgate and repair and stabilise levee at South Creek Implementation of these actions will help restore the functionality of the drainage network, improving water flow efficiency and reducing prolonged inundation following flood events. By addressing blockages, maintaining flood mitigation infrastructure, and ensuring effective drainage, the risk of water stagnation and back-flooding will be minimized. Enhancing drainage across the floodplain will also provide significant benefits to downstream estuary health. Improved water movement will help reduce sediment accumulation, nutrient buildup, and the risk of hypoxic conditions that can lead to fish kills and other ecological imbalances	HCC	N/A	Medium (12)	Within 4-8 years	Works completed.
Strategy 4: Community & Stakeholder Engagement	Local Implementation Plan: Ku-ring-gai Council	S4.KRG.A	Lower Estuary	LGA Wide	Support Community Engagement undertaken as part of the Ku-ring-gai Council – Water Sensitive City Strategy	Action 2.2 of the Ku-ring-gai Council – Water Sensitive City Strategy (WSCS) includes the extension of community engagement programs to educate the community regarding how they participate in environmental protection, advocacy, clean up and celebration, and act on climate change, extreme events, resilient and water sensitive neighbourhoods.	KC	N/A	Medium (12)	Within 4-8 years	Program and materials created, and program implemented.

CMP Strategy	Implementation Plan	S4 ID	Functional Zone	Locality	Action Name	Action Description	Lead	Support	Priority (Score)	Timing	Performance Criteria
Strategy 5: Estuary & Waterway Health	Local Implementation Plan: Ku-ring-gai Council	S5.KRG.A	Lower Estuary	Cowan Creek	Prepare and implement a catchment study and management plan for the Cowan Creek catchment	Catchment runoff from urban areas is a key issue for estuarine water quality across Cowan Creek. Therefore, this option involves undertaking a review of the Council's stormwater assets that discharge into the estuary, in order to identify and prioritise upgrading and maintenance of stormwater assets and infrastructure to improve estuarine health. The plan should analyse the local stormwater network, and identify strategic locations to minimise stormwater pollution using Water Sensitive Urban Design (WSUD) principles. The plan may also include the installation of stormwater infrastructure such as gross pollutant traps (GPTs) and detention basins. This plan should aim to reduce the impacts of urban stormwater runoff on water quality, marine litter, and siltation on the downstream coastal zone waters within Cowan Creek.	KC	NPWS	High (27)	Within 1-4 years	Plan prepared.
Strategy 5: Estuary & Waterway Health	Local Implementation Plan: Ku-ring-gai Council	S5.KRG.B	Lower Estuary	Cowan Creek	Update the catchment studies for Ku-ring-gai Creek and Lovers Jump Creek	This would involve Council undertaking a review and update of the catchment studies for Ku-ring-gai Creek and Lovers Jump Creek . The purpose of these updates will be to incorporate current information regarding catchment land usage, water quality, and the Ku-ring-gai Council – Water Sensitive City Strategy. The updated studies should identify management actions to reduce the impacts of urban stormwater runoff on water quality, marine litter, and siltation on the downstream coastal zone waters.	KC	N/A	High (24)	Within 1-4 years	Study completed.
Strategy 5: Estuary & Waterway Health	Local Implementation Plan: Northern Beaches Council	S5.NBC.C	Pittwater	Careel Bay	Investigate WSUD solutions within the Careel Creek Drainage catchment.	Undertake a planning investigation to identify opportunities to implement Water Sensitive Urban Design (WSUD) approaches within the Careel Creek drainage catchment. Identified WSUD opportunities can be used to help manage the quantity and quality of runoff, improve water quality in Pittwater, and enhance local ecological health around the waterway. This investigation will include site assessments, analysis of current drainage infrastructure, and the identification of opportunities for implementing WSUD solutions.	NBC	DCCEEW	High (27)	Within 1-4 years	Study completed.

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6 BUSINESS PLAN

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Image Source: Choo Beng Chew

6.1 Overview

The business plan outlines the key components of the funding strategy for the CMP, including the cost of the proposed actions, proposed cost-sharing arrangements and other potential funding mechanisms. It has been prepared in accordance with the requirements of the NSW CM Manual (OEH, 2018e).

6.2 The Benefits of Implementing the CMP

The HNRS is one of the Greater Sydney and Central Coast's most significant environmental, social, and economic assets. The river system supports high environmental values and plays a vital role in the social and cultural wellbeing of surrounding communities.

The Stage 1 Scoping Study (Water Technology, 2020) identified the river system as a major contributor to the regional economy through various ways, including:

- An estimated $1 billion per annum in ecosystem services (high-level estimate)
- Approximately $270 million in the replacement value of fixed foreshore assets
- Around $45 million per annum in tourism and domestic day trips
- Approximately $8 million per annum in direct value from commercial fishing and aquaculture
- An estimated $500 million per annum in agriculture value within the Partner Council LGAs.

However, a range of threats and stressors identified in this CMP pose risks to the river system's environmental, social, and economic values. These pressures are expected to intensify over coming decades due to climate change, population growth, and urban development.

The core objective of this CMP is to identify, address, and mitigate these threats - both now and into the future - through a long-term, coordinated strategy for the management of the river system and its broader coastal zone. The CMP encompasses a diverse suite of actions, including physical works, monitoring programs, technical studies, and education and engagement initiatives.

Investment in the CMP presents an opportunity to strengthen and protect the region's natural hazard resilience, water quality, environmental habitats, cultural values, and recreational amenity, delivering broad public benefits.

This business plan focusses on mitigating coastal risks in the public interest, recognising the diverse settings, pressures, and priorities across the HNRS. As such, the plan does not allocate costs to private beneficiaries but rather focuses on public good outcomes across the catchment.

6.3 Potential Funding Mechanisms

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.

Sustainable funding and financing arrangements for management actions will be established in consultation with key stakeholders. Funding for management actions may be gained from various sources, including the Partner Council's operational budgets, competitive State Government grant programs, and local third parties.

6.3.1 Council Funding

Funding for the Partner Councils is allocated based on their respective Resource Strategies and Long Term Financial Plan, which supports the Delivery Program (4-yearly) and the Operational Plan (yearly) under the IP&R Framework.

Key funding sources for the Partner Councils are statutory rates and charges (e.g., water, sewer, and waste), 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. Ordinary rates fund a range of Council operations and services and therefore may also be a key revenue stream to support the implementation of activities recommended in this CMP. The estimated annual revenue from ordinary rates and annual charges is provided in Table 6-1, based on information provided from the Partner Councils publicly reported financial statements.

Table 6-1 Estimated annual revenue for the Partner Councils from rates and annual charges

Partner Council	Estimated Annual Revenue from Rates ($ million)	Source
Hawkesbury City Council	$ 77.2	HCC Financial Statement – FY 23/24
The Hills Shire Council	$128.7	THSC Financial Statement – FY 23/24
Hornsby Shire Council	$116.6	HSC Financial Statement – FY 23/24
Ku-ring-gai Council	$98.3	KC Financial Statement – FY 23/24
Northern Beaches Council	$246.4	NBC Financial Statement – FY 23/24
Central Coast Council	$421.5	CCC Financial Statement – FY 23/24
Total	**$1.1 billion**	

Together, the Partner Councils generate over $1 billion annually in rates and charges, providing a substantial and stable revenue base to support their ongoing service delivery and infrastructure investment. While this funding is already allocated across a wide range of essential council services, it also presents an opportunity to strategically align existing financial resources with the implementation of priority actions outlined in this CMP. Moving forward, effective integration of CMP initiatives into each council's IP&R framework will be critical to ensuring that funding commitments are both realistic and sustainable over the long term.

6.3.2 External Sources of Funding

It will not be possible for the Partner Councils to implement all actions identified in this CMP without additional sources of funding. As such, the identification of grants and the submission of successful funding applications is an important component of this CMP.

There are a range of other funding mechanisms available for financing the implementation of the CMP. For example, the Partner Councils can take advantage of various state grant programs, as listed in Table 6-2. The value of this funding cannot be accurately quantified until such time as it is awarded. It should be noted that this is not an exhaustive list of all funding opportunities, and that over the ten-year lifecycle of the CMP additional or new funding sources may become available.

Table 6-2 Summary of potential funding sources of the CMP

Funding Source	Details / Description
State Government	
NSW Coastal and Estuary Grants Program	The costs associated with delivery of the CMP can be partly funded by the NSW Coastal and Estuary Grants Program administered by DCCEEW. The program supports coastal and estuary planning projects, and the implementation of works identified in certified CMPs. Funding is available under 5 funding streams: ▪ A planning stream: for planning and studies including investigation, design and cost-benefit analyses for infrastructure works recommended in a certified CMP.

Funding Source	Details / Description
	▪ Four implementation streams – one for each of the coastal management areas. The focus of these streams are projects that manage risks from coastal hazards, and improve the health of estuaries, wetlands and littoral rainforests across NSW. For projects that address a documented action in a certified CMP, funding is $2 from the State Government for every $1 provided by a Council. Certification of this CMP will facilitate eligibility for funding of many of the actions proposed in this CMP under the program. This grant funding program is contestable and prioritised to Council applications with certified CMPs and subject to State Government funding priorities and allocations.
NSW Estuary Asset Protection (NEAP) Program	As part of a two-year, National Emergency Management Authority approved $64 million Riparian Stabilisation Package, co-funded by the Australian and NSW Governments under Disaster Recovery Funding Arrangements, the NSW Estuary Asset Protection program will support the repair, restoration and regeneration of priority riparian and estuarine areas significantly affected by the February 2022 flooding. The aims of the NSW Estuary Asset Protection program are to: ▪ Assess the severity of flood impacts on estuarine and floodplain assets ▪ Identify priority areas for asset protection and increased resilience ▪ Implement actions that will provide increased resilience for estuarine and floodplain assets from flooding events.
Marine Estate Management Strategy (MEMS)	A number of management actions in the CMP may be eligible for funding under the NSW Marine Estate Management Strategy (MEMS). The MEMS provides an overarching, strategic approach to the coordination and management of the marine estate through to 2028. The management of priority threats is grouped into 9 management initiatives that summarise the objectives, benefits, threats, stressors and proposed management actions. An implementation plan (developed by the Authority's member agencies in consultation with key stakeholders) articulates the management actions in more detail. CMPs are key delivery mechanisms for the MEMS.
NSW Disaster Risk Reduction stream grants	Under 2 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 (NSW Government, 2023). 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.
Saving our Species (SoS) Program	Administered by DCCEEW, the Saving our Species (SoS) sets out the NSW Government's threatened species management plan. The main objectives of SoS are to increase the number of threatened species that are secure in the wild in NSW for 1 year and control the key threats facing the states threatened plants and animals.
NSW Heritage Grants	This program is administered by DCCEEW and aims to fund projects that provide sustainable, long-term heritage benefits and provide public benefit and enjoyment from heritage. Funding may be available for the management of heritage items in the coastal environment. Areas of interest include: ▪ Aboriginal Cultural Heritage grants ▪ Caring for State Heritage grants ▪ Community Heritage grants

Funding Source	Details / Description
	▪ Grants for local government.
NSW Environment Trust Grants	Funding is available under the NSW Environment Trust to a broad range of organisations for projects that enhance the environment of NSW. Grants may be awarded for on ground rehabilitation and improvement works, research applications, land acquisition, waste reduction and promotion of environmental education. The NSW Environment Trust is an independent statutory body established by the NSW Government to make and supervise the environment grants. The Trust is administered by DCCEEW. Suitable coastal management grant applications may relate to dune care, for example.
Crown Reserves Improvement Fund Program	Administered by Crown Lands, the Crown Reserves Improvement Fund Program provides financial support for the development, maintenance, and improvement of Crown reserves. Funding under this program is subject to a competitive grant application process and eligibility requirements which may change from year to year and in accordance with departmental priorities.
Federal Government	
Disaster Ready Fund	The Disaster Ready Fund (DRF) is the Australian Government's flagship disaster resilience and risk reduction initiative which will deliver projects that support Australians to manage the physical, social and economic impacts of disasters caused by climate change and natural hazards (NEMA, 2013). The DRF was established through the *Disaster Ready Fund Act 2019*. The DRF is intended to be an enduring fund, to provide all levels of government and affected stakeholders the certainty they need to plan for robust investments in resilience projects to reduce the impacts of disasters.
Urban Rivers and Catchments Program	The $200 million Urban Rivers and Catchments Program was established by the Federal Government to assist in restoring the health of urban waterways for native plants, animals, and local communities. The program is funding projects including, but not limited to (Australian Government, 2025): ▪ Creation of wildlife habitats and ecological corridors to support native species ▪ Replacement of concrete channels and drains with restored, vegetated stream environments ▪ Development of wetlands and interconnected ponds to slow and filter stormwater, enhance aquatic habitats, and improve water quality for native wildlife ▪ Removal of in-stream barriers (e.g., weirs) to facilitate fish passage ▪ Installation of litter and pollutant traps to prevent stormwater-borne plastics from entering aquatic and marine ecosystems.
Other funding opportunities	
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 (Landcare Australia, 2023).
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 stormwater pollution, weed and non-native plant removal, and control of human access to sensitive and vulnerable areas (Landcare Australia, 2023).

Agencies responsible for the delivery of actions in this CMP have been consulted during its development and have indicated their support. However, delivery of the actions will depend on the availability of funding which

is yet to be confirmed. Despite the priority of each action listed in the CMP, the timeframe of implementation will be influenced by the availability of resources and funding.

6.4 Partner Council Co-funding Arrangements

6.4.1 Overview

Approximately $10.7 million in Actions are proposed under the Collaborative System Implement Plan, to be delivered over a 10-year period. Funding contributions will vary for each Action depending on its location, intent, and underlying rationale. Broadly, the Actions fall into three categories:

- **Collaborative Actions:** All 6 Partner Councils contribute funding.
- **Shared Actions:** Only a subset of Partner Councils contribute, reflecting localised benefits or responsibilities.
- **State-led Actions:** Delivered by State Agencies and do not require direct Council funding contributions.

For Actions requiring co-funding from one or more of the Partner Councils, proportionate cost-sharing arrangements have been applied, based on physical and economic parameters. Several cost-sharing models were first explored in the Stage 1 Scoping Study (Water Technology, 2020), considering equity, ratepayer distribution, foreshore and waterway area, and the spread of risks and pressures across the six LGAs.

While one model guided the transition from Stage 2 to Stage 4, the implementation phase (Stage 5) adopts a revised approach to better align financial contributions with the benefits, responsibilities, and pressures experienced by each council across the catchment

6.4.2 Co-funding Models

The CMP adopts a flexible and tailored funding approach, applying different co-funding models for different depending on:

- The cause and nature of the risk being addressed
- The distribution of potential/likely benefits across each council area
- The responsibilities held by each council.

Through a collaborative workshop, the Partner Councils agreed on 4 co-funding models to guide the allocation of council contributions. These are summarised in Table 6-3, along with the types of actions each model is best suited for, and their respective strengths and weaknesses. This approach allows funding to be matched to the risk drivers, beneficiaries, and responsibilities associated with each action.

None of these methods is perfectly equitable on its own - each has advantages and limitations depending on the Action type, risk drivers, and location. However, these models provide a practical, agreed framework for sharing costs, ensuring transparency and consistency while keeping the approach simple enough for councils to apply.

It is also important to note:

- The percentages apply only to the Council contribution component of project funding. They do not include the two-thirds funding expected from the NSW Government under the Coastal and Estuary Grants Program. To estimate the residual cost to each Council after State funding, these percentages can be divided by three.
- Where only a subset of councils contributes to an Action, the same proportions are pro-rated across the participating councils only, ensuring the funding split remains fair and consistent.

Table 6-3 Co-funding models for collaborative and shared responsibility actions

ID	Description	Most Appropriate For	Strengths	Weaknesses	CCC	NBC	KC	HSC	THSC	HCC
A	Equal Contribution	Actions where councils share responsibilities and benefits equally.	▪ Simple and transparent. ▪ Signals shared ownership and collective responsibility.	▪ Does not reflect differing levels of risk causation, management responsibility, or benefit distribution.	16.7%	16.7%	16.7%	16.7%	16.7%	16.7%
B	Weighted by the catchment population within each LGA (based on ABS 2021 Census SA1 data).	Actions related to catchment based stressors, water quality and estuary health	▪ Broadly reflects the relative distribution of urbanisation pressures linked to population density.	▪ Assumes population pressure is proportional to estuary health risk, which may not be appropriate for some actions. ▪ May not reflect the distribution or rural or semi-rural pressures on catchment health (e.g., agriculture)	26%	7%	8%	22%	24%	12%
C1	Weighted by the proportion of the legally defined CMP Study Area across each LGA.	Actions related to waterway and foreshore management – including as CPW or EPW	▪ Aligns funding with the geographic extent of waterways, foreshore, and sensitive environments. ▪ Suitable where area-based hazards (e.g., erosion, flooding) drive risk.	▪ Includes areas (e.g., NPWS land) where councils have no direct role in managing risks. ▪ May not fully capture differences between urban and rural risk drivers.	51%	6%	0.3%	9%	8%	26%
C2	Weighted by the proportion of the CMP Study Area excluding NPWS land tenure.	Actions related to waterway and foreshore management, which exclude NPWS estate	▪ Better aligns with actual council responsibilities by excluding public land outside council control.	▪ Still may not capture differences between urban and rural risk drivers. ▪ Private land contributions to risks (e.g., agriculture) remain under-represented.	46%	3%	0%	6%	10%	35%
C3	Weighted by the proportion of the Council managed foreshore within the CMP Study Area.	Actions related to waterway and foreshore management – specifically riparian restoration	▪ Aligns with extent of potential riparian restoration works	▪ Limited in application outside of riparian works	60.3%	3.4%	0.0%	22.3%	0.0%	14.0%

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6.5 Cost-Benefit Distribution

As per the CM Manual (OEH, 2018d), an analysis of the distribution of costs and benefits to the public authorities, other stakeholders and the environment is recommended when preparing a CMP. During the Options Assessments undertaken in Stage 3 (Water Technology, 2025), a multi-criteria analysis was undertaken in order to assess the direct and indirect impact of each potential option on identified threats, weighted towards the level of threat. None of the recommended actions aim to benefit private interests, although they may do so indirectly as a consequence of improved estuary health (e.g., to commercial businesses in the nearby area including tourism operators and hospitality).

There are no actions within the CMP that aim to directly benefit private interests. Therefore, no public-private cost sharing arrangements are required.

6.6 Business Plan

6.6.1 Overview

This CMP has been prepared in good faith, with the intent that all actions be delivered in line with the schedule outlined in the accompanying Business Case and Implementation Plan. The sequencing and timing of actions have been developed to align with the strategic objectives of the CMP and to promote a logical, staged implementation.

However, it is important to note that many actions are dependent on external funding sources – including competitive grant programs – which are inherently uncertain and subject to change. Delivery timeframes may also be influenced by the availability of Council resources, competing priorities identified in Council's Operational and Delivery Plans, and the operational budgets of relevant State Agencies. As such, the timing and delivery of actions may not occur exactly as outlined in this CMP.

The cost estimates contained within this plan are presented in FY2026 dollars and are intended as high level figures for strategic budgeting and forward planning purposes only. They exclude allowances for future inflation, escalation, and market variability. These estimates are not suitable for detailed design, construction, or procurement purposes, and should be regarded as indicative values only, with an expected tolerance of approximately plus or minus 30%.

Both cost estimates and delivery timeframes are subject to a range of risks, including adverse weather events, legislative or regulatory changes, shifts in market conditions, and fluctuations in the availability of suitably qualified contractors or materials. These factors may materially influence the scope, sequencing, and budget requirements for specific actions.

6.6.2 Summary of Costs

A summary breakdown of the costs associated with implementing this CMP is provided in Table 6-4, with cost for the associated catchment companion provided in Table 6-5. These tables summaries the combined commitments required from State Agencies and Partner Councils to deliver both river-wide and locally focused actions over the next decade. They demonstrate the scale of resources needed not only to address immediate management priorities, but also to build adaptive capacity for future challenges such as climate change and population growth. Delivery of the CMP is estimated to cost $75 Million (2025 dollars) over 10 years.

Table 6-4 Cost breakdown for CMP implementation

Certifiable CMP		Total 10-Year Funding Contributions							
		Total Cost	**NSW State Agencies**	**Central Coast Council**	**Northern Beaches Council**	**Ku-ring-gai Council**	**Hornsby Shire Council**	**The Hills Shire Council**	**Hawkesbury City Council**
Cost Breakdown by Implementation Plan	Collaborative System Implement Plan	$10,725,000	$7,283,333	$1,338,257	$485,153	$41,831	$704,362	$348,035	$524,029
	Local Implementation Plan: Central Coast Council	$39,622,500	$25,881,667	$13,740,833	$0	$0	$0	$0	$0
	Local Implementation Plan: Northern Beaches Council	$3,071,500	$2,047,667	$0	$1,023,833	$0	$0	$0	$0
	Local Implementation Plan: Ku-ring-gai Council	$0	$0	$0	$0	$0	$0	$0	$0
	Local Implementation Plan: Hornsby Shire Council	$12,455,000	$8,266,667	$0	$0	$0	$4,188,333	$0	$0
	Local Implementation Plan: The Hills Shire Council	$835,000	$556,667	$0	$0	$0	$0	$278,333	$0
	Local Implementation Plan: Hawkesbury City Council	$1,410,000	$840,000	$0	$0	$0	$0	$0	$570,000
	NPWS Implementation Plan	$6,950,000	$6,950,000	$0	$0	$0	$0	$0	$0
Total 10 Year Financial Commitment		$75,069,000	$51,826,000	$15,079,090	$1,508,987	$41,831	$4,892,695	$626,368	**$1,094,029**
Cost Breakdown by Type and Timing	Capital Costs	$57,147,500	$38,478,333	$13,347,027	$428,946	$3,333	$4,234,837	$202,667	$452,357
	Operational and Maintenance Costs	$17,921,500	$13,347,667	$1,732,063	$1,080,041	$38,498	$657,858	$423,701	$641,672
	Cost Total: Years 1 to 4	$31,054,750	$22,222,167	$5,036,098	$636,092	$16,944	$2,290,147	$343,230	$510,071
	Cost Total: Years 5 to 8	$20,097,250	$13,738,500	$2,822,251	$688,585	$13,333	$2,205,825	$193,344	$435,411
	Cost Total: Years 9 to 10	$23,917,000	$15,865,333	$7,220,741	$184,309	$11,553	$396,723	$89,794	$148,547

Table 6-5 Cost breakdown for catchment companion implementation (non-certifiable)

Catchment Companion		Total 10-Year Funding Contributions							
		Total Cost	**NSW State Agencies**	**Central Coast Council**	**Northern Beaches Council**	**Ku-ring-gai Council**	**Hornsby Shire Council**	**The Hills Shire Council**	**Hawkesbury City Council**
Cost Breakdown by Implementation Plan	Collaborative System Implement Plan	$1,620,000	$1,186,667	$168,971	$25,344	$16,667	$36,565	$51,077	$134,710
	Local Implementation Plan: Central Coast Council	$0	$0	$0	$0	$0	$0	$0	$0
	Local Implementation Plan: Northern Beaches Council	$45,000	$30,000	$0	$15,000	$0	$0	$0	$0
	Local Implementation Plan: Ku-ring-gai Council	$130,000	$86,667	$0	$0	$43,333	$0	$0	$0
	Local Implementation Plan: Hornsby Shire Council	$0	$0	$0	$0	$0	$0	$0	$0
	Local Implementation Plan: The Hills Shire Council	$0	$0	$0	$0	$0	$0	$0	$0
	Local Implementation Plan: Hawkesbury City Council	$500,000	$333,333	$0	$0	$0	$0	$0	$166,667
	NPWS Implementation Plan	$0	$0	$0	$0	$0	$0	$0	$0
Total 10 Year Financial Commitment		**$2,295,000**	**$1,636,667**	**$168,971**	**$40,344**	**$60,000**	**$36,565**	**$51,077**	**$301,376**
Cost Breakdown by Type and Timing	Capital Costs	$0	$0	$0	$0	$0	$0	$0	$0
	Operational and Maintenance Costs	$2,295,000	$1,636,667	$168,971	$40,344	$60,000	$36,565	$51,077	$301,376
	Cost Total: Years 1 to 4	$1,035,000	$736,667	$67,588	$25,138	$50,000	$14,626	$20,431	$120,551
	Cost Total: Years 5 to 8	$840,000	$600,000	$67,588	$10,138	$6,667	$14,626	$20,431	$120,551
	Cost Total: Years 9 to 10	$420,000	$300,000	$33,794	$5,069	$3,333	$7,313	$10,215	$60,275

6.6.3 Detailed Implementation Plan

The Business Plan for the HNRS CMP translates the recommended management actions into a practical, costed pathway for delivery. The following tables present a structured summary of responsibilities, forward cost estimates, and potential funding arrangements across the Collaborative System Implementation Plan, Local Implementation Plans, and Catchment Companions:

- Table 6-7 summarises the business plan for the Collaborative System Implement Plan.
- Table 6-8 summarises the business plan for the various Local Implementation Plans.
- Table 6-9 summarises the business plan for the various Catchment Companion.

These tables provides the following information:

- **Action ID and Name** – as per the action implementation plans in Section 5.
- **Responsibilities** – including the lead agency for implementation and any supporting agencies. Shorthand is applied in this table for Central Coast Council (CCC), Hawkesbury City Council (HCC), Hornsby Shire Council (HSC), Ku-ring-gai Council (KC), Northern Beaches Council (NBC), and The Hills Shire Council (THSC).
- **Forward cost estimates** – including capital costs, and ongoing implementation and maintenance costs. These costs have been discretised into four year bands to assist with broader alignment with Delivery Program (DP) periods of the Partner Council IP&R frameworks. Where an action would only require Council in-kind staff time, assets, and services, these are noted as "$0". Definitions for cost categories include:
  - Capital Costs: Expenditure incurred to acquire, construct, or significantly upgrade physical assets. In the CMP context, capital costs typically relate to planning, design, and construction of new infrastructure or major upgrades intended to provide long-term service capacity and resilience. These costs are generally one-off and accounted for as fixed assets.
  - Operational Costs: Recurrent expenditures associated with the routine operation of programs, systems, or assets. This includes staffing, administration, utilities, and other resource inputs required to maintain functional delivery of CMP initiatives. Operational costs are ongoing and do not directly extend the service life of an asset
  - Maintenance Costs: Expenditures required to preserve the functional condition and performance of an asset over its design life. Maintenance costs include inspections, servicing, repairs, and minor renewals undertaken to mitigate deterioration, sustain safety and compliance, and avoid premature capital replacement.
- **Potential funding mechanisms** – refer to Section 6.3.
- **Co-funding model -** for actions in the Collaborative System Implement Plan (see 6.4.2)

Table 6-6 Legend for Funding Sources in Table 6-7 to 6-9

#	Funding Source
1	Council Operational and Delivery Plan Process.
2	NSW Coasts and Estuary Grants Program.
3	NSW Marine Estate Management Strategy.
4	NPWS Operating Budget.
5	NEAP Program.

#	Funding Source
6	NSW Heritage Grants Program.
7	Environmental Trust Grants.
8	TfNSW / MIDO Grants.
9	NSW Local Government Recovery Grants Program
10	Landcare / Coastcare Grants.
11	Commonwealth Urban Rivers and Catchments Program

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Table 6-7 Business Plan – Certifiable CMP: Collaborative System Implement Plan

S4 ID	Locality	Action Name	Lead	Support	Total 10 Yr Cost	Capital Costs	Operational / Maintenance Costs	Costs Years 1 to 4	Costs Years 5 to 8	Costs Years 9-10	Funding Mechan-isms	PC Co-funding Model
S1.CMP.A	Estuary-Wide	Implement the CMPs formal governance partnership for the river system	CCC, NBC, HSC, KC, THSC, HCC	DCCEEW, NPWS, Sydney Water, DPIRD-Fisheries, DPHI-Crown Lands, TfNSW,	$1,500,000	$0	$1,500,000	$600,000	$600,000	$300,000	1	A
S1.CMP.B	Estuary-Wide	Develop and execute a communications plan for Stage 5 of the CMP	CCC, NBC, HSC, KC, THSC, HCC	DCCEEW	$0	$0	$0	$0	$0	$0	1, 2	A
S2.CMP.A	Estuary-Wide	HNRS Water Quality Monitoring - Data Aggregation and Reporting	DCCEEW, CCC, NBC, HSC, KC, THSC, HCC	Sydney Water	$0	$0	$0	$0	$0	$0	1, 2	A
S2.CMP.B	Estuary-Wide	HNRS Water Quality Monitoring - Implement a Coordinated Monitoring Program	DCCEEW, CCC, NBC, HSC, KC, THSC, HCC	N/A	$250,000	$0	$250,000	$100,000	$100,000	$50,000	1, 2	C1
S2.CMP.C	Estuary-Wide	Implement a bank stability and condition monitoring program across the estuary foreshores	CCC, NBC, HSC, THSC, HCC	DCCEEW, NPWS	$300,000	$0	$300,000	$120,000	$120,000	$60,000	1, 2	C2
S3.CMP.A	Estuary-Wide	Review and update Partner Council planning instruments for alignment of a consistent best practice approach to managing stormwater and downstream estuarine water quality	CCC, NBC, HSC, KC, THSC, HCC	DPHI-Planning and Assessment, Sydney Water	$60,000	$0	$60,000	$60,000	$0	$0	1	A
S3.CMP.B	Estuary-Wide	Review and update Partner Council planning instruments for coastal hazard risk planning controls every 10 years	CCC, NBC, HSC, KC, THSC, HCC	DPHI-Planning and Assessment	$0	$0	$0	$0	$0	$0	1	A
S3.CMP.C	Estuary-Wide	Encourage eco-friendly features in seawall development applications	CCC, NBC, HSC, KC, THSC, HCC	DCCEEW, DPIRD-Fisheries	$0	$0	$0	$0	$0	$0	1	A
S3.CMP.D	Estuary-Wide	Develop Intertidal Marine Vegetation Strategy for Hawkesbury River estuary	DPIRD-Fisheries	DCCEEW, NPWS, CCC, NBC, HSC, KC, THSC, HCC	$65,000	$0	$65,000	$65,000	$0	$0	1, 2, 3	N/A
S3.CMP.E	Estuary-Wide	Develop Foreshore Stabilisation and Rehabilitation Guidelines for the HNRS	CCC, NBC, HSC, KC, THSC, HCC	DCCEEW, DPIRD-Fisheries, DPHI-Crown Lands	$0	$0	$0	$0	$0	$0	1, 2	C2
S3.CMP.G	Estuary-Wide	Undertake a Planning Proposal to adopt a CVA	CCC, NBC, HSC	NPWS, DPHI-Planning and Assessment	$75,000	$0	$75,000	$75,000	$0	$0	1, 2	A
S3.CMP.H	Estuary-Wide	Collaborate with local universities and research institutions to establish a list of research priorities for the Hawkesbury-Nepean River System	CCC, NBC, HSC, KC, THSC, HCC	GS LLS	$0	$0	$0	$0	$0	$0	1, 2	A
S4.CMP.A	Estuary-Wide	Design and Implement a Community Engagement and Education Program to support the vision and objectives of the CMP	CCC, NBC, HSC, KC, THSC, HCC	NPWS, TfNSW, GS LLS	$500,000	$0	$500,000	$200,000	$200,000	$100,000	1, 2	A
S4.CMP.B	Estuary-Wide	Community education and outreach program for estuary frontage communities	CCC, NBC, HSC, THSC, HCC	DCCEEW, GS LLS	$250,000	$0	$250,000	$100,000	$100,000	$50,000	1, 2, 7	A
S4.CMP.D	Upper Estuary	Implementing a community-based carp fishing initiative	CCC, HCC, THSC, HSC	N/A	$250,000	$0	$250,000	$100,000	$100,000	$50,000	1, 2, 7	A
S4.CMP.E	Estuary-Wide	Hawkesbury River Marine Compliance & Education Campaign	NBC, CCC, HSC	TfNSW, NSW EPA	$500,000	$0	$500,000	$200,000	$200,000	$100,000	1, 2, 7	C2
S5.CMP.A	Estuary-Wide	Undertake a coordinated riparian rehabilitation works program across the River System	CCC, NBC, HSC, HCC	DCCEEW, DPHI-Planning and Assessment, GS LLS, NPWS, KC, THSC,	$1,000,000	$0	$1,000,000	$400,000	$400,000	$200,000	1, 2, 3, 7, 11	C3

S4 ID	Locality	Action Name	Lead	Support	Total 10 Yr Cost	Capital Costs	Operational / Maintenance Costs	Costs Years 1 to 4	Costs Years 5 to 8	Costs Years 9-10	Funding Mechan-isms	PC Co-funding Model
S5.CMP.B	Estuary-Wide	Continue to support landcare networks across the river system	CCC, NBC, HSC, HCC	GS LLS, KC, THSC,	$0	$0	$0	$0	$0	$0	1, 2, 7, 10	C3
S5.CMP.C	Estuary-Wide	Fencing of riparian foreshores on high risk agricultural lands	GS LLS	CCC, HCC, THSC	$500,000	$0	$500,000	$200,000	$200,000	$100,000	1, 2, 3	N/A
S6.CMP.A	Broken Bay, Pittwater	Activate the “Coastal Hazard Emergency Action Sub-Plans” (CZEAS) for each beach as required after storm events	CCC, NBC, HSC, NPWS	DCCEEW, NSW SES	$1,000,000	$0	$1,000,000	$400,000	$400,000	$200,000	1, 2	A
S6.CMP.B	Estuary-Wide	Develop a Tide Alert Calendar Tool for the low lying communities of the river system to encourage citizen science in monitoring tidal inundation	CCC, NBC, HSC,	DCCEEW	$200,000	$0	$200,000	$0	$160,000	$40,000	1, 2	C2
S7.CMP.A	Estuary-Wide	Prepare and implement an Environmental Tourism Strategy for the Hawkesbury River System	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	NPWS First Nations Groups	$60,000	$0	$60,000	$0	$0	$60,000	1, 3, 6	B
S8.CMP.A	Estuary-Wide	Engage First Nations teams where appropriate to undertake bush regeneration works including weeding and revegetation	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	GS LLS, NPWS	$1,000,000	$0	$1,000,000	$400,000	$400,000	$200,000	1, 2, 3, 5, 7, 11	A
S8.CMP.B	Estuary-Wide	Further develop and implement community education programs for awareness and appreciation of Indigenous cultural heritage	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	GS LLS, NPWS	$485,000	$0	$485,000	$185,000	$200,000	$100,000	1, 2, 3, 5, 6	A
S8.CMP.C	Estuary-Wide	Support cultural education and awareness of estuary health issues for First Nations Groups	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	GS LLS, NPWS	$500,000	$0	$500,000	$200,000	$200,000	$100,000	1, 2, 3, 5, 7	A
S8.CMP.D	Estuary-Wide	Develop a Hawkesbury heritage central display	CCC, NBC, HSC, THSC, HCC	First Nations Groups, KC	$60,000	$30,000	$30,000	$0	$0	$60,000	1, 6	A
S8.CMP.E	Estuary-Wide	Identify opportunities for, and undertake cultural land management practices, including cultural burning	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	NPWS, RFS, GS LLS,	$50,000	$0	$50,000	$50,000	$0	$0	1, 2, 3, 5, 7, 11	C1
S8.CMP.F	Estuary-Wide	Engage with local First Nations Groups to protect and preserve cultural heritage items across the coastal zone	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	NPWS	$2,000,000	$2,000,000	$0	$800,000	$800,000	$400,000	1, 2, 3, 5, 6, 11	C3
S8.CMP.G	Estuary-Wide	Identify locations for cultural connections across the HNRS	First Nations Groups, CCC, NBC, HSC, KC, THSC, HCC	NPWS	$120,000	$60,000	$60,000	$60,000	$40,000	$20,000	1	A

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Table 6-8 Business Plan – Certifiable CMP: Local Implementation Plans

S4 ID	Locality	Action Name	Lead	Support	Total 10 Yr Cost	Capital Costs	Operational & Maintenance Costs	Costs Years 1 to 4	Costs Years 5 to 8	Costs Years 9-10	Funding Mechanisms
Local Implementation Plan: Hawkesbury City Council LGA											
S3.HCC.A	LGA Wide	Write a specific WSUD chapter in Hawkesbury City Council DCP	HCC	N/A	$0	$0	$0	$0	$0	$0	1
S3.HCC.B	LGA Wide	Environmental Conservation zoning for coastal wetland areas	HCC	DPHI-Planning and Assessment	$0	$0	$0	$0	$0	$0	1,2
S4.HCC.A	LGA Wide	Establish an environmental program for Agricultural Operators across the Hawkesbury LGA	HCC	WSU, GS LLS, Sydney Water	$250,000	$0	$250,000	$100,000	$100,000	$50,000	1,2,3
S5.HCC.A	LGA Wide	Supporting private landowners to undertake best practice management of their riparian zones	HCC	GS LLS	$0	$0	$0	$0	$0	$0	1,2,7
S5.HCC.B	LGA Wide	Continue Council's Yabby Trap Round-Up Program	HCC	N/A	$200,000	$0	$200,000	$80,000	$80,000	$40,000	1,2
S6.HCC.A	Cumberland Reach	Coastal Protection Works at Holmes Drive Reserve	HCC	DCCEEW	$300,000	$300,000	$0	$300,000	$0	$0	1,2
S6.HCC.B	Sackville	Coastal Protection Works at Churchills Wharf Reserve	HCC	DCCEEW	$280,000	$280,000	$0	$280,000	$0	$0	1,2
S6.HCC.C	Ebenezer	Provide technical advice to utilities providers regarding infrastructure risk at Argyle Bailey Memorial Reserve	HCC	N/A	$0	$0	$0	$0	$0	$0	1,2
S6.HCC.D	Windsor	Coastal Protection Works Investigation and Design: The Terrace, Windsor	HCC	DCCEEW	$150,000	$0	$150,000	$150,000	$0	$0	1,2
S6.HCC.E	Windsor	Coastal Protection Works at Governor Phillip Park	HCC	DCCEEW	$80,000	$20,000	$60,000	$0	$80,000	$0	1,2,7
Local Implementation Plan: The Hills Shire Council LGA											
S7.HCC.A	Pitt Town	Punt Road Public Boat Ramp - Upgrade Feasibility Study	HCC	N/A	$150,000	$150,000	$0	$0	$150,000	$0	1,2,8
S6.THC.A	Lower Portland	Implement the outcomes of the Blundells Swamp Inundation Mitigation Study	THSC	DCCEEW	$55,000	$0	$55,000	$55,000	$0	$0	1,2
S6.THC.B	Wisemans Ferry	Coastal Protection Works at Wisemans Ferry	THSC	DCCEEW	$230,000	$230,000	$0	$230,000	$0	$0	1,2
S6.THC.C	Wisemans Ferry	Coastal Protection Works at Webbs Creek Ferry Foreshore	THSC	DCCEEW	$150,000	$150,000	$0	$150,000	$0	$0	1,2
S6.THC.D	Leets Vale	Erosion investigation and design at River Road, Leets Vale	THSC	DCCEEW	$200,000	$0	$200,000	$200,000	$0	$0	1,2,9
S6.THC.E	Lower Portland	Coastal Protection Works at River Road, Lower Portland	THSC	DCCEEW	$200,000	$200,000	$0	$0	$200,000	$0	1,2
Local Implementation Plan: Hornsby Shire Council LGA											
S5.HSC.A	Parsley Bay	Installation of Stormwater Quality Improvement Devices at Parsley Bay	HSC	DCCEEW	$500,000	$500,000	$0	$500,000	$0	$0	1,2

S4 ID	Locality	Action Name	Lead	Support	Total 10 Yr Cost	Capital Costs	Operational & Maintenance Costs	Costs Years 1 to 4	Costs Years 5 to 8	Costs Years 9-10	Funding Mechanisms
S5.HSC.B	Brooklyn	Installation of Stormwater Quality Improvement Devices at The Gateway	HSC	DCCEEW	$500,000	$500,000	$0	$500,000	$0	$0	1,2
S5.HSC.C	Brooklyn	Installation and upgrade of Stormwater Quality Improvement Devices at Brooklyn Park	HSC	DCCEEW	$530,000	$530,000	$0	$530,000	$0	$0	1,2
S6.HSC.A	Parsley Bay	Repair and Renewal of the Parsley Bay Breakwater (Coastal Protection Works)	HSC	DCCEEW	$2,750,000	$2,750,000	$0	$0	$2,750,000	$0	1,2,8
S6.HSC.B	Parsley Bay	Repair and renewal of the Loading Dock Access Road Coastal Protection Works	HSC	DCCEEW	$1,250,000	$1,250,000	$0	$0	$1,250,000	$0	1,2
S6.HSC.C	Brooklyn	Brooklyn Road Sea Level Rise Adaptation Planning	HSC	DCCEEW	$150,000	$150,000	$0	$0	$0	$150,000	1
S6.HSC.D	Brooklyn	Coastal Protection Works at Wharf Street	HSC	DCCEEW	$350,000	$350,000	$0	$0	$350,000	$0	1,2
S6.HSC.E	Bar Island	Repair and renewal of the Bar Island jetty Coastal Protection Works	HSC	DCCEEW	$310,000	$310,000	$0	$310,000	$0	$0	1,2
S6.HSC.F	Dangar Island	Bradleys Beach Coastal Protection Works	HSC	DCCEEW	$170,000	$0	$170,000	$170,000	$0	$0	1,2,7
S6.HSC.G	Dangar Island	Repair and renewal of Coastal Protection Works from Brooklyn to Parsley Bay	HSC	DCCEEW	$1,330,000	$1,330,000	$0	$1,330,000	$0	$0	1,2
S7.HSC.A	Parsley Bay	Parsley Bay Loading Dock Upgrade	HSC	N/A	$1,400,000	$1,400,000	$0	$1,400,000	$0	$0	1,2
S7.HSC.B	Parsley Bay	Upgrade of public pontoons at Parsley Bay	HSC	N/A	$380,000	$380,000	$0	$380,000	$0	$0	1,2,8
S7.HSC.C	Brooklyn	Upgrade of McKell Park Tidal Pool	HSC	N/A	$560,000	$560,000	$0	$0	$0	$560,000	1,2
S7.HSC.D	Brooklyn	Design and install boardwalk from Brooklyn Public Wharf to Lower McKell Park	HSC	DCCEEW	$850,000	$850,000	$0	$0	$850,000	$0	1,2
S7.HSC.E	Brooklyn	Bayden Powell Avenue Dinghy and Foreshore Access improvement	HSC	N/A	$200,000	$200,000	$0	$0	$200,000	$0	1,2
S7.HSC.F	Brooklyn	Cost-Benefit Assessment of Kangaroo Point Pumpout Pontoon	HSC	N/A	$55,000	$0	$55,000	$55,000	$0	$0	1,2,8
S7.HSC.G	Dangar Island	Dangar Island Loading Dock Upgrade	HSC	N/A	$770,000	$770,000	$0	$770,000	$0	$0	1,2
S7.HSC.H	Wisemans Ferry	Upgrade of the Wisemans Ferry old public wharf	HSC	N/A	$400,000	$400,000	$0	$0	$400,000	$0	1,2
Local Implementation Plan: Central Coast Council LGA											
S2.CCC.A	Broken Bay Beaches	Develop and implement a Broken Bay Coastal Monitoring Program	CCC	DCCEEW	$250,000	$0	$250,000	$100,000	$100,000	$50,000	1,2
S2.CCC.B	Broken Bay Brisbane Water	Develop and implement a program for regular and ongoing monitoring of public coastal assets and infrastructure	CCC	N/A	$0	$0	$0	$0	$0	$0	1
S2.CCC.C	Green Point Creek Ettalong Creek	Install permanent water level gauges at key locations within Brisbane Water and Broken Bay	CCC	DCCEEW	$60,000	$60,000	$0	$0	$60,000	$0	1,2

S4 ID	Locality	Action Name	Lead	Support	Total 10 Yr Cost	Capital Costs	Operational & Maintenance Costs	Costs Years 1 to 4	Costs Years 5 to 8	Costs Years 9-10	Funding Mechanisms
	Pearl Beach Lagoon										
S3.CCC.A	Brisbane Water	Environmental Conservation zoning for coastal wetland areas	CCC	DPHI-Planning and Assessment	$0	$0	$0	$0	$0	$0	1,2
S3.CCC.B	Hardys Bay	Implement the Hardys Bay Foreshore Master Plan	CCC	N/A	$500,000	$500,000	$0	$500,000	$0	$0	1,2
S3.CCC.C	Phegans Bay	Implement the Phegans Bay Waterfront Foreshore Master Plan	CCC	N/A	$500,000	$500,000	$0	$500,000	$0	$0	1,2
S3.CCC.D	Brisbane Water	Undertake a Planning Proposal to update RH SEPP Coastal Wetlands Mapping for Brisbane Water	CCC	DPHI-Planning and Assessment	$0	$0	$0	$0	$0	$0	1,2
S3.CCC.E	LGA Wide	Review and update Council's Development Control Plan	CCC	DPHI-Planning and Assessment	$0	$0	$0	$0	$0	$0	1
S3.CCC.F	LGA Wide	Compliance auditing of private development encroachment onto public land	CCC	N/A	$0	$0	$0	$0	$0	$0	1
S3.CCC.G	LGA Wide	Investigate opportunities to purchase saltmarsh areas for incorporation into Council's reserve system.	CCC	N/A	$0	$0	$0	$0	$0	$0	1
S5.CCC.A	Brisbane Water	Water Quality Improvement Plan for Brisbane Water	CCC	DCCEEW	$250,000	$0	$250,000	$250,000	$0	$0	1,2,3,11
S5.CCC.B	Woy Woy	Investigate the feasibility of Naturalisation of the Austin Butler Drainage Channel	CCC	DCCEEW	$40,000	$0	$40,000	$0	$0	$40,000	1,2,11
S5.CCC.C	Estuary-Wide	Implement a wetland monitoring, management and restoration program	CCC	DCCEEW	$35,000	$0	$35,000	$35,000	$0	$0	1,2,3,7,11
S5.CCC.D	Davistown	Green and Golden Bell Frog Key Population Management Plan	CCC	DCCEEW	$25,000	$0	$25,000	$25,000	$0	$0	1,2,3,7,11
S6.CCC.A	Green Point	Coastal Protection Works at Bayside Drive Reserve	CCC	DCCEEW	$1,406,250	$1,406,250	$0	$1,406,250	$0	$0	1,2
S6.CCC.B	Green Point	Coastal Protection Works at Edgewater Avenue Reserve	CCC	DCCEEW	$2,500,000	$2,500,000	$0	$2,500,000	$0	$0	1,2
S6.CCC.C	Davistown	Coastal Protection Works at Illoura Reserve	CCC	DCCEEW	$656,250	$656,250	$0	$0	$656,250	$0	1,2
S6.CCC.D	Koolewong	Coastal Protection Works at Lara Street	CCC	DCCEEW	$2,187,500	$2,187,500	$0	$0	$2,187,500	$0	1,2
S6.CCC.E	Phegans Bay	Coastal Protection Works at Phegans Bay Road	CCC	DCCEEW, DPHI-Crown Lands,	$1,187,500	$1,187,500	$0	$0	$1,187,500	$0	1,2
S6.CCC.F	Booker Bay	Coastal Protection Works at Rip Road Reserve	CCC	DCCEEW	$625,000	$625,000	$0	$625,000	$0	$0	1,2
S6.CCC.G	Hardys Bay	Coastal Protection Works at the Hardys Bay extension wharf	CCC	DCCEEW	$375,000	$375,000	$0	$0	$375,000	$0	1,2
S6.CCC.H	Hardys Bay	Investigate the potential inclusion of RSL Creek and Mudflat Creek in the Central Coast Council Priority Creek Program	CCC	N/A	$0	$0	$0	$0	$0	$0	1,2
S6.CCC.I	Hardys Bay	Coastal Protection Works at Araluen Drive Reserve	CCC	DCCEEW	$1,125,000	$1,125,000	$0	$1,125,000	$0	$0	1,2

S4 ID	Locality	Action Name	Lead	Support	Total 10 Yr Cost	Capital Costs	Operational & Maintenance Costs	Costs Years 1 to 4	Costs Years 5 to 8	Costs Years 9-10	Funding Mechanisms
S6.CCC.J	Pretty Beach	Coastal Protection Works at Pretty Beach Road	CCC	DCCEEW	$1,937,500	$1,937,500	$0	$1,937,500	$0	$0	1,2
S6.CCC.K	Wagstaffe	Coastal Protection Works at Wagstaffe Wharf	CCC	DCCEEW	$125,000	$125,000	$0	$0	$125,000	$0	1,2
S6.CCC.L	Ettalong	Repair and renewal of the Lance Webb Reserve Coastal Protection Works	CCC	DCCEEW	$2,437,500	$2,437,500	$0	$2,437,500	$0	$0	1,2
S6.CCC.M	Ettalong	Ettalong Beach Foreshore Stabilisation Investigation	CCC	DCCEEW, DPHI-Crown Lands,	$65,000	$0	$65,000	$0	$65,000	$0	1,2
S6.CCC.N	Umina Beach	Prepare and Implement a Broken Bay Beach Nourishment Framework	CCC	DCCEEW, TfNSW	$205,000	$0	$205,000	$85,000	$80,000	$40,000	1,2
S6.CCC.O	Umina Beach	Implement the Umina-Ocean Beach Erosion Management Strategy	CCC	DCCEEW	$19,500,000	$19,500,000	$0	$0	$0	$19,500,000	1,2
S6.CCC.P	Umina Beach	Monitoring and improvement of coastal stormwater outlets	CCC	N/A	$0	$0	$0	$0	$0	$0	1,2
S6.CCC.Q	Pearl Beach	Coastal Protection Works at Pearl Beach	CCC	DCCEEW, DPHI-Crown Lands,	$50,000	$0	$50,000	$50,000	$0	$0	1,2
S6.CCC.R	Patonga	Repair and renewal of Patonga Coastal Protection Works	CCC	DCCEEW	$480,000	$480,000	$0	$480,000	$0	$0	1,2
S6.CCC.S	Patonga	Patonga Sand Management Plan	CCC	DCCEEW	$80,000	$0	$80,000	$0	$80,000	$0	1,2
S6.CCC.T	Patonga	Repair and renewal of the Patonga Creek Coastal Protection Works	CCC	DCCEEW	$285,000	$285,000	$0	$285,000	$0	$0	1,2
S6.CCC.U	Patonga	Patonga Levee Feasibility Investigation and Design	CCC	DCCEEW	$65,000	$0	$65,000	$0	$65,000	$0	1,2
S6.CCC.V	Broken Bay Beaches	Review and implement updated Beach Maintenance Program	CCC	DCCEEW	$550,000	$0	$550,000	$250,000	$200,000	$100,000	1,2
S6.CCC.W	Broken Bay Beaches	Develop and implement a coastal vegetation and dune management strategy	CCC	DCCEEW	$350,000	$0	$350,000	$140,000	$140,000	$70,000	1,2,7,10
S6.CCC.X	Broken Bay	Implement recommendations from Gosford Lagoons & Creek Entrance Management Review (Salients 2017) for Green Point Creek, Pearl Beach Lagoon and Ettalong Creek.	CCC	DCCEEW	$0	$0	$0	$0	$0	$0	1,2
S7.CCC.A	Gosford	Support the Gosford Foreshore Masterplan	CCC	DCCEEW, Hunter Central Coast Development Corporation (HCCDC)	$0	$0	$0	$0	$0	$0	1,2
S7.CCC.B	Ocean Beach	Construction of an all-abilities beach access point at Ocean Beach SLSC	CCC	N/A	$20,000	$20,000	$0	$0	$20,000	$0	1,2
S7.CCC.C	Patonga	Develop and implement a foreshore masterplan for Patonga Creek	CCC	N/A	$250,000	$250,000	$0	$0	$250,000	$0	1,2
S7.CCC.D	Pearl Beach	Feasibility Investigation: Ambulant Access at Pearl Beach Rock Pool Access	CCC	N/A	$0	$0	$0	$0	$0	$0	1,2

S4 ID	Locality	Action Name	Lead	Support	Total 10 Yr Cost	Capital Costs	Operational & Maintenance Costs	Costs Years 1 to 4	Costs Years 5 to 8	Costs Years 9-10	Funding Mechanisms
S7.CCC.E	Broken Bay Beaches	Prioritise and upgrade beach life guard patrol towers and ancillary structures	CCC	N/A	$250,000	$0	$250,000	$100,000	$100,000	$50,000	1,2
S7.CCC.F	Broken Bay Beaches	Review waste collection assets and servicing in coastal public spaces	CCC	N/A	$0	$0	$0	$0	$0	$0	1
S7.CCC.G	LGA Wide	Prepare Central Coast Council Dinghy Management Plan	CCC	N/A	$0	$0	$0	$0	$0	$0	1
S7.CCC.H	Spencer	Develop and implement a foreshore masterplan for Spencer	CCC	N/A	$400,000	$400,000	$0	$0	$400,000	$0	1,2
S7.CCC.I	Estuary-Wide	Undertake strategic upgrades of Council owned boat ramps in Brisbane Water	CCC	TfNSW	$750,000	$750,000	$0	$250,000	$250,000	$250,000	1,8
S7.CCC.J	Estuary-Wide	Implement the St Huberts Island Canals maintenance program	CCC	N/A	$50,000	$0	$50,000	$0	$0	$50,000	1,2
S8.CCC.A	Entrance channel	Identify the location and condition of ship wrecks near the old bar via a maritime archaeological survey.	CCC		$50,000	$0	$50,000	$0	$0	$50,000	1,6
Local Implementation Plan: Northern Beaches Council LGA											
S2.NBC.A	Pittwater-wide	Install a CoastSnap Camera Cradles at strategic locations across the LGA foreshore	NBC	DCCEEW	$100,000	$100,000	$0	$40,000	$40,000	$20,000	1,2
S2.NBC.B	Pittwater-wide	Develop and Implement a Pittwater Beach Monitoring Program	NBC	DCCEEW, NPWS	$300,000	$0	$300,000	$120,000	$120,000	$60,000	1,2
S2.NBC.C	Pittwater, Cottage Point	Install permanent tide gauges at strategic locations around the waterway	NBC	DCCEEW	$40,000	$40,000	$0	$0	$40,000	$0	1,2
S2.NBC.D	Pittwater-wide	Develop and implement a program for regular and ongoing monitoring of public coastal assets and infrastructure	NBC	N/A	$0	$0	$0	$0	$0	$0	1
S3.NBC.A	Pittwater-wide	Develop and update coastal hazard information	NBC	N/A	$50,000	$0	$50,000	$0	$50,000	$0	1,2
S3.NBC.B	Pittwater-wide	Update planning certificates with coastal hazard information	NBC	DPHI-Planning and Assessment	$0	$0	$0	$0	$0	$0	1
S3.NBC.C	Pittwater-wide	Develop planning controls to ensure buildings are sited and designed to consider coastal hazard information including coastal erosion and estuarine inundation.	NBC	DPHI-Planning and Assessment	$0	$0	$0	$0	$0	$0	1
S3.NBC.D	Pittwater-wide	Long Term Adaptation Plan for Coastal Assets and Infrastructure	NBC	N/A	$150,000	$0	$150,000	$0	$150,000	$0	1,2
S5.NBC.A	Careel Bay	Naturalisation of Careel Creek: Design and Implementation	NBC	DCCEEW	$800,000	$800,000	$0	$160,000	$640,000	$0	1,2,11
S5.NBC.B	Careel Bay	Upgrade the Careel Bay litter trap	NBC	N/A	$150,000	$150,000	$0	$150,000	$0	$0	1,2,7,11
S6.NBC.A	Station Beach	Coastal Protection Works at Station Beach	NBC	DCCEEW	$177,500	$0	$177,500	$117,500	$40,000	$20,000	1,2,7
S6.NBC.B	Sand Point Beach	Coastal Protection Works at the western end of Sand Point Beach	NBC	DCCEEW	$160,000	$0	$160,000	$64,000	$64,000	$32,000	1,2
S6.NBC.C	Sand Point Beach	Coastal Protection Works along Sand Point Beach	NBC	DCCEEW	$80,000	$0	$80,000	$80,000	$0	$0	1,2,7

S4 ID	Locality	Action Name	Lead	Support	Total 10 Yr Cost	Capital Costs	Operational & Maintenance Costs	Costs Years 1 to 4	Costs Years 5 to 8	Costs Years 9-10	Funding Mechanisms
S6.NBC.D	Careel Bay	Investigate the feasibility of channel maintenance works within Careel Bay and Careel Creek	NBC	DCCEEW	$200,000	$0	$200,000	$80,000	$80,000	$40,000	1,2
S6.NBC.E	Clareville Beach	Coastal Protection Works at Clareville Beach Reserve	NBC	DCCEEW	$62,500	$0	$62,500	$0	$62,500	$0	1,2,7
S6.NBC.F	Bayview	Coastal Protection Works at Bayview Park foreshore	NBC	DCCEEW	$33,000	$0	$33,000	$0	$0	$33,000	1,2,7
S6.NBC.G	Currawong Beach	Coastal Protection Works at Currawong Beach	NBC	DCCEEW	$98,500	$0	$98,500	$0	$98,500	$0	1,2,7
S6.NBC.H	Great Mackerel Beach	Great Mackerel Beach Foreshore Master Plan	NBC	DCCEEW	$340,000	$100,000	$240,000	$280,000	$40,000	$20,000	1,2
S6.NBC.I	Pittwater-wide	Provide coastal hazard risk information to public asset owners	NBC	NPWS	$0	$0	$0	$0	$0	$0	1
S6.NBC.J	Pittwater-wide	Pittwater dredging and beach nourishment feasibility investigation	NBC	DCCEW, NPWS	$250,000	$0	$250,000	$250,000	$0	$0	1,2
S6.NBC.K	Northern Estuary	Pittwater Wave Climate Study	NBC	DCCEEW	$80,000	$0	$80,000	$0	$80,000	$0	1,2
S7.NBC.A	Pittwater-wide	Upgrade and repair of waterway access points	NBC	N/A	$0	$0	$0	$0	$0	$0	1,8
S7.NBC.B	Sand Point	Boat Ramp repair and upgrade	NBC	TfNSW	$0	$0	$0	$0	$0	$0	1,8
Local Implementation Plan: NPWS											
S6.NPW.A	Station Beach	North Station Beach Coastal Protection Works - Sand Redistribution and Dune Building	NPWS	NBC, DPHI-Crown Lands	$114,000	$0	$114,000	$72,000	$0	$42,000	4
S6.NPW.B	The Basin	The Basin Coastal Protection Works - Sand Redistribution Program	NPWS	DPHI-Crown Lands	$350,000	$0	$350,000	$290,000	$0	$60,000	4
S6.NPW.C	Bobbin Head	Bobbin Head Foreshore Sea Level Rise Adaptation Study	NPWS	N/A	$300,000	$0	$300,000	$0	$300,000	$0	4
S6.NPW.D	Bobbin Head	Bobbin Head hydrodynamic assessment	NPWS	KC	$300,000	$0	$300,000	$300,000	$0	$0	4
S6.NPW.E	Apple Tree Bay	Repair and renewal of the Bobbin Head Coastal Protection Works	NPWS	N/A	$3,000,000	$3,000,000	$0	$3,000,000	$0	$0	4
S6.NPW.F	Coasters Retreat, Marramarra Creek, Cowan Creek, Gentlemans Halt, Berowra Creek, Mooney Mooney	Coastal Protection works for NPWS Bank Erosion Hotspot Sites	NPWS	DPHI-Crown Lands	$2,886,000	$0	$2,886,000	$1,165,000	$1,321,000	$400,000	4,5

Table 6-9 Business Plan – Catchment companion (non-certifiable)

S4 ID	Locality	Action Name	Lead	Support	Total 10 Yr Cost	Capital Costs	Operational & Maintenance Costs	Costs Years 1 to 4	Costs Years 5 to 8	Costs Years 9-10	Funding Mechanisms
S2.CMP.D	Upper catchments	Implement a bank stability and condition monitoring program across the creeks and waterways of the catchment	CCC, NBC, HSC, KC, THSC, HCC	DCCEEW, NPWS	$300,000	$0	$300,000	$120,000	$120,000	$60,000	1,2
S3.CMP.F	Ku-ring-gai Chase National Park	Support the proposal for the development of the Ku-ring-gai GeoRegion	KC, HSC, NBC	N/A	$0	$0	$0	$0	$0	$0	1
S4.CMP.C	Estuary-Wide	Develop and implement a Hawkesbury River school environmental education program focused on water quality, estuary health, and coastal hazards	NSW Department of Education	CCC, NBC, HSC, KC, THSC, HCC, First Nations Groups, GS LLS	$320,000	$0	$320,000	$140,000	$120,000	$60,000	12
S5.CMP.D	Estuary-Wide	Undertake a coordinated creek rehabilitation works program across the Partner Council's upper catchment waterways	CCC, NBC, HSC, KC, THSC, HCC	DPHI-Planning and Assessment, GS LLS	$1,000,000	$0	$1,000,000	$400,000	$400,000	$200,000	1,2,3,7,10,11
S5.HCC.C	Richmond	Implement the recommendations of the Hawkesbury Floodplain Drainage Review	HCC	N/A	$500,000	$0	$500,000	$200,000	$200,000	$100,000	1,2,9
S4.KRG.A	LGA Wide	Support Community Engagement undertaken as part of the Ku-ring-gai Council – Water Sensitive City Strategy	KC	N/A	$20,000	$0	$20,000	$20,000	$0	$0	1,2,7
S5.KRG.A	Cowan Creek	Prepare and implement a catchment study and management plan for the Cowan Creek catchment	KC	NPWS	$65,000	$0	$65,000	$65,000	$0	$0	1,2
S5.KRG.B	Cowan Creek	Update the catchment studies for Ku-ring-gai Creek and Lovers Jump Creek	KC	N/A	$45,000	$0	$45,000	$45,000	$0	$0	1,2
S5.NBC.C	Careel Bay	Investigate WSUD solutions within the Careel Creek Drainage catchment.	NBC	DCCEEW	$45,000	$0	$45,000	$45,000	$0	$0	1,2,11

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7 WHETHER THE CMP IDENTIFIES RECOMMENDED CHANGES TO THE RELEVANT PLANNING CONTROLS, INCLUDING ANY PROPOSED MAPS

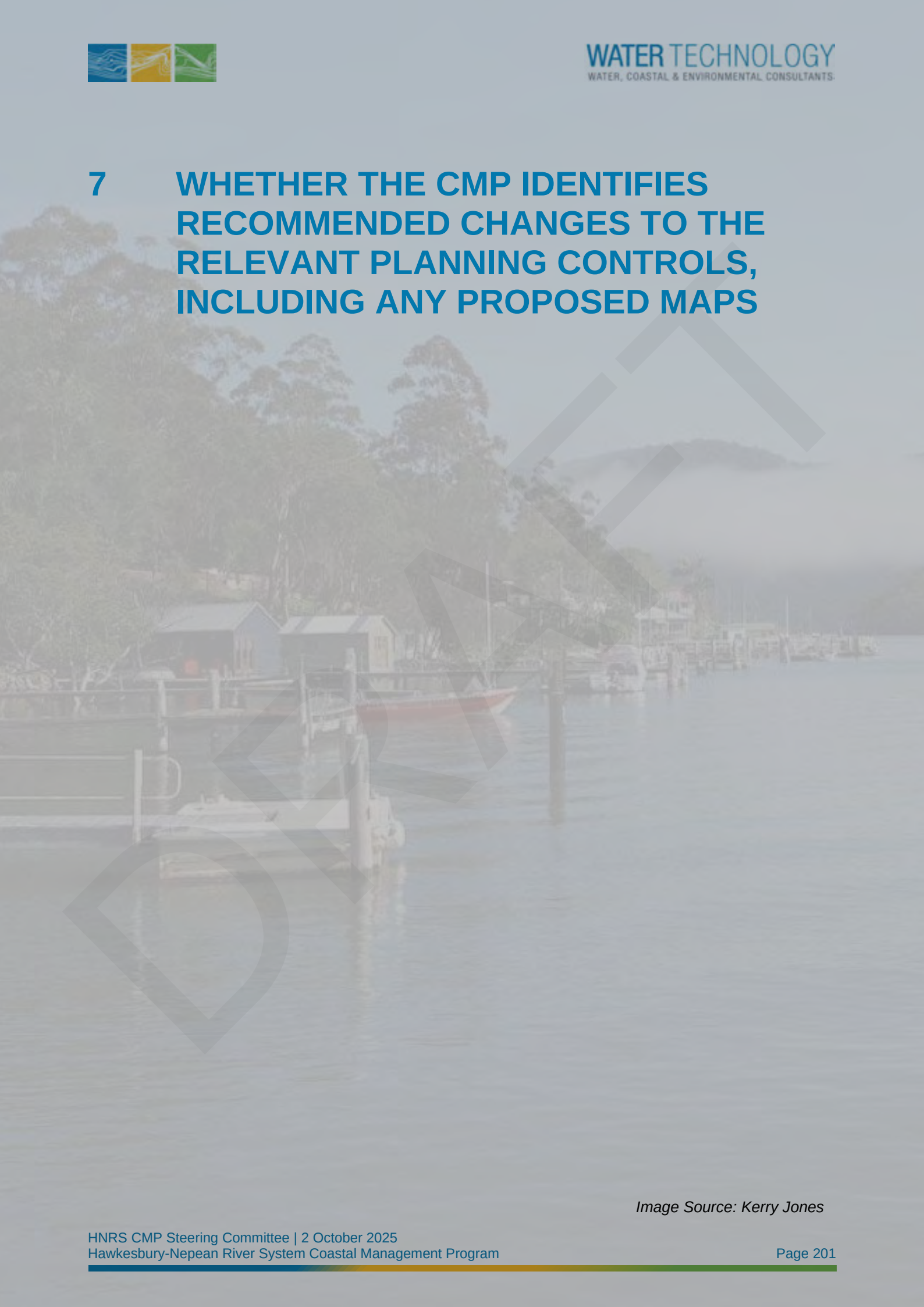


Image Source: Kerry Jones

7.1 Overview

There are 2 specific actions identified in this CMP that relate to updating and amending the R&H SEPP coastal management area (CMA) mapping across the HNRS. These updates are necessary to:

- Incorporate the latest technical studies, coastal hazard mapping, and coastal wetland mapping
- Address gaps in current R&H SEPP mapping coverage
- Support long-term land use planning and risk management across multiple LGAs.

The following sections summarise the recommended updates relating to Coastal Vulnerability Area (CVA) mapping and Coastal Wetland (CW) mapping.

7.2 CVA Mapping

At present, no R&H SEPP CVA mapping exists for the HNRS. To address this, each of the 3 Partner Councils significantly impacted by coastal hazards - Central Coast Council, Northern Beaches Council, and Hornsby Shire Council - intend to prepare planning proposals seeking adoption of CVA mapping within their LGAs.

The CVA mapping may be comprised of a combination of the following hazards within each LGA, which are identified in the CM Act:

- Beach erosion
- Shoreline recession
- Estuary entrance instability
- Coastal cliff and slope instability
- Coastal inundation
- 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.

This is outlined in Action ***S3.CMP.G Undertake a Planning Proposal to adopt a R&H SEPP CVA***. This process is summarised in Table 7-1 which outlines the technical basis for the proposed CVA updates, and opportunities for Northern Beaches and Central Coast Councils to coordinate planning proposals within their LGAs to include the outputs of other relevant neighbouring CMPs.

Table 7-1 CVA mapping updates – technical basis and potential alignment with other CMPs

Council	Technical Basis	Alignment with other CMPs
Central Coast Council	▪ Coastal Inundation Mapping from the Hawkesbury River Estuary Coastal Inundation Study (Rhelm and Baird, 2023) ▪ Beach Erosion, Coastal Inundation, and Geotechnical Slope Instability Mapping from the Open Coast and Coastal Lagoons Coastal Hazard Assessment (Bluecoast Consulting Engineers, 2024)	Potential to combine with hazard mapping from all CMPs within the LGA to prepare a single CVA planning proposal – including: ▪ The Open Coast Central Coast Open Coast CMP ▪ The Tuggerah Lakes CMP ▪ The Central Coast Lagoons CMP ▪ The Lake Macquarie CMP

Council	Technical Basis	Alignment with other CMPs
Northern Beaches Council	▪ Coastal Inundation Mapping from the Hawkesbury River Estuary Coastal Inundation Study (Rhelm and Baird, 2023) ▪ Pittwater Beach Erosion and Shoreline Recession Assessment (WRL, 2023)	Potential to combine with hazard mapping from all CMPs within the LGA to prepare a single CVA planning proposal – including: ▪ The Northern Beaches Open Coast CMP ▪ The Collaroy-Narrabeen CMP
Hornsby Shire Council	▪ Coastal Inundation Mapping from the Hawkesbury River Estuary Coastal Inundation Study (Rhelm and Baird, 2023)	N/A

7.3 Coastal Wetland Mapping

In addition to CVA mapping, this CMP recommends updating R&H SEPP Coastal Wetland Mapping for Brisbane Water within the Central Coast Council LGA. This recommendation is captured under Action ***S3.CCC.D Undertake a Planning Proposal to update R&H SEPP Coastal Wetlands Mapping for Brisbane Water***.

This update would be based on the mapping provided in the *Brisbane Waters Coastal Wetland Mapping* study (ELA, 2022), which provides contemporary mapping of wetland boundaries and ecological values.

To improve efficiency and reduce administrative burden, this planning proposal could:

- Be submitted in conjunction with the CVA planning proposal (Action S3.CMP.G), or
- Be combined with any future CMA mapping proposals arising from other CMPs within the Central Coast LGA.

A coordinated approach would streamline the planning proposal process while delivering consistent, up-to-date mapping across multiple CMP study areas.

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Figure 7-1 Coastal Wetlands located in Brisbane Water at Empire Bay (top) and Bensville (bottom) (source: Chris Drummond)

8 MONITORING, EVALUATION, AND REPORTING PROGRAM

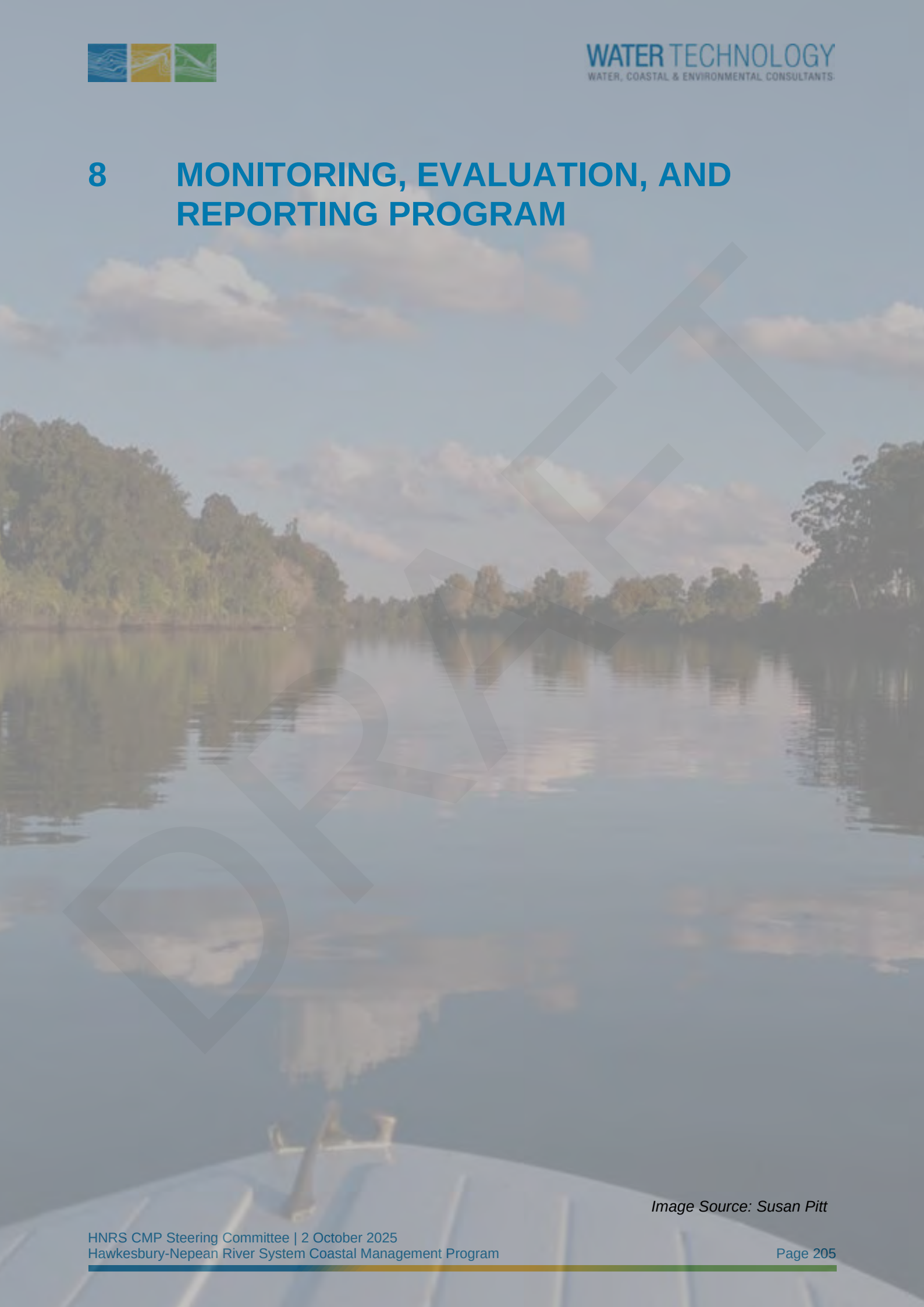


Image Source: Susan Pitt

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8.1 Purpose and Approach

Monitoring, evaluation, and reporting (MER) for the CMP is both a mandatory requirement of the CM Act, and a critical tool to assess the performance of the CMP in achieving its intended outcomes over the short, medium, and long term (OEH, 2018f). The purpose of the MER is to enable:

- Accountability – to track progress in implementing the CMP's management actions
- Performance assessment - assessing whether actions achieve their intended objectives
- Adaptive management - using evidence to refine future actions and priorities.

The MER framework for this CMP has been designed to be fit-for-purpose, systematic, and pragmatic. It follows the "Program Logic Model" approach, that links CMP management actions with outputs, intermediate impacts and longer-term outcomes. The program logic model supports a systematic and integrated approach to CMP planning, implementation, and evaluation. There is a logical flow to this process, which is summarised in Figure 6-1 below and contains three key elements described in Table 8-1.

Table 8-1 Components of the HNRS CMP MER Program

Component	Purpose	Key Evaluation Questions
Component 1: Implementation status	Tracks whether CMP management actions are being delivered as planned and on schedule.	▪ Have actions been implemented in accordance with the implementation plan?
Component 2: Environmental Outcomes	Monitors key environmental and social indicators to assess whether CMP actions are improving estuary health and values.	▪ Has the implementation of individual management actions, and the integrated CMP more generally, resulted in an improvement in the health of the coastal environment and the social / cultural values of the study area?
Component 3: Overall CMP Performance	Reviews the CMP's long-term effectiveness in meeting its objectives and the CM Act requirements.	▪ Has the CMP more broadly achieved its intended objectives? ▪ How has the CMP made a difference? ▪ Has the level of risk associated with the various stressors and hazards facing the HNRS been reduced?

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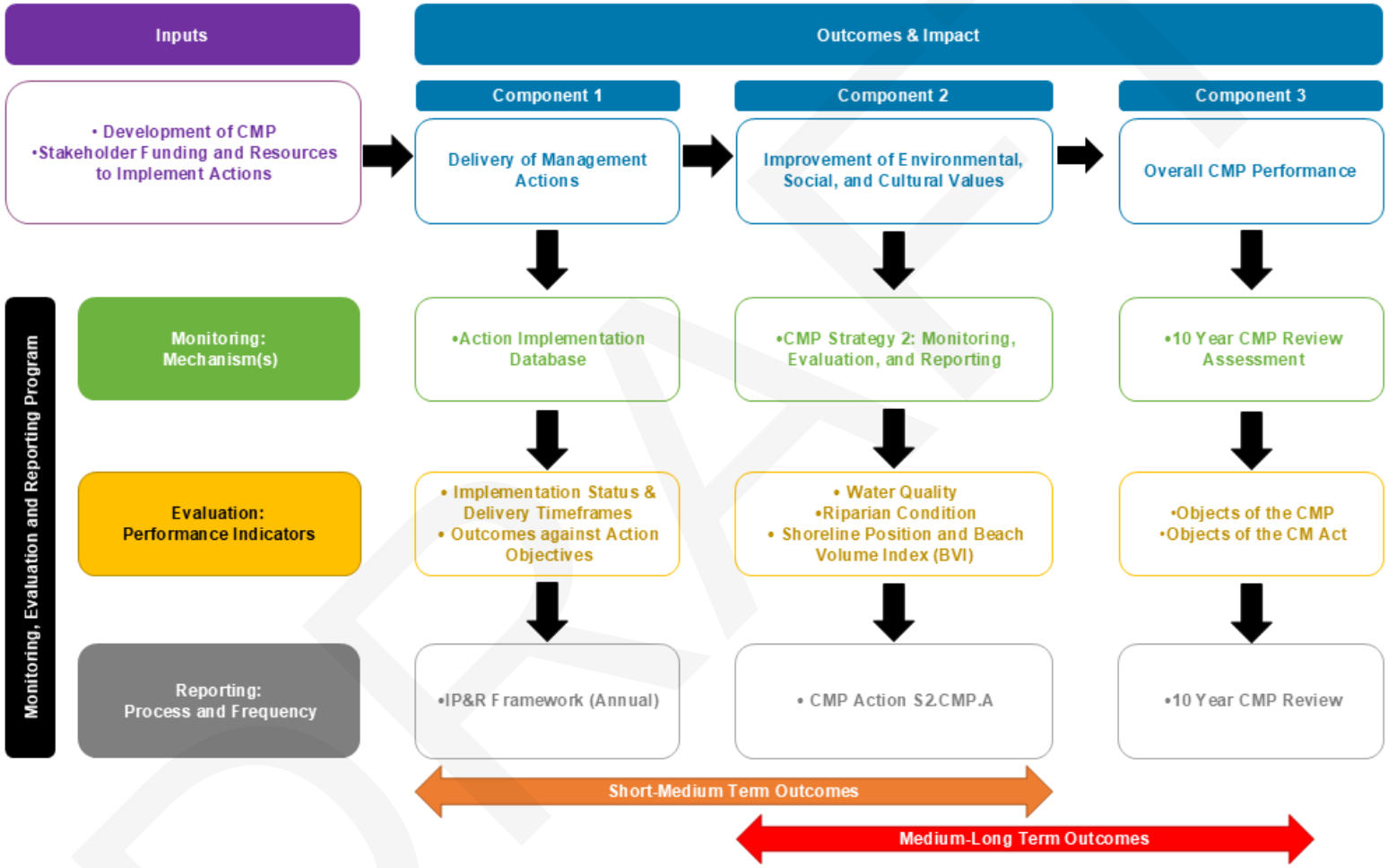


Figure 8-1 Overview of MER program for the CMP

8.2 Component 1: Delivery of Management Actions

The CMP Project Coordinator and the Partner Councils will monitor the implementation status of the various CMP actions – including which actions have been implemented, the progress of actions, barriers and issues, allocated funding and resources, and timeline of implementation.

It is recommended that an *Action Implementation Database* (AID) be maintained to monitor the status of the various CMP actions and support the CMP requirements. The fields include information relating the practical implementation of the works, and the overall status of the action:

- Implementation Status: For each action, a monitoring designation should be provided regarding the current status of that action using one of 5 categories:
  - *Completed:* Where discrete (one-off) actions items have been completed and no further actions are required.
  - *Implemented and Ongoing:* Where actions have an ongoing component and are currently being implemented.
  - *In progress/Incomplete:* This includes actions that are in progress or not yet finalised.
  - *Not Yet Commenced/Outstanding:* Where outstanding actions have not yet commenced - but have been marked for future implementation.
  - *No Longer Applicable:* Where actions are no longer applicable due to changed circumstances or superseding actions from other management plans.
- Dates of commencement and practical completion.
- Links to supporting documentation or evidence of completion.

Each action itemised in this CMP has been assigned a corresponding performance indicator(s). Each CMP action should be evaluated for its performance in achieving its objectives, using the established indicator(s). These should be recorded in the AID.

The IP&R reporting system of each Partner Council (including annual operational reporting and longer interval strategic reporting) provides the opportunity to formally report on monitoring of coastal management and its outcomes. Each Partner Council delivers an Annual Report to document its progress in implementing its 4 Year Delivery Program and Annual Operational Plan activities over each financial year. This provides for a yearly evaluation of the implementation status of each action in the CMP.

Where actions have not been included in the IP&R Framework, a yearly evaluation of those CMP actions by the officer(s) responsible for facilitating implementation of the CMP is recommended. This may be undertaken through the annual review of the Business Plan, or as a separate process.

8.3 Component 2: Environmental Parameters and Indicators

A key component of the MER process will be to utilise physical datasets that can provide an indication of key physical and environmental parameters and track the progress of the CMP towards key achieving intended outcomes.

It should be noted that while the monitoring of environmental indicators is important to ascertain the health state and/or condition of the coastal zone, it cannot always be reliably used to determine the short term “success” of individual management actions. This is because:

- The physical processes affecting the coastal zone act over a wide range of timeframes including short term (storm erosion and recovery, seasonal effects), medium term (beach rotation and impacts related to

the El Niño Southern Oscillation) and long term (such as responses to sediment budget imbalances and climate change impacts such as SLR).

- The ecological and chemical processes affecting estuary health and water quality respond to both short term stressors across the catchment, as well as to longer term historical legacy impacts.

For this reason, environmental indicators can demonstrate variability over short-, medium- and long-term cycles that may range from several days, to years or even decades. Furthermore, the cause and effect of such variability may not always be readily understood, nor easily detected in short-term datasets. In this context, linking short to medium term changes in environmental indicators to specific stressors, or the impact of CMP management actions, can often be fraught with complexity.

Nonetheless, over the *long term*, the monitoring of key environmental indicators is the most efficient and practical way to assess the overall performance of the CMP at achieving its outcomes. Assessing outcomes over the short to medium term will require consideration of the physical process context, and expert technical judgement.

With this in mind, a pragmatic approach to monitoring and evaluation is proposed for the CMP. Strategy 2 of the CMP includes a range of management actions that are inherently linked to the MER process, including those listed in Table 8-2.

Table 8-2 Key management actions linked to the MER

Monitoring Type	Action ID	Action Name
Water Quality	S2.CMP.A	HNRS Water Quality Monitoring - Data Aggregation and Reporting
Water Quality	S2.CMP.B	HNRS Water Quality Monitoring - Implement a Coordinated Monitoring Program (see Figure 8-2)
Foreshore Condition	S2.CMP.C	Implement a bank stability and condition monitoring program across the estuary foreshores
Beach Monitoring	S2.NBC.B	Develop and Implement a Pittwater Beach Monitoring Program
Beach Monitoring	S2.CCC.A	Develop and implement a Broken Bay Coastal Monitoring Program

There are also a number of monitoring programs external to the CMP process that can provide physical datasets to support the MER, including:

- The NSW Beachwatch Programs (DCCEEW, 2025).
- Annual State of the Beaches Reporting (DCCEEW, 2024).

Using Indicators to Inform Management

The ‘environmental indicators’ proposed to be monitored through action S2.NBC.B and S2.CCC.A (which include shoreline position, beach volume, dune vegetation condition, and water quality) may be applied to inform and 'trigger’ certain management actions such as beach scraping or post storm re-profiling etc. This information may also be applied to facilitate an adaptive approach to defining when coastal protection works are constructed at specific locations. An example of this trigger based approach is provided in Action S6.CCC.O (Implementation of the Umina-Ocean Beach Erosion Management Strategy).

Importance of Vertical Integration

This component of the MER framework will be vertically integrated with statewide monitoring and evaluation systems to ensure consistency, comparability, and transparency. This means that:

- Data collected under the CMP will be structured and reported in a way that aligns with state-level frameworks, including the NSW Government's Statewide MER for Estuaries (DCCEEW, 2025) and the MEMS Environmental Condition Monitoring Framework (Aither, 2019; Thornborough, et al., 2023).
- Consistent indicators, metrics, and reporting formats will allow the condition of the HNRS to be rolled up into broader regional and statewide assessments, providing a clear line of sight from local action to state priorities.
- This alignment will reduce duplication, strengthen data sharing across agencies, and enable evidence-based planning at multiple levels of government.

By embedding vertical integration into the MER process, the CMP ensures that local monitoring contributes to a cohesive, statewide understanding of estuary and coastal health, supporting both local decision-making and state-level policy development.



Figure 8-2 Water Quality Monitoring in Lower Hawkesbury – an example of key monitoring element of the MER (source: Ana Rubio)

8.4 Component 3: Achievement of Objects of the CMP and CM Act

The CMP should be treated as a living document, reviewed and updated over time to ensure it remains relevant and effective. While annual reviews track implementation progress through the IP&R framework of the respective Partner Councils, the MER program also requires a strategic review at set intervals to evaluate the CMP's overall performance.

The CM Act (Section 18(1)) and CM Manual requires Council to ensure that the CMP is reviewed at least once every 10 years. However, it should be noted that it may be reviewed and/or updated sooner for any reason, including if there are significant new circumstances which need to be considered.

The Purpose of the Review

The review of the CMP should be undertaken through a formalised process and represents a significant opportunity to:

- Assess the extent to which the CMP has achieved its stated objectives, providing an evidence base for whether the program is delivering on its promises.

- Examine how well the CMP has contributed to meeting the broader objectives of the CM Act, ensuring alignment between local implementation and legislative intent.
- Reflect on what has worked well, where challenges have arisen, and what lessons can be carried forward into future CMP cycles.

Key Issues for Evaluation

The review should focus on 3 main areas:

- Risk Assessment: The primary mechanism for gauging whether the CMP has been successful should be the re-evaluation of the threats and risks across the study area through a repeat of the CMP's Stage 1 (first pass) and Stage 2 (detailed) risk assessment process. Controls that assist with managing the threats should be included when assessing the level of risk, particularly those actions that have or are being implemented through the CMP. There are 3 specific questions to be answered:
  - Has the level of risk changed?
  - Have the very high or high threats been adequately managed?
  - Are there any new or emerging threats that need to be captured? – including those associated with climate change. These emerging and evolving risks include the impacts of sea level rise on inundation risk, and habitat squeeze and migration.
- CMP Performance: This will include a formal review of the implemented management actions. The review should include a granular assessment of:
  - The status of CMP actions, including the extent to which actions proposed to be wholly implemented within that 10-year period have been implemented.
  - Identification of the CMP's successes, highlights, limitations, and any barriers to the effective implementation.
- Future Improvements: Finally, the review should identify opportunities to strengthen the effectiveness of the CMP moving forward. This might include:
  - Refining existing actions, incorporating new priorities or emerging issues, or adapting management approaches in response to evolving risks.
  - Consideration of any new or updated scientific knowledge, including data garnered and compiled from the monitoring programs included in the CMP.
  - The progress of any actions and commitments which continue beyond the original 10-year timeframe.

If the need arises, new actions or items can also be added to the CMP as part of the review process. Any such changes to the CMP would need to be endorsed by stakeholders and relevant government agencies, as well as the communities of the river system.

Outcomes

The strategic review ensures the CMP remains current, evidence-based, and responsive to evolving risks and priorities. It provides a foundation for the next CMP cycle, integrating lessons learned with emerging challenges and opportunities.

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9 REFERENCE LIST

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Image Source: Gary Harris

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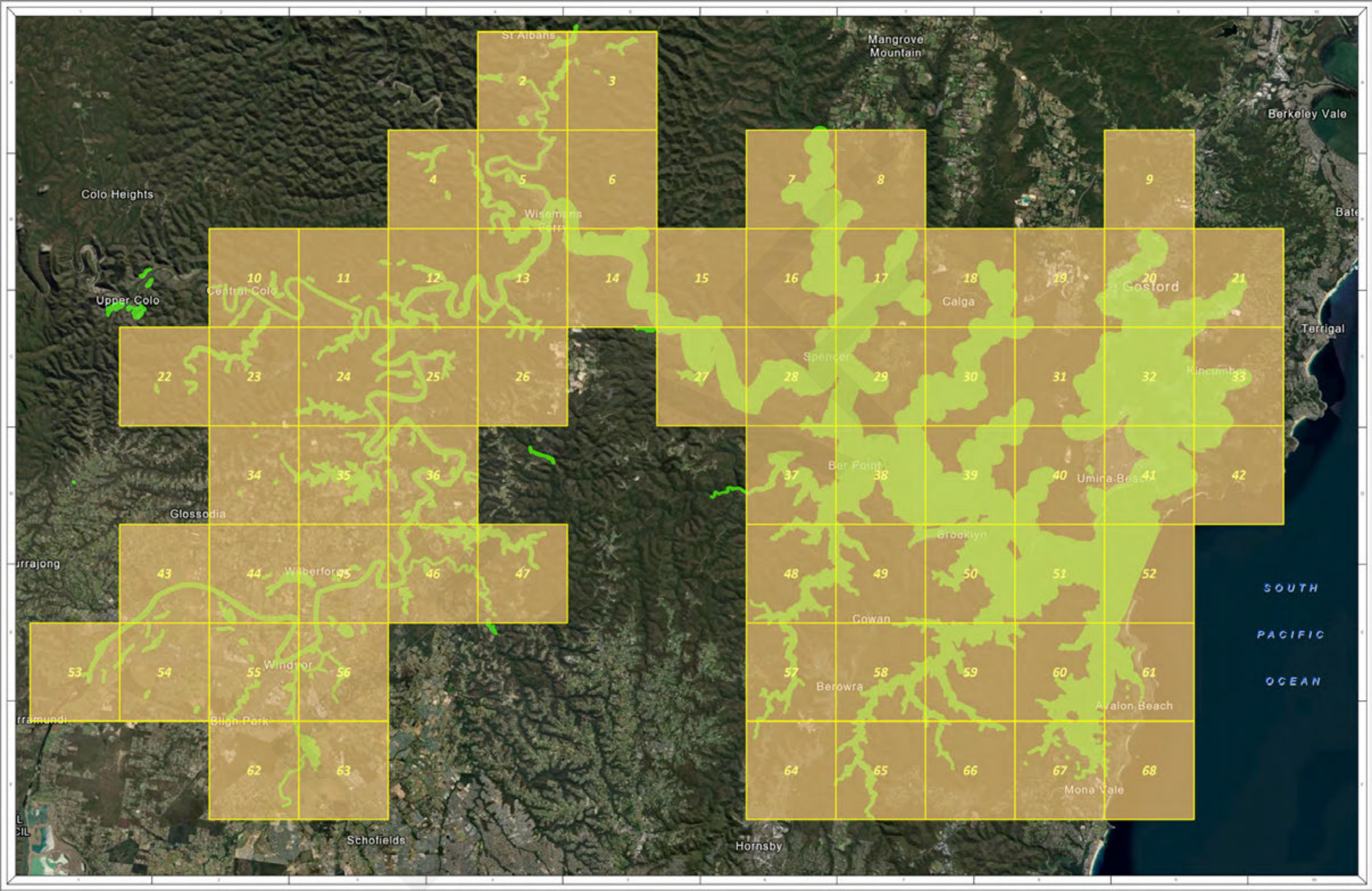
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APPENDIX A
STUDY AREA MAPPING COMPENDIUM

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Map Extent Study Area

0 3 6 12 Kilometers

1:200,000 at A3

Fig A-1: Mapping Overview

Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



ST ALBANS

Macdonald River

Wellums Lake

Yengo National Park

Wrights Creek

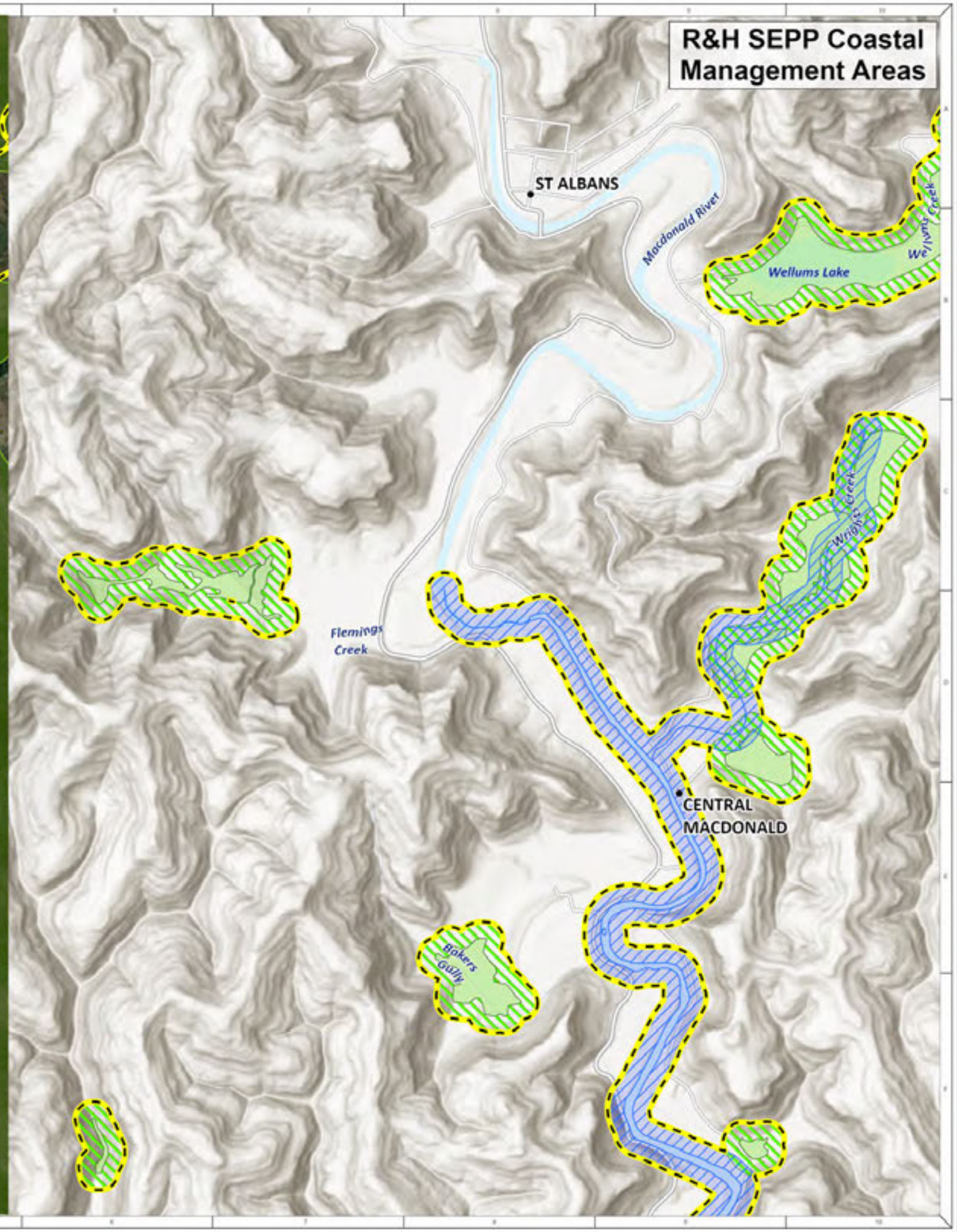
Flemings Creek

CENTRAL MACDONALD

Parr State Conservation Area

Bakers Gully

R&H SEPP Coastal Management Areas



CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-2
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Wellums Creek

Wellums Lake

WRIGHTS CREEK

Wrights Creek

Yengo National Park

Dharug National Park

Gosford

Sydney

R&H SEPP Coastal Management Areas

Wellums Creek

Wellums Lake

WRIGHTS CREEK

Wrights Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

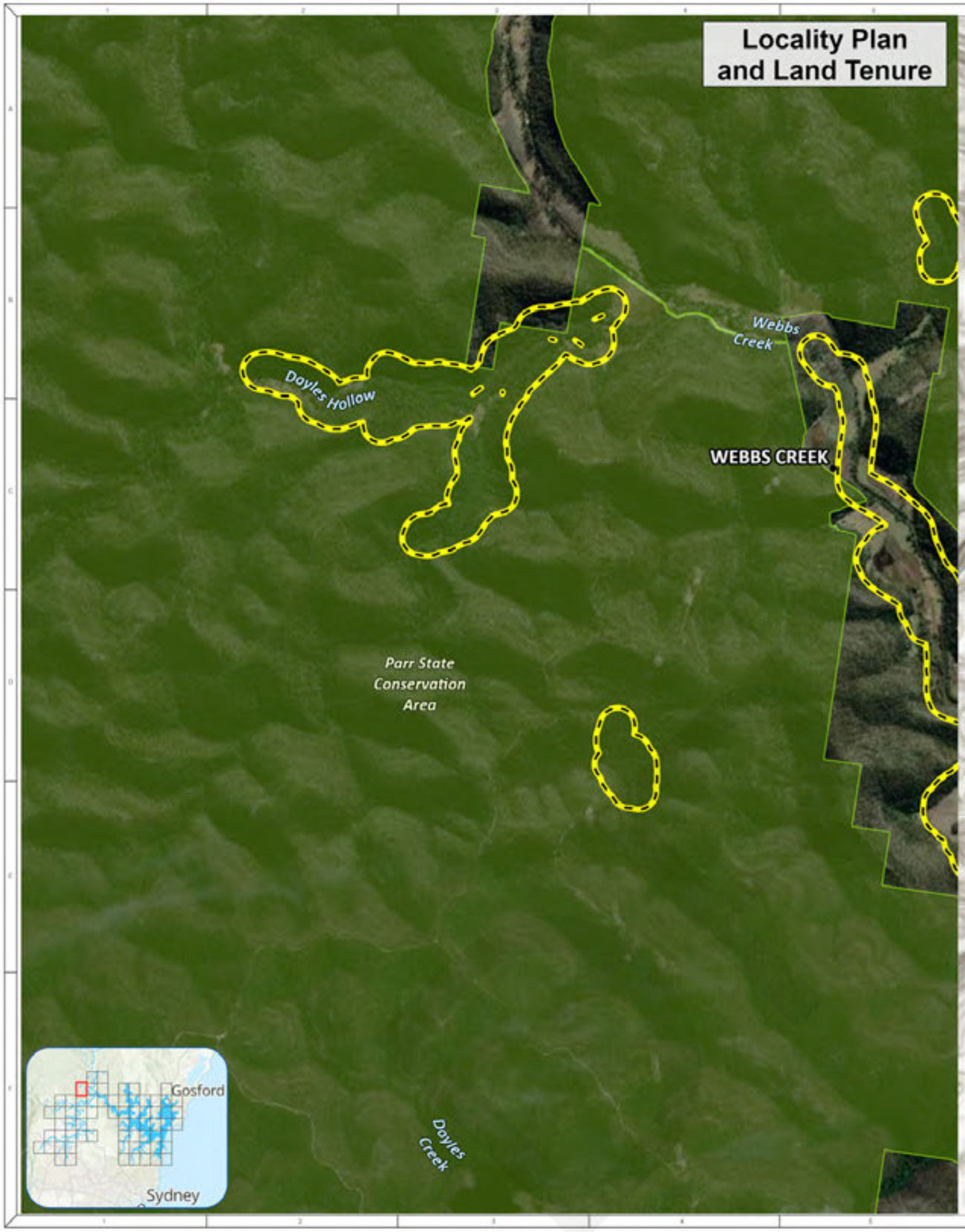
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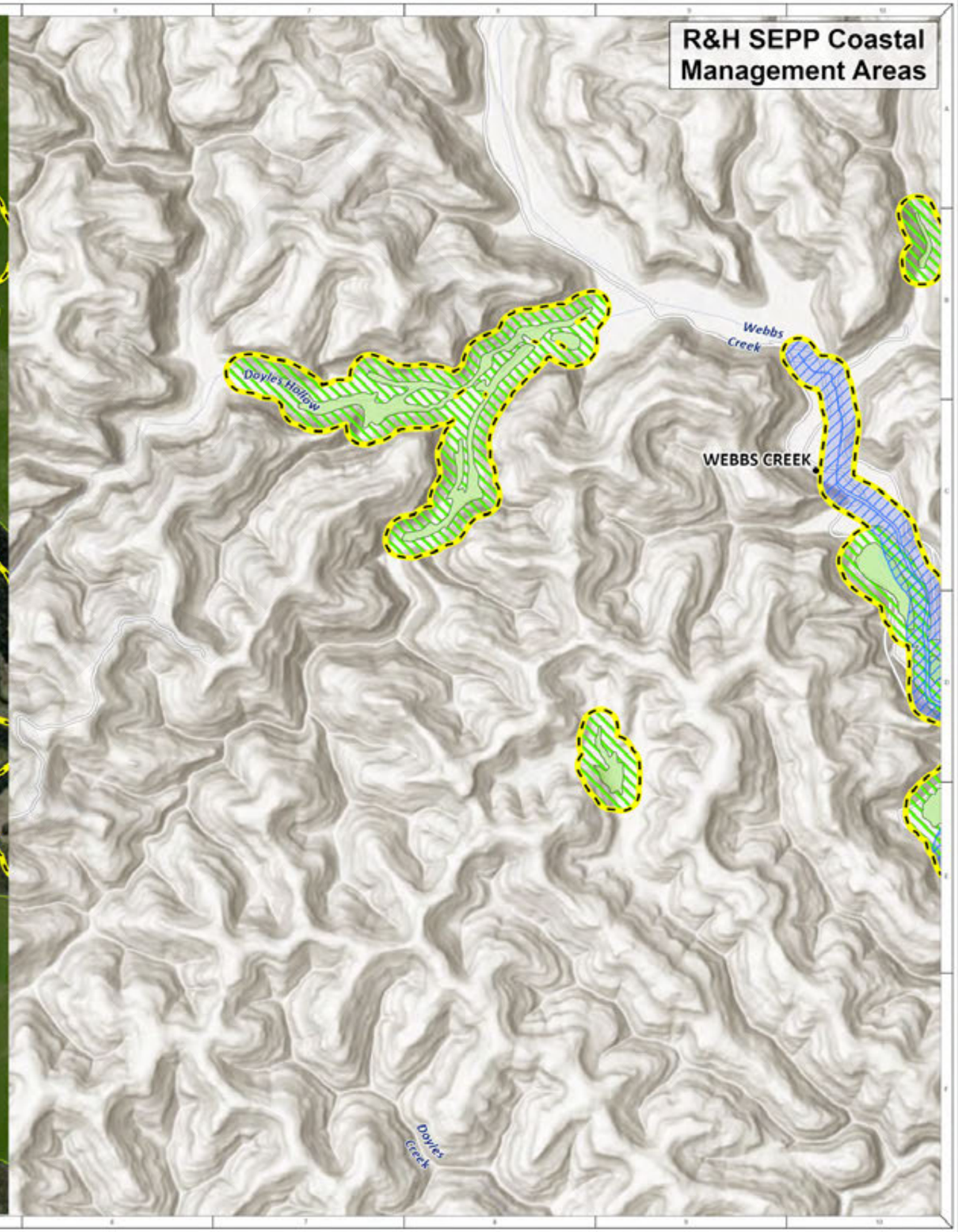
WATER TECHNOLOGY

Figure A-3
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



R&H SEPP Coastal Management Areas



CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-4
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



Bakers Gully
Parr State Conservation Area
Yengo National Park
Macdonald River
LOWER MACDONALD
Dharug National Park
Webbs Creek
Fowlers Gully
Doyles Creek
WISEMANS FERRY HISTORIC SITE
Hawkesbury River
WISEMANS FERRY
Wisemans Ferry Historic Site

R&H SEPP Coastal Management Areas

Bakers Gully
Macdonald River
LOWER MACDONALD
Webbs Creek
Fowlers Gully
Doyles Creek
WISEMANS FERRY HISTORIC SITE
Hawkesbury River
WISEMANS FERRY

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-5
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



Yengo National Park

Dharug National Park

Hawkesbury River

Roses Creek

Mill Creek

R&H SEPP Coastal Management Areas



NOTE
Water Technology Pty Ltd has prepared this document in accordance with instruction of The CMP Steering Committee for their specific use.

DISCLAIMER
The CMP Steering Committee and Water Technology Pty Ltd. does not warrant that this document is definitive nor free from error and does not accept liability for any loss caused or arising from reliance upon information provided herein.

Contains NSW Spatial Data © State of NSW

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-6
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Ten mile Hollow
McIntosh Gully
Worleys Creek
MANGROVE CREEK
Dharug National Park
Popran National Park
Sugee bag Creek
Bedlam Creek
GREENGROVE
Ironbark Creek
Mangrove Creek
Birdseye Creek
Screech owl Creek
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-7
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Gosford
Sydney

Wet weather Gully
Young Gully
Gang gang Gully
Lloyd jones Gully
Bedlam Creek
Donovans Gully
Drifters Gully
Elwell Gully
Leo Gully
Red Gully
Stubbs Gully
Wallaby rock Gully
Apple tree Gully
Bathtub Gully
Whisky Gully
Ainsworth Gully
Waratah Gully
Popran Creek
Popran National Park
Cloie Gully
Red belly black Gully
Ferny Gully
Dingo Gully
Koala Gully
MOUNT OLIVE LOOKOUT
Swamp wallaby Gully
Ironbark Creek
Mangrove Creek
Hominy Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-8
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Jilliby State Conservation Area
Cunninghams Gully
Lowes Gully
Footes Gully
Ourimbah Creek
Bumbies Creek
Platypus Creek
Dog Trap Gully
Bonnybalow Creek
OURIMBAH
LISAROW
NIAGARA PARK
Narara Creek
NARARA
Wyoming Creek
Fountain Creek
Gosford
Sydney

R&H SEPP Coastal Management Areas

Cunninghams Gully
Lowes Gully
Footes Gully
Ourimbah Creek
Bumbies Creek
Platypus Creek
Dog Trap Gully
Bonnybalow Creek
OURIMBAH
LISAROW
NIAGARA PARK
Narara Creek
NARARA
Wyoming Creek
Fountain Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-9
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



Conservation Area

CENTRAL COLO

Colo River

Whatleys Creek

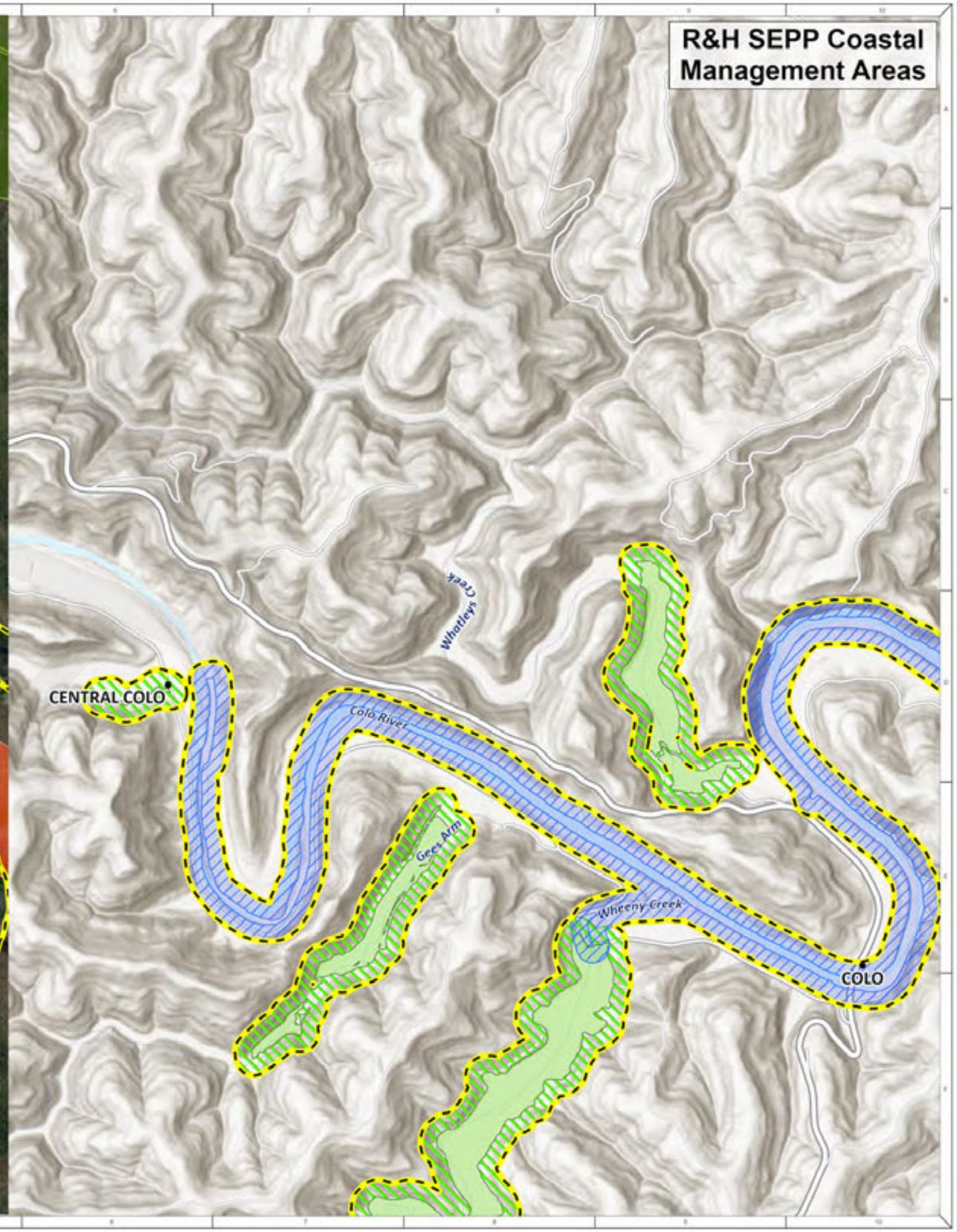
Gees Arm

Wollemi National Park

Wheeny Creek

COLO

R&H SEPP Coastal Management Areas



CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-10
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Parr State Conservation Area

Greens Creek

Colo River

COLO

LOWER PORTLAND

Turnbulls Arm

Hawkesbury River

Gosford

Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

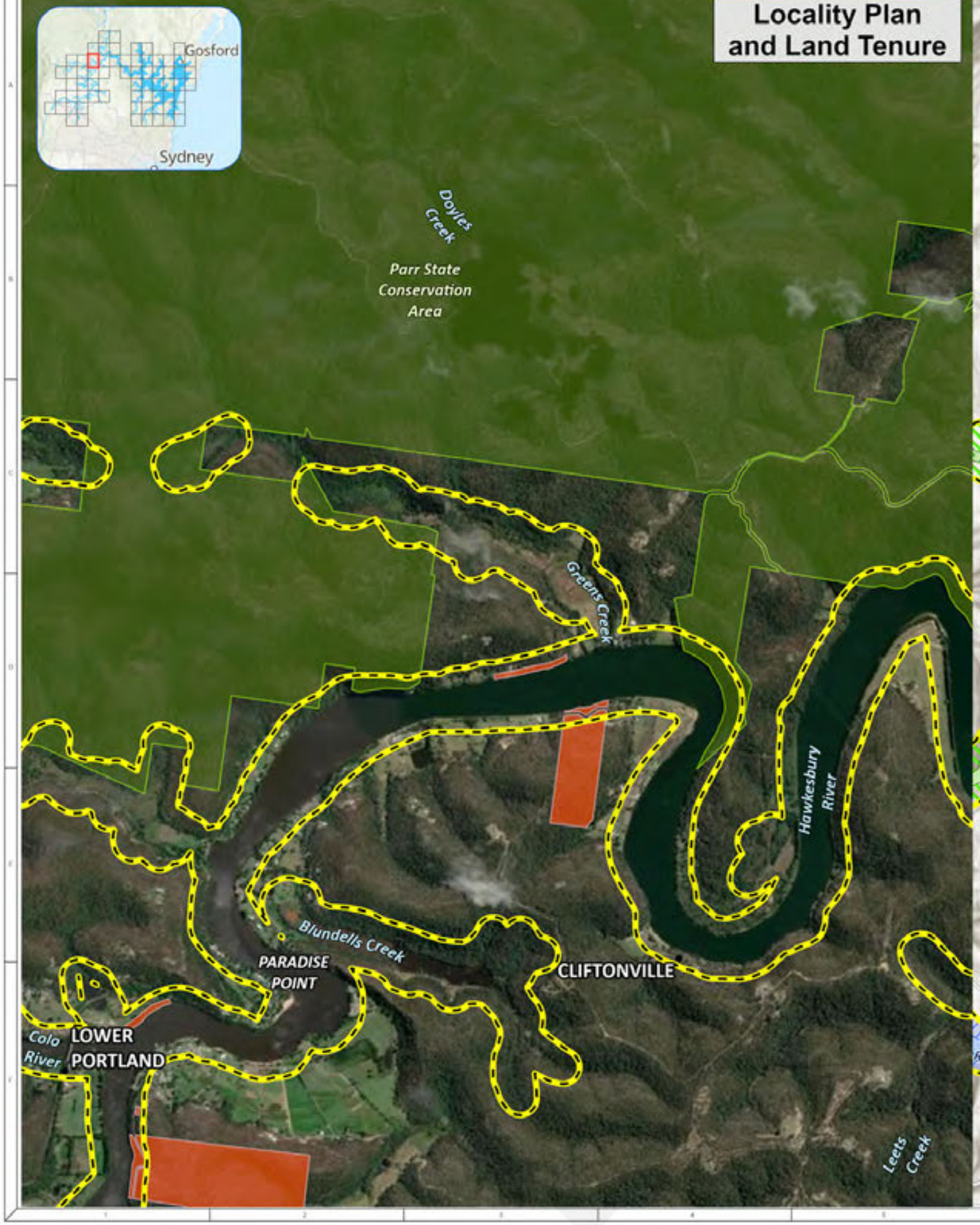
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WATER TECHNOLOGY

Figure A-11
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



R&H SEPP Coastal Management Areas



CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-12
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Doyles Creek
Webbs Creek
Fowlers Gully
Hawkesbury River
Wisemans Ferry Historic Site
Dharug National Park
Parr State Conservation Area
Lookout
HAWKINS LOOKOUT
Mill Creek
Maroota Historic Site
LEETS VALE
WEAVERS
Leets Creek
Douglass Creek
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-13
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Roses Creek
Dharug National Park
Mill Creek
Hawkesbury River
LAUGHTONDALE
Maroota Historic Site
WEAVERS
Marramarra National Park
LOWER HAWKESBURY
Dalgetys Creek
Coopers Creek
Gosford
Sydney

R&H SEPP Coastal Management Areas

Mill Creek
Roses Creek
Hawkesbury River
LAUGHTONDALE
WEAVERS
LOWER HAWKESBURY
Dalgetys Creek
Coopers Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-14
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



Dharug National Park

Dinner Creek

Hawkesbury River

Gunderman Creek

Dalgetys Creek

GUNDERMAN

Marramarra National Park

Allens Creek

R&H SEPP Coastal Management Areas

Mill Creek

Dinner Creek

Gunderman Creek

Dalgetys Creek

Hawkesbury River

GUNDERMAN

Allens Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-15
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Birdseye Creek
Ironbark Creek
Mangrove Creek
Screech owl Creek
Popran National Park
Dharug National Park
LOWER MANGROVE
Little farm Gully
Woodbury Gully
Dinner Creek
Lemon tree Gully
Fatheringham Gully
Tarboy Creek
Crump Gully
Scotchmans Creek
Breakfast Creek

Gosford
Sydney

R&H SEPP Coastal Management Areas

Birdseye Creek
Ironbark Creek
Mangrove Creek
Screech owl Creek
LOWER MANGROVE
Little farm Gully
Dinner Creek
Woodbury Gully
Lemon tree Gully
Fatheringham Gully
Tarboy Creek
Crump Gully
Scotchmans Creek
Breakfast Creek
Allens Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-16
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Tonbark Creek
Koala Gully
MOUNT OLIVE LOOKOUT
Swamp
Hominy Creek
Popran National Park
Hospital Gully
GLENWORTH VALLEY
LOWER MANGROVE
Singleton Gully
Toomey Gully
Cabbage tree Creek
Dinner Creek
Popran Creek
Kellys Creek
Dharug National Park
Tarbay Creek
Tarbay Gully
Mangrove Creek
NEVER FAIL ISLAND
Scotchmans Creek
NEVER FAIL
Calverts Creek
MOUNT WHITE
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-17
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Popran Creek
Ausburn Creek
Brisbane Water National Park
Cabbage tree Creek
Mooney mooney Creek
Floods Creek
CALGA
MOONEY MOONEY LOOKOUT
Popran National Park
Kellys Creek
Piles Creek
Chris Gully
MORROW POINT
Gosford
Sydney

R&H SEPP Coastal Management Areas

Popran Creek
Mooney mooney Creek
Ausburn Creek
Cabbage tree Creek
Floods Creek
CALGA
MOONEY MOONEY LOOKOUT
Christy Gully
Kellys Creek
Piles Creek
MORROW POINT

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-18
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Gosford
Sydney
Narara Creek
Floods Creek
Hunter Creek
Fountain Creek
Piles Creek
Leask Creek
Mooney Mooney Aboriginal Area
Brisbane Water National Park
PILES CREEK LOOKOUT
Rat Gully
WEST GOSFORD
KARIONG
KARIONG HILL LOOKOUT
POINT CLARE
Coorumbine Creek
TASCOTT
Brisbane Water

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-19
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



NARARA
WYOMING
NORTH GOSFORD
WEST GOSFORD
GOSFORD
SPRINGFIELD
POINT CLARE
EAST GOSFORD
TASCOTT
IRONBARK POINT
Fountain Creek
Wyoming Creek
Wingello Creek
Brodys Gully
Narara Creek
Coorumbine Creek
Erina Creek
Brisbane Water
Brisbane Water National Park
NURRUNGA LOOKOUT
PRESIDENTS HILL LOOKOUT
YARUGA LOOKOUT
REDGUM LOOKOUT
OURAKA LOOKOUT

R&H SEPP Coastal Management Areas

NARARA
WYOMING
NORTH GOSFORD
WEST GOSFORD
GOSFORD
SPRINGFIELD
POINT CLARE
EAST GOSFORD
TASCOTT
IRONBARK POINT
Fountain Creek
Wyoming Creek
Wingello Creek
Brodys Gully
Narara Creek
Coorumbine Creek
Erina Creek
Brisbane Water
NURRUNGA LOOKOUT
PRESIDENTS HILL LOOKOUT
YARUGA LOOKOUT
REDGUM LOOKOUT
OURAKA LOOKOUT

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-20
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



MOUNT ELLIOT
Wingello Creek
ST JOHN LOOKOUT
Fires Creek
HOLGATE
Seymour Pond
Maddens Creek
Bradys Gully
SPRINGFIELD
ERINA HEIGHTS
ERINA
Erina Creek
Brisbane Water
Nunns Creek
NYARI LOOKOUT
COLIN WATTERS LOOKOUT
WARRIWARRI LOOKOUT

R&H SEPP Coastal Management Areas

Wyoming Creek
MOUNT ELLIOT
Wingello Creek
ST JOHN LOOKOUT
Fires Creek
HOLGATE
Seymour Pond
Maddens Creek
Bradys Gully
SPRINGFIELD
ERINA HEIGHTS
ERINA
Erina Creek
Brisbane Water
Nunns Creek
NYARI LOOKOUT
COLIN WATTERS LOOKOUT
WARRIWARRI LOOKOUT

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-21
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Wollemi National Park

Gees Arm

WHEENY CREEK

Wheeny Creek

Green swamp Creek

Timmins Arm

Gosford

Sydney

R&H SEPP Coastal Management Areas

Gees Arm

WHEENY CREEK

Wheeny Creek

Green Swamp Creek

Timmins Arm

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-22
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Gees Arm
Wheeny Creek
Wollemi National Park
BLAXLANDS RIDGE
Turnbulls Arm
Roberts Creek
Gosford
Sydney

R&H SEPP Coastal Management Areas

Gees Arm
Wheeny Creek
Turnbulls Arm
BLAXLANDS RIDGE
Roberts Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-23
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

COLO

Colo River

LOWER PORTLAND

Turnbulls Arm

Roberts Creek

Hawkesbury River

Gosford

Sydney

R&H SEPP Coastal Management Areas

COLO

Colo River

LOWER PORTLAND

Turnbulls Arm

Roberts Creek

Hawkesbury River

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-24
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Blundells Creek
PARADISE POINT
CLIFTONVILLE
Colo River
LOWER PORTLAND
Leets Creek
Doyles Swamp Creek
Fernbed Gully
Trotts Gully
CUMBERLAND REACH
SACKVILLE NORTH
Lambs Creek
Hawkesbury River
Jubilee vineyard Creek
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-25
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Leets Creek
Trotts Gully
Douglass Creek
Doyles swamp Creek
Little cattai Creek
CORNELIA
Blue gum Gully
Stone chimney Arm
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-26
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

GUNDERMAN
SINGLETONS MILL
PADDYS BIGHT
Dharug National Park
Marramarra National Park
Hawkesbury River
Gunderman Creek
Dalgetys Creek
Allens Creek
Cohens Creek
Ashdale Creek
Layburys Creek
Gosford
Sydney

R&H SEPP Coastal Management Areas

GUNDERMAN
SINGLETONS MILL
PADDYS BIGHT
Hawkesbury River
Gunderman Creek
Dalgetys Creek
Allens Creek
Cohens Creek
Ashdale Creek
Layburys Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-27
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Dharug National Park
Crump Gully
Cotchmans Creek
WENDOREE PARK
TRIANGLE ISLAND
SPENCER
Breakfast Creek
Mangrove Creek
Allens Creek
Cohens Creek
COURANGRA POINT
GENTLEMANS HALT
Hawkesbury River
PADDYS BIGHT
Marramarra National Park
BIG JIMS POINT
Pumpkin Point Creek
MUD ISLAND
PUMPKIN POINT
Gosford
Sydney

R&H SEPP Coastal Management Areas

Crump Gully
Cotchmans Creek
WENDOREE PARK
TRIANGLE ISLAND
Breakfast Creek
SPENCER
Mangrove Creek
Allens Creek
GENTLEMANS HALT
Cohens Creek
COURANGRA POINT
Hawkesbury River
PADDYS BIGHT
BIG JIMS POINT
Pumpkin Point Creek
MUD ISLAND
PUMPKIN POINT

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-28
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Gosford
Sydney

Dharug National Park
Tarbay Creek
Tarbay Gully
Scotchmans Creek
NEVER FAIL ISLAND
NEVER FAIL
MOUNT WHITE
WENDOREE PARK
TRIANGLE ISLAND
Green Point Gully
Calverts Creek
Maisie talbot Gully
James talbot Gully
Mangrove Creek
Breakfast Creek
Hawkesbury River
GENTLEMANS HALT
Marramarra National Park
MARLOW
Marlows Gully
GREEN POINT BAY
Brisbane Water National Park
Popran National Park
BIG JIMS POINT
FOX BAY
Cascade Gully
Mooney mooney Creek
Pumpkin Point Creek
PUMPKIN POINT

R&H SEPP Coastal Management Areas

Tarbay Creek
Scotchmans Creek
Tarbay Gully
NEVER FAIL ISLAND
NEVER FAIL
MOUNT WHITE
TRIANGLE ISLAND
WENDOREE PARK
Green Point Gully
Maisie talbot Gully
Mangrove Creek
Hawkesbury River
Breakfast Creek
GENTLEMANS HALT
James talbot Gully
MARLOW
Marlows Gully
GREEN POINT BAY
Calverts Creek
BIG JIMS POINT
FOX BAY
Cascade Gully
Pumpkin Point Creek
Mooney mooney Creek
PUMPKIN POINT

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-29
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Kellys Creek
Popran National Park
Piles Creek
Christy Gully
MORROW POINT
Mooney mooney Creek
NATIVE DOG BAY
Green point Gully
Myron Brook
Brisbane Water National Park
TWO DOLLAR BAY
Calverts Creek
MOONEY MOONEY CREEK
GREEN POINT BAY
WALBANK POINT
LEMON TREE POINT
FOLEYS BAY
GREEN POINT
WONDABYNE
Mullet Creek
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-30
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

PILES CREEK LOOKOUT
Piles Creek
Rat Gully
Karíong Brook
Myron Brook
STAPLES LOOKOUT
Brisbane Water National Park
TASCOTT
Brisbane Water
WOY WOY BAY
PHEGANS BAY
PHEGANS LOOKOUT
WONDABYNE
HORSFIELD BAY
WOY WOY INLET
BEAUTY POINT
CURRAWONG POINT
Woy woy Creek
Mullet Creek
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-31
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

POINT CLARE
Brisbane Water National Park
TASCOTT
IRONBARK POINT
Lookout
GREEN POINT
GREEN POINT
Brisbane Water
KOOLEWONG
Egan Gully
YATTALUNGA
MOUNT PLEASANT LOOKOUT
SARATOGA
PADDYS CHANNEL PELICAN ISLAND
Kincumber Broadwater
DAVISTOWN
WOY WOY
WOY WOY BAY
BEAUTY POINT
EMPIRE BAY
Cockle Bay Nature Reserve
Bouddi National Park
Gosford
Sydney

R&H SEPP Coastal Management Areas

POINT CLARE
TASCOTT
IRONBARK POINT
Lookout
GREEN POINT
GREEN POINT
Brisbane Water
KOOLEWONG
Egan Gully
YATTALUNGA
MOUNT PLEASANT LOOKOUT
SARATOGA
PADDYS CHANNEL PELICAN ISLAND
Kincumber Broadwater
DAVISTOWN
PHEGANS LOOKOUT
BEAUTY POINT
WOY WOY
EMPIRE BAY

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-32
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



Brisbane Water
Nurms Creek
Lookout
Egan Gully
NYARI LOOKOUT
COLIN WATTERS LOOKOUT
WARRIWARRI LOOKOUT
PICKETTS VALLEY
Lookout
ILLAWONG LOOKOUT
Avoca Lake
Saltwater Creek
KINCUMBER
Kincumber Creek
Kincumber Broadwater
KINCUMBER SOUTH
Pickett's Gully
Cockrone Gully
Cockrone Lagoon
BENSVILLE
Bouddi National Park
MACMASTERS BEACH
Cockle Bay Nature Reserve

R&H SEPP Coastal Management Areas

Brisbane Water
Nurms Creek
Lookout
Egan Gully
NYARI LOOKOUT
COLIN WATTERS LOOKOUT
WARRIWARRI LOOKOUT
PICKETTS VALLEY
Lookout
ILLAWONG LOOKOUT
Avoca Lake
Saltwater Creek
KINCUMBER
Kincumber Creek
Kincumber Broadwater
KINCUMBER SOUTH
Pickett's Gully
Cockrone Gully
Cockrone Lagoon
BENSVILLE
MACMASTERS BEACH

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-33
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Wollemi National Park

Roberts Creek

STANLEY PARK

EAST KURRAJONG

Howes Creek

Currency Creek

Gosford

Sydney

R&H SEPP Coastal Management Areas

Roberts Creek

STANLEY PARK

EAST KURRAJONG

Howes Creek

GLOSSODIA

Currency Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-34
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Roberts Creek
Hawkesbury River
SACKVILLE
Currency Creek
Howes Creek
EBENEZER
Tin Gully
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-35
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



SACKVILLE NORTH

PORTLAND HEAD

EBENEZER

Lambs Creek

Jubilee vineyard Creek

Currency Creek

Maroota Ridge State Conservation Area

Hawkesbury River

Stone drain Creek

Halls Lagoon

Batts hollow Gully

Wyingo

Wheeny Lagoon

Little cattai Creek

Fairs Creek

Cattai National Park

R&H SEPP Coastal Management Areas

SACKVILLE NORTH
Lambs Creek
Jubilee vineyard Creek
Currency Creek
PORTLAND HEAD
Hawkesbury River
Stone drain Creek
Halls Lagoon
EBENEZER
Batts hollow Gully
Wyingo
Wheeny Lagoon
Little cattai Creek
Fairs Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-36
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Hawkesbury River
Pumpkin Point Creek
MUD ISLAND
PUMPKIN POINT
Marramarra National Park
BIG BAY
FRIENDLY ISLAND
FRIENDLY BAY
FISHERMANS POINT
BACK BAY
FISHERMANS POINT
KULKAH BAY
Marramarra Creek
BAR ISLAND
PELICAN ISLAND
Berowra Creek
BEROWRA POINT
BEROWRA CREEK
COBA BAY
Muogamarra Nature Reserve
COBA POINT
Coba Creek
DONNYBROOK BAY
Gosford
Sydney

R&H SEPP Coastal Management Areas

Hawkesbury River
Pumpkin Point Creek
MUD ISLAND
PUMPKIN POINT
BIG BAY
FRIENDLY ISLAND
FRIENDLY BAY
FISHERMANS POINT
BACK BAY
FISHERMANS POINT
KULKAH BAY
Marramarra Creek
BAR ISLAND
PELICAN ISLAND
BEROWRA POINT
BEROWRA CREEK
Berowra Creek
COBA BAY
COBA POINT
Coba Creek
DONNYBROOK BAY

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-37
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Gosford
Sydney

Popran National Park
Brisbane Water National Park
Marramarra National Park
Cascade Gully
Mooney mooney Creek
Mooney
Hawkesbury River
Pumpkin point Creek
Marramarra Creek
Muogamarra Nature Reserve
Muogamarra Creek
Lloyd Gully
Spectacle Island Nature Reserve
Long Island Nature Reserve
Seymours Creek
Berowra Creek

PUMPKIN POINT
FOX BAY
SAILORS CHEST POINT
CHEERO POINT
CHEERO POINT
SUNSHINE BAY
SNAKE ISLAND
BAR POINT
BAR POINT
PRICKLY POINT
MILSON ISLAND
MILSONS PASSAGE
GRACES SHORE
MOONEY MOONEY BAY
FISHERMANS POINT
BACK BAY
FISHERMANS POINT
CABBAGE POINT
MOONEY MOONEY
BAR ISLAND
MUOGAMARRA POINT
PEAT ISLAND
PEATS BIGHT
SUNNY CORNER
MOONEY MOONEY POINT
OLGA BAY
BEROWRA POINT
KANGAROO POINT

BIG JIMS POINT

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-38
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Gosford
Sydney
WONDABYNE
Brisbane Water National Park
Double Lagoon
COGRA BAY
MOONEY MOONEY
Mooney mooney Creek
Mullet Creek
Gordon Gully
ALISON POINT
COGRA POINT
TANK COVE
Tank Creek
SPECTACLE ISLAND
Spectacle Island Nature Reserve
DANGAR ISLAND
Hawkesbury River
BRADLEYS BEACH
MAREELA REEF
BRADLEYS BAY
WHISTLING KITE POINT
LITTLE WOBBY BEACH
Long Island Nature Reserve
LONG ISLAND
FLAT ROCK POINT
BROOKLYN
PARSLEY BAY
Ku-ring-gai Chase National Park
Junction Gully
Sentinel Gully
Perrotts Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-39
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Gosford
Sydney
HORSFIELD BAY
WOY WOY INLET
Water
BEAUTY POINT
CURRAWONG POINT
Woy woy Creek
WONDABYNE
Mullet Creek
Brisbane Water National Park
UMINA BEACH
Kahibah Creek
Tank Creek
Patonga Creek
Illuka Creek
Ettalong Creek
MOUNT ETTALONG LOOKOUT
Pearl beach Lagoon
Broken Bay
Green point Creek
PEARL BEACH
PATONGA
Sentinel Gully
MIDDLE HEAD BEACH

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-40
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

BEAUTY POINT
WOY WOY
Brisbane Water
EMPIRE BAY
Kincumber Broadwater
Cockle Bay Nature Reserve
BLACKWALL
DALEYS POINT
BLACKWALL MOUNT LOOKOUT
ETTALONG BEACH
BOOKER BAY
ETTALONG BEACH
ROCKY POINT
ALLEN STROM LOOKOUT
UMINA BEACH
OCEAN BEACH
HARDYS BAY
KILLCARE
LOBSTER BEACH
PRETTY BEACH
PRETTY BEACH
LOBSTER BEACH LOOKOUT
PUTTY BEACH
UMINA BEACH
Bouddi National Park
BOX HEAD
LITTLE BOX HEAD
LITTLE TALLOW BEACH
TALLOW BEACH
IRON LADDER BEACH
Broken Bay
BOX HEAD
Gosford
Sydney

R&H SEPP Coastal Management Areas

BEAUTY POINT
WOY WOY
Brisbane Water
EMPIRE BAY
Kincumber Broadwater
BLACKWALL
DALEYS POINT
DALEYS POINT
BLACKWALL MOUNT LOOKOUT
ETTALONG BEACH
BOOKER BAY
ETTALONG BEACH
ROCKY POINT ALLEN STROM LOOKOUT
UMINA BEACH
OCEAN BEACH
KILLCARE
HARDYS BAY
PRETTY BEACH
LOBSTER BEACH
PRETTY BEACH
LOBSTER BEACH LOOKOUT
UMINA BEACH
PUTTY BEACH
BOX HEAD
LITTLE BOX HEAD
LITTLE TALLOW BEACH
TALLOW BEACH
IRON LADDER BEACH
Broken Bay
BOX HEAD

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-41
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

KINCUMBER SOUTH
Pickett's Gully
Kincumber Broadwater
BENSVILLE
MACMASTERS BEACH
Cockle Bay Nature Reserve
LITTLE BEACH
BOUDDI
Bouddi National Park
Brisbane Water
KILLCARE HEIGHTS
MARIE BYLES LOOKOUT
MAITLAND BAY BEACH
BOUDDI LOOKOUT
Cave Gully
THIRD POINT
BOUDDI POINT
BULLIMAH LOOKOUT
PUTTY BEACH
BULLIMAH BEACH
GERRIN POINT LOOKOUT
GERRIN POINT

Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-42
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



TENNYSON

GLOSSODIA

Currency Creek

THE TERRACE

Hawkesbury River

STREETON LOOKOUT

Redbank Creek

NORTH RICHMOND

RICHMOND LOWLANDS

Cooley Creek

Pughs Lagoon

R&H SEPP Coastal Management Areas

Howes Creek

TENNYSON

GLOSSODIA

Currency Creek

THE TERRACE

Hawkesbury River

STREETON LOOKOUT

Redbank Creek

NORTH RICHMOND

RICHMOND LOWLANDS

Cooley Creek

Pughs Lagoon

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-43
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



Currency Creek

FREEMANS REACH

Bushells Lagoon

STREETON LOOKOUT

Bakers Lagoon

Hawkesbury River

THE BREAKAWAY

CORNWALLIS

Cooley Creek

R&H SEPP Coastal Management Areas

GLOSSODIA

Currency Creek

FREEMANS REACH

Bushells Lagoon

Buttsworth Creek

STREETON LOOKOUT

Bakers Lagoon

Hawkesbury River

THE BREAKAWAY

CORNWALLIS

Cooley Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-44
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Currency Creek
Tin Gully
Browns Creek
Browns Creek
GRONOS POINT
WILBERFORCE
Bushells Lagoon
Buttsworth Creek
Bodu narang Gully
PITT TOWN BOTTOMS
Pitt Town Nature Reserve
PITT TOWN
Scheyville National Park
THE BREAKAWAY
Hawkesbury River
Pitt town Lagoon
Llewellyn Creek
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-45
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

EBENEZER

Hawkesbury River

Wyingarl

Wheeny Lagoon

Little Cattai Creek

Fairs Creek

Cattai National Park

Browns Creek

CATTAI

Cattai Creek

GRONOS POINT

Longneck Lagoon

Longneck Creek

Llewellyn Creek

Scheyville National Park

MARAYLYA

LONGNECK LAGOON LOOKOUT

Gosford

Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-46
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Batts hollow Gully
Wonga Creek
Origma Creek
Kellys Creek
Fairs Creek
Virgin Creek
Brush tail Creek
Cattai National Park
O'haras Creek
Cattai Creek
Rocky Gully
Fern Creek
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-47
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

Gosford
Sydney

COBA BAY
BEROWRA CREEK
COBA POINT
Coba Creek
DONNYBROOK BAY
Denny Creek
ANTS NEST POINT
COBA POINT
Marramarra National Park
BEROWRA WATERS
SQUARE BAY
Berowra Creek
COLLINGRIDGE POINT
NEVERFAIL BAY
TWIN GUMS
COLLINGRIDGE POINT
Muogamarra Nature Reserve
HALF MOON BAY
OAKY POINT
JOE CRAFTS BAY
Calabash Creek
CALABASH BAY
CUNIO POINT
DEEP BAY
CALABASH POINT
Banks Creek
Joe crafts Creek
Fosters Creek
DUSTHOLE POINT

R&H SEPP Coastal Management Areas

BEROWRA CREEK
COBA BAY
COBA POINT
Coba Creek
DONNYBROOK BAY
Denny Creek
COBA POINT
ANTS NEST POINT
BEROWRA WATERS
SQUARE BAY
Berowra Creek
COLLINGRIDGE POINT
NEVERFAIL BAY
TWIN GUMS
COLLINGRIDGE POINT
HALF MOON BAY
OAKY POINT
JOE CRAFTS BAY
Calabash Creek
Banks Creek
CALABASH BAY
CALABASH POINT
CUNIO POINT
DEEP BAY
Joe crafts Creek
Fosters Creek
DUSTHOLE POINT

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-48
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

SUNNY CORNER
BEROWRA POINT
OLGA BAY
KANGAROO POINT
Long Island Nature Reserve
Muogamarra Creek
Lloyd Gully
Berowra Creek
KIMMERIKONG BAY
ANTS NEST POINT
Kimmerikong Creek
TIPPER LOOKOUT
Seymours Creek
Porto Gully
Marramarra National Park
BENNETS BAY
BEROWRA WATERS
Muogamarra Nature Reserve
BUJWA BAY
Campbells Creek
Ku-ring-gai Chase National Park
Bujwa Creek
Lookout
COWAN
JERUSALEM BAY
PINTA BAY
Yatala Creek
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-49
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Hawkesbury River
Mullet Creek
DANGAR ISLAND
DANGAR ISLAND
BRADLEYS BEACH
MAREELA REEF
BRADLEYS BAY
WHISTLING KITE POINT
LITTLE WOBBY BEACH
Patonga Creek
Long Island Nature Reserve
LONG ISLAND
FLAT ROCK POINT
BROOKLYN
PARSLEY BAY
Junction Gully
DEAD HORSE BAY
LITTLE WOBBY
Sentinel Gully
CROPPY POINT
CROPPY BEACH
SANDY BAY
GREEN POINT
Porto Gully
Campbells Creek
PORTO BAY
MUD POINT
GUNYAH POINT
JUNO POINT
GUNYAH BEACH
ELEANOR BEACH
Ku-ring-gai Chase National Park
TAFFYS LOOKOUT
Taffys Gully
Cowan Creek
CHALLENGER HEAD
FISHERMANS BEACH
JERUSALEM BAY
PINTA BAY
LITTLE SHARK ROCK POINT
AMERICA BAY
SHARK ROCK POINT
COWAN POINT
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-50
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

PEARL BEACH
Pearl beach Lagoon
Broken Bay
Green point Creek
Brisbane Water National Park
PATONGA
Junction Gully
PATONGA BEACH
BRISK BAY
DARK CORNER
WARRAH LOOKOUT
MIDDLE HEAD BEACH
MIDDLE HEAD
Sentinel Gully
Patonga Creek
PACIFIC HEAD
LITTLE PATONGA BEACH
WALKER POINT
Hawkesbury River
JUNO POINT
FLINT AND STEEL POINT
FLINT AND STEEL BEACH
FLINT AND STEEL BAY
FLANNEL FLOWER BEACH
WEST HEAD LOOKOUT
WEST HEAD
WEST HEAD BEACH
SECOND HEAD
THIRD HEAD
RESOLUTE BEACH
HUNGRY BEACH
LITTLE PITTWATER
Ku-ring-gai Chase National Park
GREAT MACKEREL BEACH
CURRAWONG BEACH
SINCLAIR POINT
THE BASIN
Gosford
Sydney

R&H SEPP Coastal Management Areas

PEARL BEACH
Lagoon
Green point Creek
PATONGA
Junction Gully
PATONGA BEACH
BRISK BAY
DARK CORNER
WARRAH LOOKOUT
MIDDLE HEAD BEACH
MIDDLE HEAD
Sentinel Gully
Patonga Creek
PACIFIC HEAD
LITTLE PATONGA BEACH
WALKER POINT
Hawkesbury River
Broken Bay
JUNO POINT
FLINT AND STEEL POINT
FLINT AND STEEL BEACH
FLANNEL FLOWER BEACH
FLINT AND STEEL BAY
WEST HEAD LOOKOUT
WEST HEAD
WEST HEAD BEACH
SECOND HEAD
THIRD HEAD
RESOLUTE BEACH
HUNGRY BEACH
LITTLE PITTWATER
GREAT MACKEREL BEACH
CURRAWONG BEACH
SINCLAIR POINT
AMERICA BAY
THE BASIN

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-51
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

LITTLE BOX HEAD
BOX HEAD
Bouddi National Park
LITTLE TALLOW BEACH
IRON LADDER BEACH
BOX HEAD
Broken Bay
Broken Bay
Ku-ring-gai Chase National Park
WEST HEAD
WEST HEAD BEACH
SECOND HEAD
STATION BEACH
PALM BEACH
OBSERVATION POINT
SNAPPERMAN BEACH
PALM BEACH
Gosford
Sydney

R&H SEPP Coastal Management Areas

LITTLE BOX HEAD
BOX HEAD
LITTLE TALLOW BEACH
IRON LADDER BEACH
BOX HEAD
Broken Bay
Broken Bay
WEST HEAD
WEST HEAD BEACH
SECOND HEAD
STATION BEACH
PALM BEACH
OBSERVATION POINT
SNAPPERMAN BEACH
PALM BEACH

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

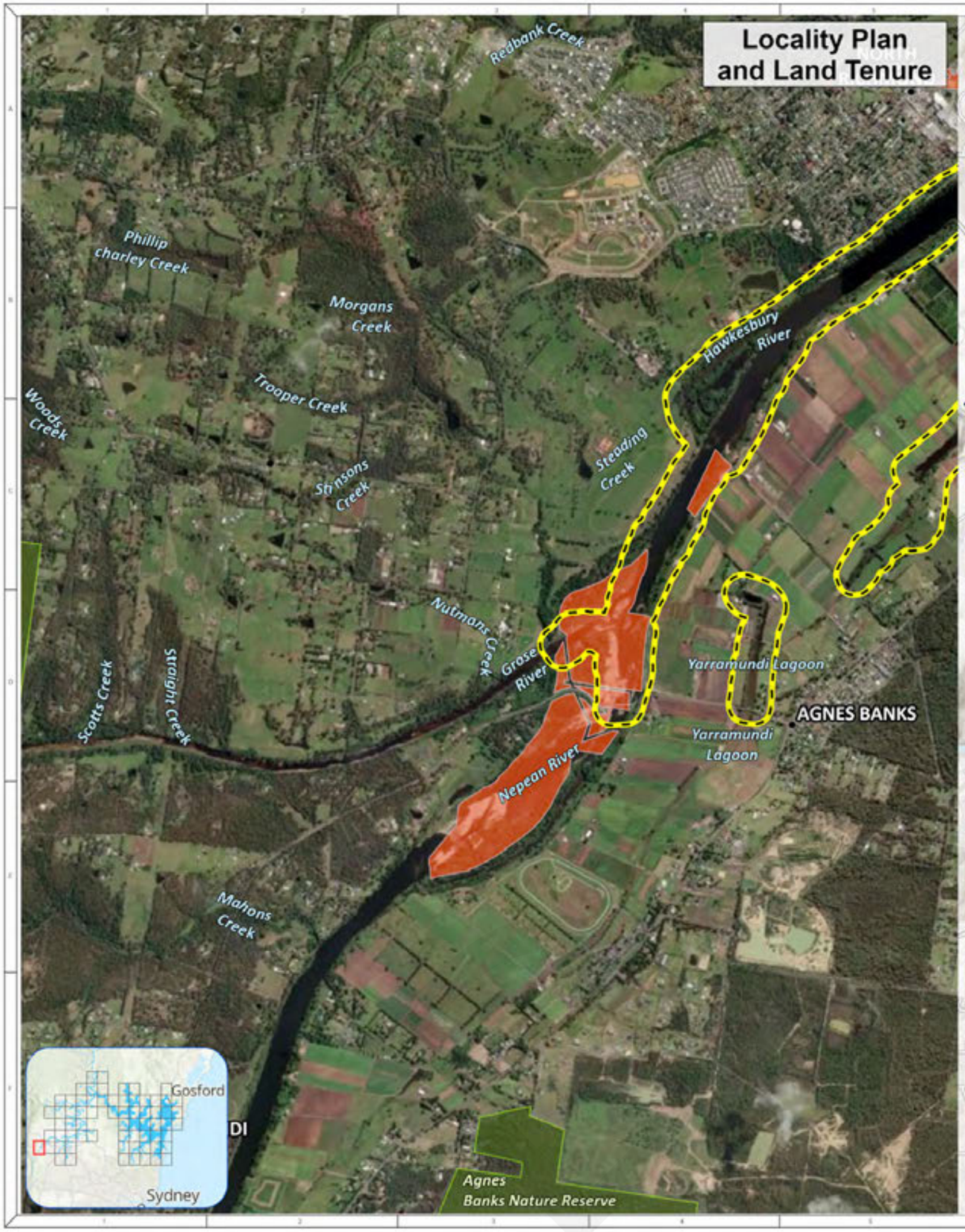
0 250 500 1,000 Meters

1:29,000 at A3

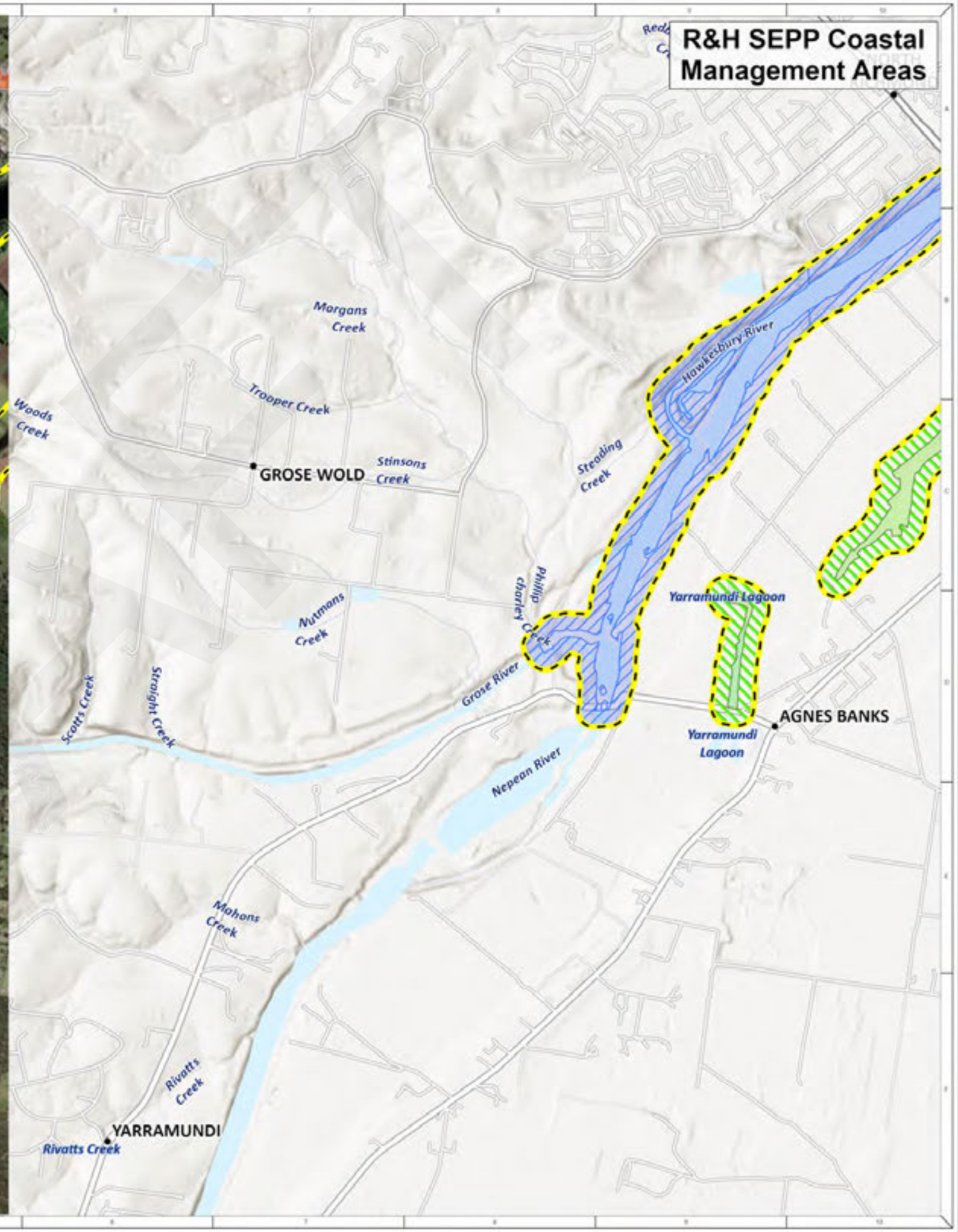
WATER TECHNOLOGY

Figure A-52
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure



R&H SEPP Coastal Management Areas



CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-53
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

NORTH RICHMOND
Hawkesbury River
RICHMOND LOWLANDS
Cooley Creek
Pughs Lagoon
DIGHTS HILL
RICHMOND
HOBARTVILLE
Gosford
Sydney

R&H SEPP Coastal Management Areas

NORTH RICHMOND
Hawkesbury River
RICHMOND LOWLANDS
Cooley Creek
Pughs Lagoon
DIGHTS HILL
RICHMOND
HOBARTVILLE

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-54
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Bakers Lagoon
Hawkesbury River
THE BREAKAWAY
CORNWALLIS
Cooley Creek
RICHMOND AERODROME
CLARENDON
WINDSOR
SOUTH WINDSOR
Rickabys Creek
Wianamatta / South Creek
BLIGH PARK
Windsor Downs Nature Reserve
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-55
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

PITT TOWN BOTTOMS
THE BREAKAWAY
Badu narang Gully
Pitt Town Nature Reserve
PITT TOWN
Pitt town Lagoon
Llewellyn Creek
Scheyville National Park
Hawkesbury River
THE PENINSULAR
South creek / Wianamatta
MCGRATHS HILL
Killarney chain of ponds
OAKVILLE
Mckenzies Creek
MULGRAVE
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-56
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Banks Creek
Calabash Creek
CALABASH BAY
CALABASH POINT
CUNIO POINT
DEEP BAY
Muogamarra Nature Reserve
Joe crafts Creek
DUSTHOLE POINT
DUSTHOLE BAY
BEROWRA WATERS
FRANKS BIGHT
Franks Gully
Fosters Creek
Crossland Creek
Washtub Gully
Racemosa Creek
BERILEE
BEROWRA HEIGHTS
Banggarai Creek
BARNETTS LOOKOUT
Berowra Valley National Park
Sams Creek
BEROWRA
Still Creek
CROSSLANDS
Berowra Creek
Calna Creek
Charltons Creek
Waratah Gully
Winson Gully
Donnelly Creek
Gleeson Creek
Lyrebird Gully
Mount Kuring-gai Aboriginal Area
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-57
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Gosford
Sydney
Bujwa Creek
Kimmerikong Creek
Lookout
COWAN
JERUSALEM BAY
PINTA BAY
Joe Crofts Creek
Yatala Creek
Racemosa Creek
LOOKING GLASS BAY
COTTAGE POINT
Cowan Creek
BEROWRA
COWAN WATER
Ku-ring-gai Chase National Park
Waratah Gully
WARATAH BAY
PEACH TREES
STINGRAY BAY
Smiths Creek
LORDS BAY
COTTON TREE BAY
Winson Gully
WINSON BAY

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-58
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Taffys Gully
JERUSALEM BAY
PINTA BAY
FISHERMANS BEACH
LITTLE SHARK ROCK POINT
AMERICA BAY
SHARK ROCK POINT
LITTLE JERUSALEM BAY
COWAN POINT
HALLETS BEACH
REFUGE BAY
Cowan Creek
CASTLE BAY
DEVILS HOLE BAY
YEOMANS BAY
Refuge Gully
COTTAGE POINT
COTTAGE POINT
PRATT BAY
WILLUNGA TRIG
Coal and candle Creek
Ku-ring-gai Chase National Park
Salvation Creek
Yeomans Creek
ILLAWONG BAY
Smiths Creek
AKUNA BAY
KU-RING-GAI CHASE
AKUNA BAY
Gosford
Sydney

GMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-59
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

LITTLE PITTWATER
GREAT MACKEREL BEACH
MACKEREL BEACH
CURRAWONG BEACH
SINCLAIR POINT
AMERICA BAY
THE BASIN
CURRAWONG BEACH
SOLDIERS POINT
THE BASIN BEACH
COASTERS RETREAT
Refuge Gully
Ku-ring-gai Chase National Park
PORTUGUESE BEACH
PORTUGUESE BAY
PUGNOSE POINT
WILLUNGA TRIG
TOWLERS LOOKOUT
PERRYS BEACH
LONGNOSE POINT
TREHARNE COVE
Salvation Creek
MORNING BAY
PITTWATER
BIRNIE LOOKOUT
WOODY POINT
LITTLE LOVETT BAY
CLAREVILLE BEACH
LOVETT BAY
TAYLORS BEACH
LONG BEACH
TAYLORS POINT
ROCKY POINT
PITT POINT
SCOTLAND ISLAND
REFUGE COVE
ELVINA BAY
PITTWATER
SOUTH BEACH
SALT PAN COVE
MCCARRS CREEK
CHURCH POINT
SALT PAN POINT
Mccarrs Creek
BOTHAMS BEACH
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-60
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

STATION BEACH
PALM BEACH
OBSERVATION POINT
SNAPPERMAN BEACH
PALM BEACH
SAND POINT
SAND POINT
SANDY BEACH
LITTLE HEAD
Dark Gully
WHALE BEACH
WHALE BEACH
STOKES POINT
CAREEL BAY
CAREEL HEAD
STOKES POINT
CAREEL BAY
PARADISE BEACH
PARADISE BEACH
BANGALLEY HEAD
Careel Creek
NORTH AVALON
AVALON
CLAREVILLE BEACH
CLAREVILLE
LONG BEACH
AVALON BEACH
AVALON BEACH
CLAREVILLE BEACH
TAYLORS POINT
REFUGE COVE
BILGOLA PLATEAU
BILGOLA BEACH
BILGOLA HEAD
BILGOLA BEACH
SALT PAN COVE
Mcmahons Creek
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-61
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

BLIGH PARK

Rickabys Creek

Windsor Downs Nature Reserve

WINDSOR DOWNS

BERKSHIRE PARK

Castlereagh Nature Reserve

South creek / Wianamatta

Gosford

Sydney

R&H SEPP Coastal Management Areas

BLIGH PARK

Rickabys Creek

Eastern Creek

WINDSOR DOWNS

BERKSHIRE PARK

South creek / Wianamatta

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-62
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

VINEYARD
GRANTHAM FARM
RICHARDS
RIVERSTONE
ANGUS
South creek / Wianamatta
Killarney chain of ponds
Mckenzies Creek
First ponds Creek
Eastern Creek
Bells Creek
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-63
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

Charltons Creek
Berowra Creek
Calna Creek
Donnelly Creek
Berowra Valley National Park
Winson Gully
Mount Kuring-gai Aboriginal Area
Provest Creek
Gleeson Creek
Lyrebird Gully
MOUNT KURING-GAI
Loddon Creek
HORNSBY HEIGHTS
MOUNT COLAH
Apple tree Creek
Cockle Creek
Ku-ring-gai Chase National Park
Grimsons Gully
Walls Gully
ASQUITH
HOOKHAMS CORNER
HORNSBY
Lovers jump Creek
Caley Brook
Hornsby Creek
Fraters Brook
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-64
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

LORDS BAY
COTTON TREE BAY
Winson Gully
WINSON BAY
APPLE TREE BAY
BOBBIN HEAD
FOLEYS BAY
BOBBIN HEAD
Apple tree Creek
Cowan Creek
Ku-ring-gai Chase National Park
DUFFYS FOREST
SLADE LOOKOUT
Waterfall Gully
Kuring-gai Creek
Kierans Creek
Cowan Creek
Gosford
Sydney

R&H SEPP Coastal Management Areas

Waratah Gully
LORDS BAY
COTTON TREE BAY
Winson Gully
WINSON BAY
APPLE TREE BAY
Appletree Creek
Cowan Creek
BOBBIN HEAD
FOLEYS BAY
BOBBIN HEAD
Cockle Creek
DUFFYS FOREST
SLADE LOOKOUT
Waterfall Gully
Kuring-gai Creek
Kierans Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-65
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

ILLAWONG BAY
Smiths Creek
Coal and Candle Creek
AKUNA BAY
KU-RING-GAI CHASE
AKUNA BAY
Ku-ring-gai Chase National Park
MCCARRS CREEK
TERREY HILLS
Mccarrs Creek
Wirreanda Creek
TUMBLEDOWN DICK
Neverfail Gully
Kierans Creek
Garigal National Park
Deep Creek
Gosford
Sydney

R&H SEPP Coastal Management Areas

ILLAWONG BAY
Coal and Candle Creek
Smiths Creek
AKUNA BAY
KU-RING-GAI CHASE
AKUNA BAY
MCCARRS CREEK
Mccarrs Creek
TERREY HILLS
Wirreanda Creek
TUMBLEDOWN DICK
Neverfail Gully
Kierans Creek
Deep Creek

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-66
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

LOVETT BAY
ROCKY POINT
PITT POINT
SCOTLAND ISLAND
ELVINA BAY
PITTWATER
REFUGE COVE
SOUTH BEACH
SALT PAN COVE
CHURCH POINT
BOTHAMS BEACH
Ku-ring-gai Chase National Park
Coal and candle Creek
BROWNS BAY
HORSESHOE COVE
GREEN POINT
CRYSTAL BAY
HAYSTACK POINT
LOQUAT VALLEY
MAYBANKE COVE
HERON COVE
MCCARRS CREEK
Mccarrs Creek
Crystal Creek
OLD MANGROVE BAY
WINNERERREMY BAY
WINJI JIMMI BAY
WINJI JIMMI
Wirreanda Creek
INGLESIDE HEIGHTS
BAYVIEW
Cahill Creek
MONA VALE
Cicada glen Creek
INGLESIDE
Narrabeen Creek
MONA VALE BEACH
Fern Creek
WARRIEWOOD
WARRIEWOOD BEACH
Mullet Creek
ELANORA HEIGHTS
TURIMETTA HEADLAND
TURIMETTA BEACH
Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Use Area
Coastal Wetland
Coastal Wetland Proximity Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-67
Hawkesbury-Nepean River System CMP

Locality Plan and Land Tenure

R&H SEPP Coastal Management Areas

LONG BEACH
TAYLORS POINT
REFUGE COVE
BILGOLA PLATEAU
BILGOLA BEACH
BILGOLA HEAD
SALT PAN COVE
Careel Creek
Bilgola Creek
Mcmahons Creek
NEWPORT
NEWPORT BEACH
CRYSTAL BAY
HAYSTACK POINT
HERON COVE
OLD MANGROVE BAY
WINJI JIMMI BAY
BUNGAN HEAD
BASIN BEACH
MONA VALE BEACH
WARRIEWOOD BEACH
TURIMETTA HEADLAND
TURIMETTA HEAD
TURIMETTA BEACH

Gosford
Sydney

CMP Study Area
Council Reserve
Crown Land Reserve
NPWS Estate
Coastal Environment Area
Coastal Wetland
Coastal Wetland Proximity Area
Coastal Use Area
Littoral Rainforest
Littoral Rainforest Proximity Area

0 250 500 1,000 Meters

1:29,000 at A3

WATER TECHNOLOGY

Figure A-68
Hawkesbury-Nepean River System CMP

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

APPENDIX B
CMP MANAGEMENT ACTION MAPPING

DRAFT



Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area

Data sources:

Contains SIXMAPS Information © State of NSW 2025

0 2.5 5 km

Figure B1

2025-09-19T19:31:35.957

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

S5.HCC.C

S7.HCC.A

S5.HCC.C

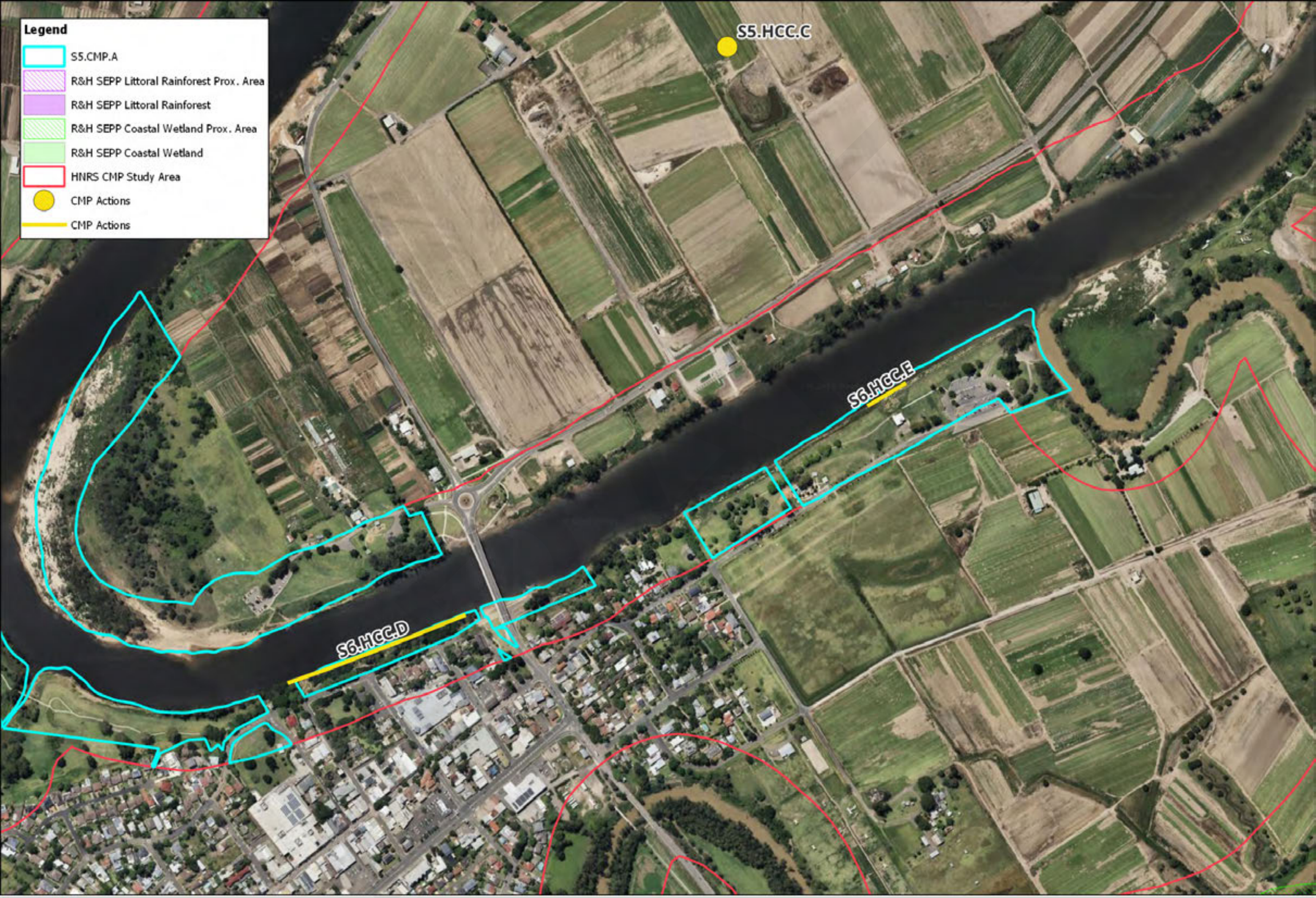
S6.HCC.D S6.HCC.E

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 1 2 km

Figure B2

2025-09-19T19:40:44.322

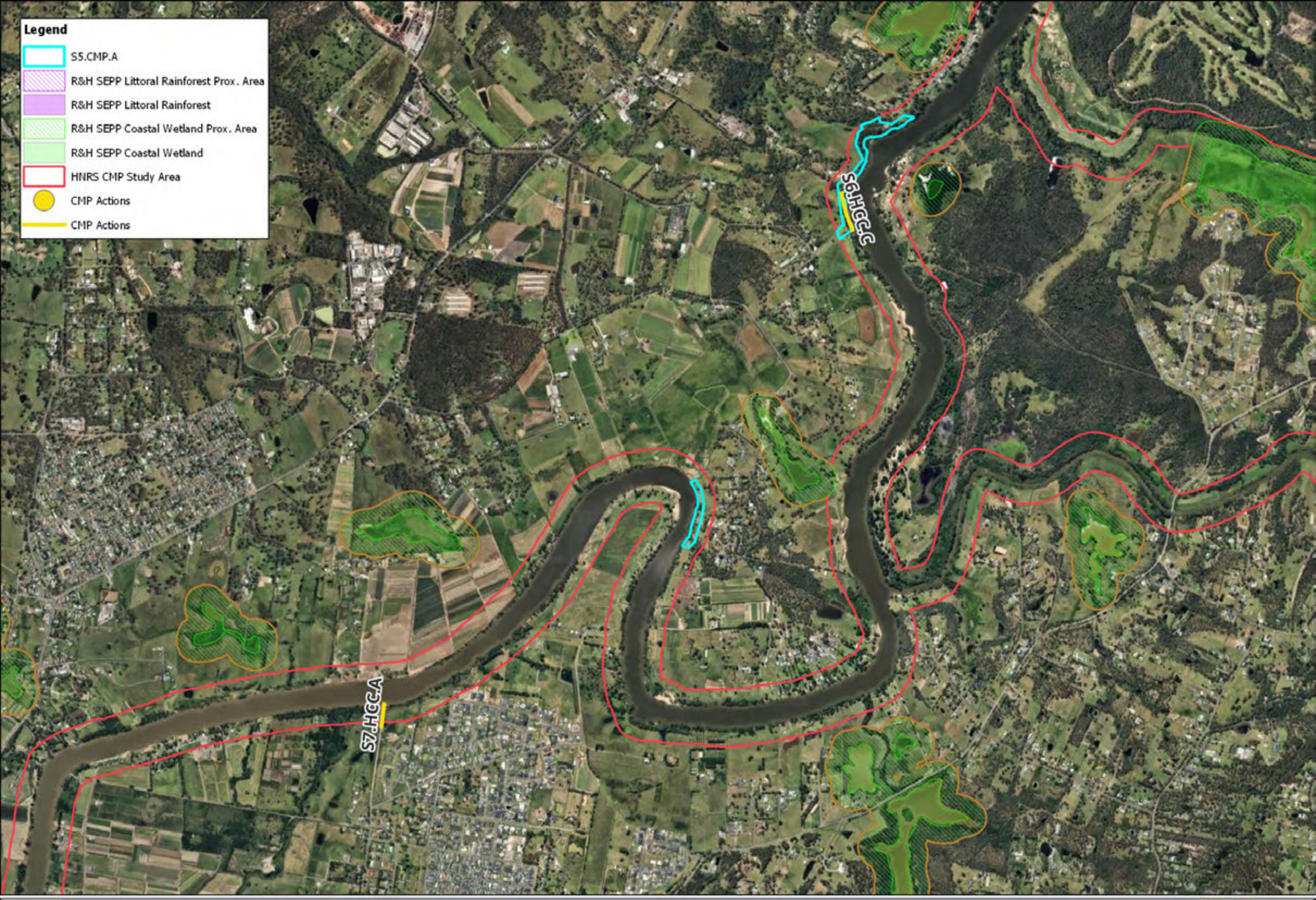


Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B3

2025-09-19T19:40:50.453



Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 0.75 1.5 km

Figure B4

2025-09-19T19:40:55.982

S6.HCC.B

Legend

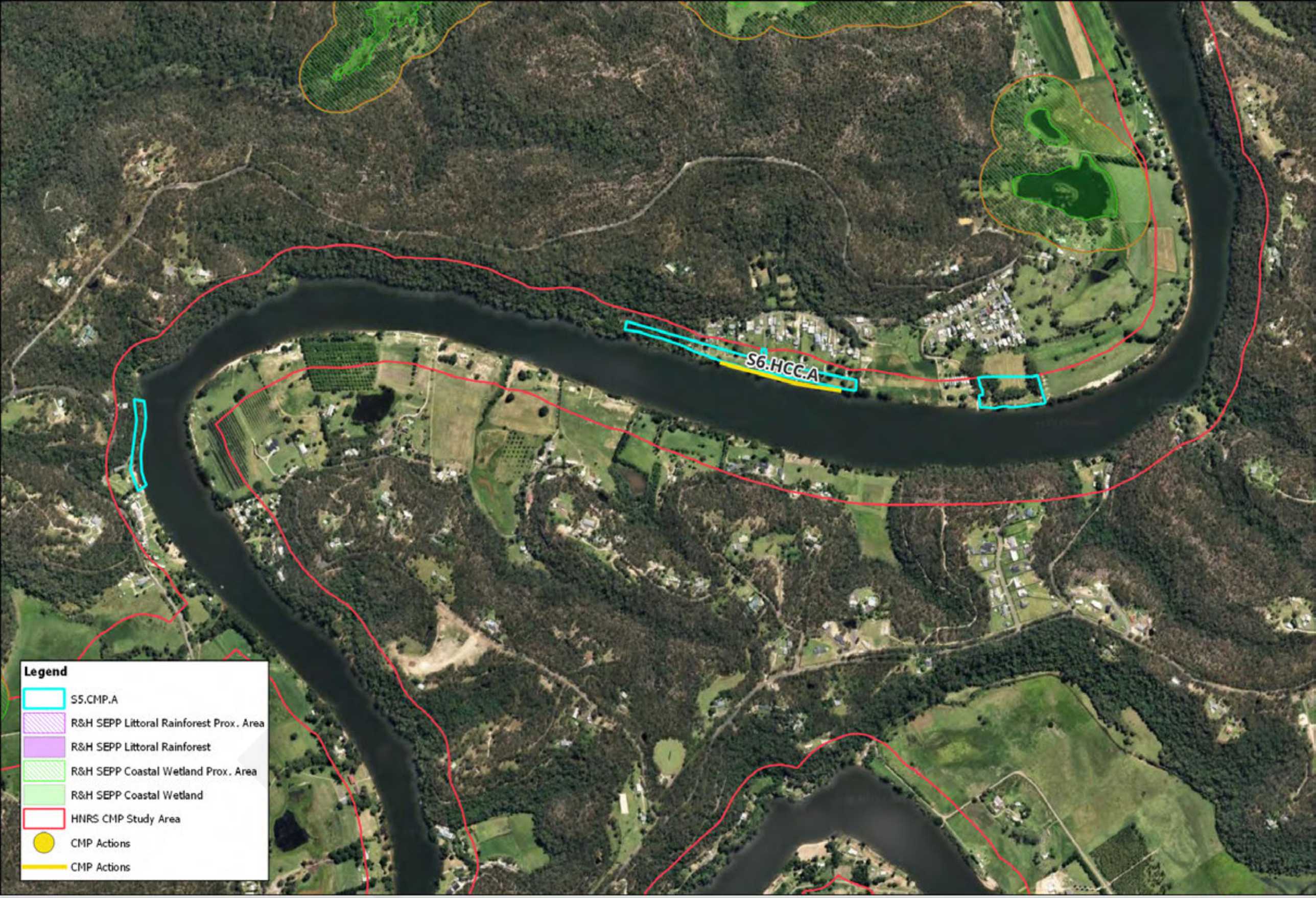
- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B5

2025-09-19T19:41:02.593



Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B6

2025-09-19T19:41:09.537

S6.THC.A

S6.THC.E

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B7

2025-09-19T19:41:22.700

S6.THC.D

S6.THC.D

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B8

2025-09-19T19:41:37.161

S6.THC.B

S7.HSC.H

S6.THC.G

Legend

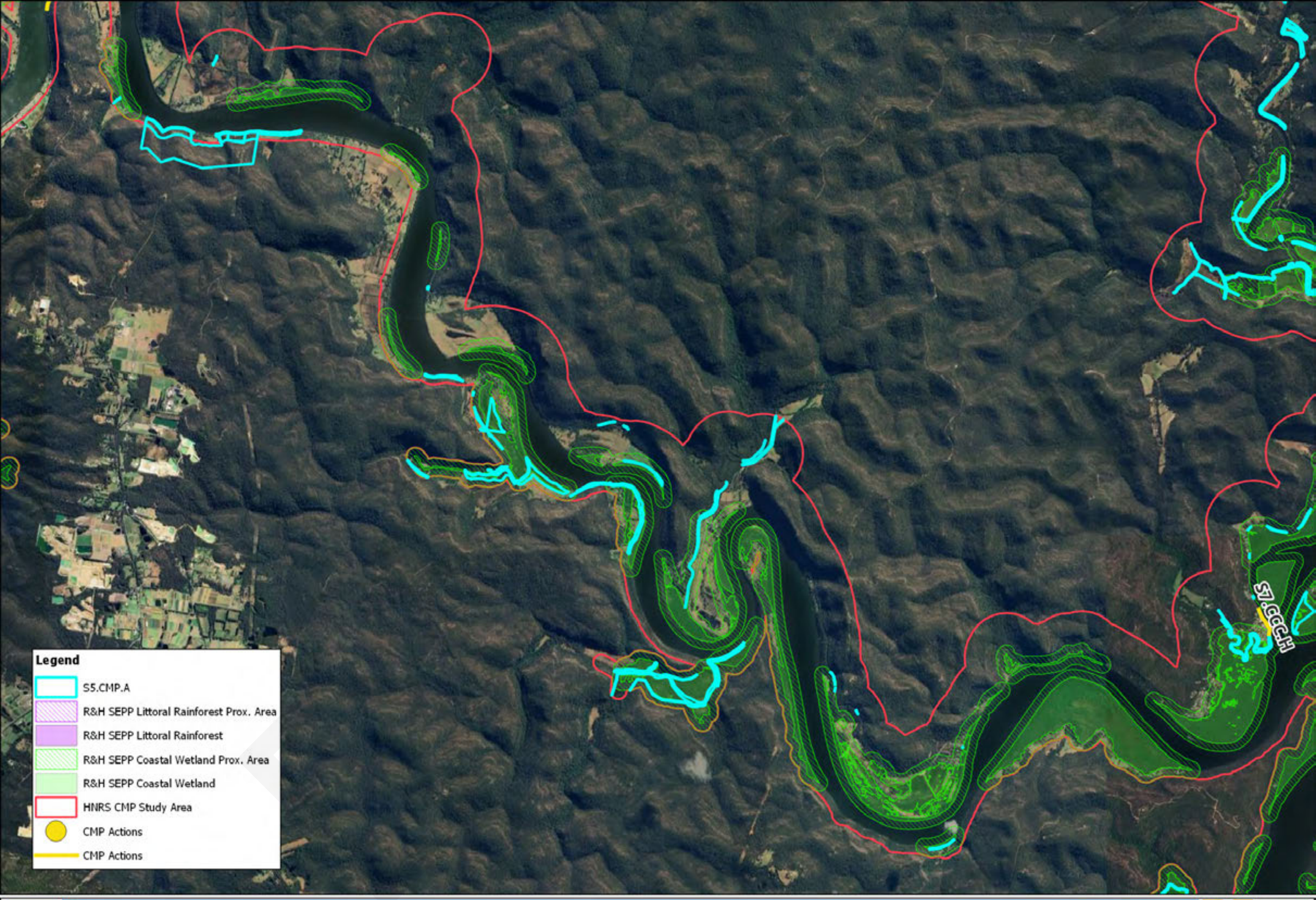
- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B9

2025-09-19T19:41:45.687

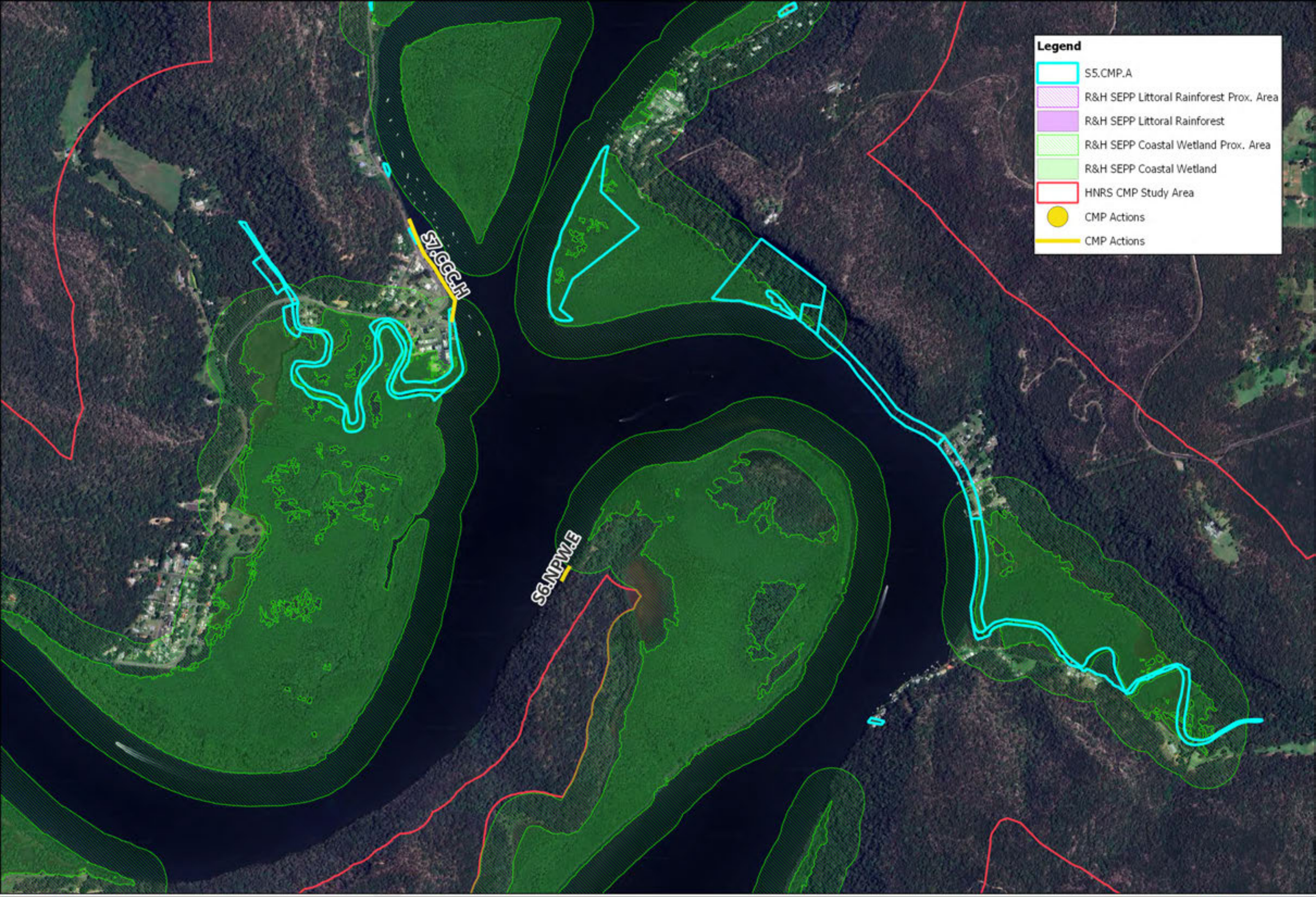


Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 1 2 km

Figure B10

2025-09-19T19:41:57.025



Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B11

2025-09-26T11:34:30.782



Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 10 20 m

Figure B12

2025-09-19T19:42:10.176

S7.HSC.F

S7.HSC.E

S5.HSC.C

S6.HSC.C

S6.HSC.D

S6.HSC.C

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

Data sources:

Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B13

2025-09-19T19:42:16.473

S5.HSC.B
S7.HSC.D
S7.HSC.C
S6.HSC.G
S6.HSC.B
S7.HSC.A
S5.HSC.A
S7.HSC.B
S7.HSC.B
S6.HSC.A

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B14

2025-09-19T19:42:23.893



Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B15

2025-09-19T19:42:34.758



Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B16

2025-09-19T19:42:43.275

S3.CCC.E
S6.CCC.V
S2.CCC.C
S6.CCC.X
S6.CCC.W
S6.CCC.Q
S6.CCC.X
S2.CCC.C
S7.CCC.D

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B17

2025-09-19T19:42:53.341

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

S6.CCC.V
S6.CCC.O
S7.CCC.E
S7.CCC.B
S6.CCC.W
S6.CCC.P
S6.CCC.N
S6.CCC.V
S6.CCC.P
S7.CCC.E
S6.CCC.W
S6.CCC.V
S6.CCC.W
S6.CCC.V
S2.CCC.C
S6.CCC.X

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B18

2025-09-19T19:43:06.981

S6.CCC.N
S6.CCC.M
S6.CCC.L
S6.CCC.G
S6.CCC.O
S6.CCC.V
S6.CCC.K
S8.CCC.A
S6.CCC.J
S3.CCC.B
S6.CCC.I

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B19

2025-09-19T19:43:23.265



Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B20

2025-09-19T19:43:36.070

S6.CCC.C

S7.CCC.J

S6.CCC.F

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B21

2025-09-19T19:43:53.779

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

S6.CCC.D

S3.CCC.C

S6.CCC.E

S5.CCC.B

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B22

2025-09-19T19:44:10.213

S6.CCC.A

S6.CCC.A

S6.CCC.A

S6.CCC.B

Legend

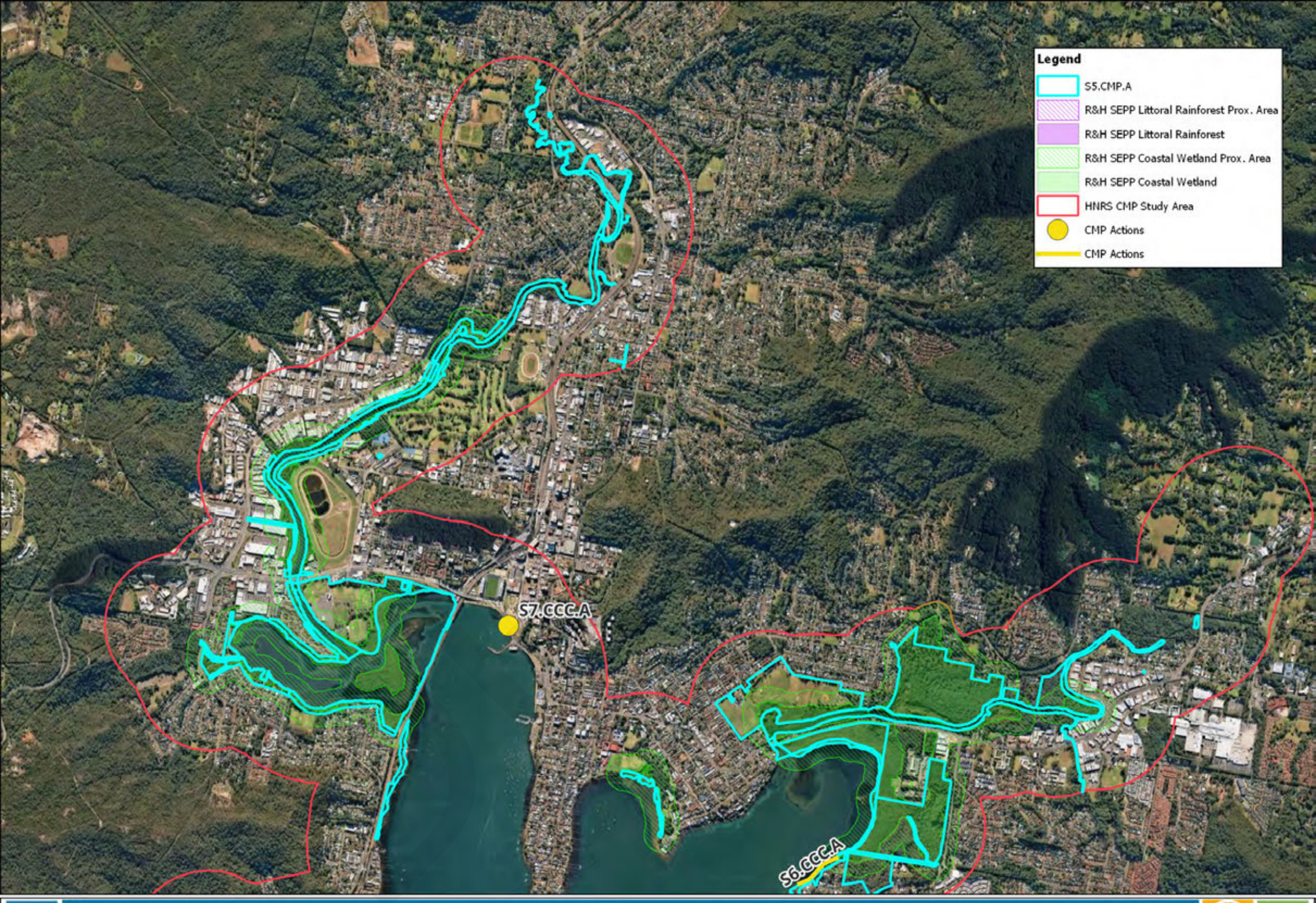
- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 100 200 m

Figure B23

2025-09-19T19:44:24.419



Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 1 2 km

Figure B24

2025-09-19T19:44:35.283

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

S6.NBC.H

S6.NBC.G

S6.NPW.A

S6.NBC.A

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 250 500 m

Figure B25

2025-09-19T19:44:46.179

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

S6.NBC.H

S6.NBC.G

S6.NPW.B

S6.NPW.E

S6.NPW.E

S6.NBC.B

S6.NBC.C

S7.NBC.B

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 250 500 m

Figure B26

2025-09-26T09:50:13.159

Legend

- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

S6.NBC.D

S5.NBC.B

S5.NBC.A

S6.NBC.E

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 250 500 m

Figure B27

2025-09-19T19:45:02.863

S2.NBC.C

S6.NBC.F

Legend

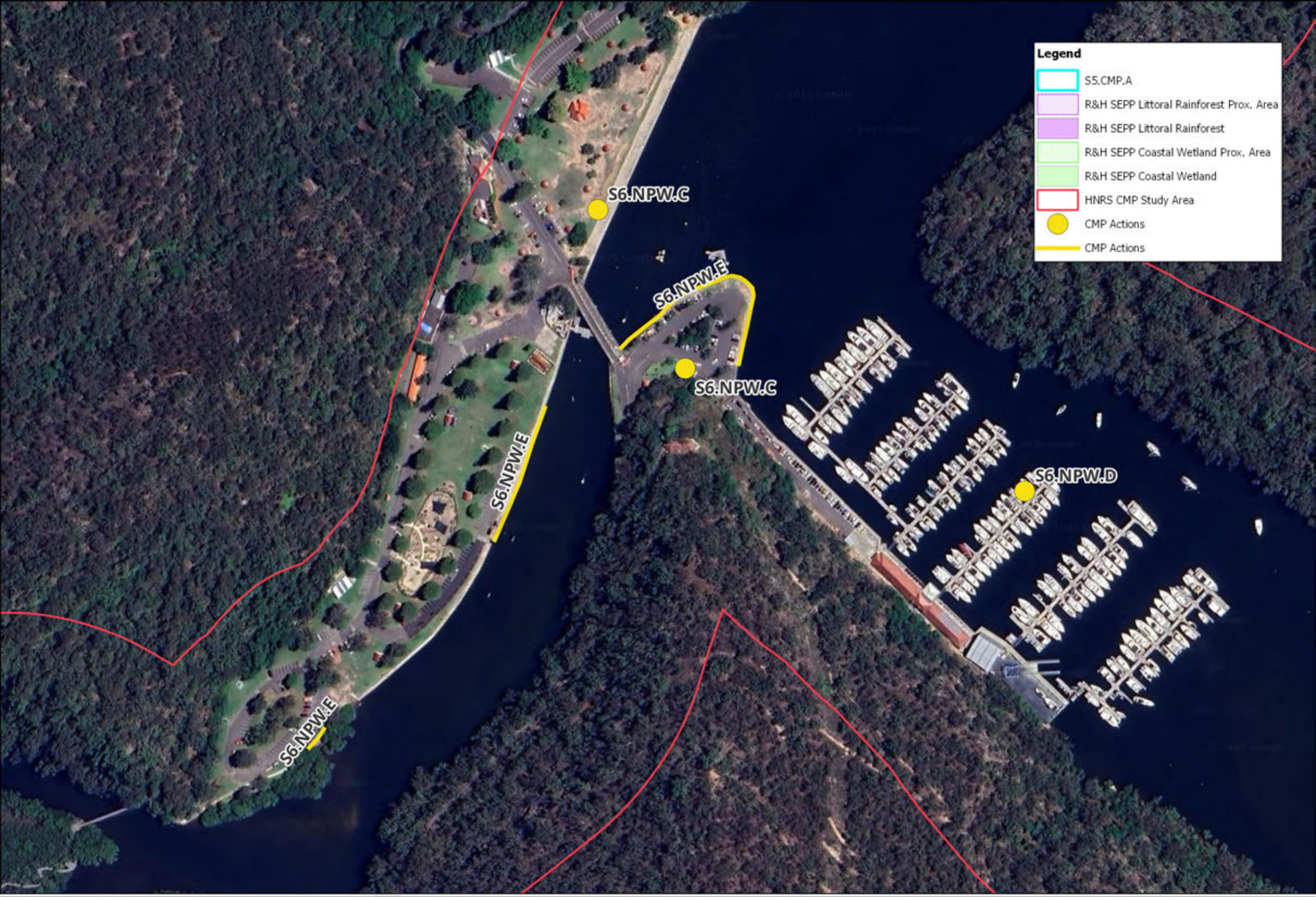
- S5.CMP.A
- R&H SEPP Littoral Rainforest Prox. Area
- R&H SEPP Littoral Rainforest
- R&H SEPP Coastal Wetland Prox. Area
- R&H SEPP Coastal Wetland
- HNRS CMP Study Area
- CMP Actions
- CMP Actions

Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 250 500 m

Figure B28

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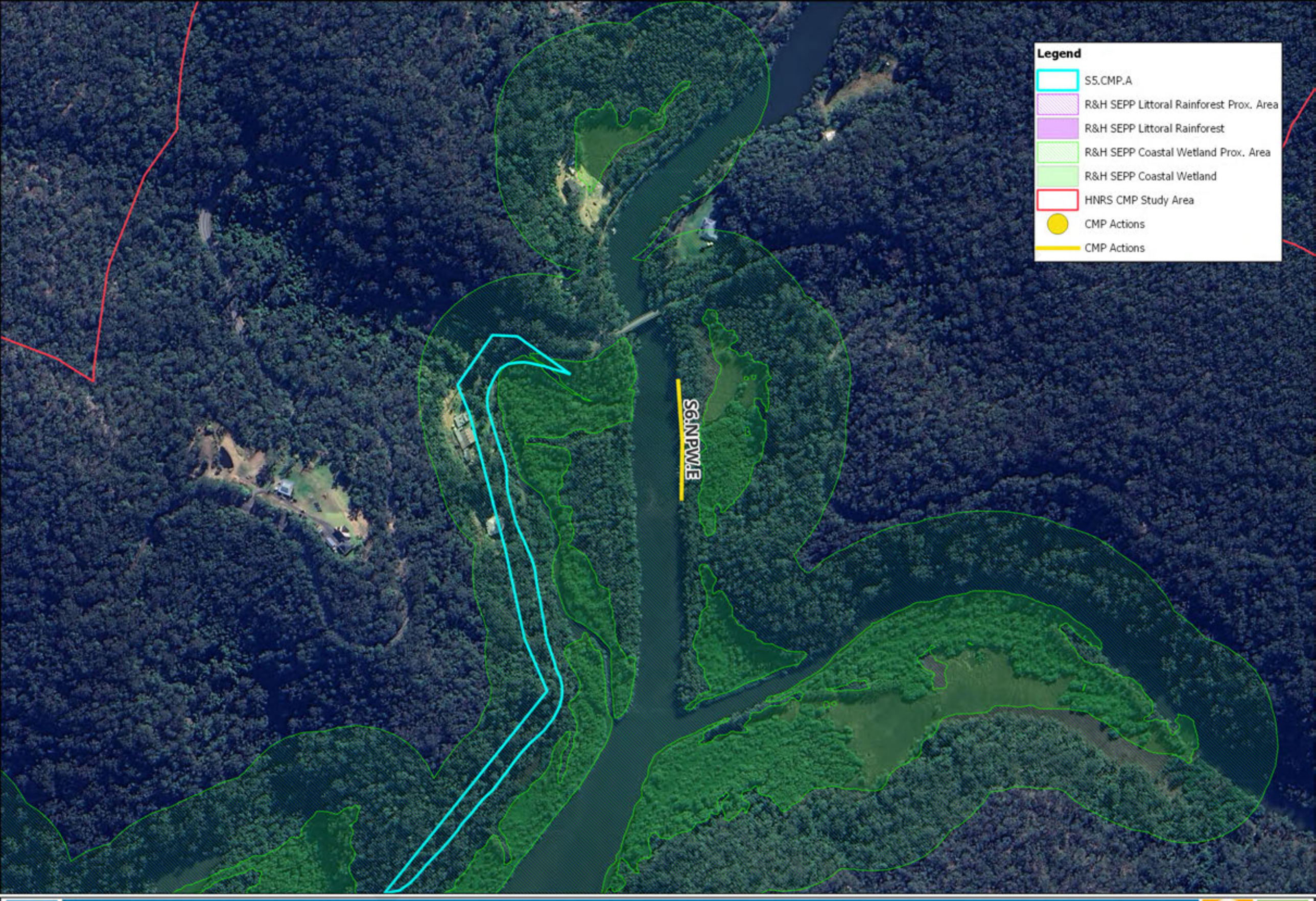


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0 50 100 m

Figure B29

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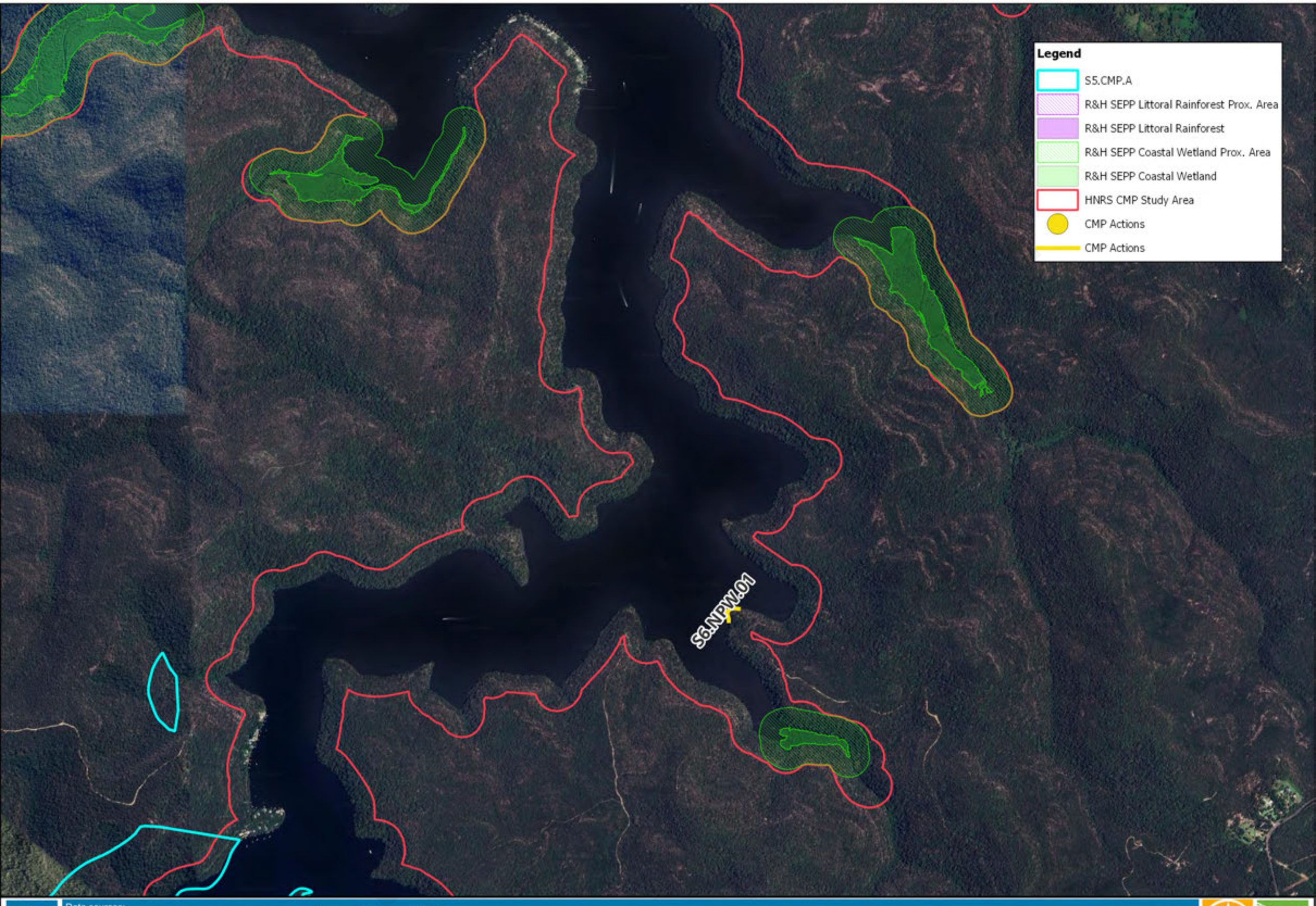


Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 250 500 m

Figure B30

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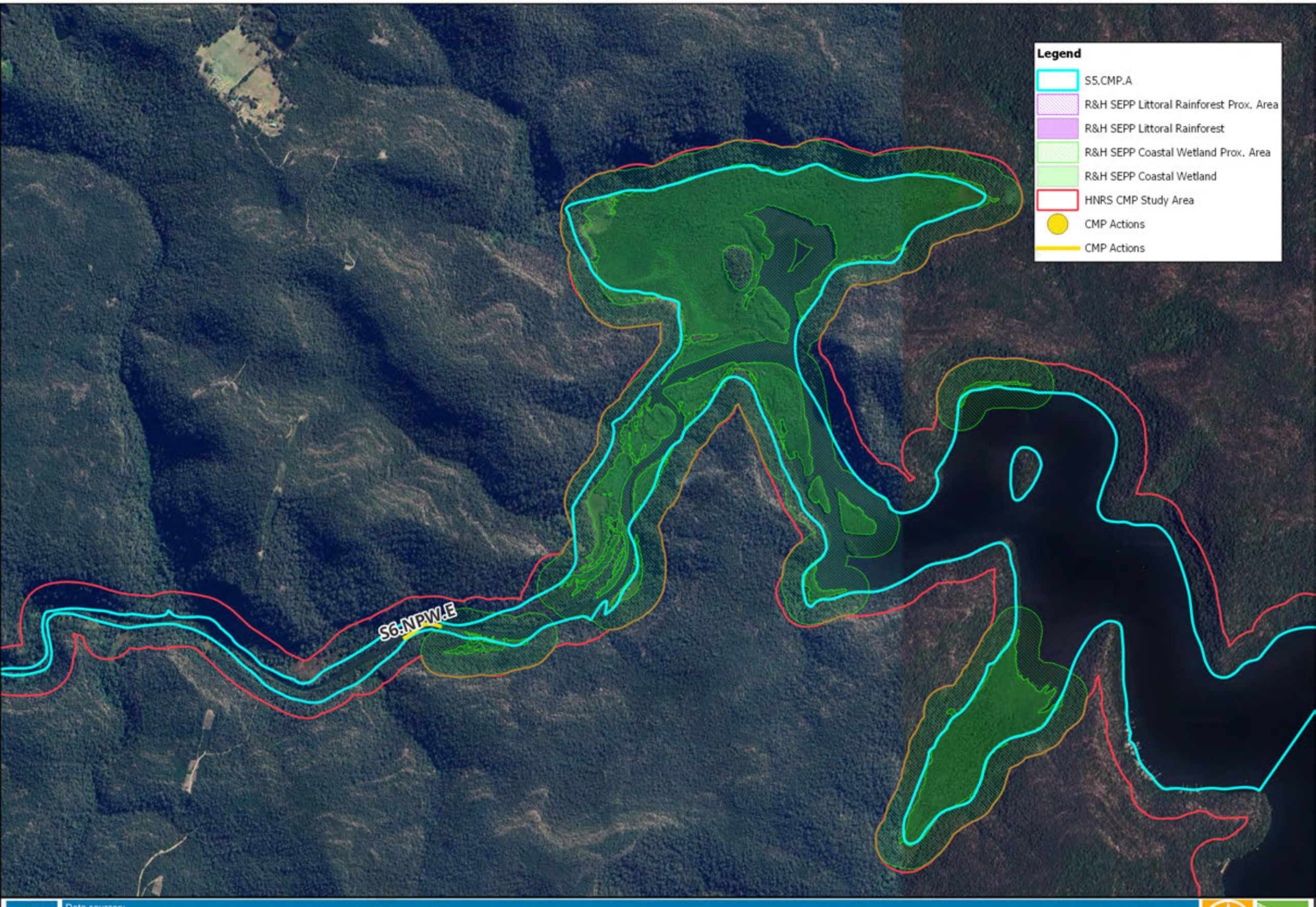


Data sources:
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0 250 500 m

Figure B31

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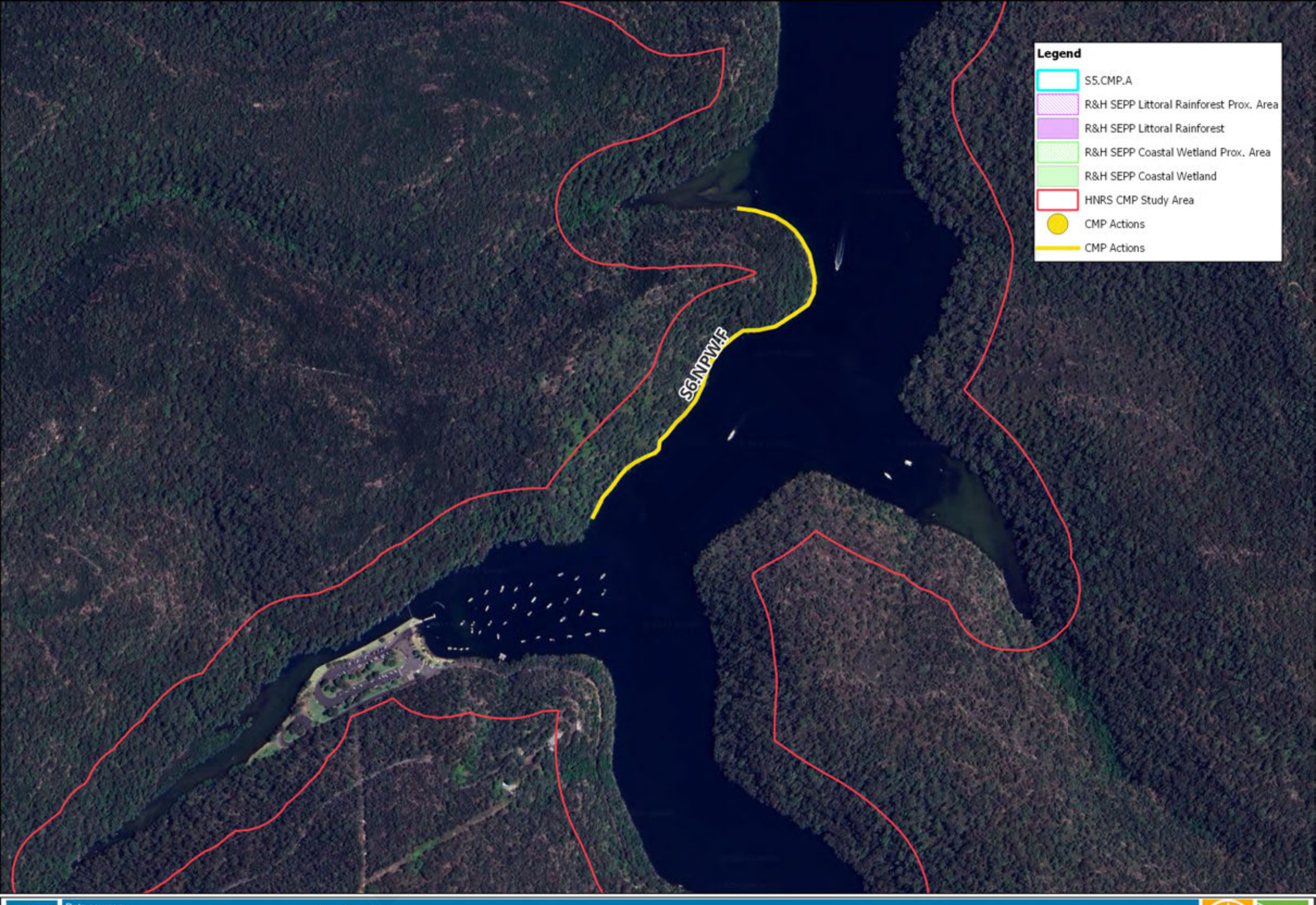


Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 250 500 m

Figure B32

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Data sources:
Contains SIXMAPS Information © State of NSW 2025

0 50 100 m

Figure B33

2025-10-02T08:34:26.779

APPENDIX C
COASTAL PROTECTION WORKS – REFERENCE COMPENDIUM

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C-1 Overview

Concept designs are a critical step in translating the strategic directions of the CMP into practical, on-ground outcomes. By setting out the form and function of proposed works at a concept level, they provide a shared reference point for Councils, agencies, and the community, bridging the gap between high-level strategy and detailed design.

This Appendix presents an overview of concept designs for actions in the CMP that are designated as designated as Coastal Protection Works (CPW), as per the definition provided in the CM Act (see Section 5.1.1). The purpose of these concept designs is to provide sufficient technical detail on the nature and scope of proposed CPW to enable determining authorities to consistently interpret the actions and apply streamlined approval pathways as relevant.

The Appendix is structured into two parts:

- Section C-2 - Provides a set of generic concept designs for common types of CPW, including rock-armoured seawalls and revetments, geotextile sand container (GSC) seawalls and revetments, “living shoreline” seawalls, beach nourishment, and dune management works. These designs are provided for CPW actions where no site-specific technical design study has yet been undertaken.
- Section C-3 Provides concept designs for specific sites and actions where detailed site-specific technical investigations have already been completed.

This compendium has been developed to provide clarity, promote consistency, and build confidence in the interpretation and application of CPW actions under the CMP. By setting out concept-level designs, it supports both the streamlined approvals pathway, and the practical implementation of priority works across the HNRS. These designs will also serve as the foundation for the progression to detailed engineering design, cost refinement, and future funding applications.

All design parameters depicted are indicative only, high level in nature, and remain subject to refinement through geotechnical investigations, detailed design development, cost estimation, and stakeholder engagement.

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C-2 Generic Concept Designs for CPW

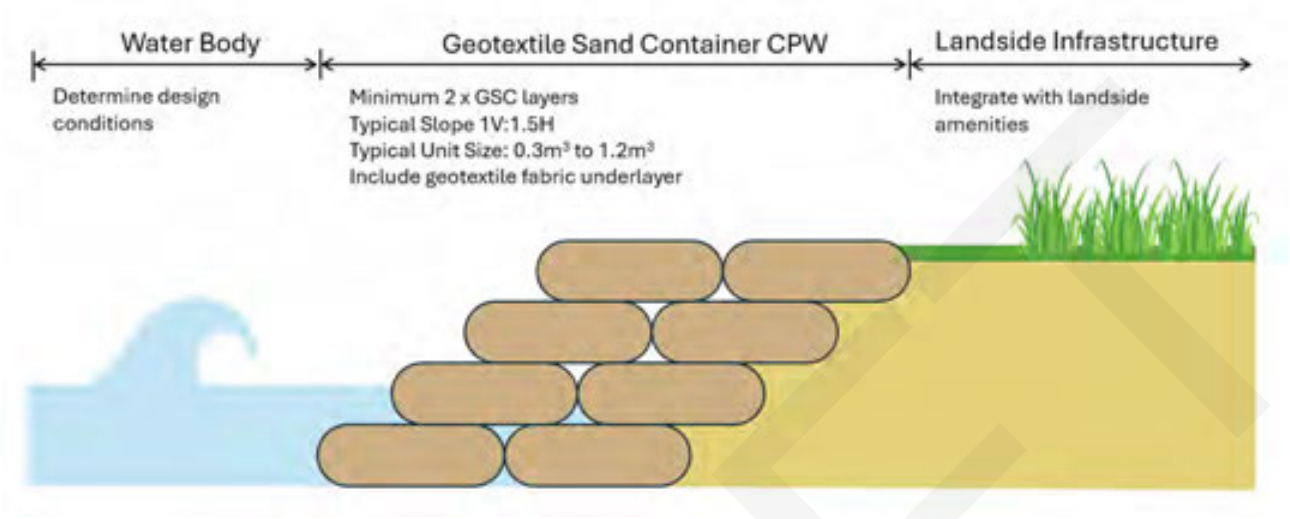


Figure C-1 Concept Design for CPW: Geotextile Sand Container (GSC) structures

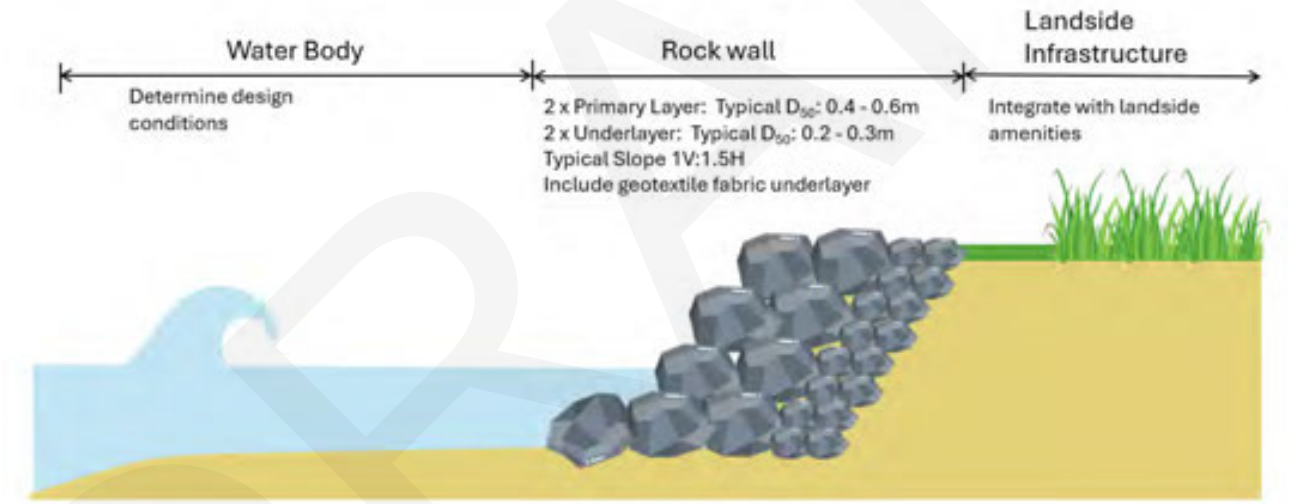


Figure C-2 Concept Design for CPW: Rock armoured structures

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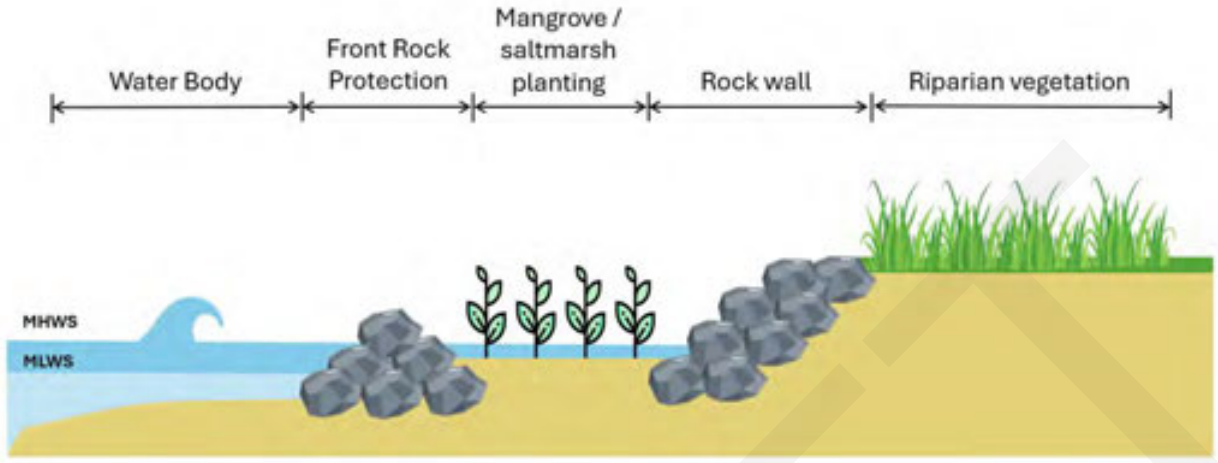


Figure C-3 Concept Design for CPW: Rock bench living shoreline structures

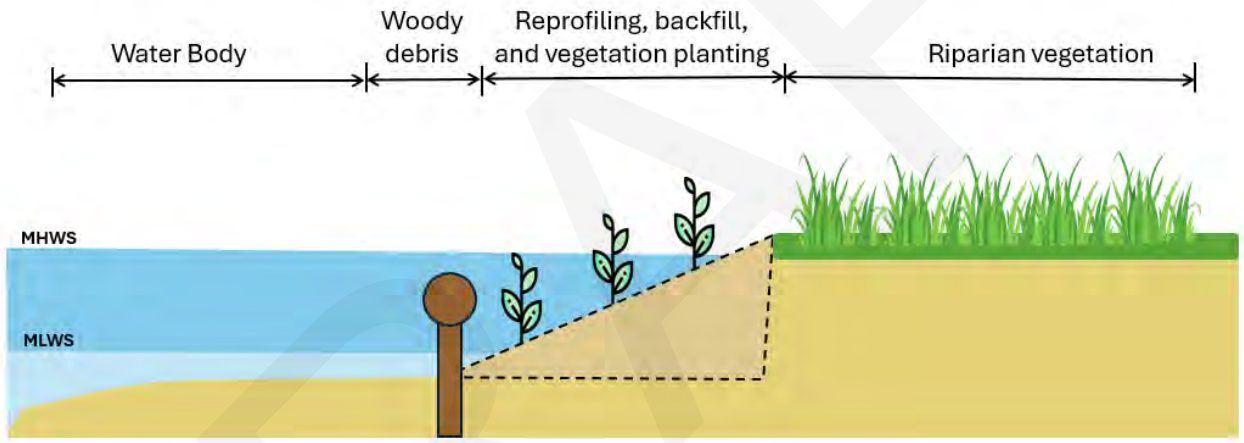


Figure C-4 Concept Design for CPW: Bank reprofiling and woody debris installation

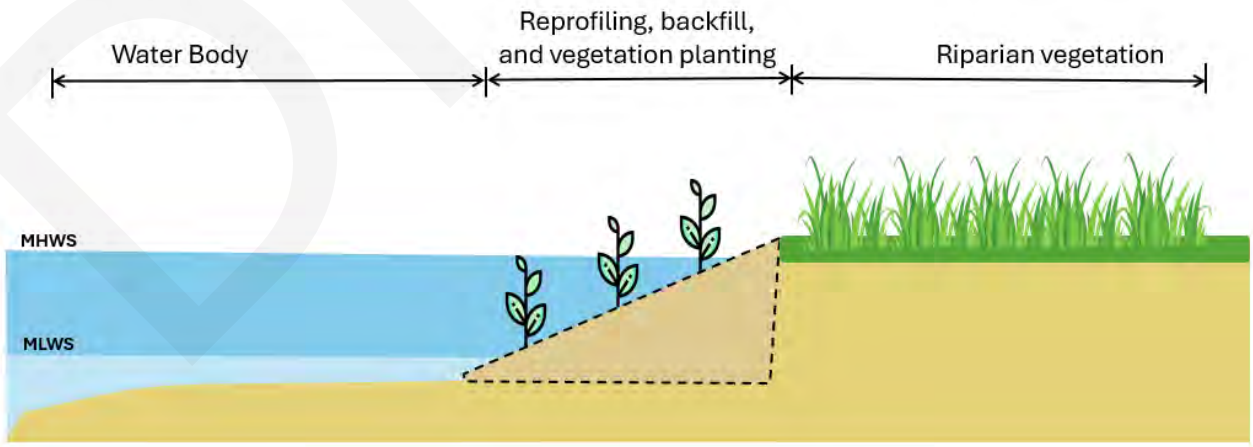


Figure C-5 Concept Design for CPW: Bank reprofiling

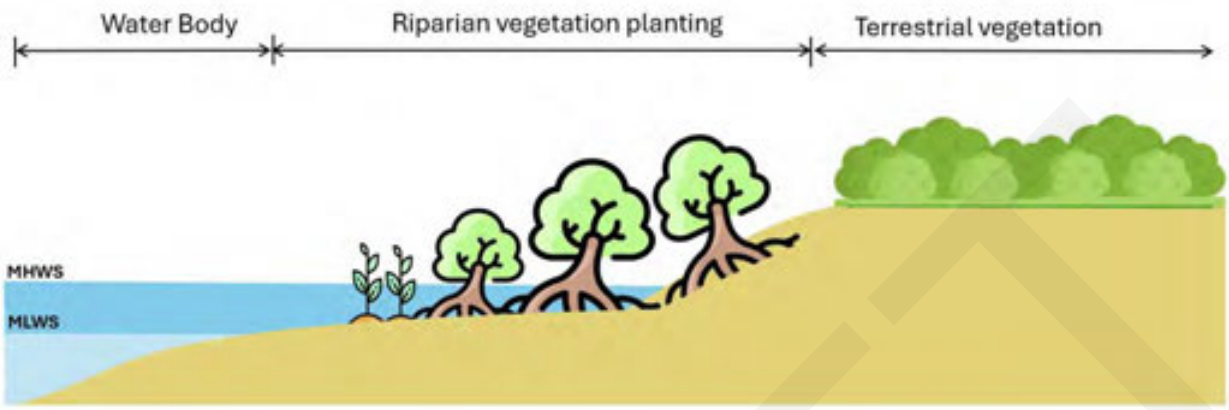


Figure C-6 Concept Design for CPW: Riparian vegetation planting

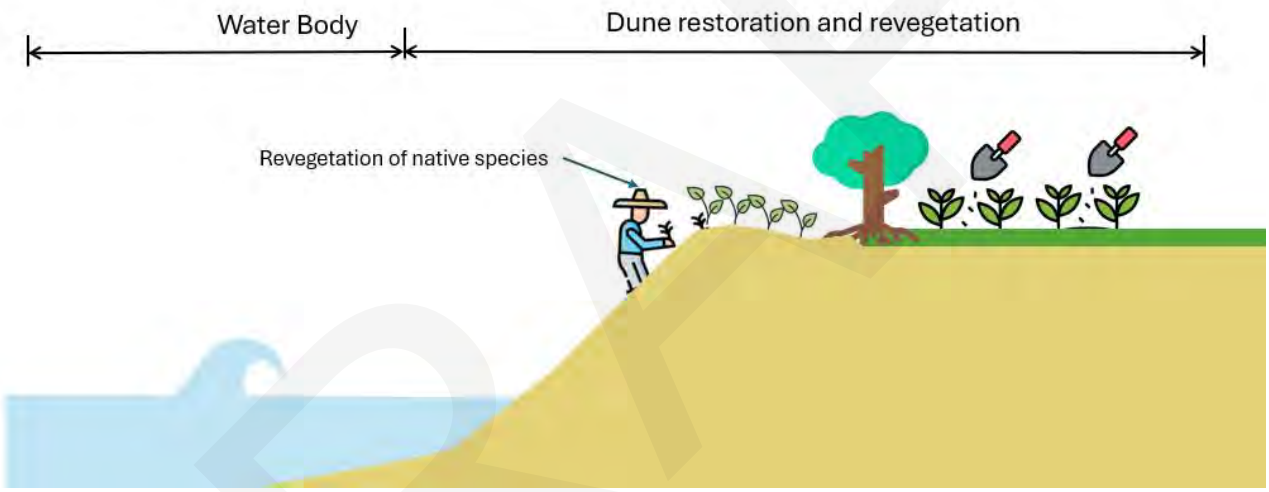


Figure C-7 Concept Design for CPW: Dune restoration and revegetation

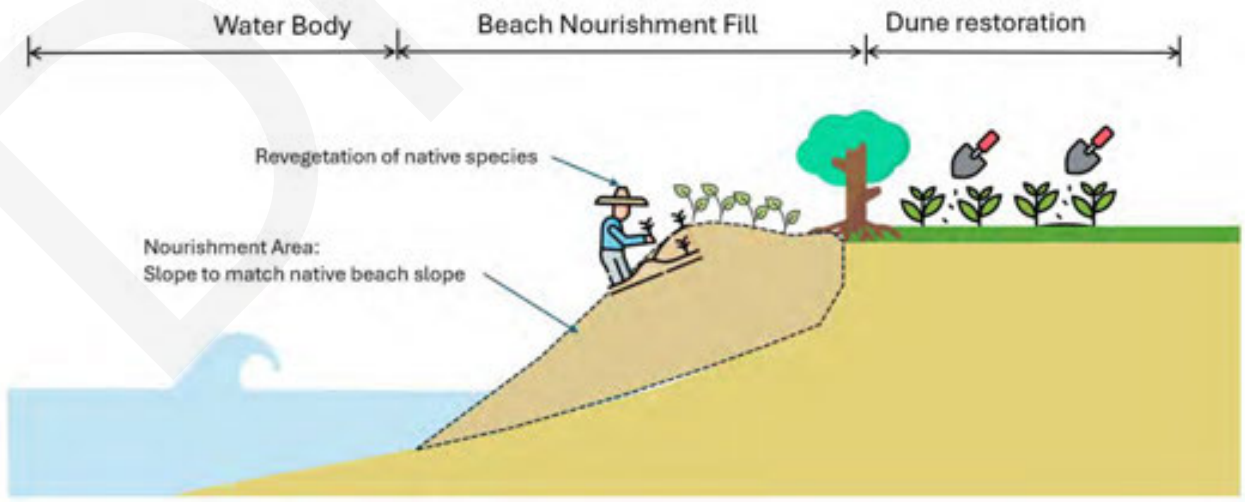


Figure C-8 Concept Design for CPW: Beach nourishment and dune restoration

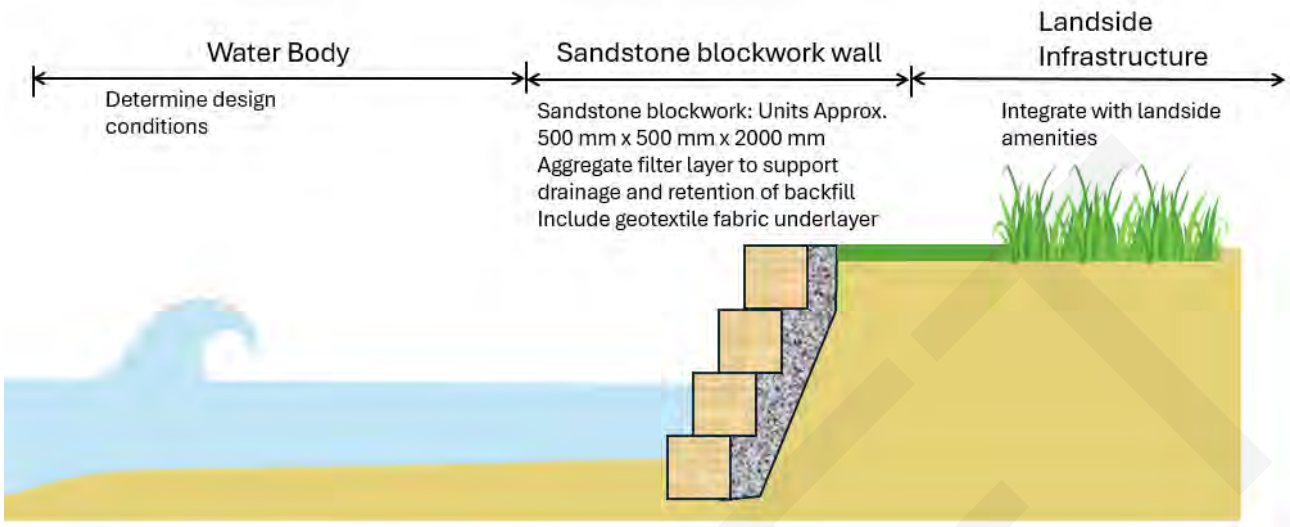


Figure C-9 Concept Design for CPW: Sandstone blockwork revetment

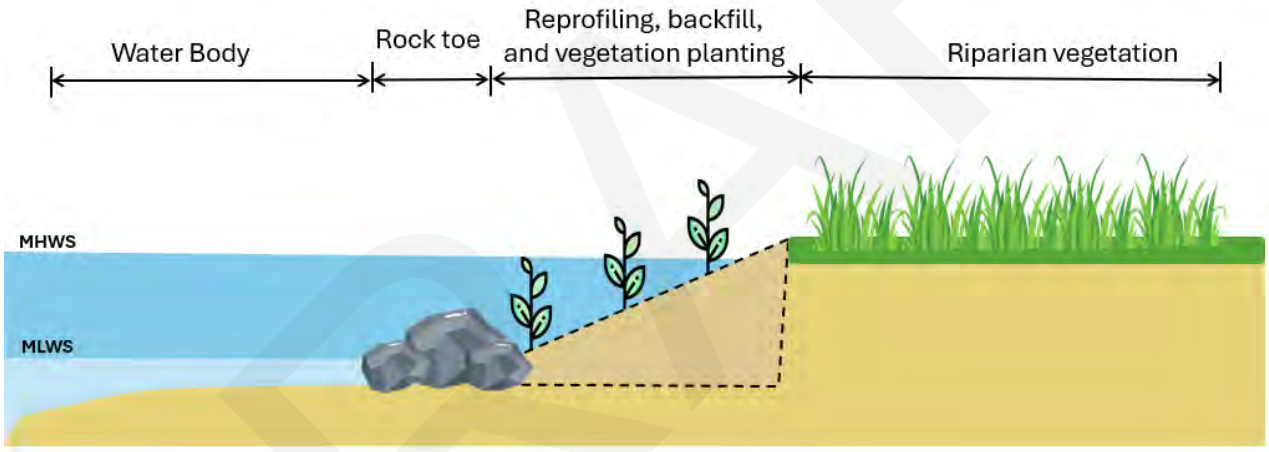


Figure C-10 Concept Design for CPW: Reprofiling with rock toe

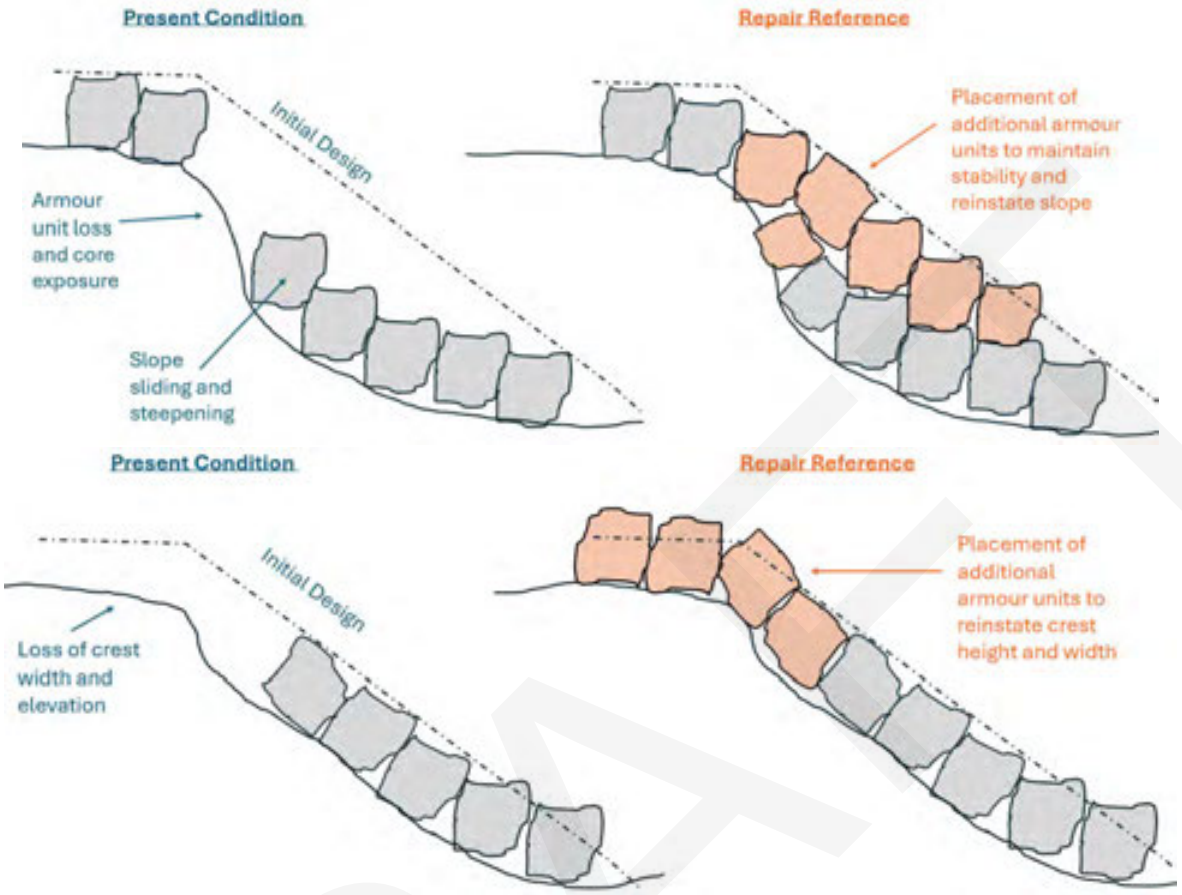


Figure C-11 Repair reference concept for rock armoured CPW

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C-3 Specific Concept Designs for CPW

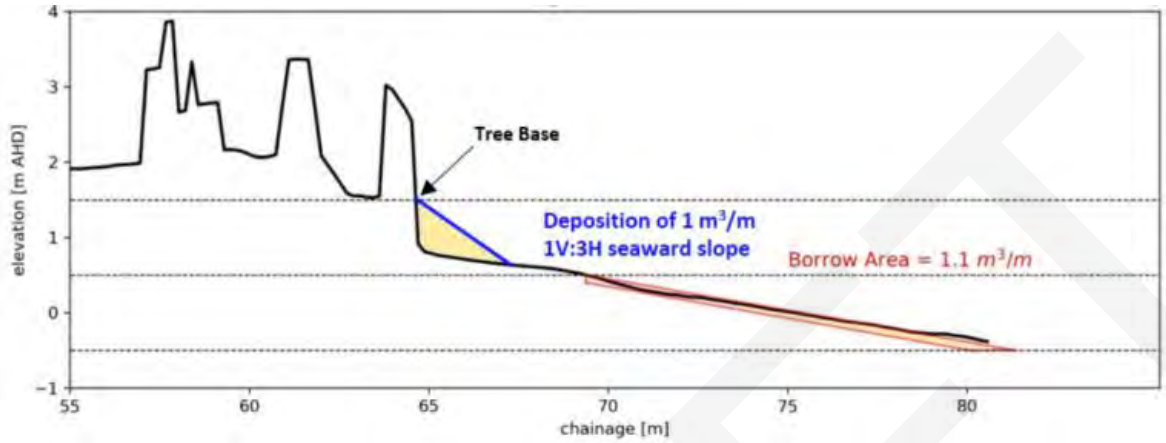


Figure C-12 Concept Design for Action S6.NBC.B. Source and further reference: (WRL, 2019)

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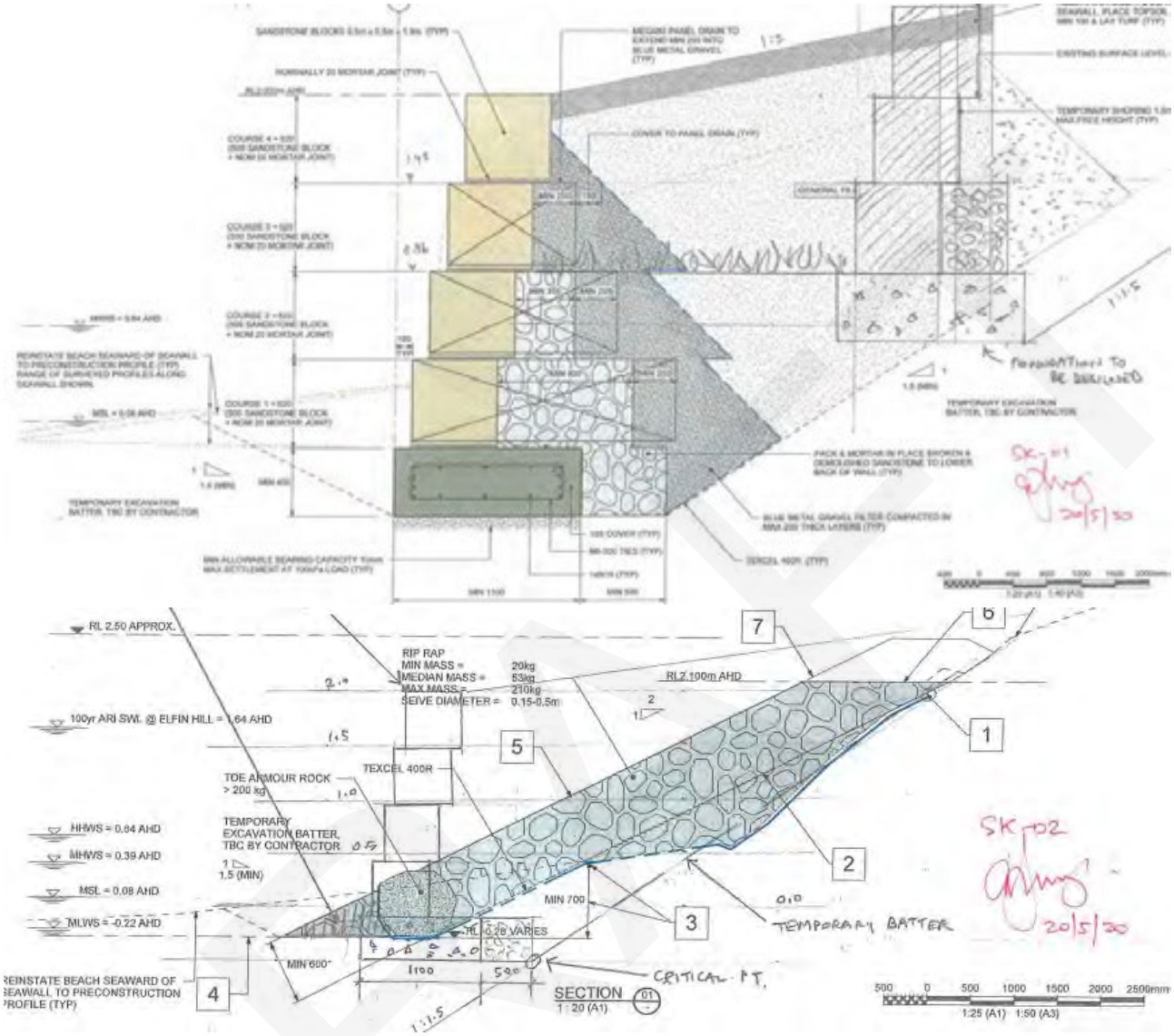


Figure C-13 Concept Design for Action S6.CCC.F. Source and further reference: (RHDHV, 2020)

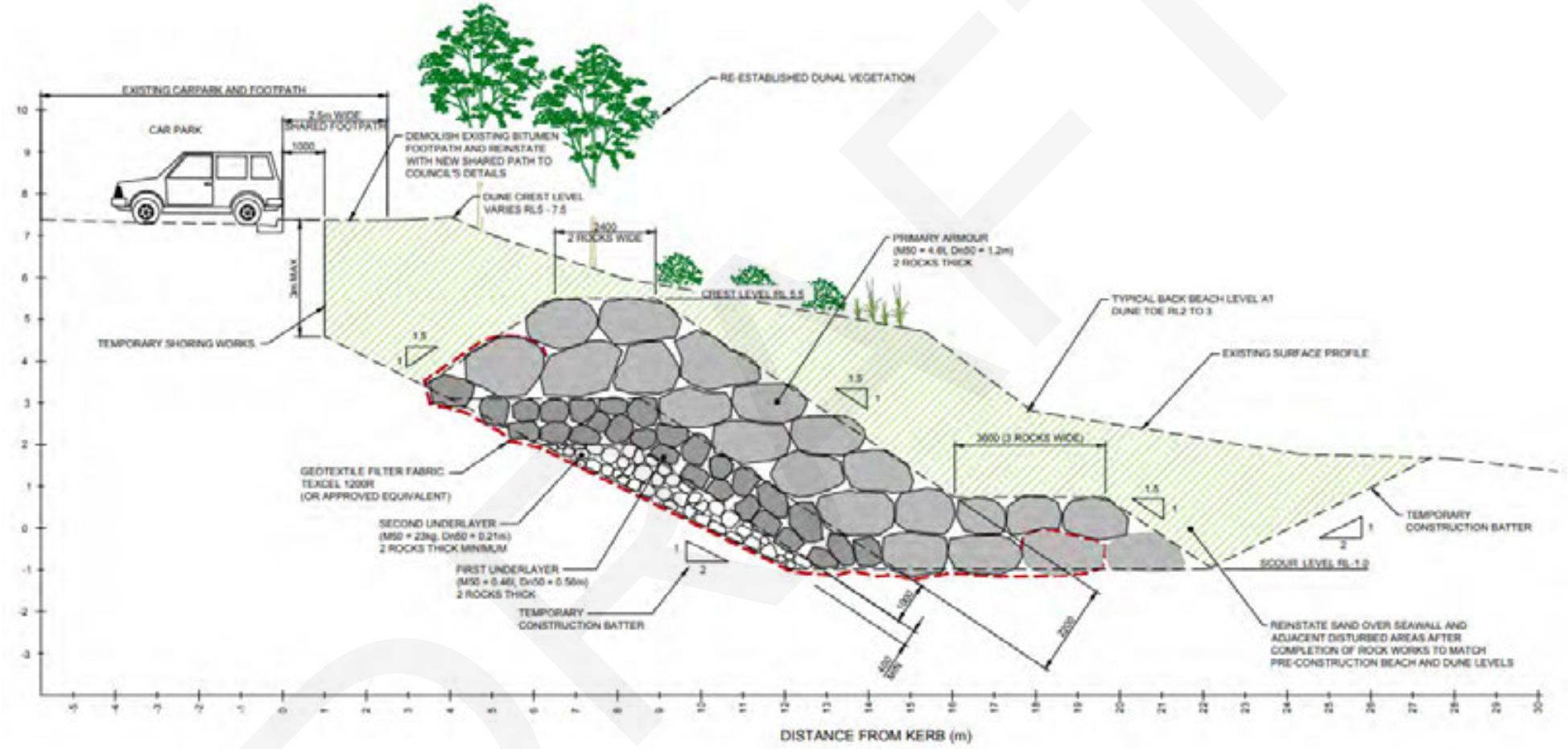


Figure C-14 Concept Design for Action S6.CCC.O. Source and further reference: (RHDHV, 2019)

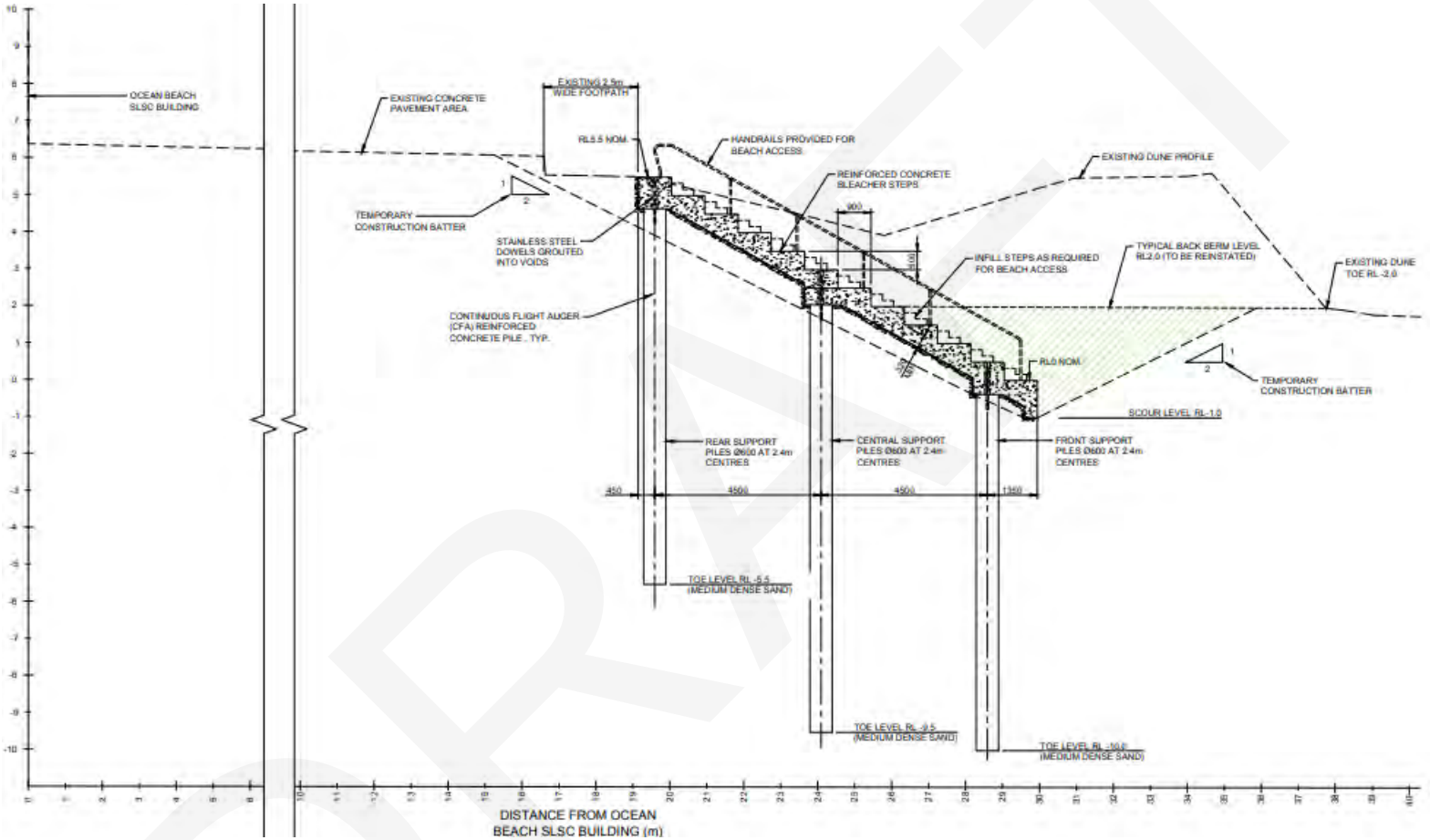


Figure C-15 Concept Design for Action S6.CCC.O. Source and further reference: (RHDHV, 2019)

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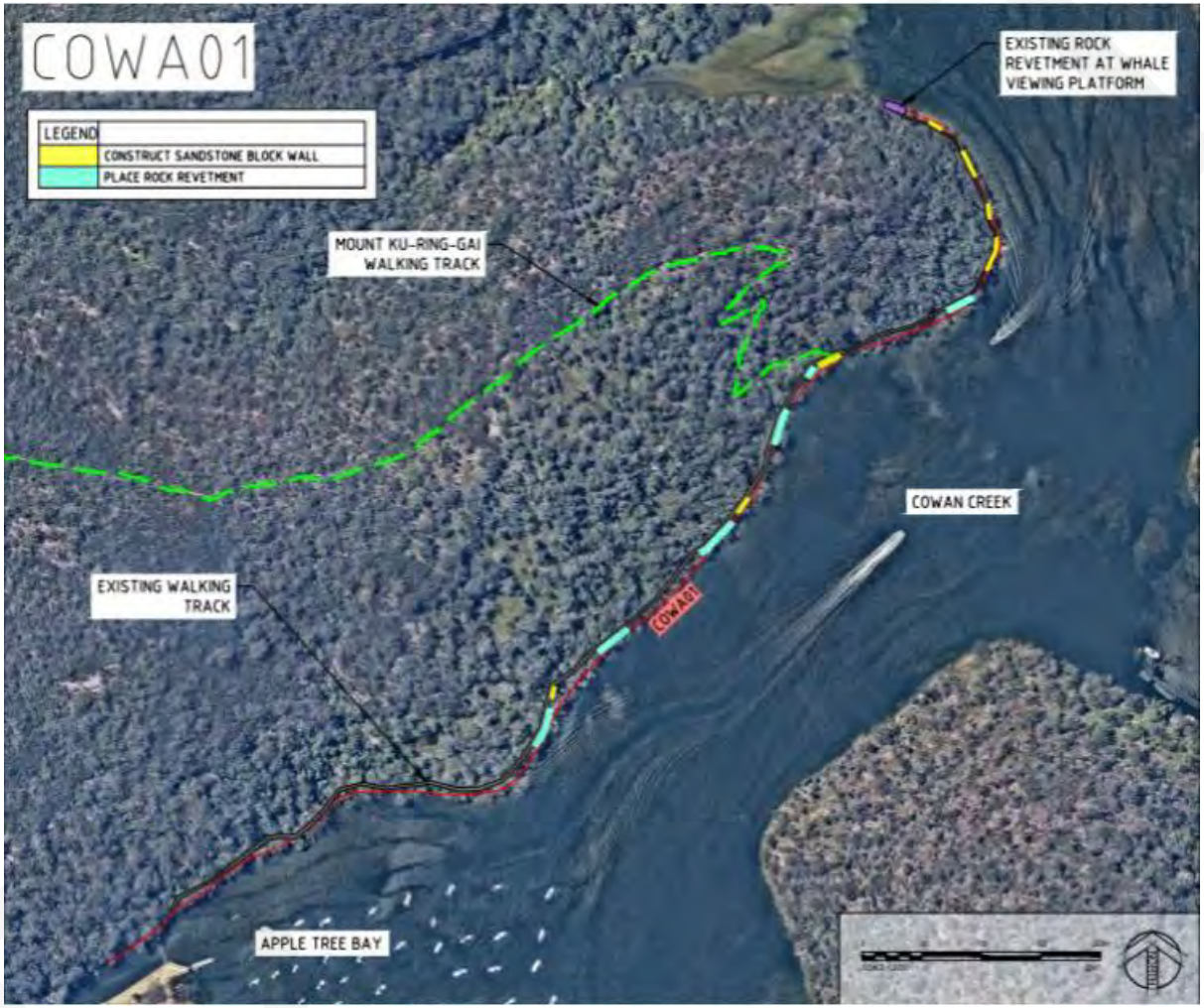


Figure C-16 Concept Design for Action S6.NPW.F at Cowan Creek. Source and further reference: (Alluvium, 2025)

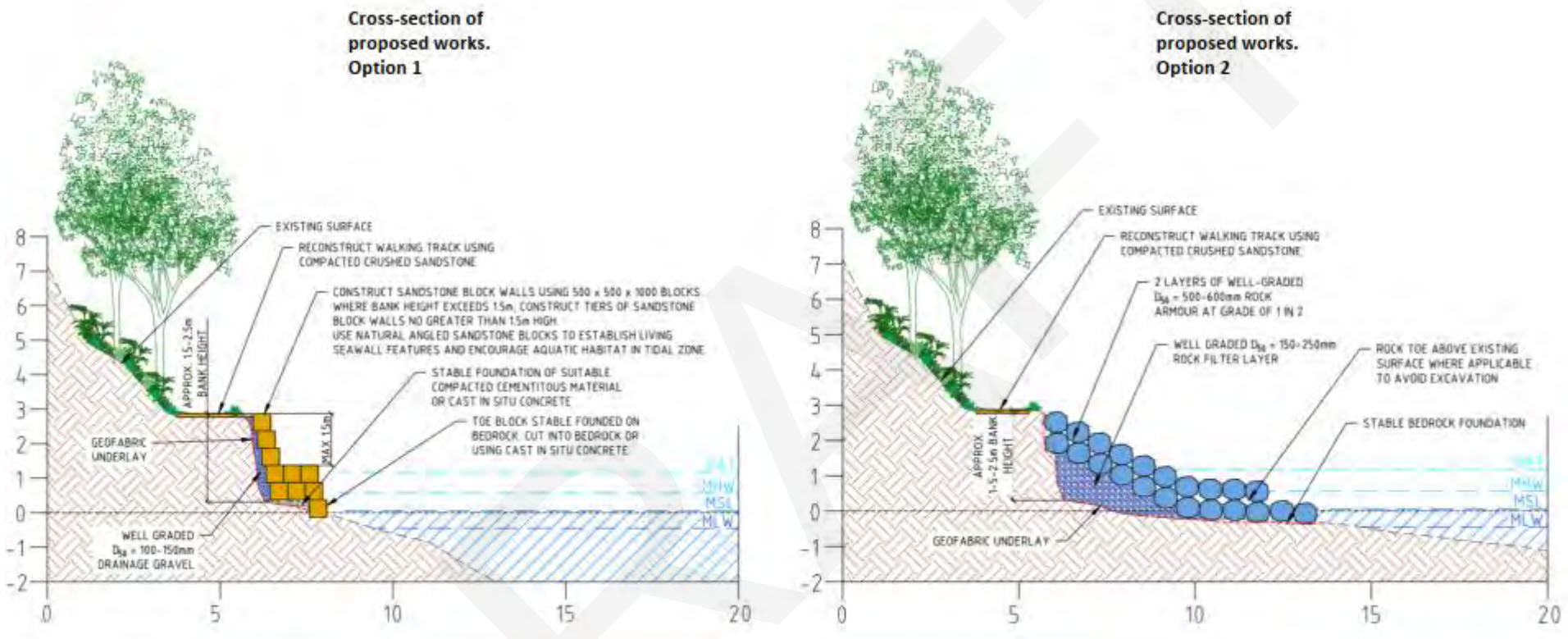


Figure C-17 Concept Design for Action S6.NPW.F at Cowan Creek. Source and further reference: (Alluvium, 2025)

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Figure C-18 Concept Design for Action S6.NPW.F at Coasters Retreat. Source and further reference: (Alluvium, 2025)

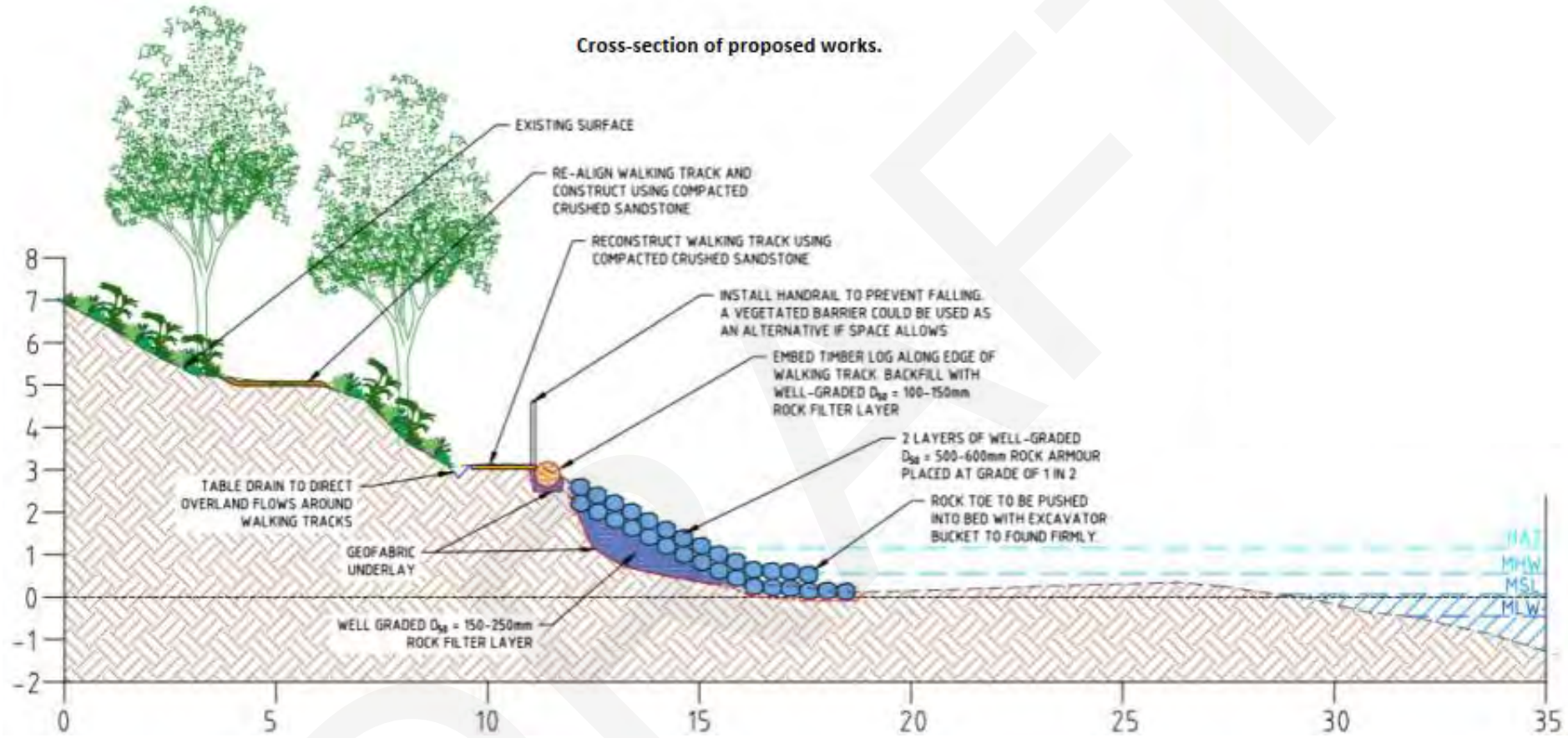


Figure C-19 Concept Design for Action S6.NPW.F at Coasters Retreat. Source and further reference: (Alluvium, 2025)

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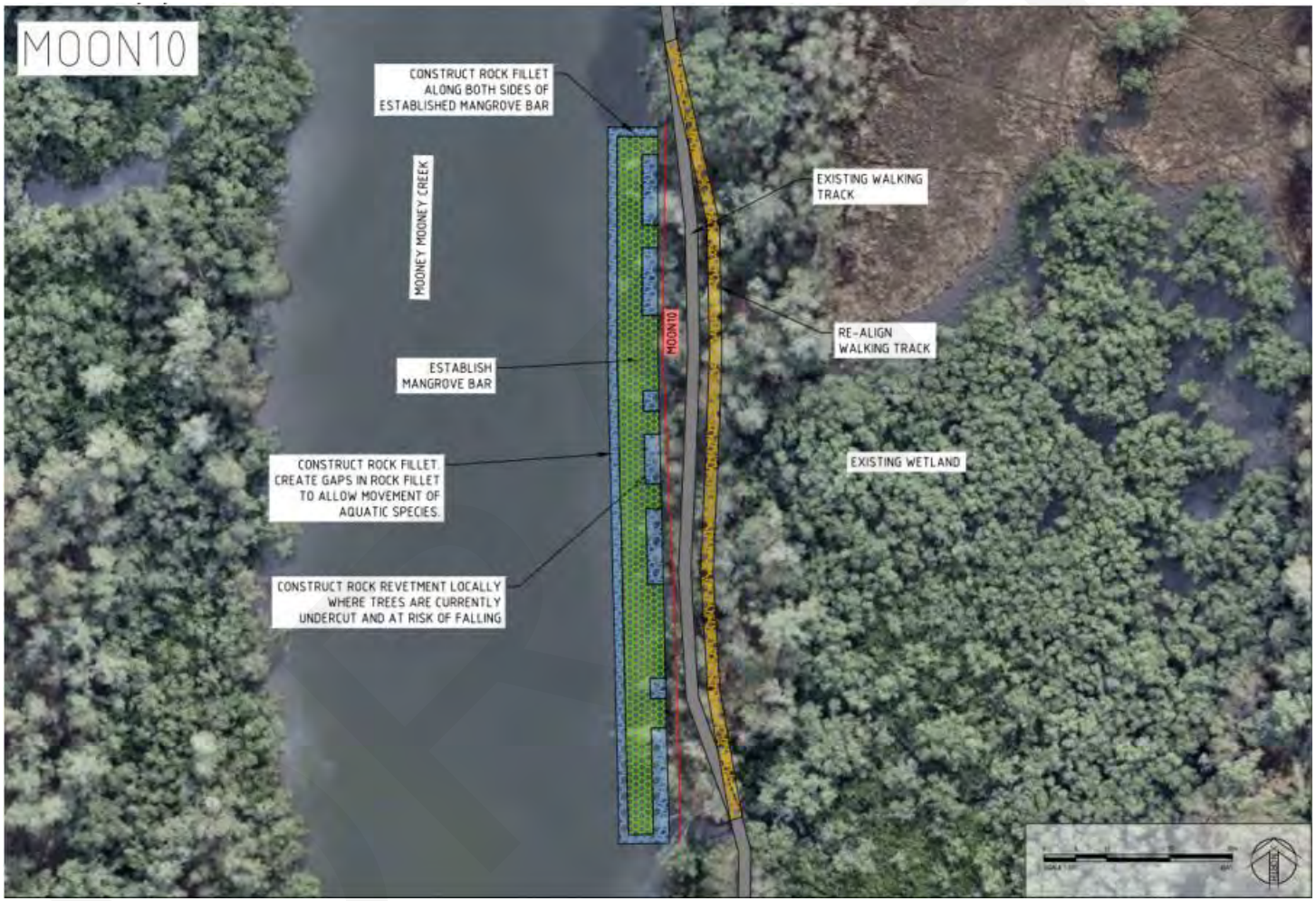


Figure C-20 Concept Design for Action S6.NPW.F at Mooney Mooney Creek. Source and further reference: (Alluvium, 2025)

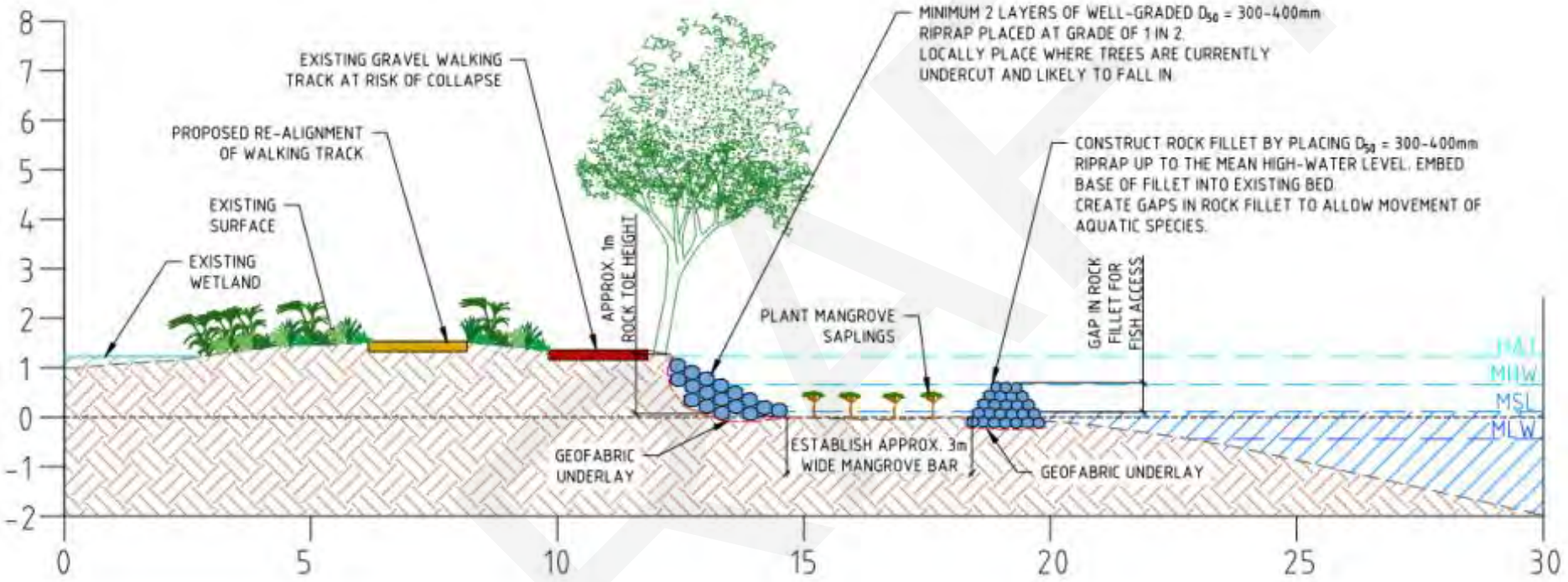


Figure C-21 Concept Design for Action S6.NPW.F at Mooney Mooney Creek. Source and further reference: (Alluvium, 2025)

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Figure C-22 Concept Design for Action S6.NPW.F at Berowra Creek. Source and further reference: (Alluvium, 2025)

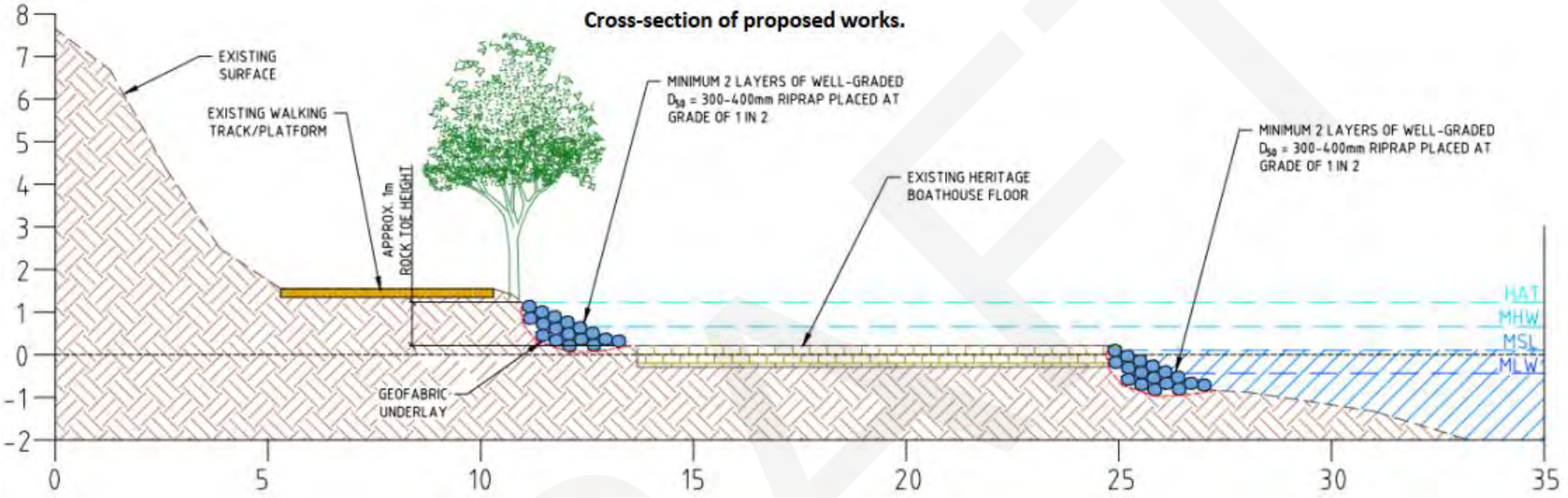


Figure C-23 Concept Design for Action S6.NPW.F at Berowra Creek. Source and further reference: (Alluvium, 2025)

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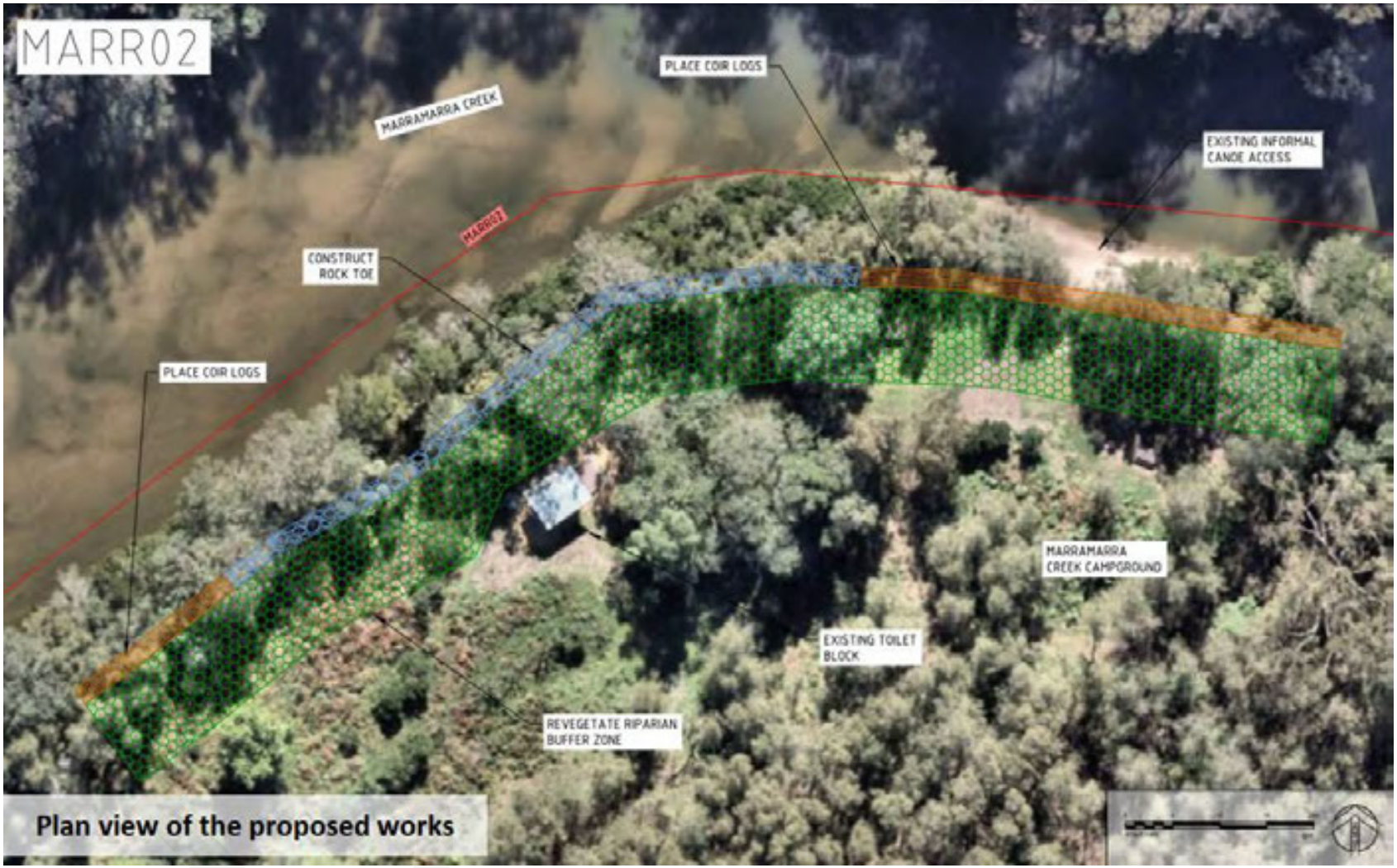


Figure C-24 Concept Design for Action S6.NPW.F at Marramarra Creek. Source and further reference: (Alluvium, 2025)

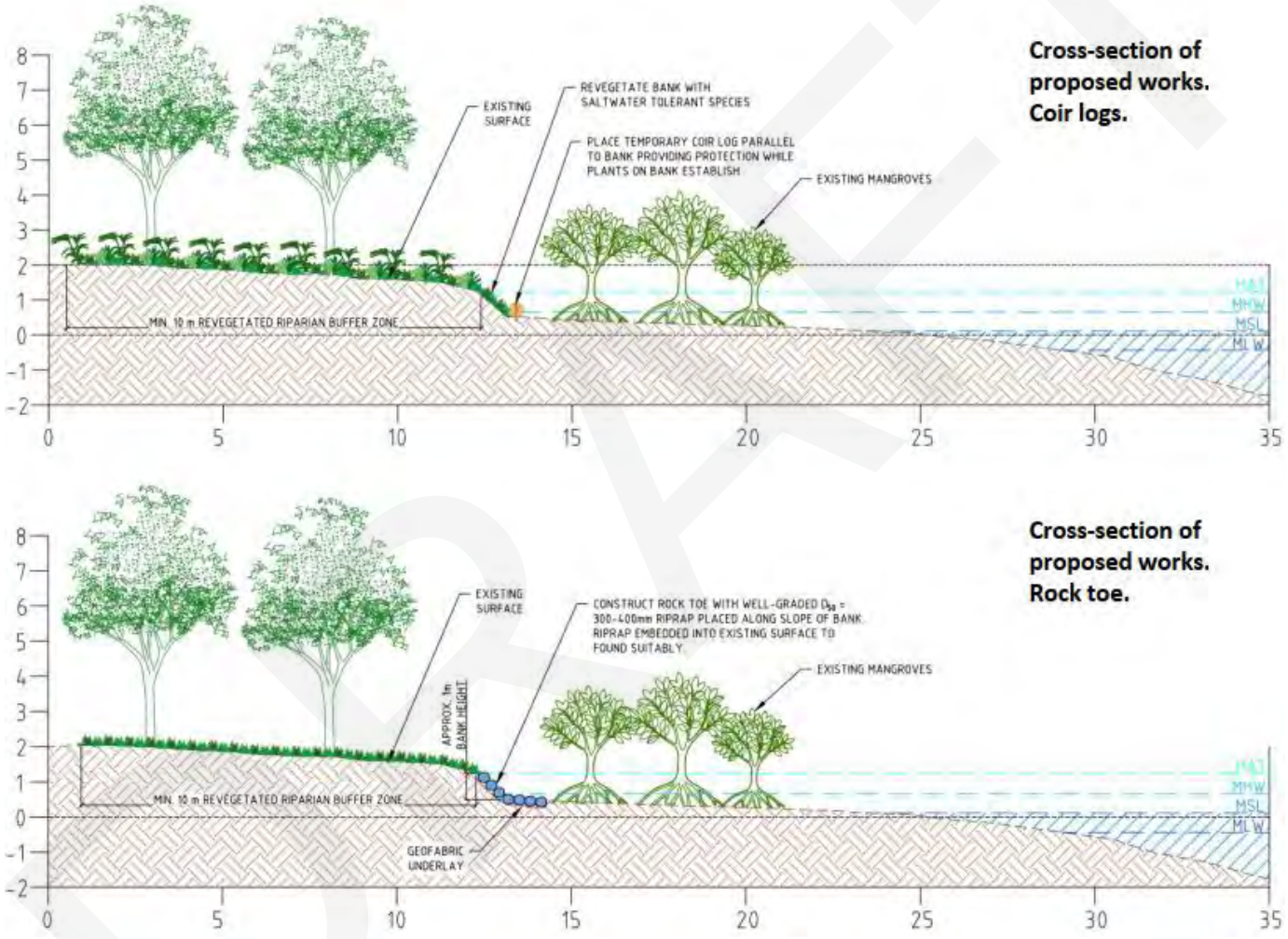


Figure C-25 Concept Design for Action S6.NPW.F at Marramarra Creek. Source and further reference: (Alluvium, 2025)

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Figure C-26 Concept Design for Action S6.NPW.F at Gentlemans Halt. Source and further reference: (Alluvium, 2025)

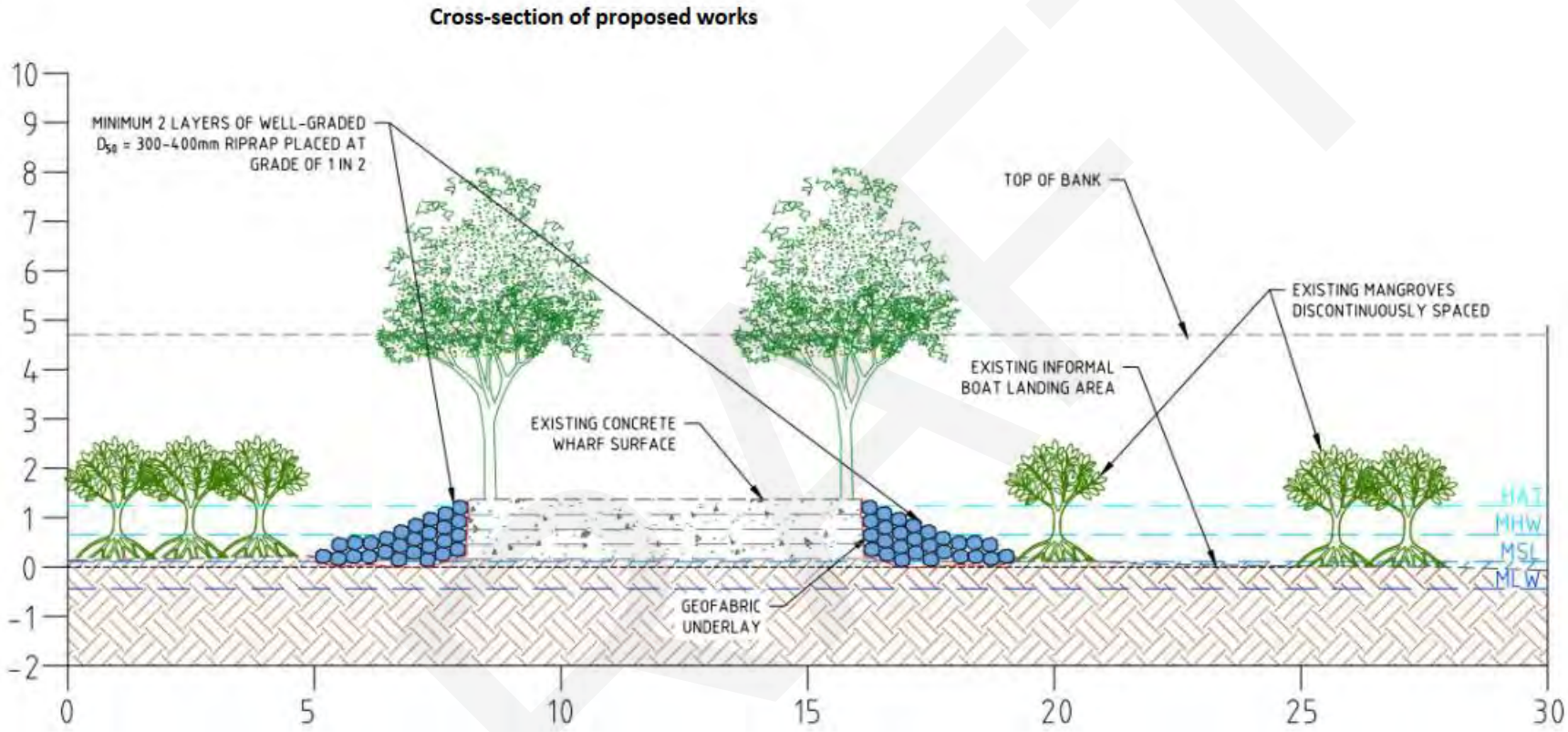


Figure C-27 Concept Design for Action S6.NPW.F at Gentlemans Halt. Source and further reference: (Alluvium, 2025)

Concept design option 1
Beach nourishment and revegetation
Import sand to form a sand dune, then revegetate
Pros: A nature-based solution that does not impact beach use
Cons: The need to import or scrape sand, and the risk of a major storm washing away the sand leading to a need to top up again.
Design life estimate: 5-10 years

Plan view of the proposed works



Cross section of proposed works

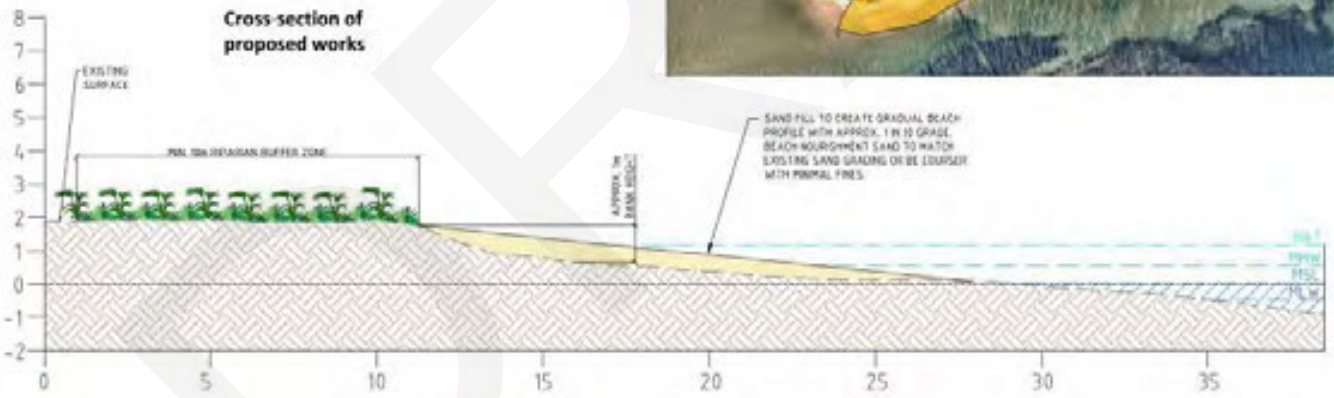


Figure C-28 Concept Design for Action S6.NPW.B at The Basin. Source and further reference: (Alluvium, 2025)

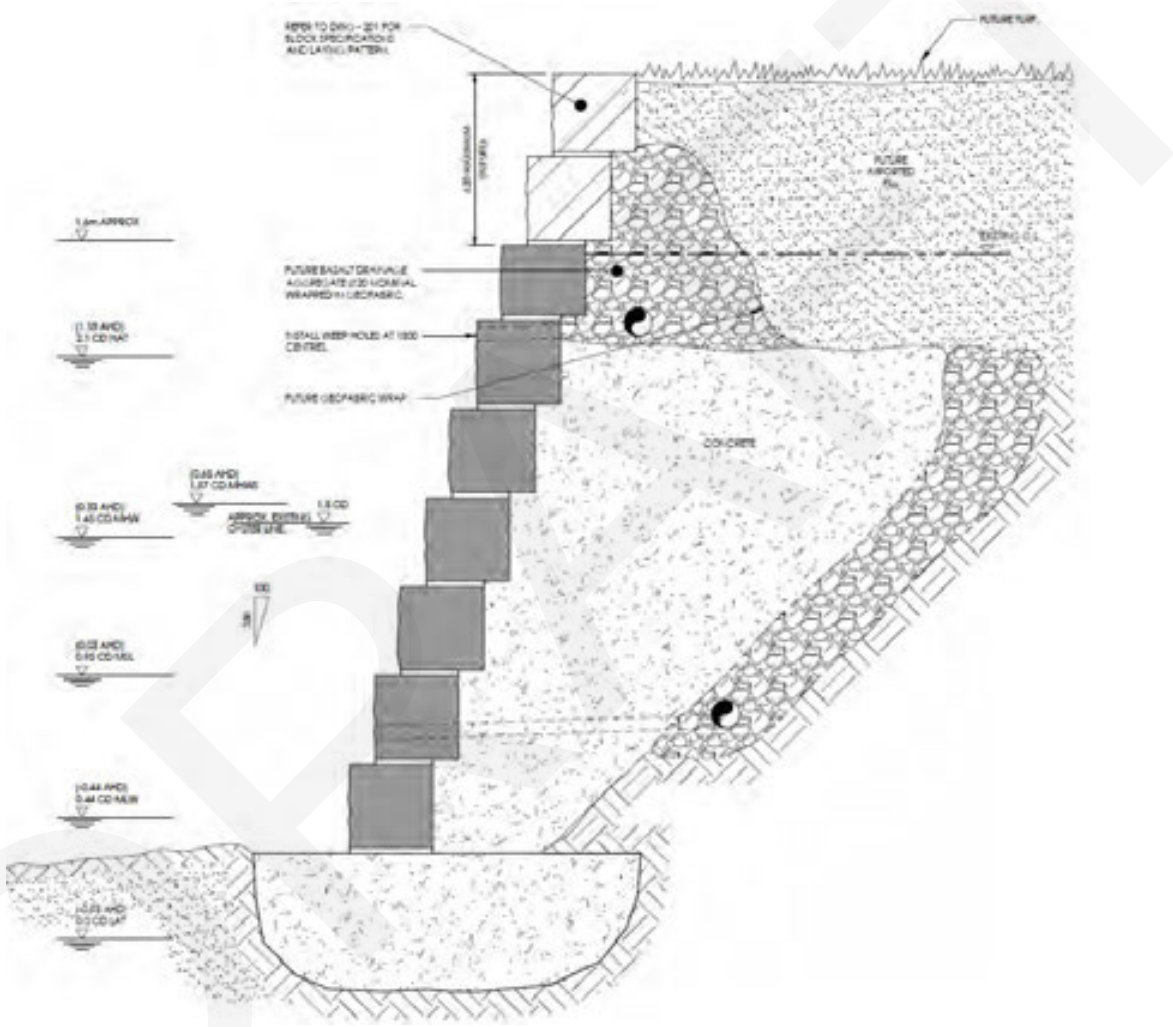


Figure C-29 Concept Design for Action S6.NPW.E at Bobbin Head (sandstone blockwork sections). Source and further reference: (Alluvium, 2025)



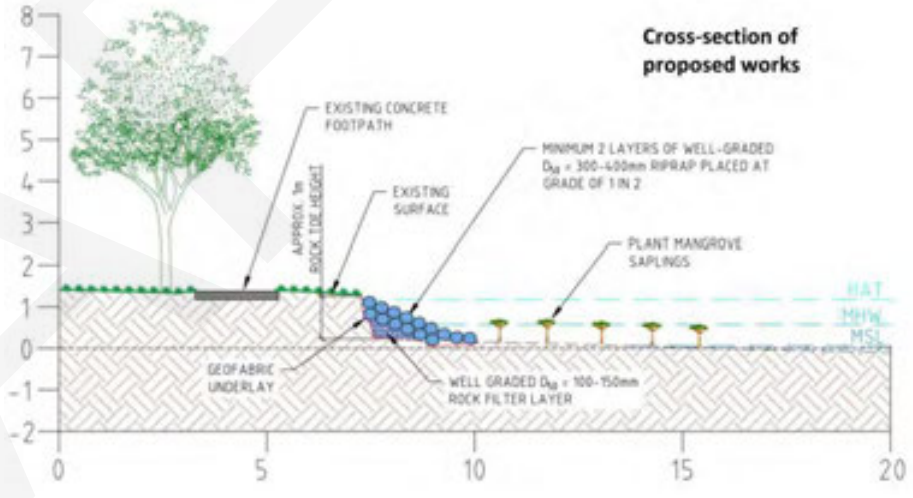


Figure C-30 Concept Design for Action S6.NPW.E at Bobbin Head (grouted rock wall section). Source and further reference: (Alluvium, 2025)

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APPENDIX D
ALIGNMENT OF THE CMP WITH THE OBJECTS OF THE CM ACT, AND R&H SEPP

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Table D-1 Objects of the CM Act and how they have been addressed in this CMP

CM Act Objects	How this is addressed in this CMP
a. to protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience	Stage 2 included a range of detailed studies of the various threats to physical coastal processes and environmental values of the study area. This is discussed in the CMP in Section 4 with a summary of key issues in Section 3. Stage 3 of the CMP process involved the development of management actions to address the risks and issues identified in Stage 2. Management options were identified that address the threats to the natural coastal processes and environmental values of the coastal zone. These actions were then assessed and prioritised using key criteria that included their efficacy in terms of the protection of these values. A number of actions outlined in Section 5 aim to protect and enhance natural coastal processes and coastal environmental values
b. to support the social and cultural values of the coastal zone and maintain public access and recreational amenity	Stage 2 included a range of detailed studies of the various threats to social and cultural values of the study area. This is discussed in the CMP in Section 4 with a summary of key issues in Section 3. Key social and cultural issues indigenous and non-indigenous cultural risks, population impacts and public safety hazards, including safe access to the coastal zone, amenity of the coastal zone and use. Stage 3 of the CMP process involved the development of management actions to address these risks and issues identified in Stage 2. Management options were identified that address the threats to the social and environmental values of the coastal zone. These actions were then assessed and prioritised using key criteria that included their efficacy in terms of the protection of these values. These actions are spelt out in Section 5.
c. to acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone	Extensive engagement with First Nations Groups has been undertaken as part of the preparation of this CMP – as described in Section 4.5. Through this engagement the CMP has identified the threats and risks to ACH values (see Section 3) and developed specific management actions aimed at protection of ACH and increasing the participation of local First Nations groups in coastal zone management detailed in Section 5.
d. to recognise the coastal zone as a vital economic zone and to support sustainable coastal economies	The Stage 1 Scoping Study of this CMP provided an overview of the economic value of the coastal zone, and this information is reiterated in the Business Plan (see Section 6). Management options were identified that address the threats to the economic value of the coastal zone (including coastal hazards, and the loss of social and recreational amenity). These actions were then assessed and prioritised using key criteria that included their efficacy in terms of the protection of these values. More information is provided in Section 5.
e. to facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making	Stage 2 included a range of detailed studies of the various threats to environmental and ecological values of the study area. This is discussed in the CMP in Section 3. Numerous actions are related to maintaining sustainable planning controls that appropriately manage development in the dynamic coastal zone. These actions were then assessed and prioritised using key criteria that included their efficacy in terms of the protection of these values. More information is provided in Section 5.
f. to mitigate current and future risks from coastal hazards, taking into account the effects of climate change	The extent of current and future coastal hazards - and the associated risks – were assessed in detail in Stage 2 of the CMP and summarised in the CMP in Section 3). Numerous options were developed with the aim to mitigate the impacts of coastal hazards on the study area. These actions are spelt out in Section 5. This includes incorporating the effects of climate change, including sea level rise.
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 assessed in detail in Stage 2 of the CMP, for example coastal erosion, and inundation, and regional processes. Numerous actions related to maintaining sustainable planning controls to appropriately managed development in the dynamic coastal zone, with recognition of the local and regional scale effects of coastal processes, understanding that coastal land may be lost to the sea. More information is provided in Section 5.

CM Act Objects	How this is addressed in this CMP
(including estuaries and other arms of the sea), and to manage coastal use and development accordingly	
h. to promote integrated and co-ordinated coastal planning, management and reporting	This CMP includes a Collaborative System Implement Plan to facilitate a large scale, coordinated approach to coastal zone and estuary management. Actions in the plan are delivered by multiple Councils through coordinated delivery partnerships. These Actions are detailed in Section 5.3. Inherently, the CMP process provides an integrated approach to coastal planning and management by providing a holistic "system wide" view of the coastal zone across the HNRS. The CMP also sets out a clear MER framework to monitor progress towards implementing the coastal management actions outlined in the CMP, and to assess the performance of the CMP in achieving its intended outcomes, and the objects of the CM Act. This provides an integrated and co-ordinated approach to reporting. The proposed MER program has followed the structure of a "Program Logic Model", that describes how the program is intended to work by linking activities with outputs, intermediate impacts, and longer-term outcomes. The program logic model supports a systematic and integrated approach to CMP planning, implementation, and evaluation.
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	The CMP includes a range of actions aimed at improving the resilience of coastal assets and infrastructure. These are covered in Section 5 in the action tables. These actions have been developed based on a thorough review of coastal hazard risks, and associated impacts of assets and infrastructure – this is discussed in Section 3. Future hazard projections have included a range of future SLR scenarios that account for future uncertainty associated with climate change and the response of coastal systems, including extreme storm events.
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	This CMP has included a review and assessment of policies and activities from government and public authorities relating to the coastal zone, which facilitates the proper integration of management programs. This is provided in Section 2, and in further detail in the Stage 1 Scoping Study. To ensure the coordination of government and public authorities, a robust program of engagement with a range of public authorities was performed - including relevant state government agencies, and adjacent local government stakeholders.
k. to support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions	During Stage 1 of the CMP, a comprehensive Stakeholder and Community Engagement Strategy was developed. This outlined the timing, content, and engagement methods to be utilised during Stages 2 to 4 of the CMP. The engagement strategy was developed in accordance with the CMP Engagement Guidelines (OEH, 2018), and the use of the International Association for Public Participation (IAP2) guidelines. This strategy has been implemented through the development of the CMP, which has involved a robust regime of stakeholder and community engagement integrated through all stages. A summary of the engagement process for the CMP is described in Section 4.5. In addition, public participation in coastal management is encouraged through a series of actions, includes set out in Section 5.
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	Whilst there are no actions in this CMP with the explicit intention to purchase private properties - the CMP has included a range of actions intended to promote the protection, enhancement, maintenance, and restoration of the environment of the coastal zone. This includes numerous actions related to dune restoration work, access tracks to minimise damage to vegetation and others.

CM Act Objects	How this is addressed in this CMP
m. to support the objects of the Marine Estate Management Act 2014; and	Stage 1 of this CMP identified a range of threats and risks to the study area, including the NSW Marine Estate Threat and Risk Assessment (TARA) (BMT WBM, 2017) – and included strong consideration of stressors identified in the TARA as high priority. This is described in Section 3 and 4. The CMP supports the objectives of the MEM Act by identifying and implementing actions that address these high priority stressors – both in the present day and over future planning horizons.

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Table D-2 Objects of the CM Act for the various CMAs, and how they have been addressed in this CMP

CMA Objectives	How this is addressed in this CMP
Coastal Wetlands and Littoral Rainforests	
(a) to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity,	Potential risks to the coastal wetlands and littoral rainforests across the CMP study area have been identified and assessed in various Stage 2 studies. The identification and design of management actions in Stage 3 and 4 are cognisant of the need to protect coastal wetlands and littoral rainforests in their natural state and to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change. Actions that may have a potential impacts on these areas were assessed as such and did not proceed to Stage 4.
(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	
Coastal Vulnerability Area	
(a) to ensure public safety and prevent risks to human life,	A detailed risk assessment of coastal hazard risks to public safety and public and private assets was undertaken in Stage 2 of the CMP, through the following studies: ▪ The Hawkesbury River Estuary Coastal Inundation Study (Rhelm and Baird, 2023) ▪ Pittwater Beach Erosion and Shoreline Recession Assessment (WRL, 2023) ▪ Central Coast Open Coast and Coastal Lagoons Coastal Hazard Assessment (Bluecoast Consulting Engineers, 2024) This included associated risks to public safety through coastal hazards, infrastructure and use of the coastal zone, including both in the present day and into the future, incorporating climate change. Subsequently, in Stage 3, actions were developed and prioritised in terms of their ability to mitigate these risks – whilst also considering social, environmental and cultural values.
(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	Numerous actions relate to foreshore restoration works – in order to conserve wetlands, beaches, dunes and the natural features of foreshores. This takes into account the beach systems and natural sediment transport pathways.
(d) to maintain public access, amenity and use of beaches and foreshores,	Numerous actions relate to maintenance and upgrade of foreshore accessways in order to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms. This also includes dune restoration works, dinghy storage racks to increase the use of beaches and foreshores and retaining public foreshores and recreational areas.
(e) to encourage land use that reduces exposure to risks from coastal hazards, including through siting, design, construction and operational decisions	Several actions relate to maintaining and enforcing planning controls to encourage land use that reduces exposure to risks from coastal hazards and ensures ecologically sustainable development.

CMA Objectives	How this is addressed in this CMP
	This includes the design, construction and operational decisions of land use, including adaptation pathways for landwards movement.
(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,	Numerous actions relate to beach restoration and dune restoration works – in order to preserve beaches, dunes and the natural features of foreshores. All potential options in Stage 3 were assessed, not just on their ability to provide coastal hazard protection, but their impact on the coastal environment, public safety, social and recreational amenity. As a result, this CMP promotes the use of "nature-based solutions", and numerous actions relate to beach restoration and dune restoration works. If these are not sufficient, then other actions, for example relocation of assets, are management actions that are promoted through the CMP.
(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 (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	Numerous studies in Stage 2 of the CMP specifically investigated coastal hazard risks to essential infrastructure including roads, wastewater assets, major infrastructure. In Stage 3, actions were developed specifically to address these risks. The CZEAS documents attached to this CMP (Appendix E, F and G) prioritises actions that support the continued functionality of essential infrastructure during a coastal hazard emergency. The actions that improve the resilience of coastal development and communities are provided in Section 5, after being evaluated for their feasibility, acceptability and viability to meet these objectives in Section 4.
(i) to improve the resilience of coastal development and communities by improving adaptive capacity and reducing reliance on emergency responses.	
Coastal Environment Area	
(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,	The various threats to the environmental, social and cultural values of the study area were assessed in detail in the various Stage 2 studies. These values and their associated threats were considered in the development and assessment of management actions in Stage 3. Numerous actions relate to foreshore / riparian restoration and dune restoration works – in order to preserve the natural features of foreshores. Numerous actions relate to maintenance and upgrade of foreshore accessways in order to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.
(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,	

CMA Objectives	How this is addressed in this CMP
(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	
Coastal Use Area	
(a) 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	The various threats to the scenic, social and cultural values of the study area were assessed in detail in the various Stage 2 studies (See Section 4). These values and their associated threats were considered in the development and assessment of management actions in Stage 3. All potential options in Stage 3 were assessed, not just on their ability to provide coastal hazard protection, but also their impact on the coastal environment, public safety, social and recreational amenity. This is outlined in Section 3, and if they did not meet this criteria, then the proposed option did not proceed through to Stage 4 of the CMP.
(b) to accommodate both urbanised and natural stretches of coastline	

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APPENDIX E
COASTAL ZONE EMERGENCY ACTION SUBPLAN: BROKEN BAY BEACHES

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Coastal Zone Emergency Action Subplan – Broken Bay Beaches

Hawkesbury-Nepean River System CMP

Central Coast Council

29 August 2025

Coastal Zone Emergency Action Subplan – Broken Bay Beaches

Hawkesbury-Nepean River System CMP

Central Coast Council

29 August 2025

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GLOSSARY AND ABBREVIATIONS

Term	Definition
AIDR	The Australian Institute for Disaster Resilience
Beach erosion	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.
BoM	Bureau of Meteorology
Council	Central Coast Council
CM Act	*The Coastal Management Act 2016*
Coastal cliff and slope instability	Geotechnical instabilities on coastal cliffs and bluffs, including rock falls, slumps, and landslides.
Coastal emergency	An emergency due to actual or imminent coastal inundation, coastal erosion, or coastal cliff and slope instability which (a) threatens endangers, or threatens to endanger, the safety or health of persons; or (b) destroys or damages, or threatens to destroy or damage, any property or the natural environment.
Coastal inundation	Coastal inundation occurs when a combination of marine and atmospheric processes raises the water level at the coast above normal elevations, causing land that is usually 'dry' to become inundated by sea water. Alternatively, the elevated water level may result in wave run-up and overtopping of natural or built shoreline structures (e.g., dunes, seawalls).
Coastal lake or watercourse entrance instability	Refers to the variety of potential hazards and risks associated with the dynamic nature of both natural and trained entrances. Coastal lake and watercourse entrances are highly active environments with their shape constantly changing in response to processes such as alongshore sediment transport, tidal flows, storms and catchment flooding.
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.
Combat Agency	The agency identified in this subplan as the agency primarily responsible for controlling the response to a particular emergency (SERM Act 1989).
CZEAS	Coastal Zone Emergency Action Subplan (this document)
DCCEEW	The NSW Department of Climate Change, Energy, the Environment and Water. Prior to 1 January 2024, the responsibilities of the department were carried out by the former NSW Department of Planning and Environment (DPE).
ECL	East Coast Low
EMPLAN	Emergency Management Plan
Essential infrastructure	Defined in the CM Act as infrastructure for the following purposes: electricity generation, transmission and distribution, telecommunications, rail, roads, gas, sewerage systems, water supply systems or stormwater management systems, airports, ports shipping and harbours.
Estuary	The CM Act defines an estuary as any part of a river, lake, lagoon, or coastal creek that is affected by coastal tides, up to the highest astronomical tide.

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Term	Definition
FRNSW	Fire and Rescue NSW
Hs	Significant Wave Height - the average of the highest one third of waves during a specific period.
LEMC	Local Emergency Management Committee. The LEMC is constituted under the SERM Act for each local government area and is responsible for preparing plans for response and recovery from emergencies.
LEMO	Local Emergency Management Officer
Local Emergency Operations Controller (LEOCON)	A Police Officer appointed by the District Emergency Operations Controller as the Local Emergency Operations Controller for the Local Government Area.
LGA	Local Government Area
MHWS	Mean High Water Springs. The long-term mean of the heights of 2 successive high waters during those periods of 24 hours (approximately once a fortnight) when the range of tide is greatest, during full and new moon.
NABE	Nature Assisted Beach Enhancement - sometimes referred to as beach scraping.
NSW SES	NSW State Emergency Service
Regional Emergency Operations Controller (REOCON)	The NSW Police Southern Region Commander is appointed as the REOCON. This role is typically responsible for coordinating emergency management efforts within a specific region of NSW during crises or disasters. performs the role of REOCON.
RFS	NSW Rural Fire Service
State Emergency Operations Controller (SEOCON)	This SEOCON role is a member of the New South Wales Police Force Senior Executive Service responsible for overseeing emergency response operations at the state level during major emergencies or disasters.
SERM Act	*State Emergency and Rescue Management Act 1989*
Tsunami	Defined in the State tsunami Plan as “A series of ocean waves with very long wavelengths (typically hundreds of kilometres) caused by large-scale disturbances of the ocean, such as earthquakes, landslide, volcanic eruptions, explosions, or meteorites”.
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.

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1 INTRODUCTION

1.1 Background

This Coastal Zone Emergency Action Subplan (CZEAS) forms an integral part of the Hawkesbury-Nepean River System Coastal Management Program (HNRS CMP). It applies specifically to the beaches of Broken Bay within the Central Coast Council Local Government Area (LGA), which fall inside the legally defined study area for the HNRS CMP (Water Technology, 2025).

This CZEAS has been prepared in accordance with the requirements of:

- *The Coastal Management Act 2016* (the CM Act).
- The NSW Coastal Management Manual (OEH, 2018a).
- The NSW Guideline for preparing a coastal zone emergency action subplan (DPIE, 2019).

This document has been prepared to align with the CZEAS prepared for the Central Coast Council Open Coast Beaches CMP (OC CMP) (Worley Consulting, 2025) – which covers all other open coast beaches in the Central Coast LGA.

1.2 Purpose and Objectives

As specified in the CM Act, a CZEAS is a plan that outlines the roles and responsibilities of all public authorities (including the local council) in response to coastal emergency events immediately preceding or during periods of beach erosion, coastal inundation, or coastal cliff and slope instability, where those processes occur through storm activity or an extreme or irregular event.

Subsequently, this CZEAS details arrangements for the four phases of emergency events (prevention, preparation, response, and recovery) relating to coastal hazards for the Broken Bay beaches.

In accordance with the New South Wales (NSW) Guideline for preparing a coastal zone emergency action subplan (DPIE, 2019), the purpose of this CZEAS is to identify and facilitate the implementation of appropriate emergency response actions in order to:

- Protect human life and public safety.
- Minimise damage to property and assets.
- Minimise impacts on social environmental and economic values.
- Not create additional hazards or risk.

The objectives of this CZEAS are to:

- Set a clear definition for what constitutes a coastal emergency (Section 2), and associated triggers for emergency response actions (Section 3).
- Identify the locations that may be affected by beach erosion, coastal inundation, or coastal cliff and slope instability that would constitute a coastal emergency (Section 4).
- Outline the roles and responsibilities of all public authorities, including Central Coast Council (Council), and coordinate their response to emergencies immediately preceding or during periods of beach erosion, coastal inundation and coastal cliff and slope instability (Section 5).
- Outline the communications required in the four phases of emergency management (Section 6).
- Summarise key actions to be carried out in the four phases of emergency (Section 7).

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- Identify approvals pathways for CZEAS actions as they relate to the NSW Coastal Management Framework (Section 8).

1.3 Consultation

Agencies other than Council involved in the implementation of this CZEAS, such as NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), NSW State Emergency Service (NSW SES), and approval agencies have been provided a copy of the draft CZEAS for review and comment. The final CZEAS has addressed all feedback received from key stakeholders.

1.4 Study Area

There are 5 beaches (Figure 1-1) in the HNRS CMP Study Area in Broken Bay that are potentially at risk of coastal hazards:

- Ettalong Beach
- Ocean/Umina Beach
- Pearl Beach
- Patonga
- Little Patonga Beach



Figure 1-1 CMP and CZEAS study area

1.5 Overview of this CZEAS

A quick-reference overview of the contents of this CZEAS is provided in Figure 1-2, which contains references to the various sections of the CZEAS where more detail is provided. It is important to note that this procedural flow chart is a non-linear continuum and contains feedback loops based on continuous monitoring and assessment throughout a given emergency event.

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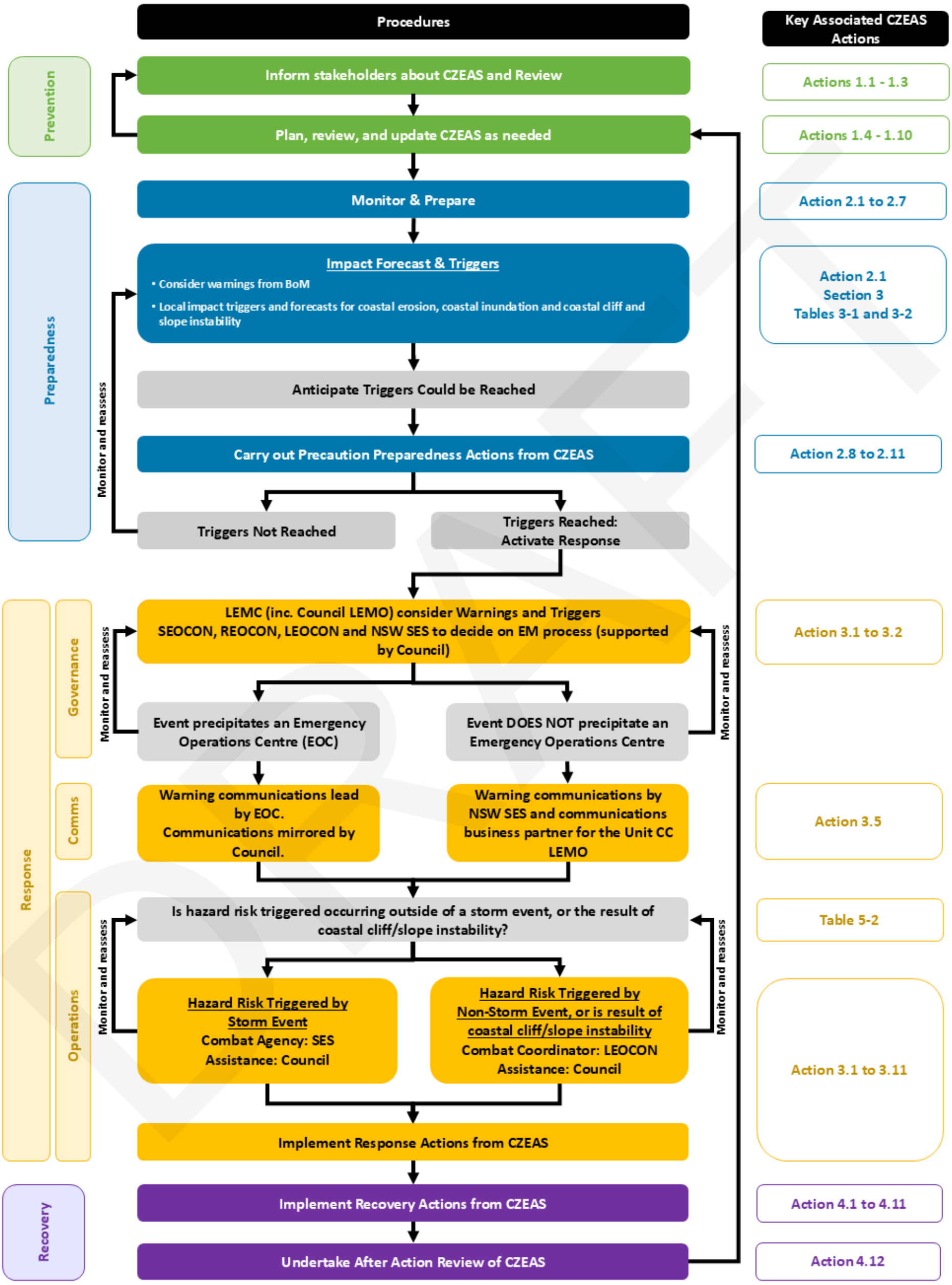


Figure 1-2 Quick reference overview of this CZEAS

2 SCOPE OF THE CZEAS

2.1 What is an Emergency?

2.1.1 Definition

An "emergency" is defined in the *State Emergency and Rescue Management Act 1989* (SERM Act) and the State Disaster Plan as:

> "*An emergency due to an actual or imminent occurrence (such as fire, flood, storm, earthquake, explosion, terrorist act, accident, epidemic or warlike action) which -*
>
> *a) endangers, or threatens to endanger, the safety or health of persons or animals in the State; or*
>
> *b) destroys or damages, or threatens to destroy or damage, any property in the State, or*
>
> *c) causes a failure of, or a significant disruption to, an essential service or infrastructure, being an emergency, which requires a significant and co-ordinated response.*
>
> *For the purposes of the definition of emergency, property in the State includes any part of the environment of the State. Accordingly, a reference in the Act to -*
>
> *a) threats or danger to property includes a reference to threats or danger to the environment, and*
>
> *b) the protection of property includes a reference to the protection of the environment."*

2.1.2 The Four Phases of an Emergency

Both the SERM Act and the NSW Coastal Management Manual (OEH, 2018a) identify four distinct stages of an emergency – prevention, preparation, response, and recovery (Figure 2-1).



Figure 2-1 Stages of Emergency Planning

2.2 Coastal Hazards

2.2.1 Definitions of Coastal Hazards

The NSW 2017 State Level Risk Assessment (NSW Office of Emergency Management, 2017) classifies storm and coastal erosion as priority hazards that pose a significant risk to the state. The CM Act identifies three types of coastal hazards that should be considered when developing a CZEAS. These are defined in the guidelines (DPIE, 2019) as:

- **Beach erosion:** Not all beach erosion occurring during a storm event provokes a coastal emergency response. Therefore, a "beach erosion emergency" in the context of this CZEAS can be defined as an actual or imminent occurrence of a beach erosion event that occurs when wind, waves, and currents are removing the sediment that comprises the foreshore and/or frontal dune system, landward of the fully accreted condition. The consequence of such erosion can create risks to public safety, and public and private assets - which requires a coordinated emergency response.
- **Coastal inundation:** Coastal inundation occurs when marine and atmospheric forces combine and raise water levels at the coast (or inside estuaries) above normal elevations causing dry land to be inundated by seawater. Coastal inundation is often associated with storms and results in elevated still water levels (storm surge), wave set-up, wave runup and over-wash flows. Storm surges and powerful waves can also penetrate estuaries giving rise to strong currents or seiching. This may result in the inundation of roads and low-lying land adjacent to estuaries. For the open coast, it is associated with wave overtopping of beach dunes and the extent of wave runup onto the back-beach area.
- **Coastal cliff and slope instability:** This refers to a variety of geotechnical processes on coastal cliffs and bluffs, including rock fall, slumps, and landslides. These may be driven by coastal processes such as wave undercutting and overtopping, or by differential weathering of rock layers in cliffs and bluffs or by surface and groundwater flows generated by extreme rainfall. Instability may occur during or following a coastal storm event but may also occur at other times. There may be very little warning that a coastal cliff or slope instability incident is imminent. These hazards may endanger life and property at the site of the process (e.g., through collapse of a lookout platform or walking track, or undermining of dwellings), and at the toe of the cliff or bluff (rock platform or beach).

As stipulated in the *NSW Guideline for preparing a coastal zone emergency action subplan* (DPIE, 2019), the other coastal hazards identified in the CM Act are outside the scope of this CZEAS – including long term shoreline recession, coastal lake or watercourse entrance instability, tidal inundation, and erosion and inundation of estuary foreshores caused by tidal waters and the action of waves. These hazards either pertain to estuary environments outside the scope of this CZEAS or are not related to storm activity or an extreme or irregular event.

As outlined in Section 2.3, this CZEAS does not relate to other forms of inundation including flooding from land or tsunamis.

2.2.2 Recognising the Complexity of Coastal Hazard Events

Storm Clustering

From a coastal hazard perspective, it is important to note the impacts of storm clustering. An erosion storm cluster occurs when a beach is unable to adequately recover from a previous storm event before a subsequent one commences. The response of a beach to a storm and a storm cluster will depend largely on the physical characteristics of that particular beach, including sediment type, shoreline orientation and wave climate (Geoscience Australia, 2021).

In this way, a cluster of less severe storm events can generate a greater erosion response than an individual, high severity event (Gravois, Baldock, Callaghan, Daivies, & Nichol, 2018).

The implication for the CZEAS are:

- Even moderate swell events may cause significant levels of damage if they occur after a large event.
- Emergency teams must re-evaluate site conditions after each event to update risk profiles.
- Recovery and readiness plans must anticipate follow-up storms before full repairs or natural recovery occur.

- Previously stable areas (e.g., access points, cliffs, dunes) may become dangerous after cumulative impacts.

Cascading and Compounding Emergencies

The Broken Bay coastline is impacted by East Coast Lows (ECLs), and this phenomenon is one of the most significant contributing factors to the occurrence and intensity of coastal hazard emergencies along the NSW coast (AdaptNSW, 2023). ECLs are intense low-pressure systems that occur off the east coast of Australia. They bring damaging winds and surf, as well as heavy rainfall, which leads to erosion and flooding.

Consequently, coastal hazards emergencies do not always occur at a localised scale, nor with a single discrete hazard type. When facing events like an ECL, the consequences can be multifaceted. Coastal erosion and inundation may be occurring at numerous beaches concurrently, while the same event may also generate rainfall that leads to riverine or estuarine flooding, and potential coastal cliff and slope instability.

In this way, cascading and compounding natural hazard emergencies can place significant strain on the resources and capabilities of combat agencies during response efforts. These concurrent crises require a coordinated response from multiple agencies and authorities.

The implication for the CZEAS are:

- Multi-hazard environments: Agencies may face erosion, inundation, flooding, and cliff instability all at once, requiring broader coordination.
- Concurrent site demands: Multiple locations may need simultaneous interventions, creating critical decisions on priorities and triage.
- Communication pressure: Rapid, clear information-sharing across agencies and the public becomes critical to avoid confusion or duplication.
- Logistical complexity: Access routes, staging areas, and evacuation options can be compromised by overlapping hazards.

2.3 Coastal Emergencies Covered by the CZEAS

2.3.1 Legislative Requirements

The scope of this CZEAS is dictated by the requirements of the CM Act and the SERM Act.

SERM Act 1989

The SERM Act established the overarching framework for emergency management in NSW. The SERM Act outlines roles and responsibilities for all emergency management in the state, and specifies:

- That emergency management committees are established at the state, regional and local levels.
- That emergency management plans (EMPLANs) are prepared and reviewed at the state, regional and local level.
- Arrangements for controlling emergency operations.
- Responsibilities of emergency operations controllers.

The NSW State EMPLAN (NSW Office of Emergency Management, 2023) describes the NSW approach to emergency management, the governance and coordination arrangements, and roles and responsibilities of agencies. The plan is supported by hazard specific subplans and functional area supporting plans.

The NSW SES is the designated combat agency for management of floods, tsunami, and storms, including severe storms which cause coastal erosion. The NSW SES prepares the State Storm Plan, State Flood Plan and State Tsunami Plan, which are subplans to the NSW State EMPLAN.

CM Act 2016

The CM Act identifies specific emergency management considerations associated with beach erosion, coastal inundation, and cliff instability. Section 15 (3) of the CM Act states that:

> *"A **coastal zone emergency action subplan** is a plan that outlines the roles and responsibilities of all public authorities (including the local council) in response to emergencies immediately preceding or during periods of **beach erosion**, **coastal inundation** or **cliff instability**, where the beach erosion, coastal inundation or cliff instability occurs through storm activity or an extreme or irregular event"*

Mandatory requirements for a CMP, including the preparation of a CZEAS where required, are identified in Part A of the NSW Coastal Management Manual (OEH, 2018a).

When preparing a CZEAS, it is crucial to consider the relationship between the coastal management framework established by the CM Act, and the broader NSW emergency management framework. This relationship is depicted in Figure 2-2. To this end, Section 15 (4) of the CM Act states that:

> *"A coastal management program **must not** include the following—*
>
> *(a) matters dealt with in any plan made under the State Emergency and Rescue Management Act 1989 in relation to the response to emergencies"*

The purpose of this clause is to ensure that is no duplication or ambiguity of emergency response planning, and to ensure that the CZEAS is consistent with the emergency management provisions addressed in the stage, regional and local EMPLANs, and state and local flood plans .

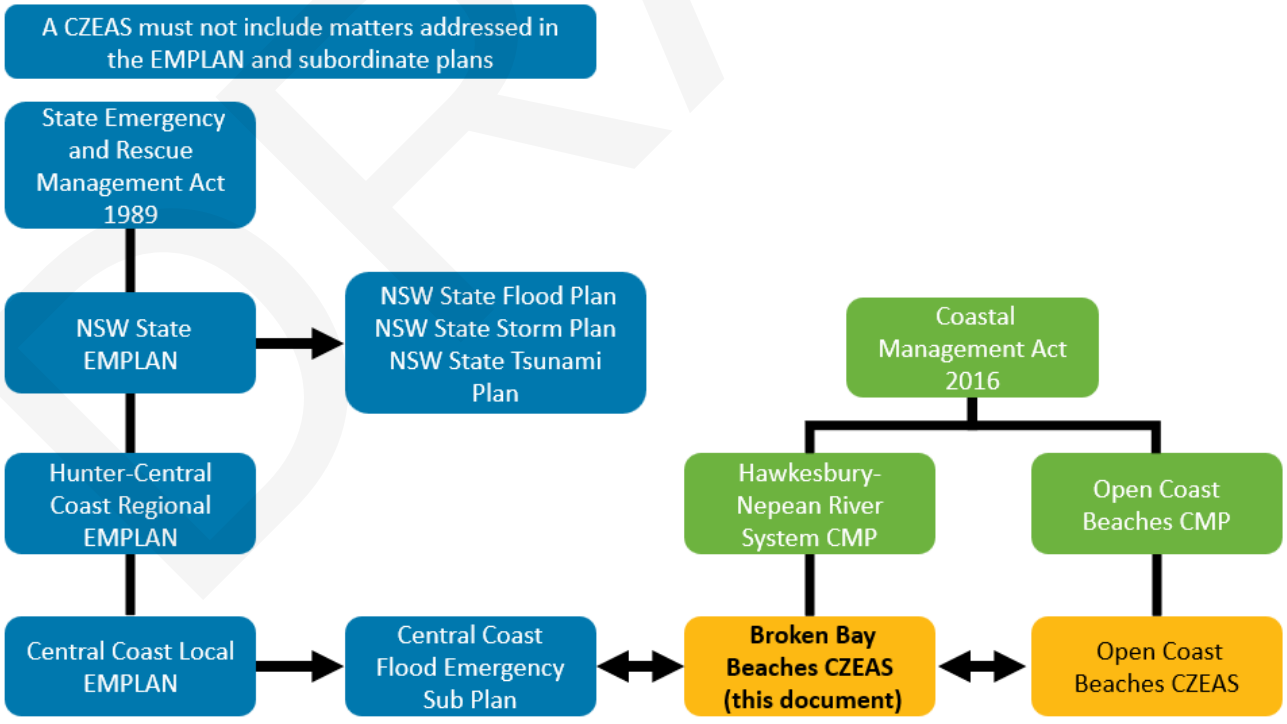


Figure 2-2 Simplified legislative framework for emergency management in NSW and its relationship with coastal management legislation and coastal management programs

2.3.2 Relationship of the CZEAS to other Emergency Plans

The requirements of the CM Act stipulate that this CZEAS must not cover emergencies that are already dealt with by another plan made under the SERM Act.

NSW State Storm Plan

The NSW State Storm Plan (NSW SES, 2023) is a sub plan to the NSW State EMPLAN (see Figure 2-2), and is a comprehensive strategy to effectively prepare for and respond to severe storms across NSW. Section 1.4.3 of the plan states that:

> *"Coastal erosion caused by storm activity is within the scope of this plan. Emergency management of coastal erosion that is not caused by storm activity will be controlled and coordinated by the Local Emergency Operations Controller (LEOCON)".*

Coastal erosion is therefore within the scope of the NSW State Storm Plan. However, in doing so, the Plan identifies the triggers and instances for when local councils need to activate their CZEAS at a local level. It is in this way that these two emergency planning documents dovetail, without overlapping.

Section 1.4.4 of the State Storm Plan (NSW SES, 2023) states that the arrangements for the emergency management of flooding are dealt with in the New South Wales State Flood Emergency Sub Plan (NSW SES, 2021) – described below.

NSW State Flood Plan

The NSW Flood Plan (NSW SES, 2021) is a sub plan to the NSW State EMPLAN (see Figure 2-2), and sets out the state level multi-agency arrangements for the emergency management of flooding in NSW. Section 1.4.2 of the NSW Flood Plan defines "flooding" as:

> "*a relatively high-water level which overtops the natural or artificial banks in any part of a stream, river,* ***estuary****, lake, or dam, and/or local overland flooding associated with drainage before entering a watercourse,* ***and/or coastal inundation resulting from super-elevated sea levels and/or waves (including tsunami) overtopping coastline defences***".

Subsequently, at a strategic level, the emergency management arrangements for prevention, preparation, response, and initial recovery for still water level coastal inundation is covered by the NSW Flood Plan. At a more regional, level this issue is addressed by the Central Coast Flood Emergency Sub Plan (NSW SES, 2021) – described below.

NSW State Tsunami Plan

The NSW Tsunami Emergency Sub Plan (NSW SES , 2023) is a sub-plan to the NSW State EMPLAN. The purpose of the plan is to set out the state-wide multi-agency arrangements for the emergency management of tsunamis in NSW – including the prevention, preparation, response, and initial recovery (including immediate relief) for tsunami activity at the strategic level. The plan accounts for all tsunami magnitudes and generation mechanisms.

The NSW SES is identified in the NSW State EMPLAN (NSW Office of Emergency Management, 2023) and the SES Act as the lead (combat) agency for preparation for and response to tsunami, and for leading the coordinated response to the impact of tsunami including the evacuation of affected communities and immediate relief if required.

Central Coast Council Flood Emergency Sub Plan

The Central Coast Council Flood Emergency Sub Plan (NSW SES, 2021) is a sub plan of the Central Coast EMPLAN 2021 (Central Coast Council , 2023) – see Figure 2-2, but specifically covers the local preparedness

measures, the conduct of response operations, and the coordination of immediate recovery measures from flooding within the entirety of the Central Coast LGA. The Plan therefore covers land-based flooding across open coast and in estuarine settings of the LGA. The additional arrangements required for wave run-up hazards are therefore covered as part of this CZEAS.

Central Coast Open Coast CMP and CZEAS

A CZEAS was developed for the Central Coast Open Coast CMP (Worley Consulting, 2025). For consistency across all beaches within the Central Coast LGA, this CZEAS has been aligned with the Open Coast CMP CZEAS to the greatest extent practical.

Summary

Table 2-1 and Table 2-2 below provide an overview of the planning hierarchy for coastal hazards across the study area.

Table 2-1 Planning hierarchy for coastal hazards listed in the CM Act across the study area

Coastal Hazard	Strategic Arrangements	Local Operations
Coastal erosion	The NSW State Storm Plan (NSW SES, 2023)	This CZEAS
Coastal inundation – land-based flooding	The NSW State Flood Plan (NSW SES, 2021)	Central Coast Council Flood Emergency Sub Plan (NSW SES, 2021)
Coastal inundation –wave run-up	The NSW State Flood Plan (NSW SES, 2021)	This CZEAS
Coastal cliff and slope instability	The NSW State Storm Plan (NSW SES, 2023)	This CZEAS

Table 2-2 Planning hierarchy for coastal hazards not listed in the CM Act across the study area

Coastal Hazard	Strategic Arrangements	Local Operations
Tsunami	The NSW State Tsunami Plan	Central Coast Council Flood Emergency Sub Plan (Central Coast Council , 2023)

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3 TRIGGERS FOR EMERGENCY ACTION

3.1 Overview

For the purposes of this CZEAS, a coastal emergency event within Broken Bay beaches is occurring when one or more of the below triggers occurs:

- The following **official hazard forecasts** are issued:
  - When the Bureau of Meteorology (BoM) has issued the release of a **Coastal Hazard Warning** that applies to any of the locations at risk identified in Section 0. More detail regarding these warnings is provided in Section 3.2.
- The following **local impact forecasts** are made:
  - In addition to the BoM Coastal Hazard Warning, there are location-specific forecast and triggers for when coastal hazards will activate this CZEAS. These triggers are discussed in Section 3.3.

In identifying triggers for erosion protection works, a balance needed to be found between predicted storm erosion and inundation in large events, and avoiding the triggers being reached too often, resulting in “false alarms” and implementation of emergency coastal protection works unnecessarily often.

3.2 BoM Coastal Hazard Warnings

The actions contained in this CZEAS are triggered by the release of a **Coastal Hazard Warning** from the BoM. The BoM issues Coastal Hazard Warnings for abnormally high tides or storm tides that:

- May be higher than the highest astronomical tide, and
- Could flood low lying coastal areas.

The BoM also issues **Severe Weather Warning for Damaging or Dangerous Surf -** when the waves are expected to be powerful enough to cause damage to property or significant erosion to beaches.

These warnings are issued whenever a coastal hazard is:

- Happening in an area, or
- Is expected to develop or move into an area.

A Coastal Hazard Warning includes:

- A list of all potential phenomena, coastal forecast districts and locations that may be affected.
- A description of the threat and the area likely to be affected (the threat area).
- The time the warning was issued and what time the next warning will be issued.
- A description of the weather pattern, including forecast developments of significant weather systems.
- A technical summary of all potential phenomena, their timing and likelihood.
- Confirmed observations and reports.
- Recommended actions.

The lead time depends on the weather situation. It can extend from an hour to 36 hours. While the threat remains, a Coastal Hazard Warning is updated routinely every 6 hours. More frequent warnings may be issued if required.

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NSW weather warnings are issued by the BoM and can be found at the following link: http://www.bom.gov.au/nsw/warnings/. Alternatively, the BoM weather App can show only the weather warnings that apply to the area set by the user.

3.3 Local Impact Triggers and Forecasts

The Role of Local Triggers

In addition to the official warnings from the Bureau of Meteorology, the NSW State Storm Plan stipulates that the response phase of the storm plan is triggered when information processes or intelligence indicates imminent or actual storm impacts to the community (NSW SES, 2023). For example, if there is no official warning from the Bureau of Meteorology, other evidence may be used to determine that there is a coastal hazard risk to the community that will trigger the actions in this CZEAS, including:

- Verbal advice from BoM forecasters
- Advice issued from the DCCEEW Coastal Expert.
- Real-time local monitoring and forecast systems

This is particularly important as there are a number of possible scenarios under which coastal erosion may occur without an official BoM Coastal Hazard Warning being issued. This may include a storm clustering event, where a local beach profile may be depleted from a recent event to the extent that even a relatively low or moderate swell coinciding with a high tide may erode the dune system resulting in landward recession of the erosion escarpment.

Given such complexities, *triggers alone* cannot replace expert engineering judgment. Response decisions must account for real-time conditions, local intelligence, and agency consultation.

Monitoring and Data Sources

To strengthen early warnings and improve preparedness, it is necessary for Council to monitor additional sources of forecasting and intelligence information. Forecasts and real-time data regarding various coastal hazard parameters (such as wave conditions, tide level, and beach state) can provide information on coastal inundation and erosion along coastlines several days in advance of an impending hazard events, potentially providing a “window of opportunity” to implement a range of emergency responses (Matheen & Nashwan, 2022).

Forecasting coastal erosion and inundation is a complex and challenging task due to the fact that it is not solely governed by a single factor, rather an intricate interplay of several variables, including:

- The astronomical tide cycle, and potential magnitude and timing of storm surge.
- Offshore wave height and direction, and the complex nearshore wave transformation processes that will impacts on wave conditions in the nearshore.
- The beach state prior to the onset of the storm. Beaches undergo continuous cyclic evolution in the form of erosion and accretion, and the beach profile at any given instant has an effect on the impact of subsequent storms.

Subsequently, as part of an early warning process, Council should actively monitor forecasts and real-time information related to ocean waves and tides, using the available data sources provided in Table 3-1. Council can also actively monitor the state of their beaches using the tools and data sources provided in Table 3-1, noting that no forecasts are available for beach erosion, and these datasets are limited in their ability to provide real-time (or even near-real time) information.

Table 3-1 Available sources of data for coastal hazard parameters

Parameter	Forecast Source	Forecast Window	Real-time Information
Wave Height	BoM Interactive Weather and Wave Forecast[1].	7 days	MHL NSW Ocean Wave Data Collection Program[2].
	The NSW Nearshore Wave Tool[3]	5 days	
Ocean Tide	MHL NSW Tide Charts[4]	1 year	MHL NSW Ocean Tide Data Collection Program[5]
	BoM New South Wales Tide Tables[6]	1 year	
Parameter	**Historical Data Availability**		**Data Type**
Beach State	Central Coast Council Beach Monitoring and Inspections		Photographs, Beach surveys
	CoastSnap (at available beaches)		Photographs
	NSW Beach Profile Database		Beach profiles
	CoastSat		Shoreline position

Proposed Trigger Conditions

A proposed set of conditions for triggering the Preparedness, Response and Recovery phases of the CZEAS is presented in Table 3-2, in consistency with the Open Coast CZEAS (Worley Consulting, 2025).

Table 3-2 LGA-wide and local triggers

Phase	Trigger
Prevention Phase	Prevention actions are to be undertaken as soon as practicable and are independent of the occurrence of a coastal inundation emergency
Preparedness Phase	**LGA-wide trigger**: Significant wave height at Sydney to exceed 5 m within next 5 days **Site specific triggers**: Sydney Hs forecast to exceed 3m, direction S to ENE within next 5 days apply at the following locations, subject to advice/consultation with DCCEEW: ▪ Ettalong Beach ▪ Ocean Beach ▪ Umina Beach ▪ Peral Beach ▪ Patonga Beach ▪ Little Patonga Beach
Response Phase	**LGA-wide trigger:** Significant wave height at Sydney to exceed 5 m within next 12 hours **Site specific triggers**: Sydney Hs forecast to exceed 3m, direction S to ENE within next 12 hours, OR coastal hazards are impacting critical public infrastructure. Site specific triggers apply at the locations listed above.

[1] http://www.bom.gov.au/australia/charts/viewer/index.shtml
[2] https://mhl.nsw.gov.au/Data-Wave
[3] https://nearshore.waves.nsw.gov.au/home/forecast
[4] https://mhl.nsw.gov.au/TideCharts
[5] https://mhl.nsw.gov.au/Data-OceanTide
[6] http://www.bom.gov.au/oceanography/projects/ntc/tide_tables.shtml

Phase	Trigger
Recovery Phase	Wave heights fall below trigger levels for 24 hours, BoM lifts warnings and confirmation that danger has passed received from DCCEEW

In addition to the triggers outlined above - location-specific triggers for when coastal hazards will activate the Response Phase of this CZEAS include when:

- *Coastal erosion* is occurring or expected to occur at key locations at risk of beach erosion identified in Section 4, impacting or with potential to impact on public or private assets and/or affect safe access/egress.
- *Wave run-up* is occurring or expected to occur at the key locations at risk of coastal inundation identified in Section 4, affecting/with potential to affect safe access/egress or impacting/with potential to impact on public or private assets.
- A situation in which *instability of coastal cliffs and slopes* is imminent, occurring or has occurred, and the threat of landslide endangers, or threatens to endanger, the safety or health of people or destroys or damages, or threatens to destroy or damage any sites and assets, as identified in Section 4.

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4 AREAS AT RISK

4.1 Overview

This CZEAS only applies to the known locations affected by beach erosion, coastal inundation or cliff and slope instability as noted in this section.

It is possible that beach erosion, coastal inundation or cliff and slope instability will affect additional locations not currently assessed or known to be risk locations anywhere in the Broken Bay beaches. In this event, Council should assess these locations and revise this CZEAS to include new locations at risk, as the need arises.

Mapping in Appendix A of this CZEAS depicts mapped coastal hazard extents, including:

- Beach Erosion: The Present Day 1% Annual Exceedance Probability Coastal Hazard Mapping (Bluecoast Consulting Engineers, 2024)
- Coastal Inundation of open coast beaches: The Present Day 2% Wave Run-up Line (Bluecoast Consulting Engineers, 2024)
- Coastal Inundation of estuarine foreshores (for Brisbane Water and Patonga Creek): The Hawkesbury River Coastal Inundation Study (Rhelm and Baird, 2023)
- Coastal Cliff and Slope Instability: The Present Day Coastal Cliff and Slope Instability Hazard Line (JK Geotechnics, 2023)

Based on analysis of the datasets listed above, Table 4-1 summarises the risks of beach erosion and coastal inundation at the 6 beaches. It should be noted that hazard information for Little Patonga Beach is unavailable; therefore, a more generalised risk assessment has been applied for this location to guide emergency response actions.

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Table 4-1 Summary of risks of beach erosion and coastal inundation

Beach	Beach Erosion	Coastal Inundation	Coastal Cliff/Slope Instability	Overall Risk
Ettalong Beach** Figure A-1	The main road along the beach (The Esplanade) is at risk of erosion across the reaches of foreshore that are not currently protected by permanent Coastal Protection Works (CPW). Towards the eastern end of Ettalong Beach, the foreshore in the vicinity of the Ettalong Wharf is also potentially exposed	The 1% AEP estuary inundation layer shows inundation of public roads (The Esplanade) and private properties along The Esplanade in between Kourung Street, and Ridge Street.	Not Mapped.	**High** – western parts of Ettalong beach due to both erosion and inundation.
Ocean/Umina Beach Figure A-2 and Figure A-3	In a 1% AEP event, the main road along the beach (The Esplanade) is at risk of erosion with potential impacts in adjacent properties particularly those near the intersection with Barrenjoey Road. Erosion from this event is close to compromising Ocean Beach Surf Life Saving Club (SLSC). There is little impact of erosion in the central and western parts) of the beach except to beach access paths (e.g. in front of Umina Beach SLSC). Some of the foreshore recreation infrastructure in the NRMA Ocean Beach Holiday Resort could be impacted by erosion in a 1% AEP event.	In a 1% AEP event, the main road along the beach (The Esplanade) is at risk of inundation near the intersection with Barrenjoey Road. However, there are no properties at the eastern end of the beach that are at risk of inundation in this event. There is little impact of inundation in the central and western parts of the beach except to beach access paths (e.g. in front of Umina Beach SLSC). There is a landward incursion of inundation at the Ettalong Creek entrance in a 1% AEP event. This may impact the adjacent infrastructure in the NRMA Ocean Beach Holiday Resort.	Not Mapped.	**High** – western part of Ocean/Umina Beach particularly due to the impacts of beach erosion. **Low** - central and eastern parts of Ocean/Umina Beach due to little impacts of beach erosion and coastal inundation

Beach	Beach Erosion	Coastal Inundation	Coastal Cliff/Slope Instability	Overall Risk
Pearl Beach	There are about 25 foreshore properties north of the entrance to Pearl Beach Lagoon that will be impacted by erosion in a 1% AEP event. In the south of the beach there are 4 foreshore properties close to the entrance of Green Point Creek that will be impacted in a 1% AEP event. Impacts are also expected to public roads such as Coral Cres and Pearl Parade.	Foreshore properties north of the entrance to Pearl Beach Lagoon will be slightly inundated in a 1% AEP event with no above floor flooding. In the south of the beach), there are 4 foreshore properties close to the entrance of Green Point Creek that will be impacted in a 1% AEP event, with the possibility of above floor inundation.	Coastal cliff/slope instability may present a risk to the Pearl Beach ocean pool and corresponding access point.	**High** - about 30 properties will be impacted by erosion in a 1% AEP event. A few properties in the south of the beach will be inundated a 1% AEP event.
Patonga	There are little risks of beach erosion impacts on private or public infrastructure other than a small section of Patonga Drive in front of The Boathouse Hotel, the Ferry Wharf, and the access road to the Boat Ramp.	There are significant risks associated with coastal inundation – with the primary mechanism being storm tide inundation from the Patonga Creek side (western side) of the township. Over 60 properties are identified as at risk, located along Patonga Drive, Bay Street, and Jacaranda Ave.	Not Mapped.	**High** – about 60 properties will be impacted by coastal inundation in a 1% AEP event.
Little Patonga	No erosion or inundation (wave run-up) mapping is available for Little Patonga Beach. Based on proximity to the foreshore it is likely that the walking trail and amenities building may be at risk from both hazards.		Not Mapped.	**Medium** – walking trail and amenities building likely to be be at risk

5 ROLES AND RESPONSIBILITIES

5.1 Agencies and Personnel

The general responsibilities of emergency services organisations and support agencies are listed in the Local and State EMPLANs, such as the NSW State Storm Plan (NSW SES, 2023), NSW State Flood Plan (NSW SES, 2021), and the Central Coast Council Flood Emergency Sub Plan (NSW SES, 2021). Table 5-1 summarises the roles and responsibilities of these stakeholders that are specifically relevant to this CZEAS.

It should be noted that private landholders are responsible for private land. Private property owners have responsibilities to monitor, manage, prepare and repair their properties for risks associated with coastal erosion, inundation and cliff and slope instability. Any physical works on private property are subject to development controls and environmental planning instruments, including the Central Coast Development Control Plan (DCP). Private property owners should notify Council immediately of any concerns outside of their property; however, property owners should seek advice directly from suitably qualified geotechnical and/or coastal engineers with regards to instability concerns within their property boundaries. Council does not have a positive obligation to take particular action to protect private property. There is, however, a statutory obligation upon Council to consider any valid development application for coastal protection works which may be lodged by property owners.

Table 5-1 Roles and Responsibilities

Organisation / Personnel	Responsibilities
Central Coast Council	▪ Prepare, maintain, and update this CZEAS (NSW SES, 2023). ▪ Provide the NSW SES with a copy of this CZEAS (NSW SES, 2023). ▪ Assist the NSW SES with community awareness programs to ensure people in locations potentially threatened by coastal erosion, inundation, and cliff/slope instability understand the threat and its management (NSW SES, 2023). ▪ Prevention & Preparation: Implement the Prevention and Preparation Phase emergency actions prior to a coastal emergency event occurring. ▪ Response: In the event of a coastal emergency at a location at risk, activate this CZEAS and implement the Response Phase emergency actions for the duration of the coastal emergency event. ▪ Recovery: Implement the Recovery Phase emergency actions following a coastal emergency event. ▪ Under the CM Act, Council is the designated coastal authority with responsibility for care of public land within its care, control, and management. The carrying out (or authorising and coordinating) of coastal emergency protective works to protect public assets from coastal erosion, inundation, and cliff/slope instability is Council's role, if it chooses to undertake such measures. ▪ Assist, at their request, the Police, NSW SES, and Local Emergency Operations Controller (LEOCON) in dealing with a coastal emergency. ▪ Liaise with the NSW SES Incident Controller to provide advice regarding the need for response actions by the NSW SES such as evacuations.
Local Emergency Management Committee (LEMC)	▪ The LEMC is constituted under the SERM Act for each local government area and is responsible for preparing plans for response and recovery from emergencies. ▪ The LEMC is chaired by the Chief Executive Officer or their nominated representative from Central Coast Council. Represented on the LEMC are combat agencies including:

Organisation / Personnel	Responsibilities
	– Police. – Rural Fire Service. – Fire and Rescue NSW. – State Emergency Services. – Surf Life Saving NSW. – Marine Rescue. ▪ The LEMC will review the Central Coast Local EMPLAN every three (3) years, or following any: – activation of the Plan in response to an emergency; – legislative changes affecting the Plan; – exercises conducted to test all or part of the Plan; – In the event of that deficiencies are identified; or – Change of roles and responsibilities.
Local Emergency Operations Controller (LEOCON)	▪ Monitor coastal emergency event operations. ▪ Act as the combat/responsible agency in the event of: – Coastal erosion that is not caused by direct storm activity, as per Section 1.4.3 of the NSW State Storm Plan (NSW SES, 2023); or – Coastal cliff and slope instability ▪ Coordinate support to the NSW SES Local Incident Controller, if requested to do so.
Central Coast Council Local Emergency Management Officer (LEMO)	▪ If requested by the NSW SES Incident Controller, advise appropriate agencies and officers of the start of response operations. ▪ Provide executive support to the LEMC and LEOCON in accordance with the Central Coast Local EMPLAN.
Regional Emergency Operations Controller (REOCON)	▪ The REOCON is responsible for the overall control and coordination of emergency response operations at Region level for which the REOCON is the designated controller (NSW Office of Emergency Management, 2023). ▪ The REOCON is also the designated controller where there is no designated Combat Agency, or where it is necessary to coordinate two or more local level operations which are controlled by Emergency Operations Controllers, or when directed by the SEOCON. ▪ The REOCON is responsible, when requested by a combat agency, to co-ordinate the provision of resources support.
State Emergency Operations Controller (SEOCON)	▪ Responsible for the control and coordination of emergency response operations at State level, for which the SEOCON is the designated Controller or where there is no designated Combat Agency (NSW Office of Emergency Management, 2023). ▪ Provide advice to the Minister regarding emergencies, including whether or not a declaration of a ‘State of Emergency’ may be necessary. ▪ Consider requests for State or Commonwealth assistance. ▪ Coordinate the establishment of a Major Evacuation Centre in accordance with Major Evacuation Centre Guidelines if required.
NSW State Emergency Service	▪ Act as the combat/responsible agency for damage control and the coordination of community evacuation during the following coastal zone hazards as per the Central Coast Local EMPLAN (Central Coast Council , 2023):

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Organisation / Personnel	Responsibilities
(NSW SES) Local Unit Members	– Flooding. – Storms. – Tsunami. ▪ Act as the combat/responsible agency in the event of coastal erosion that is caused by storm activity (NSW SES, 2023). ▪ NSW SES roles and responsibilities in relation to storms and coastal erosion are detailed within the NSW State Storm Plan (NSW SES, 2023), and where relevant the NSW State Flood Plan (NSW SES, 2021). Responsibilities may include: – Assist in the collection of flood and coastal erosion/inundation information for the development of intelligence. – Evacuation. – Delivery of warnings. – Assisting with road closures and traffic control operations. ▪ The NSW SES is not authorised to undertake emergency coastal protection works such as placement of rock armour or geotextile sand containers. ▪ Undertake preparedness education related to its legislated responsibilities of flood, storm, tsunami, and earthquake.
NSW SES Incident Controller	▪ Deal with floods as per the Central Coast Flood Emergency Sub Plan (NSW SES, 2021) ▪ Identify and monitor people and/or communities at risk of flooding and coastal erosion. ▪ Provide an information service in relation to: – Coastal erosion. – Coastal inundation. – Road conditions and closures (general information only). – Warning products in line with the AWS. ▪ Direct the evacuation of people and/or communities. ▪ Ensure caravan parks are advised of flood/coastal inundation warnings. ▪ Coordinate the collection of flood and coastal erosion/inundation information for development of intelligence.
NSW Rural Fire Service (RFS)	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: ▪ Identify and notify the NSW SES of any locations at risk of fire or hazardous materials that pose a significant threat to surrounding populations due to the impact of a flood for incorporation into NSW SES flood intelligence and planning. ▪ Conduct HAZMAT operations including asbestos risks, arising from flood and storm emergencies in coordination with the SES Incident Controller. ▪ Assist the NSW SES with the: – Delivery of warning products in line with the AWS, and the conduct of evacuations. – Warning and/or evacuation of at-risk communities. – Monitoring/reconnaissance of flood prone areas. ▪ Provide equipment for pumping flood water out of buildings and from low-lying areas. ▪ Assist with clean-up operations, including the hosing of flood affected properties.

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Organisation / Personnel	Responsibilities
Ambulance Service of NSW	▪ The roles and responsibilities for NSW Ambulance are outlined in the Health Services (HEALTHPLAN) Supporting Plan and NSW State Flood Plan (NSW SES, 2021). Roles and responsibilities in addition those include: – Participate in NSW SES briefings, training & exercises as required. – Provide a Liaison Officer to the NSW SES State Command or Incident Control Centre/s as required. – Provide Incident Management Personnel and Liaison Officers to the NSW SES where required.
Australian Government Bureau of Meteorology (BoM)	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: ▪ The BoM issue public weather and storm warning products before and during a storm (NSW SES, 2023). These may include: – Coastal Hazard Warnings – Severe Thunderstorm Warnings. – Severe Weather Warnings. – Tropical Cyclone Watches. – Tropical Cyclone Warnings. – Coastal Strong Wind, Gale Storm and Hurricane Force Warnings. – Flood Watches and Flood Warnings. ▪ Provide weather and flood information directly to the NSW SES, LEMC and relevant agencies (NSW SES, 2021).
Marine Rescue NSW	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: ▪ When requested by NSW SES, assist in flood operations when training and equipment are available and suitable including assistance with: – Warning and/or evacuation of at-risk communities. – Providing communications personnel. – Property protection tasks including sandbagging. – Flood rescue operations
NSW Department of Climate Change, Energy, the Environment and Water	DCCEEW is the NSW government authority responsible for advising on coastal zone management. Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: ▪ Advise the NSW SES about conditions which may lead to coastal erosion; ▪ Provide storm damage response teams to assist the NSW SES and National Parks and Wildlife Service. ▪ Provide related advice on coastal hazards to Council and the NSW SES on request. ▪ Support recovery committees as required.
NSW National Parks and Wildlife Service	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: ▪ Assist the NSW SES with identification of road infrastructure in National Parks at risk from storms. ▪ Close and reopen NPWS managed roads when affected by storms and advise the NSW SES of its status.

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Organisation / Personnel	Responsibilities
	▪ Facilitate the safe reliable access by emergency resources on NPWS managed roads. ▪ Assist the NSW SES with the communication of warnings and information provision to the public through variable message signs and other appropriate means.
NSW Police Force	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: ▪ Provide Incident Management personnel and Liaison Officers to the NSW SES Operation Centre if required. ▪ When requested by LEOCON, act as the response agency for coastal cliff and slope instability ▪ When requested by NSW SES in storm operations: – Restrict access to areas affected by storms. – Assist with warning and/or evacuation of at-risk communities. – Provide specialist storm damage response teams to assist the NSW SES if available. – Assist with monitoring and reconnaissance of areas potentially damaged by storms. ▪ Coordinate search and rescue operations. ▪ Conduct road and traffic control operations in conjunction with NSW SES, Council and/or TfNSW. ▪ Coordinate security of supply lines for evacuated and damaged areas. ▪ Manage Disaster Victim Registration. ▪ Operate the Public Information and Inquiry Centre, if requested or otherwise needed during flood events.
Surf Life Saving NSW	▪ Where local arrangements allow, provide support to NSW SES as per agreed arrangements (NSW SES, 2023). This includes providing assistance to close beach access during and after storm events.
Transport for NSW	Roles and responsibilities are outlined in NSW State Storm Plan (NSW SES, 2023) and NSW State Flood Plan (NSW SES, 2021) and include: ▪ TfNSW (Maritime), following the direction of the NSW Police Force will assist in the identification and recovery of vessels.

5.2 Combat Agencies

It is important to note that the NSW State Storm Plan (NSW SES, 2023) and the Hunter and Central Coast Regional EMPLAN (Hunter-Central Coast Regional Emergency Management Committee, 2021) identify different combat agencies are responsible for different types of coastal hazard - and that this also varies depending on whether or not the emergency event is occurring within or outside of a storm event. This information is summarised in Table 5-2.

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Table 5-2 Combat agencies for coastal hazard events

Coastal hazard	Storm Event	Non-Storm Event	Reference
Coastal erosion and inundation	NSW SES	LEOCON	NSW State Storm Plan
Coastal cliff and slope instability	LEOCON	LEOCON	Hunter/Central Coast Regional EMPLAN

5.3 Emergency Operation Centres

An Emergency Operations Centre (EOC) is a centre established at State, Region, or Local level as a centre of communication and as a centre for the coordination of operations and support during an emergency. In NSW, the activation of an EOC is triggered by various factors depending on the nature and severity of the emergency or incident. Emergencies that exceed the capabilities of individual agencies or require a coordinated multi-agency response may prompt the activation of the EOC to manage resources and coordination effectively.

As per the NSW State EMPLAN (NSW Office of Emergency Management, 2023):

- The SEOCON is responsible for establishing and controlling a State Emergency Operations Centre (SEOC)
- The REOCON is responsible for establishing and controlling a Regional Emergency Operations Centre (REOC)
- The LEOCON is responsible for establishing and controlling a Local Emergency Operations Centre (LEOC)

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6 COMMUNICATION PROTOCOLS

6.1 Overview

Council will provide information about anticipated coastal emergency events to impacted communities through the following mechanisms provided in Table 6-1.

Table 6-1 Communication Protocols

Communication	
	▪ Provide routine emergency management briefings to communicate the strategy outlined in this plan including coastal emergency triggers, areas at risk, roles and responsibilities and response action plan.
	▪ Provide emergency management information (in the form of signage and brochures) at local community centres and community information hubs. ▪ Inform the community of Council's intended erosion emergency responses under this CZEAS. ▪ Inform community members and businesses about the need to develop a household / business Emergency Management Plan (EMP) for coastal hazards.
	▪ In consultation with the NSW SES and BoM, provide public information about approaching coastal emergencies where possible through digital means including social media. ▪ Provide emergency management briefings to the public as needed, in particular affected landholders, to communicate the strategy outlined in this CZEAS, including coastal emergency event triggers, locations at risk, roles and responsibilities and the emergency response actions, including what actions a landholder may need to take and any assistance that may be available to them. ▪ Coordinate with the NSW SES to ensure residents are aware of urgent hazards during emergency events and provide assistance with door-to-door communication as necessary. ▪ See Section 6.2 for more information about message construction.
	▪ Place barriers and signage at Council-managed beach access tracks that are closed due to the impacts of coastal erosion, inundation and/or cliff/slope instability.
	▪ Provide up to date information on Council's website regarding Council-managed beach access tracks closures and re-openings.

6.2 Message Construction

6.2.1 The AWS Framework

As per Section 6.1, Council is to consult with the NSW SES and BoM, in order to help provide public information about approaching coastal emergencies.

The design of Council's external messaging during an emergency event should be aligned with the Australian Warning System framework (AIDR, 2021) – which is a new national approach to information and warnings during emergencies like bushfire, flood, storm, extreme heat, and severe weather. There are three warning levels, provided in Table 6-2, as per AIDR (2021).

Table 6-2 Warning Levels from the Australian Warning System framework (AIDR, 2021)

Alert Level	Description
Advice (Yellow)	An incident has started. There is no immediate danger. Stay up to date in case the situation changes.
Watch and Act (Orange)	There is a heightened level of threat. Conditions are changing and you need to start taking action now to protect you and your family.
Emergency Warning (Red)	An Emergency Warning is the highest level of warning. You may be in danger and need to take action immediately. Any delay now puts your life at risk.

The Australian Warning System utilises a system of triangular hazard icons with escalating tiers and associated colour palettes. Specific icons have been developed for bushfire, flood, storm, extreme heat, and severe weather, as per Figure 6-1 below. It is recommended that the following icons are used:

- "Storm" icon – for coastal erosion, coastal inundation, and coastal cliff and slope instability that are jointly occurring with storm events.
- "Other" icon – for coastal erosion and coastal cliff and slope instability that does not directly coincide with storm events (as these two hazards may also occur in the aftermath of a specific storm event).

The Australian Warning System utilises a nested model for communications that includes the warning level + hazard / location + action statements – as per Figure 6-1. Each warning level has a set of action statements to give the community clearer advice about what to do. Calls to action can be used flexibly across all three warning levels and contextualised for each hazard for a given location. Table 6-3 provides some examples of the Australian Warning System's "calls to action" input (AIDR, 2021) that may be useful in a coastal emergency.

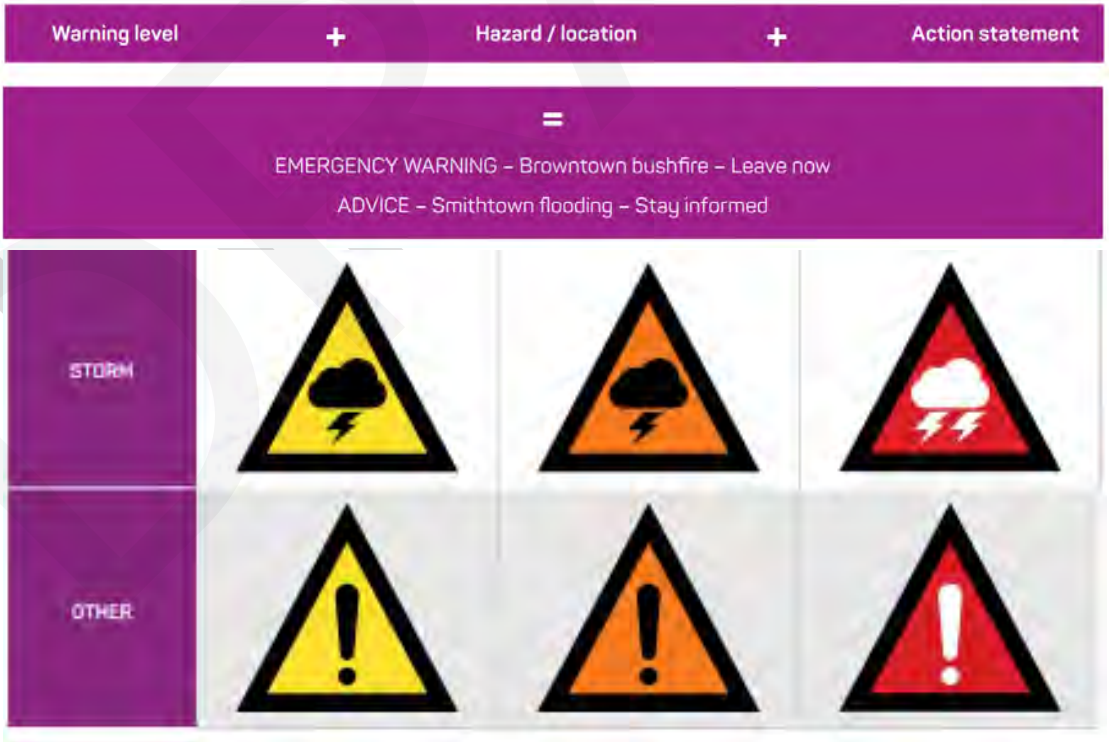


Figure 6-1 Australian Warning System messaging model (top) and hazard icons (AIDR, 2021)

Table 6-3 Examples of Australian Warning System calls to action (AIDR, 2021) that may be used in a coastal emergency

Advice	Watch and Act	Emergency Warning
▪ Prepare now ▪ Stay informed ▪ Monitor conditions ▪ Threat is reduced ▪ Avoid the area ▪ Return with caution	▪ Prepare to leave/evacuate ▪ Leave/evacuate now (if you are not prepared) ▪ Prepare to take shelter ▪ Move/stay indoors ▪ Stay near shelter ▪ Walk two or more streets back ▪ Monitor conditions as they are changing ▪ Move to higher ground (away from creeks/rivers/coast) ▪ Limit time outside ▪ Avoid the area ▪ Stay away from damaged buildings and other hazards ▪ Prepare for isolation ▪ Do not enter flood water ▪ Not safe to return ▪ Prepare your property	▪ Leave/evacuate (immediately, by am/pm/hazard timing) ▪ Seek/take shelter now ▪ Shelter indoors now ▪ Too late/dangerous to leave

6.2.2 Message Communication

According to the Australian Disaster Resilience Handbook (AIDR, 2009):

'the best predictions, the best interpretive material and the best warning messages are of little value if they have no impact on damages or safety. Failure is guaranteed if warning messages based on … predictions and interpretations … are not conveyed effectively to those expected to respond. In essence, a warning which is not communicated effectively is no warning at all if it is not heard or heeded'.

The handbook identifies two different types of message communication based on target audience:

1. General warnings are disseminated ('broadcast') to whole communities or regions.
2. Specific warnings are intended for individuals or parts of communities and reflect the need for 'narrowcasting' to specific audiences who may have specific characteristics or be at different kinds of risk.

A combination of the following warning methods may be utilised:

- Internet – including authorised social media and the official Council website.
- Mobile and fixed public address systems
- Two-way radio
- Emergency Alert
- Telephone/fax
- Doorknocking

- Variable message signs
- Community notices in identified hubs
- Distribution through established community liaison networks/partnerships

Emergency Alert is a national telephony-based alert system used by emergency service agencies to send voice messages and short message service (SMS) to landline/mobile telephones in times of emergency. Where appropriate and usually in conjunction with other warning messages, Emergency Alert is used to send SMS/voice alerts to landline and mobile telephones in a specified geographic area. The emergency alert system should be used in conjunction with the three levels of emergency waring depicted in Figure 6-1.

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7 EMERGENCY RESPONSE ACTION PLAN

7.1 Overview

This section outlines what actions are to be undertaken in the four phases of emergency management at each of the locations at risk that this CZEAS applies to.

- **LGA-wide Actions:** Section 7.2 summarises the coastal emergency actions through the four phases of emergency management (see Figure 2-1), which apply to the locations at risk along the entire study area.
- **Site-Specific Actions:** In addition to the LGA-wide actions specified in the table below that would apply generally to all areas impacted by a coastal emergency, site-specific emergency actions that would apply to particular locations are outlined in individual site plans in Appendix A.

Council's ability to undertake the actions identified in this subplan will be dependent on the availability of resources during emergency events. The actions prescribed must not conflict with or impede the actions of the NSW SES or the other agencies with roles and responsibilities listed in Section 5 of this document.

All actions must not put personnel, staff or volunteers in danger. Emergency management works must not be undertaken during extreme weather unless environmental conditions permit works to be undertaken safely. Implementation of the actions outlined in this document are to be undertaken in accordance with the provisions of Council's Work Health and Safety Management System. The safety of the personnel who might be working under the extreme adverse weather conditions that gave rise to the emergency is to be prioritised over the execution of any actions outlined in this document. The implementation of an applicable safety hazard risk assessment is required prior to the undertaking of any intervention or non-intervention management measures.

Actions in this CZEAS aim to reduce risk:

- In areas where Council has chosen not to implement other coastal protection works to reduce coastal hazard risks, which have been evaluated as tolerable or acceptable.
- Where coastal hazard risks persist because an agreed action in this CMP has not yet been implemented.
- In situations where coastal hazard risks persist even after the implementation of other actions, leading to what is termed as residual risk.
- When rare and large or unexpected events occur, outside the design criteria or capacity of agreed management actions in this CMP.

7.2 Study Area Wide Actions

The following tables set out the LGA-wide emergency actions to be undertaken across the four phases of emergency management: Prevention, Preparedness, Response, and Recovery. These actions provide a consistent framework for managing coastal hazard risks across all locations within the study area, ensuring clarity around responsibilities, timing, and operational priorities. Site-specific actions for individual locations are provided separately in Appendix A.

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Table 7-1 Coastal Emergency Actions: Phase 1 – Prevention

Action	Description	Responsibility	Timing
1.1	**Inform:** Make this CZEAS available to all relevant stakeholders identified in Section 5 of this CZEAS.	Council	Ongoing
1.2	**Inform:** Share information with NSW SES for incorporation into coastal hazard planning and intelligence for the study area	Council NSW SES	Ongoing
1.3(a)	**Inform:** Provide advice to the community, landholders, and the NSW SES about the potential for a coastal emergency from beach erosion, coastal inundation or cliff or slope instability – and the types of responses that are and are not permitted.	Council	Ongoing
1.3(b)	**Inform:** Inform the community of Council's intended erosion emergency responses under this CZEAS.	Council	Ongoing
1.4	**Plan:** Apply development controls to developments in the coastal hazard areas in accordance with the LEP and DCP.	Council	Ongoing
1.5	**Plan:** Maintain a plant and equipment resource list for equipment necessary to enact the actions in this Subplan.	Council NSW SES	Ongoing
1.6	**Plan:** Develop protocols between Council and NSW SES and LECON in relation to operational activities for situations where an Emergency Operations Centre (EOC) is not established.	Council	Ongoing
1.7	**Review:** Through the Local Emergency Management Committee (LEMC), consult with SES, DCCEEW, Local Police, LEOCON, FRNSW to ensure this CZEAS remains consistent the relevant local, regional, and state-based emergency management plans (see Figure 2-2).	Council	Within 6 months of EMPLAN updates
1.8	**Review:** Review and update this CZEAS in line with any future updates to the CVA Mapping or CMP implementation.	Council NSW SES	Ongoing
1.9	**Plan:** Establish internal operational protocol and procedures for all coastal hazard scenarios for LEMO, Council's coastal officers and works crews, and communications staff.	Council	Ongoing

Action	Description	Responsibility	Timing
1.10	**Monitor:** Monitoring of physical environmental conditions to assess potential for occurrence of coastal emergency and seeking appropriate advice when required	Council NSW SES DCCEEW	Ongoing

Table 7-2 Coastal Emergency Actions: Phase 2 – Preparedness

Action	Description	Responsibility	Timing
"Sunny Day" Preparedness			
2.1	**Monitor:** Undertake regular monitoring of coastal conditions, tide, wave height, rainfall, and weather condition forecasts for indication of approaching coastal hazards, as per Section 3.	Council	Ongoing
2.2	**Inform:** Inform community members and businesses about the need to develop a household / business Emergency Management Plan (EMP) for coastal hazards.	Council	Ongoing
2.3	**Inform:** Inform Council staff about the emergency responses within this plan and ensure relevant personnel have the copies of the plan.	Council	Ongoing
2.4	**Plan:** The LEMC will review the Local EMPLAN every three (3) years as per Table 5-1 to ensure interoperability preparedness.	LEMC	Ongoing
2.5	**Plan:** Prepare an up-to-date list of contact details for key Council staff involved in coordinating actions under the CZEAS (include responsibilities of staff who prepare for, manage and coordinate recovery from an erosion emergency event) and individuals from whom Council may need advice, such as DCCEEW staff, or with whom to integrate from other emergency sectors).	Council	Ongoing
2.6	**Plan:** Prioritise planning and response to maximise (to the greatest extent practical) continued functionality for essential infrastructure during an emergency event.	Council	Ongoing
2.7	**Plan:** Develop an operations procedure to guide Council's response to coastal emergency events (including resourcing, internal training, testing and periodic review).	Council	Ongoing

Action	Description	Responsibility	Timing
Precaution Preparedness - where of triggers for Response Phase are anticipated			
2.8	**Plan:** Ensure signage to close Council-managed beach access tracks and other public areas, and signage warning pedestrians of coastal hazards risks are available for use during coastal emergencies.	Council	Ongoing
2.9	**Plan:** Ensure appropriate plant, equipment and experienced personnel are available for protection of assets at risk. Both internal and external personnel will be required based on specific scope of works. Place appropriate equipment on standby (back up radios, signs, and barricades etc.).	Council	Ongoing
2.10	**Monitor:** Undertake regular monitoring of hazard forecasts and local forecasts and triggers (see Section 3) that may activate the Response Phase.	Council NSW SES	Ongoing
2.11	**Inform:** Initiate communications protocol described in this CZEAS to advise the community of the likelihood of an impending coastal inundation emergency that would initiate actions under the Subplan	Council	Within 24 hours after *Preparedness* Phase triggered

Table 7-3 Coastal Emergency Actions: Phase 3 – Response

Action	Description	Responsibility	Timing / Trigger
3.1	**Monitor:** Undertake regular monitoring of hazard forecasts and local forecasts and triggers (see Section 3) that may activate the Response Phase	Council NSW SES	Ongoing
3.2(a)	**Plan:** The LEMC (inc. Council LEMO) should consider Council advice regarding Warnings and Triggers, and advice provided by the NSW BoM. From here SEOCON, REOCON, LEOCON and NSW SES are to decide on the emergency management process (supported by Council). This may include the establishment of an Emergency Operations Centre (EOC).	SEOCON REOCON LEOCON NSW SES	Response phase activated.
3.2(b)	**Plan:** No actions undertaken should impede, conflict, or overlap with those of response agencies under the SERM Act unless there is prior agreement between the relevant parties.	Council	Response phase activated.

Action	Description	Responsibility	Timing / Trigger
3.3	**Implement:** Initiate erection of safety barriers or safety signage across potentially dangerous access points on roads assessed within the CZEAS to be vulnerable to coastal hazards. ▪ Refer to the coastal hazard maps in Appendix A and specific locations listed in Section 4 of this CZEAS as a guide to assess locations where action such as road closures will be required. Sections of roadway that may be subject to inundation that pose a high public safety risk should be temporarily closed to public access. This can be done through erection of temporary barricades, cyclone fencing and/or signage ▪ Undertake inspection of these areas where it is safe to do so and inform the NSW SES of any intelligence on unforeseen impacts of coastal inundation gathered during the emergency. In a potential emergency event, the foreshore areas listed in Table 4-1 should be inspected daily, particularly at high tide, where resources permit. Work with NSW SES and NSW DCCEEW-CPHR to collect data during and after coastal inundation events (e.g. RTK survey of debris lines, photographs of inundated or eroded areas. ▪ Assist the NSW SES to enact closure of access points that the NSW SES Incident Controller has deemed to be unsafe and that may not have been identified as specific locations of coastal erosion or inundation risk within this CZEAS. ▪ Council will coordinate the closure and reopening of council managed roads once inspections have been carried out by the relevant authority.	Council	Response phase activated. Ony if/when safe to do so.
3.4	**Implement:** Install temporary fencing and/or signage on council managed land (e.g. foreshore reserves) affected by coastal inundation or erosion resulting from major storm activity or an extreme or irregular event, where this has resulted in unsafe conditions	Council	Response phase activated. Ony if/when safe to do so.
3.5	**Communicate:** Implement the communication protocol in conjunction with the combat agency (NSW SES) to advise landholders, residents, public authorities and other organisations that a coastal emergency is likely or is occurring and that actions in this CZEAS are to be implemented. When EOC not is in place, communications are to be directed through the communications business partner for the Coastal Management Unit. LEMO to be copied into all communications for oversight (see Figure 1-2). Release media information as necessary to keep the community informed. Community information hubs and social media to be utilised, refer to Section 6.	Council NSW SES	Response phase activated.

Action	Description	Responsibility	Timing / Trigger
3.6	**Implement:** Provide support to NSW SES in accordance with the provisions in the Central Coast Local EMPLAN as required and where resources allow	Council	As requested by NSW SES.
3.7	**Implement:** Manage Essential Infrastructure under Council control (water supply and sewerage operations). Through consultation with utilities providers assess the requirement and options for utilities management where such infrastructure becomes or is likely to become affected by coastal hazards.	Council	Response phase activated. Ony if/when safe to do so.
3.8	**Communicate:** Liaise with other agencies (e.g., Transport for NSW, NSW DPHI – Crown Lands, National Parks and Wildlife Service) if debris from coastal erosion or inundation creates a safety hazard in adjoining areas (or liaise with road owners to enable closure).	Council	As required.
3.9	**Respond:** Seek specialist coastal engineering advice where required.	Council DCCEEW	As required.
3.10	**Respond:** Seek advice from DCCEEW staff as required.	Council DCCEEW	As required.
3.11	**Respond:** Install emergency coastal protection works (ECPW) at the locations outlined in Section 7.3 and Appendix A of this CZEAS. This will comprise the placement of sand, or the placement of sandbags for a period of not more than 90 days.	Council	Response phase activated. Ony if/when safe to do so.

Table 7-4 Coastal Emergency Actions: Phase 4 – Recovery

Action	Description	Responsibility	Timing / Trigger
4.1(a)	**Monitor:** Initiate Recovery phase of CZEAS once waves and water levels have fallen below trigger levels. ▪ Continue to monitor waves and water levels throughout the event, and initiate the Recovery Phase of the CZEAS 24 hours after the cancellation of the Severe Weather Warning from the Bureau of Meteorology, AND real-time monitoring indicates that significant wave height at Sydney has fallen below 3 m AND water levels at high tide have fallen to below Mean High Water Springs. ▪ Monitor physical environmental conditions to assess whether the trigger conditions to initiate the recovery phase have been reached	Council	Once trigger for recovery phase is reached

Action	Description	Responsibility	Timing / Trigger
4.1(b)	**Monitor:** Conduct/organise detailed inspections of sites potentially affected by coastal hazards and assess damage to assets and the natural environment. Assess the structural integrity of any damaged infrastructure. Seek professional advice as required.	Council	Recovery phase activated. Following an emergency event. Once it is safe to do so.
4.2	**Restore:** Assess and where practical, remove any threats to public safety, such as debris deposited or exposed in public areas. Where required, supporting agencies will assist with clean-up operations after coastal inundation events, where possible when resources and personnel permit. NSW SES will support the short-term transition to recovery as per the State Recovery Plan and NSW Flood Plan.	Council	Recovery phase activated. Following an emergency event. Once it is safe to do so.
4.3	**Restore:** Assess and reopen Council-managed roads and access points once inspections have been carried out by the relevant authority and deemed safe to do so. Maintain temporary safety fencing and associated warning signage, as necessary. Liaise with NSW-SES as required	Council	Recovery phase activated. Following an emergency event. Once it is safe to do so.
4.4	**Monitor:** Undertake post-storm reconnaissance of affected areas to gather intelligence including recording of maximum erosion or inundation levels, mapping of inundation extents, surveys of debris marks, post-event damage assessments. Use the intelligence gathered to improve future CZEAS operations and share resources/work with the NSW SES and NSW DCCEEW to assist in future decision-making.	Council	Initiate within 24 hours after Recovery Phase has been activated
4.5	**Restore:** Assess, repair and/or replace any essential Council-owned/managed structures that are damaged as a result of a coastal emergency. Assess the structural integrity of unprotected assets affected by or damaged during the emergency event. Geotechnical, structural and/or coastal engineering investigations may be required to understand residual risk following an emergency event. Expert advice to be sought as required.	Council	Recovery phase activated. Following an emergency event. Once it is safe to do so.
4.6	**Restore:** Restore safe foreshore access in public spaces. This may require regrading of eroded steep embankments greater than 1 m in vertical height to 1V:4H at designated public access points to restore foreshore amenity	Council	Recovery phase activated. Following an emergency event. Once it is safe to do so.
4.7	**Restore:** Replenish any emergency materials and supplies for use in any future erosion events.	Council	Recovery phase activated.

Action	Description	Responsibility	Timing / Trigger
4.8	**Restore:** Remove any temporary coastal protection works placed during the coastal emergency in accordance with the requirements of the CM Act. Obtain expert coastal engineering advice to assess the safety and condition of any temporary coastal protection works placed during the coastal emergency and remove these if required, or seek the appropriate development approval for these to remain in place, based on expert advice.	Council NSW SES DCCEEW	Initiate within 90 days after Recovery Phase has been activated.
4.9	**Monitor and Inform:** Investigate any unauthorised private coastal works and monitor as necessary. Liaise with property owners to ensure any private and/or public structures do not pose a risk to the public. Issue orders under the *Local Government Act 1993* and/or the *Environmental Planning and Assessment Act 1979* when properties are deemed structurally unsafe, or where erosion or inundation protection works have been constructed illegally or result in exposure of contamination/landfill, or where structures otherwise pose a risk to the public. Ensure premises are fit and safe for reoccupation and assess any need for demolition.	Council	Recovery phase activated.
4.10	**Inform:** Continue to maintain a communication strategy warning of the dangers of any persisting high, unstable, or near-vertical erosion escarpments drying out and collapsing without notice.	Council	Recovery phase activated.
4.11	**Record:** Record coastal emergency impacts and response actions. Take remedial action where necessary. Maintaining photographic and written records of events and decision-making processes. See Section 7.4.	Council	Recovery phase activated.
4.12	**Review:** Undertake an After Action Review (see section 7.5) review of this CZEAS and update as necessary to improve the future effectiveness of coastal emergency response actions.	Council NSW SES DCCEEW	Within 2 weeks of plan activation, or as necessary.
4.13	**Inform:** Erect permanent warning signs if necessary.	Council	Following an emergency event.

7.3 Emergency Coastal Protection Works

7.3.1 Definition

Emergency coastal protection works (ECPW) are defined in the State Environmental Planning Policy (Resilience and Hazards) 2021 as:

"*works comprising the placement of sand, or the placing of sandbags for a period of not more than 90 days, on a beach, or a sand dune adjacent to a beach, to mitigate the effects of coastal hazards on land*"

7.3.2 Specifications for Emergency Coastal Protection Works

Types of ECPW Set out in the CZEAS

Locations where ECPW may be carried out, the nature of the works, and accosted triggers are summarised in identified Table 7-5. The nominated ECPW would generally be comprised:

- **Geotextile sand containers (sandbags)**: The ECPW will be temporary and generally constructed as a single stack of sandbags along the erosion scarp to a maximum height of 1.5 – 2.0 m from the toe of the escarpment (DECCW, 2011), as shown in Figure 7-1. Approximately 25 containers are required for every 10m of structure length, with the total number required dependant on the length of shoreline requiring immediate protection and the number of containers that can be installed in the time available.
- **Beach scraping:** Beach scraping as a form of beach nourishment, could also be undertaken during the response phase if time, resource and event magnitude permit. Determination of local specifications for the scraping works would be dependant upon the beach state at the time, and would therefore involve consultation with relevant NSW government agencies as per the communication protocol. Such works would also be undertaken as per the protocols and methods set out in the Central Coast Develop Beach Maintenance Program, which is included as an action in both the HNRS CMP (Water Technology, 2025) and the OC CMP (Worley Consulting, 2025). Nominally the following parameters apply:
  - The 'borrow' area should be restricted to within the intertidal zone with no greater than 0.3 m depth removed from the beach profile between elevations of - 0.5mAHD and +1.0 mAHD.
  - The 'placement' area should be placed at the base of the asset at a slope of approximately 1 in 8. Placement volumes are likely to be approximately 10 - 20m^3/m width of beach. Ideally a small lip can be left to minimise sand blowing over the top of foreshore, and/or other considerations such as use of jute mesh and plantings on the landward margin of the nourishment if appropriate can increase stability.
  - There are numerous technical references which can assist in the delivery of beach scaping work for either Response or Recovery (Gordon, 2015; Carley, et al., 2010)

Importantly, during the emergency response phase, the window for physical works is extremely limited. Realistically, only the measures listed above are likely to be feasible. Any larger or more complex measures would need to be assessed case-by-case and are unlikely to proceed within the short timeframes associated with active emergency conditions (Worley Consulting, 2025).

The determination of which ECPW measure is most appropriate should be made in conjunction with technical coastal engineering advice, including engagement with DCCEEW (see Response Action 3.9 to 3.11). All emergency works must be undertaken in consultation with a suitably qualified coastal or geotechnical engineer to ensure structural integrity, safety, and compliance with environmental and planning requirements.

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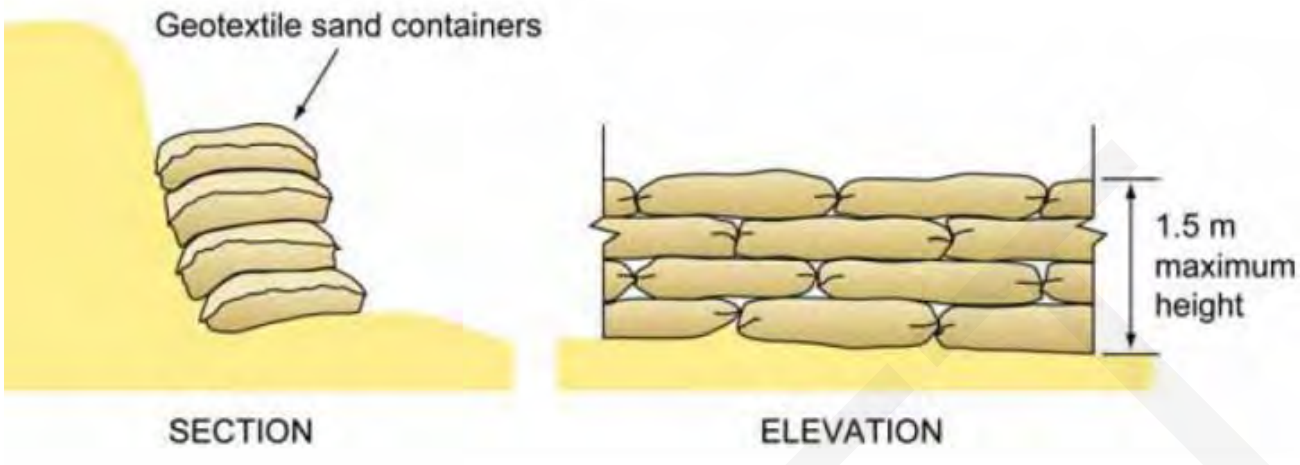


Figure 7-1 Concept Sand Container Placement Method (DECCW, 2011)

Nominated Locations for ECPW

ECPW would prioritise sections of the shoreline most exposed at the time and remain within the area specified in the mapping in Appendix A. This sites have generally been identified for locations where major public assets and infrastructure are impacted by the available coastal hazard mapping (see Sectio 4).

Appendix A of this document provides a series of Local Area Sub-Plan for local beaches considered to be exposed to high levels of infrastructure or public safety risk due to coastal hazards. These plans provide local beach-level specificity to CZEAS actions, along with associated companion mapping.

Table 7-5 Nominated Emergency Coastal Protection Works

Location	Response Phase	Recovery Phase
Ettalong	▪ Sandbag ECPW	▪ Placement of sand on an opportunistic basis from dredging activities in the Ettalong Channel
Umina / Ocean Beach	▪ Sandbag ECPW ▪ Beach Scraping	▪ Placement of sand on an opportunistic basis from dredging activities in the Ettalong Channel ▪ Beach Scraping
Pearl Beach	▪ Sandbag ECPW ▪ Beach Scraping	▪ Beach Scraping
Patonga Beach	▪ Sandbag ECPW ▪ Beach Scraping	▪ Beach Scraping

7.4 Recording Coastal Emergency Impacts and Emergency Response Actions

After a coastal emergency event, Council is to issue a formal After Action Review in coordination with LEMC partners, in order to record the following details in a database, and to maintain effective emergency actions and understand any changes in coastal conditions over time (DPIE, 2019):

- Details of the emergency event – including any coastal erosion, coastal inundation (and wave run-up), and coastal cliff and slope instability. Details are to include the weather conditions and tide under which they were caused including photographs where possible.
- The location of any assets and infrastructure that were damaged and details of the extent of the damage.
- Details of any emergency coastal protection works undertaken (including NABE), including the cost and the installation date.
- Details of any planned future coastal protection works in the CMP that are not yet undertaken, including the cost and the expected implementation timeframe.
- Details of any survey of the beach levels and other features that may be considered required to provide a greater understanding of the hazard or the event.
- Where possible, community feedback regarding the emergency communication and response efforts.
- Review and update (if required) this CZEAS, in particular the Emergency Action Plan, in consultation with the NSW SES and any other relevant agencies (see Section 5 above).

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8 APPROVALS PATHWAYS

Information on approval pathways for coastal protection works and emergency coastal protection works are set out in the NSW coastal protection works fact sheet (NSW DPE, 2018). A public authority may carry out coastal protection works without development consent if the works are:

- Identified in the relevant certified CMP.
- Beach nourishment.
- Placing sand bags for not more than 90 days.
- Routine maintenance works or repairs to existing coastal protection works.
- Explicitly identified in a certified CZEAS

The NSW coastal management framework requires all proposals for coastal protection works to be considered strategically through the development of a CMP. Public authorities can carry out emergency coastal protection works, as exempt development, where these works are in accordance with a CZEAS (such as this document) prepared by the relevant council and included in a certified CMP – see Figure 8-1.

Where works do not meet these criteria, assessment and approval by the relevant Regional or Local Planning Panel would be required before implementation.

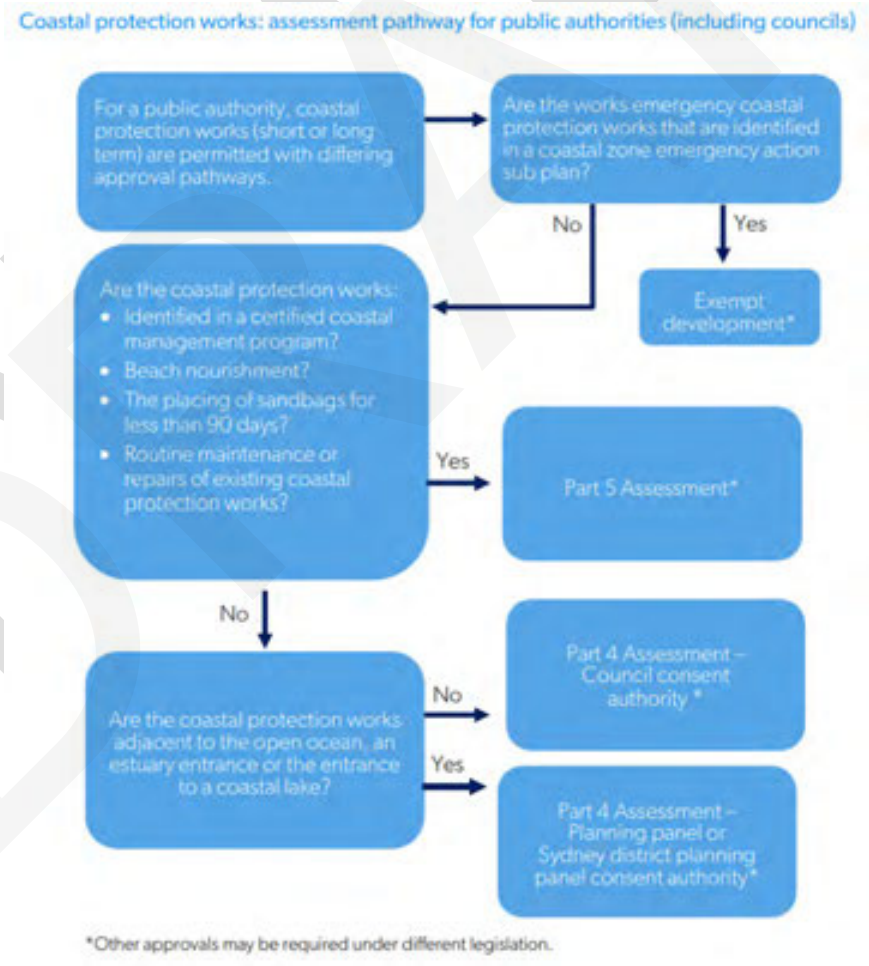


Figure 8-1 Coastal protection works: assessment pathway for public authorities (including councils). Source: DPE (2018).

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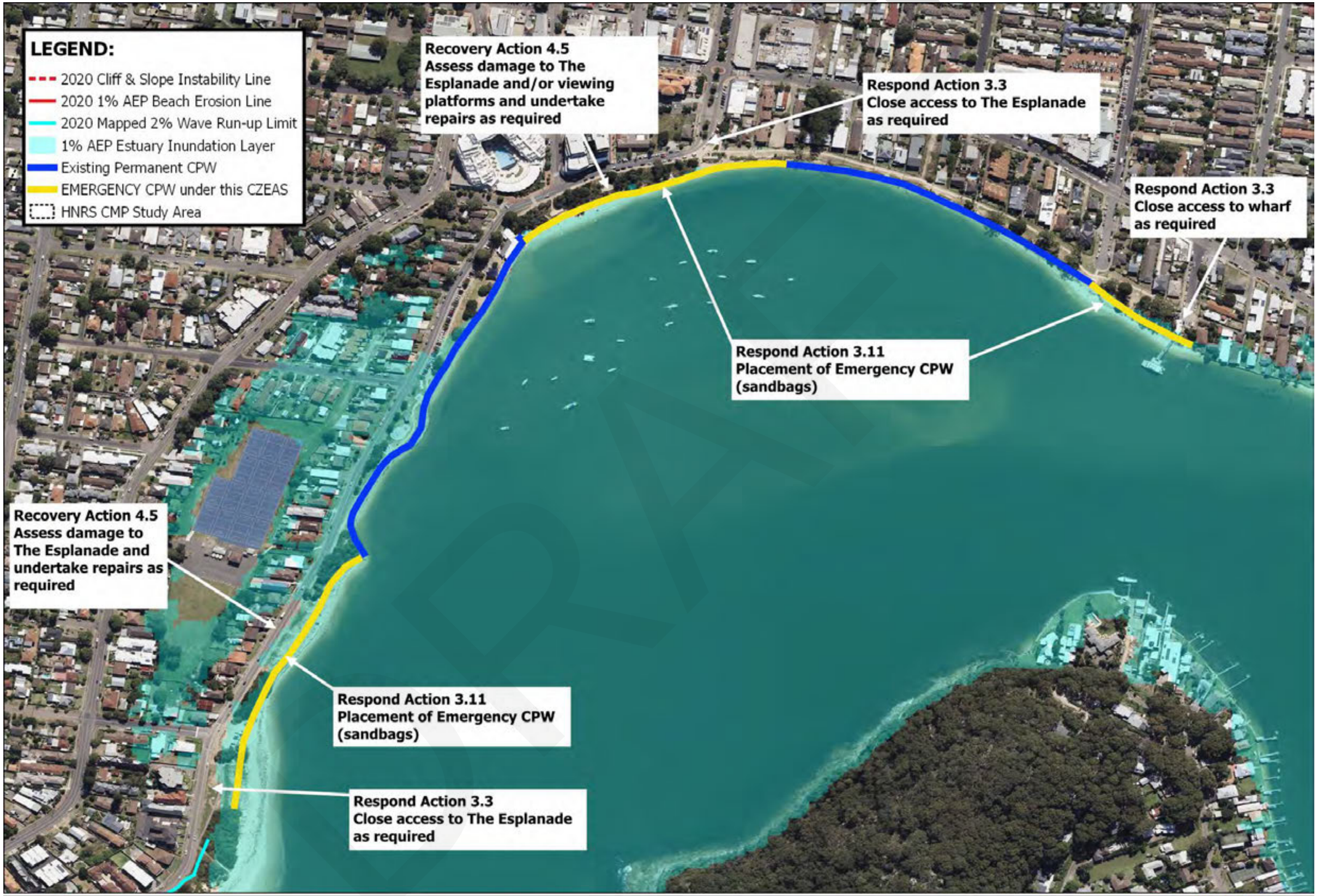
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APPENDIX A
BEACHES – LOCAL AREA PLANS

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Data sources:
Contains NSW SEED Portal Information © State of NSW 2025

0 100 200 m

Broken Bay Beaches CZEAS

Figure A-1: Ettalong Foreshore

2025-08-28T20:29:49.769



Data sources:
Contains NSW SEED Portal Information © State of NSW 2025

0 100 200 m

Broken Bay Beaches CZEAS

Figure A-2: Ocean Beach

2025-08-28T21:25:51.393



Data sources:
Contains NSW SEED Portal Information © State of NSW 2025

0 100 200 m

Broken Bay Beaches CZEAS

Figure A-3: Ocean Beach

2025-08-28T21:27:07.218

LEGEND:

- 2020 Cliff & Slope Instability Line
- 2020 1% AEP Beach Erosion Line
- 2020 Mapped 2% Wave Run-up Limit
- Existing Permanent CPW
- EMERGENCY CPW under this CZEAS
- HNRS CMP Study Area

Respond Action 3.3
Close access to Coral Crescent and Pearl Parade as necessary

Recovery Action 4.6
Collapse escarpment at accessway(s) to reinstate safe access

Respond Action 3.11
Placement of Emergency CPW (sandbags and/or beach scraping)

Respond Action 3.3
Close access to Pearl Beach ocean pool as becessary

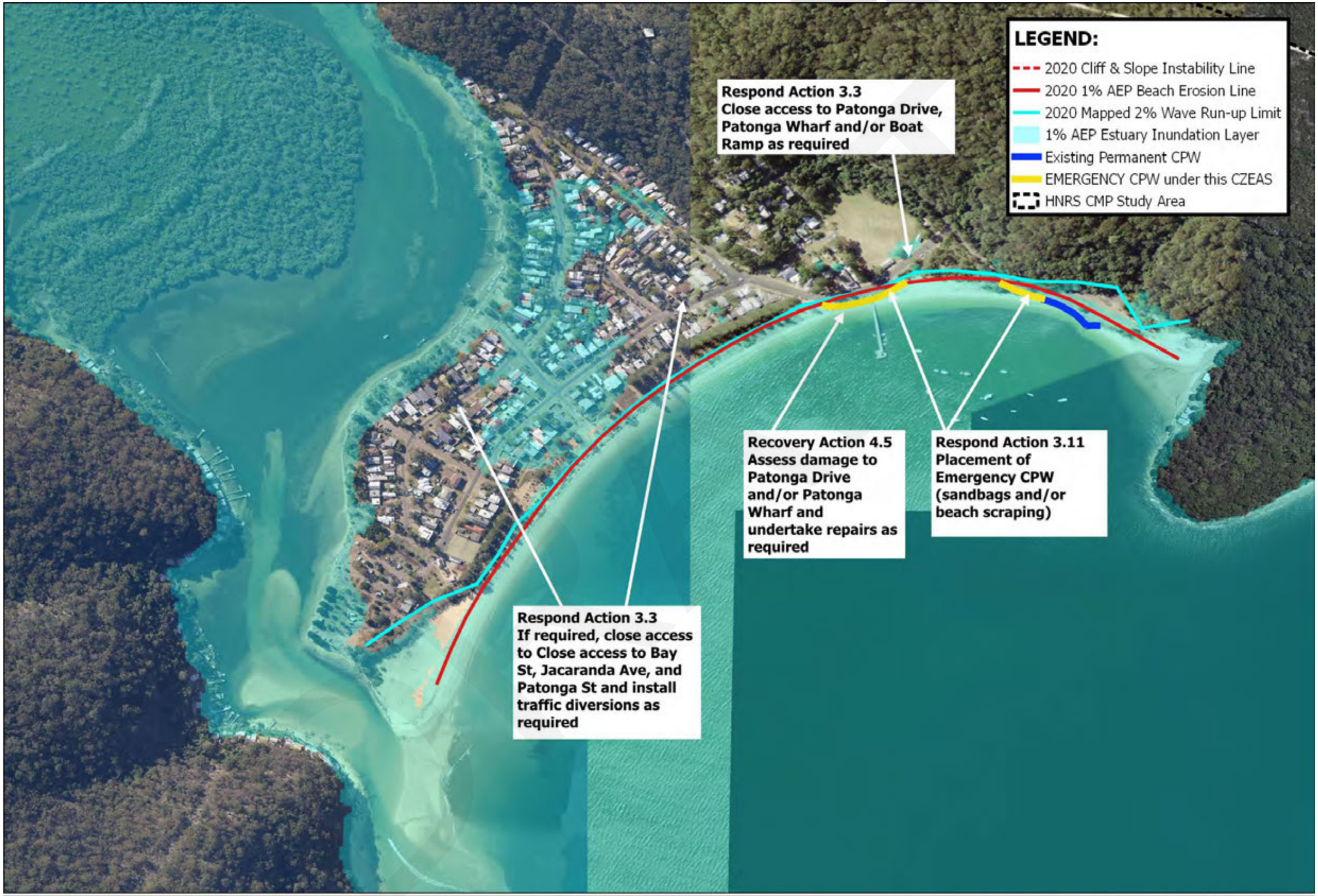
Data sources:
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0 100 200 m

Broken Bay Beaches CZEAS

Figure A-4: Pearl Beach

2025-08-29T13:10:05.896



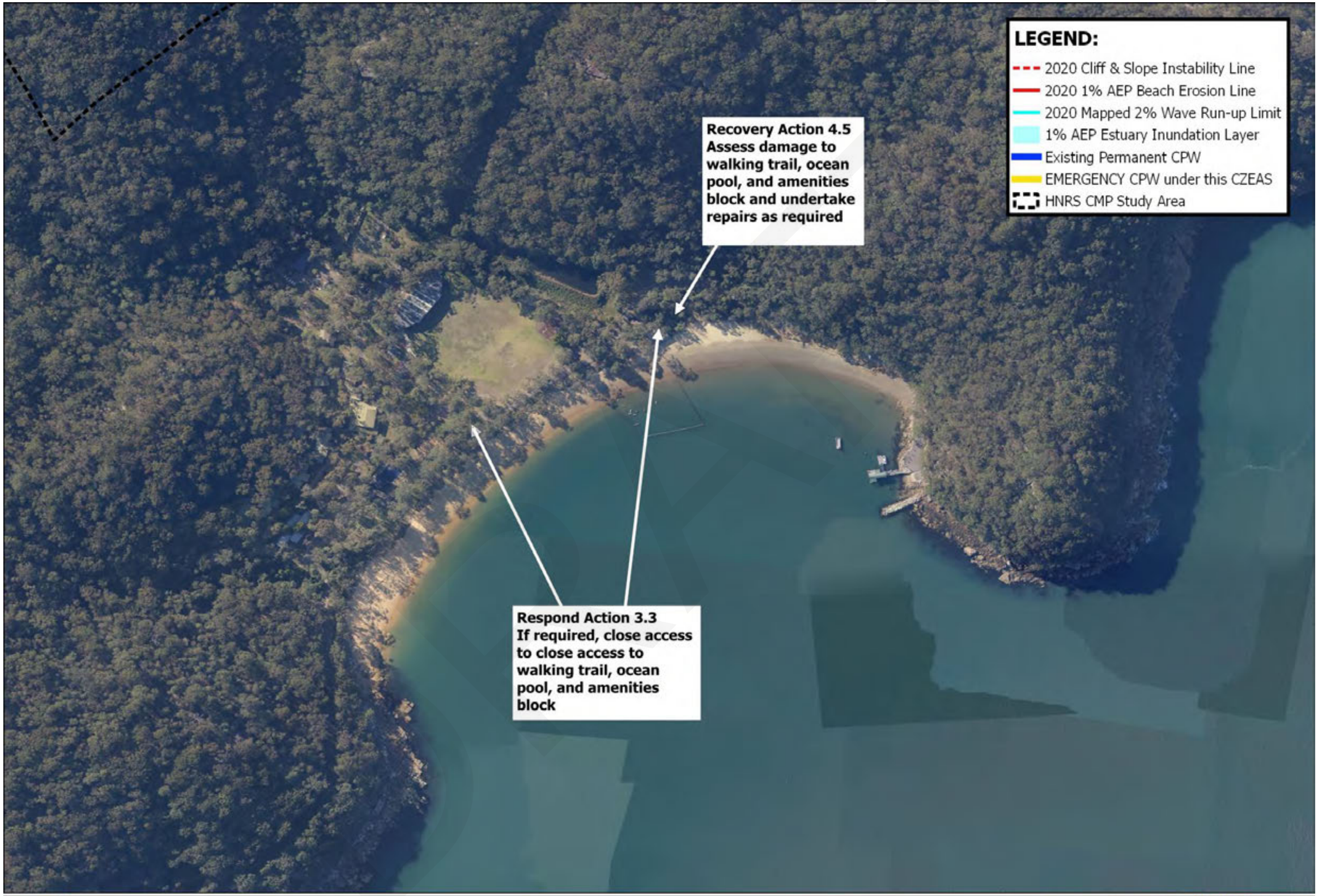
Data sources:
Contains NSW SEED Portal Information © State of NSW 2025

0 100 200 m

Broken Bay Beaches CZEAS

Figure A-5: Patonga Beach

2025-08-29T13:41:36.136



Data sources:
Contains NSW SEED Portal Information © State of NSW 2025

0 100 200 m

Broken Bay Beaches CZEAS

Figure A-5: Little Patonga Beach

2025-08-29T15:34:58.127

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Varsity Lakes QLD 4227
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APPENDIX F
COASTAL ZONE EMERGENCY ACTION SUBPLAN: PITTWATER

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APPENDIX G
COASTAL ZONE EMERGENCY ACTION SUBPLAN: LOWER HAWKESBURY RIVER

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APPENDIX H
GLOSSARY OF TERMS AND ABBREVIATIONS

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Term	Definition
Acceptable risk	A risk that, following an understanding of the likelihood and consequences, is sufficiently low to require no new treatments or actions to reduce risk further. Individuals and society can live with this risk without feeling the necessity to reduce risks further. Positive and negative risks are negligible or so small that no risk treatments are needed.
Accretion	As the build-up of sediments to form land or shoaling in coastal waters or waterways. It may be either natural or artificial. Natural accretion is the build-up of land on the beach, dunes, or in the water by natural processes, such as waves, current and wind. Artificial accretion is a similar build-up of land resulting from built structures such as groynes or breakwaters, or activities such as filling and beach nourishment, or also aggradation.
ACH	Aboriginal Cultural Heritage.
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.
AHD	Australian Height Datum (AHD) is the geodetic datum for altitude measurement in Australia. The level of 0.0 m AHD approximately corresponds to mean sea level.
Alongshore or Longshore	Parallel to and near the shoreline.
Ambulatory	In relation to the coastal foreshore, this means the movement of the foreshore seaward or landward over time, in response to coastal processes and sediment budgets. The movement of the foreshore may occur at different rates or in different directions along a beach or within a sediment compartment.
Annual Exceedance Probability (AEP)	The probability (expressed as a percentage) of an exceedance (e.g., large wave height or high water level) in a given year.
Aquatic habitat	Typical submerged communities extending from near sea, river, or lake level down several feet, such as tidal flats, oyster beds, clam flats, seagrass beds, or fishing reefs.
Asset	Something of value and may be environmental, economic, social, recreational or a piece of built infrastructure.
Astronomical tide	Water level variations due to the combined effects of the Earth's rotation, the Moon's orbit around the Earth and the Earth's orbit around the Sun. It excludes and oceanographic or meteorological influences.
Back beach or back shore	The zone of the shore or beach lying between the foreshore and the coastline comprising the berm or berms and acted upon by waves only during severe storms, especially when combined with exceptionally high water.
BCR	Benefit-Cost Ratio.
Beach	The CM Act defines beach as an area that is generally composed of sand or pebbles or similar sediment that extends landward from the lowest astronomical tide to the line of vegetation or bedrock or structure.
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.

Term	Definition
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 plan shape	The shape of the beach in plan; usually shown as a contour line, combination of contour lines or recognisable features such as beach crest and/or the still water line.
Beach profile	A cross-section taken perpendicular to a given beach contour; the profile may include the face of a dune or seawall, extend over the backshore, across the foreshore, and seaward underwater into the nearshore zone.
Beach rotation	Beach rotation refers to a natural morphological process whereby the opposing ends of an embayed beach may narrow and widen in opposition to one another in response to seasonal or periodic changes in climate parameters such as wave direction and/or gradients in wave energy.
Beach scraping	Also referred to as 'nature assisted beach enhancement' (NABE) is a mechanical intervention to speed up the natural processes of berm and foredune recovery after a storm event.
Beach system	The CM Act defines as 'the processes that produce the beach fluctuation zone and the incipient foredunes and foredunes landward of the relevant beach'. In general, this means coastal lands, composed of sand, gravel or shell, between a seaward limit of 40 metres depth in the State coastal waters and a landward limit at the lee side of the dunes.
Berm	On a beach, a nearly horizontal plateau on the beach face or backshore, formed by the deposition of beach material by wave action or by means of a mechanical plant as part of a beach renourishment scheme. Some natural beaches have no berm, others have several.
Biodiversity	The variety and variability of wildlife (both plants and animals) and habitats. Biodiversity is typically a measure of variation at the genetic, species, and ecosystem level.
Blow out	A depression on the land surface (usually a dune) caused by wind erosion.
Bluff	A high, steep bank or cliff.
BoM	The Australian Bureau of Meteorology.
Breaker zone (or surf zone)	The zone within which waves approaching the coastline commence breaking, typically in water depths of between 5 and 10 metres for ocean coasts, but sometimes in shallower water.
Buffer area	A parcel or strip of land that is designed and designated to permanently remain vegetated in an undisturbed and natural condition to protect an adjacent aquatic or wetland site from upland impacts, to provide habitat for wildlife and to afford limited public access.
Capital Costs	Expenditure incurred to acquire, construct, or significantly upgrade physical assets. In the CMP context, capital costs typically relate to planning, design, and construction of new infrastructure or major upgrades intended to provide long-term service capacity and resilience. These costs are generally one-off and accounted for as fixed assets

Term	Definition
CBA	Cost-Benefit Analysis (CBA) is a systematic economic evaluation technique used to assess and compare the costs and benefits of a proposed project, policy, or investment. It involves quantifying both the positive outcomes (benefits) and the negative aspects (costs) of a decision to determine if the benefits outweigh the costs. CBA typically assigns monetary values to all relevant factors, allowing decision-makers to make informed choices by comparing the net benefits (benefits minus costs) of different options. The goal of CBA is to maximize societal welfare by ensuring that resources are allocated efficiently and that projects or policies with a positive net benefit are favoured.
CEA	Coastal Environment Area – a mapped area under the R&H SEPP.
Cliff	A high, steep face of rock; a precipice.
Climate	The characteristic weather of a region, particularly regarding temperature and precipitation, averaged over some significant interval of time (years).
Climate change	The long-term change (decades or longer) in pattern of weather, and related changes in oceans, land surfaces and ice sheets.
CM Act	*NSW Coastal Management Act 2016.*
CM Manual	The NSW Coastal Management Manual.
CMA	Coastal Management Area - Any one of 4 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.
CMP	Coastal Management Program – a long-term strategy for the coordinated management of land within the coastal zone, prepared and adopted under Part 3 of the CM Act.
Coast	A strip of land of variable width that extends from the shoreline inland to the first significant landform that is not influenced by coastal processes (such as waves, tides and associated currents).
Coastal cliff and slope instability	Geotechnical instabilities on coastal cliffs and bluffs, including rock falls, slumps, and landslides.
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 salt water 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 emergency	An emergency due to actual or imminent coastal inundation, coastal erosion, or coastal cliff and slope instability which (a) threatens endangers, or threatens to endanger, the safety or health of persons; or (b) destroys or damages, or threatens to destroy or damage, any property or the natural environment.
Coastal engineering	A branch of civil engineering that applies engineering principles specifically to projects within the coastal zone (nearshore, estuary, marine, and shoreline).

Term	Definition
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 and 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	Coastal inundation occurs when a combination of marine and atmospheric processes raises the water level at the coast above normal elevations, causing land that is usually 'dry' to become inundated by sea water. Alternatively, the elevated water level may result in wave run-up and overtopping of natural or built shoreline structures (e.g., dunes, seawalls).
Coastal lake or watercourse entrance instability	Refers to the variety of potential hazards and risks associated with the dynamic nature of both natural and trained entrances. Coastal lake and watercourse entrances are highly active environments with their shape constantly changing in response to processes such as alongshore sediment transport, tidal flows, storms and catchment flooding.
Coastal processes	Marine, physical, meteorological and biological activities that interact with the geology and sediments to produce a particular coastal system.
Coastal protection works (CPW)	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 sediment compartment	An area of the coast defined by its sediment flows and landforms. Coastal sediment compartments may be mapped at primary, secondary or tertiary (local) scales. Boundaries are generally defined by structural features related to the geologic frameworks that define the planform of the coast.
Coastal wetland	Wetlands are areas that are inundated cyclically, intermittently or permanently with fresh, brackish or saline water and have soils, plants and animals in them that are adapted to, and depend on, moist conditions for at least part of their lifecycle. Coastal wetlands include marshes, mangroves, swamps, melaleuca forests, casuarina forests, sedgelands, brackish and freshwater swamps and wet meadows.
Coastal zone	As defined in the CM Act and CM SEPP: the area of land comprised of the following coastal management areas: the coastal wetlands and littoral rainforest area, the coastal vulnerability area, the coastal environment area and the coastal use area.
Crown Land	In NSW, crown land refers to land that is owned by the NSW government and managed by various government agencies. In relation to this CMP, Crown lands include submerged Crown land, seabed and subsoil to 3 nautical miles from the coastline of NSW that is within the limits of the coastal waters of the State.

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Term	Definition
CSP	Community Strategic Plan. The CSP forms the overarching, visionary document that translates the community's key priorities and aspirations into long-term strategic goals that guide the future direction of a given LGA. The Plan represents the highest level of strategic planning undertaken by a local council. The CMP must reflect and support implementation of the CSP. Under the CM Act, the objectives and management actions developed as part of CMPs are required to be strategically aligned with the objectives and strategies outlined in the CSP.
CUA	Coastal Use Area – land identified by the CM Act and R&H SEPP as being land adjacent to coastal waters, estuaries, coastal lakes and lagoons where development is or may be carried out (now or in the future). The R&H SEPP maps the extent of the coastal use area for planning purposes.
CVA	Coastal Vulnerability Area – defined in the CM Act as land subject to 7 coastal hazards.
CWLR	Coastal Wetland and Littoral Rainforests – a mapped area under the R&H SEPP.
CZEAS	A coastal zone emergency action subplan – Defined in the CM Act as plan that outlines the roles and responsibilities of all public authorities (including the local council) in response to emergencies immediately preceding or during periods of beach erosion, coastal inundation or coastal cliff and slope instability, where the beach erosion, coastal inundation or coastal cliff and slope instability occurs through storm activity or an extreme or irregular event.
CZMP	Coastal Zone Management Plan – a plan for managing the coastal zone developed under the old (now superseded) coastal management framework for NSW. Now replaced by CMPs.
DCCEEW	The NSW Department of Climate Change, Energy, the Environment and Water.
Design storm	A hypothetical extreme storm with waves that coastal protection structures will often be designed to withstand. The severity of the storm (i.e., return period) is chosen in view of the acceptable level of risk of damage or failure. A design storm consists of a design wave condition, a design water level, and a duration.
DP	Delivery Programs. The Delivery Program is a 4 year program that translates the strategic objectives of the Community Strategic Plan into actions. It is a fixed 4 year program, which is a statement of commitment from each newly elected Council. It identifies all key activities a council has committed to undertake over its 4 year life cycle.
DPIRD	The NSW Department of Primary Industries and Regional Development
DPHI	The NSW Department of Planning, Housing and Infrastructure. Prior to 1 January 2024, the responsibilities of the department were carried out by the former NSW Department of Planning and Environment (DPE).
East Coast Low (ECL)	An intense low-pressure system that occurs off the east coast of Australia, bringing storms, high waves and heavy rain. East coast lows generally occur in autumn and winter off NSW, southern Queensland, and eastern Victoria.

Term	Definition
Economic evaluation	An assessment that helps decision-makers to understand the socioeconomic implications of adopting alternative management options and to make choices that will provide net benefits to the community. Cost-benefit analysis is a type of economic evaluation that considers and evaluates a wide range of costs and benefits associated with a proposal, in qualitative or quantitative (monetary) terms (with future costs and benefits reduced to today's prices), compared with a base case. It may be used in conjunction with other criteria (such as technical feasibility, community acceptance or environmental impact) to select optimal management responses. A multi-criteria assessment is not an economic evaluation but may assist decision-making in other ways.
Ecosystem	The living organisms and the non-living environment interacting in an area, encompassing the relationships between biological, geochemical, and geophysical systems; or a community and its environment including living and non-living components.
Entrance management	Includes artificial opening of entrances, managing the configuration, height or location of the beach berm to facilitate entrance opening at a level lower than the natural range.
Environmental Protection Works (EPW)	These are defined in the Standard Instrument - Principal Local Environmental Plan (2006 EPI 155a) as: *"works associated with the rehabilitation of land towards its natural state or any work to protect land from environmental degradation, and includes bush regeneration works, wetland protection works, erosion protection works, dune restoration works and the like, but does not include coastal protection works"*.
EP&A Act	The NSW Environmental Planning and Assessment Act - An act that governs land use planning and development in NSW, focusing on sustainable development, environmental protection, community participation, and compliance measures.
Erosion	The removal of land by natural forces such as waves, tidal currents and / or littoral currents.
Essential infrastructure	The CM Act defines infrastructure for the following purposes: electricity generation, transmission and distribution, telecommunications, rail, roads, gas, sewerage systems, water supply systems or stormwater management systems, airports, ports shipping and harbours.
Estuary	The CM Act defines as any part of a river, lake, lagoon, or coastal creek whose level is periodically or intermittently affected by coastal tides, up to the highest astronomical tide.
Extreme storm event	The storm for which characteristics (wave height, period, water level etc.) were derived by statistical 'extreme value' analysis. Typically, these are storms with average recurrence intervals (ARI) ranging from one to 100 years.
Fit for purpose	Right for the job it is intended to do. A fit for purpose assessment considers the level of data detail and the types of consultation required to make a reasonable management decision. In general, the detail and consultation required will increase with risk, complexity and impact.
Flood tide delta	Deposit of marine sediment (usually sand) within a coastal embayment that has formed at the landward side of a tidal inlet by rising (or flood) tidal currents and wave action.
Foredune	The larger and more mature dune lying between the incipient dune and the hind dune 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.

Term	Definition
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'.
Geomorphology	A branch of physical geography encompassing the formation of the earth's surface, including the distribution of land and water.
Geotechnical investigations	Subsurface investigation of soils, rock, and other strata for the purposes of engineering design.
Groyne	A shore protection structure built (usually perpendicular to the shoreline) to trap littoral drift or retard erosion of the shore; or a narrow, roughly shore normal structure built to reduce longshore currents, and/or to trap and retain littoral material. Most groynes are of timber or rock and extend from a seawall, or the backshore, well onto the foreshore and rarely even further offshore.
GSC	Geotextile Sand Container. A sand filled container made out of a synthetic geotextile synthetic fabric which may be woven or non woven.
HHWSS	High High Water Solstice Springs. The HHWSS tidal plane was originally defined as the level beyond which tides seldom reach. It is consistent with predicted levels for higher (king) tides but is slightly lower than highest astronomical tide (HAT).
Hydrodynamic	Relates to the specific scientific principles that deal with the motion of fluids and the forces acting on solid bodies immersed in fluids, and in motion relative to them.
IAP2	International Association for Public Participation.
ICOLL	Intermittently Closed and Open Lakes and Lagoons. Coastal lakes and lagoons where the entrance may be closed to the sea from time to time and for varying periods, by accretion of a berm. ICOLLs have sensitive water quality because they accumulate loads of sediment and nutrients from the catchment and may have poor water circulation and flushing. The most sensitive waterways listed in the R&H SEPP are all ICOLLs. The catchments of these lakes and lagoons are included in the coastal environment area.
Impacts	Include damage, harm or losses to exposed communities, property, services, livelihoods, access, use and amenity, heritage, ecosystems and the environment because of exposure and sensitivity. Impacts may also be positive.
Incipient dune	The most seaward and immature dune of the dune system. Vegetation characterised by grasses such as spinifex. On an accreting coastline, the incipient dune will develop into a foredune.
Intertidal zone	The region of the foreshore that is above the water at LAT but submerged at HAT.
IPCC	Intergovernmental Panel on Climate Change. A scientific and intergovernmental body under the auspices of the United Nations, set up at the request of member governments, dedicated to the task of providing the world with an objective, scientific view of climate change and its political and economic impacts.
IP&R	NSW Integrated Planning and Reporting Framework.
King tides	Any high water level that is well above the average, commonly applied to two spring tides that are the highest for the year, one during summer and one in winter.

Term	Definition
LALC	A Local Aboriginal Land Council (LALC) in New South Wales, Australia, is a statutory body established under the New South Wales *Aboriginal Land Rights Act 1983*. These councils are created to represent the interests and needs of the local Aboriginal communities within their respective areas. The primary purpose of Local Aboriginal Land Councils is to acquire, hold, and manage land on behalf of the Aboriginal people in their local areas.
LEP	Local Environmental Plan.
LG Act	*The Local Government Act 1993*
LGA	Local Government Area.
Littoral	Of or pertaining to a shore, especially of the sea. Often used as a general term for the coastal zone influenced by wave action, or, more specifically, the shore zone between the high and low water marks.
Littoral rainforest	A closed forest ecological community recognised by its close proximity to the ocean (generally <2km) and closed canopy (i.e., ~70% of the sky obscured by tree leaves and limbs). Listed as an endangered ecological community under the *NSW Biodiversity Conservation Act 2016.* Littoral rainforest areas are mapped with coastal wetlands in the R&H SEPP, to form the coastal wetlands and littoral rainforests management area. Development controls apply to the management area and a proximity area which is also mapped.
LLS	NSW Local Land Services.
Longshore transport (littoral drift)	Refers to the sediment moved along a coastline under the action of wave-induced longshore currents. The net drift is the sum of the positive (conventionally northwards direction in NSW) and negative (southwards in NSW) direction. The gross drift is the sum of the drift magnitudes (absolute values). The differential drift is the difference between the net drift into and out of a coastal compartment. Both gross and net drift are typically averaged over a year and expressed in m3/yr.
Maintenance costs	Expenditures required to preserve the functional condition and performance of an asset over its design life. Maintenance costs include inspections, servicing, repairs, and minor renewals undertaken to mitigate deterioration, sustain safety and compliance, and avoid premature capital replacement.
Marine estate	The *Marine Estate Management Act 2014* defines it as: *(a) the coastal waters of the State within the meaning of Part 10 of the Interpretation Act 1987,* *(b) estuaries (being any part of a river whose level is periodically or intermittently affected by coastal tides) up to the highest astronomical tide,* *(c) lakes, lagoons and other partially enclosed bodies of water that are permanently, periodically or intermittently open to the sea,* *(d) coastal wetlands (including saltmarsh, mangroves and seagrass),* *(e) lands immediately adjacent to, or in the immediate proximity of, the coastal waters of the State that are subject to oceanic processes (including beaches, dunes, headlands and rock platforms),* *(f) any other place or thing declared by the regulations to be the marine estate, but does not include any place or thing declared by the regulations not to be the marine estate.*

Term	Definition
MCA	Multi-criteria analysis. A decision-making methodology used to evaluate and compare multiple options or alternatives based on a set of diverse and often conflicting criteria. It enables a systematic approach to complex decision processes by assigning weights to these criteria to reflect their relative importance. MCA helps decision-makers assess the trade-offs and make informed choices, considering a variety of factors, such as cost, environmental impact, social implications, and more. This method assists in addressing decisions that involve multiple objectives, enabling a structured and transparent evaluation process that supports rational and well-informed decision-making.
MEMA	Marine Estate Management Authority.
MEMS	Marine Estate Management Strategy.
MER	Monitoring, evaluation, and reporting. MER is an essential component of any CMP and is a mandatory requirement for CMPs under the CM Act. The purpose of the MER component is to monitor progress towards implementing the coastal management actions outlined in the CMP, and to assess the performance of the CMP in achieving its intended outcomes, and the objects of the CM Act.
MHW	Mean high water mark – 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 over out over the year. In NSW, the methods for determining the position of the MHWM are outlined in the Crown Directions to Surveyors - No. 6 Water as a Boundary.
MIDO	The NSW Maritime Infrastructure Delivery Office.
MSL	Mean Sea Level. The mean level of the sea over a long period (preferably 18.6 years) or the mean level which would exist in the absence of tides.
Multi-criteria analysis	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 test complex trade-offs among alternatives.
Natural character	Includes all-natural aspects of the land and sea, including the underlying ecological, hydrological and geomorphological processes that shape landforms (including underwater features) and the natural movements of water and sediment. Natural character also includes aspects of the environment that affect human experience including the natural darkness of the night sky, the sounds and smell of the coast, and the context and setting of natural places.
Near shore	The area of ocean close to the coast that is affected by waves, tides and longshore currents.
No or low regrets actions	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.
NPV	Net Present Value, the difference between the present value of cash inflows and the present value of cash outflows over a period of time.
NPWS	The NSW National Parks and Wildlife Service.
NSW	New South Wales.
NSW Coastal Council	Established under Part 4 of the CM Act. A group of 3 to 7 coastal experts, appointed by the Minister to provide advice on coastal management issues.

Term	Definition
Operational Costs	Recurrent expenditures associated with the routine operation of programs, systems, or assets. This includes staffing, administration, utilities, and other resource inputs required to maintain functional delivery of CMP initiatives. Operational costs are ongoing and do not directly extend the service life of an asset.
Outflanking or end effects	Erosion behind or around the land-based end of a groyne, jetty, or breakwater or the terminus of a revetment or seawall, usually causing failure of the structure or its function.
Overwash	The part of the wave uprush that runs over the crest of a berm or structure and does not flow directly back to the ocean or lake. When waves overtop a coastal protection structure, they often carry sediment landwards, which is then lost to the beach system. Also defines a process in which waves penetrate inland of the beach, which is common on low barriers.
Progradation	The building forward or outward toward the sea of a shoreline or coastline (as with a beach, delta, or fan) by nearshore deposition of river-borne sediments or by continuous accumulation of beach material thrown up by waves or moved by longshore drifting.
Public Authority	Defined in the CM Act as a Minister of the Crown of the State, a State owned corporation, an electricity supply authority, a department or instrumentality of the State, a local council and any other public or local authority constituted by or under any Act and includes any prescribed body.
Recession	A continuing landward movement of the shoreline; or a net landward movement of the shoreline over a specified time.
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 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.
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.
R&H SEPP	State Environmental Planning Policy (Resilience and Hazards) 2021.
Risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood.
Sea level rise	An increase in the mean level of the oceans. Relative sea level occurs where there is a local increase in the level of the ocean relative to the land, which might be caused by ocean rising, the land subsiding, or both. In areas with rapid land level uplift (e.g., seismically active areas), relative sea level can fall.
Sediment transport	The process whereby sediment is moved offshore, onshore or along shore by wave, current or wind action.
Sediment Compartment	A sediment compartment is an area in which coastal processes, and their effects on the geology of the coast, are broadly homogeneous. The compartment boundary is usually a feature such as a headland or river mouth which effectively divides the compartment and its processes from its neighbour.
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.

Term	Definition
Significant wave height (Hs)	Due to the random nature and size of waves, the term “significant wave height” is used by engineers and scientists to quantify wave heights in a sea state. It represents the average of all the third highest waves that occur over a particular timeframe. It is typically written as Hs. It is important to appreciate that in deep offshore waters the largest individual wave in the sea state may be around twice the significant wave height
Stakeholder	A person or organisation with an interest or concern in something.
Storm demand	Storm demand is the volume of beach sand eroded from the subaerial (visible) part of the beach and dunes during a storm. Typically, it has been defined as the volume of eroded sand as measured above mean sea level (~ 0 m AHD datum).
Storm surge	The increase in coastal water levels caused by the barometric and wind set-up effects of storms. Barometric set-up refers to the increase in coastal water levels associated with the lower atmospheric pressure of storms. Wind set-up refers to the increase in coastal water levels caused by an onshore wind driving water shorewards and piling it up against the coast.
Storm tides	The total observed sea level during a storm, which is the combination of storm surge and normal astronomical tide.
Storm tide inundation	Flooding of coastal land due to inundation from storm tides. Inundation generally persists for the duration of a high tide, though it may persist longer in extreme cases.
Subaerial	On the earth’s surface, not underwater or underground.
TfNSW	Transport for NSW.
Tidal currents	Currents caused by the incoming (ebb) or outgoing (flood) tide (see Tide). Tidal currents are typically the main current within estuaries, particularly in the entrance area where tidal currents transport marine sediments (sand).
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. Sometimes referred to as ”sunny day flooding”.
Tide	The periodic rise and fall of the water of oceans, seas, bays, etc., caused mainly by the gravitational interactions between the Earth, Moon and Sun.
Tolerable risk	A risk that, following an understanding of the likelihood and consequences, is low enough to allow the exposure to continue, and at the same time high enough to require new treatments or actions to reduce risk. Society can live with this risk but believe that as much as is reasonably practical should be done to reduce the risks further. Note that individuals may find this risk unacceptable and choose to take their own steps, within reason, to make this risk acceptable. Residual risks are considered tolerable only if risk reduction is impractical.
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.

Term	Definition
Vulnerability	A function of exposure and sensitivity of assets to a hazard, which determines the potential impacts of the hazard. For instance, the vulnerability of coastal assets may be influenced by the extent and impact of environmental, social and economic factors such as saline contamination of soils from flooding, erosion of built-up and natural areas, loss of vegetation, disruption to use, or access, or continuity of service, or loss of amenity, corrosion of built structures, undermining of foundations or damage to contents. Vulnerability also considers the adaptive capacity which is the capacity to adapt or the resilience in the system to manage the impacts and changes.
Wave climate	The seasonal and annual distribution of wave height, period and direction.
Wave energy	The capacity of waves to do work. The energy of a wave system is theoretically proportional to the square of the wave height; a high–energy coast is characterised by breaker heights greater than 50 centimetres and a low–energy coast is characterised by breaker heights less than 10 centimetres. Most of the wave energy along equilibrium beaches is used in shoaling and in sand movement. The NSW coast is a high wave energy coast.
Wave Height (H)	The vertical difference between the elevation of a wave crest and a neighbouring trough.
Wave Length (L)	The horizontal distance between two wave crests.
Wave Period (T)	The time it takes for two successive wave crests to pass a given point.
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.
Zone of reduced foundation capacity (ZRFC)	A Zone of Reduced Foundation Capacity (ZRFC) for building foundations is delineated to take account of the reduced bearing capacity of the sand adjacent to the storm erosion escarpment. Nielsen et al (1992) recommended that structural loads should only be transmitted to soil foundations outside of this zone (i.e., landward, or below), as the factor of safety within the zone is less than 1.5 during extreme scour conditions at the face of the escarpment.
Zone of slope adjustment (ZSA)	The area landward of an escarpment cut by storm bite, which may be affected by slumping to the angle of repose of the sand as it dries.

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