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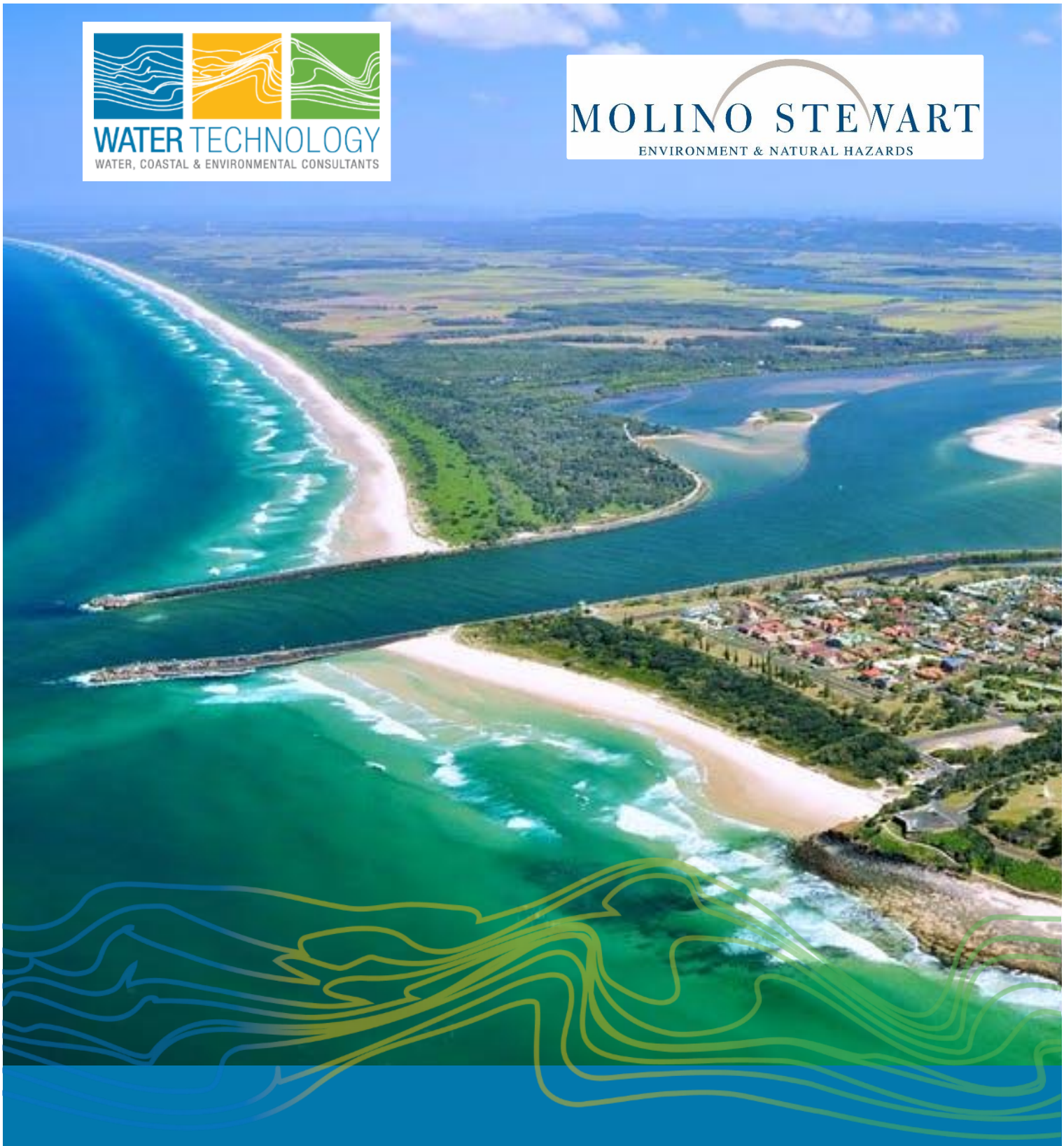

Final Report

Stage 1 Scoping Study for the Ballina Shire Coastline Coastal Management Program

Ballina Shire Council

07 July 2022

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Project Details

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Acknowledgement of Country

Ballina Shire Council acknowledges that we are here on the land of the Bundjalung people. The Bundjalung are the traditional owners of this land and are part of the oldest surviving continuous culture in the world.

EXECUTIVE SUMMARY

Ballina Shire's coastline is a major asset for the North Coast region. It spans from Patches Beach in the south to Seven Mile Beach in the north, and includes the downstream reaches of the Richmond River. This coastal zone provides a stunning natural environment, areas of cultural significance, a multitude of social and recreational benefits, and is a key contributor to the regional economy. However, the coastal zone is facing increasing pressure from coastal hazards, population growth and climate change.

Why Develop a CMP?

Under the NSW Coastal Management Framework, Ballina Shire Council is preparing a series of Coastal Management Programs (CMPs) in order to address current and future risks, and to enhance the coordinated management of the coastal zone within its Local Government Area (LGA). The CMP is an opportunity to develop a strategic, long-term approach to coastal management, and maintain the health of the coast for current and future generations.

The CMP seeks to achieve the objectives of the *Coastal Management Act, 2016* through a program that will identify coastal management issues, pressures, and risks. It involves developing a strategy to address these risks in a cost-effective and sustainable manner through an integrated forward program. As such, it sets the long-term strategy for the coordinated management of the coast, and will update and superseded Ballina's existing Coastal Zone Management Plan from 2016.

The CMP will improve coordination across local and state government agencies, and provide a robust and defensible platform to secure funding from the NSW Government's Coastal and Estuary Grants Program. It will enable the implementation of projects that will provide tangible benefits to the local community right across the coastline, such as by ensuring safe and sustainable access to the coastal zone, protecting public and private assets from current and future coastal hazards, and maintaining healthy ecosystems, biodiversity and indigenous cultural heritage.

The stakeholder engagement activities undertaken as part of this Scoping Study demonstrated significant support for the development of a CMP across a broad range of local and state government agencies.

CMP Scope

The spatial scope of this CMP includes Ballina Shire's open coast beaches from Patches to Seven Mile Beach, in addition to Shaws Bay, and the lower reaches of the Richmond River and North Creek.

The Open Coast CMP is one of four programs that will span the coastal zone of the LGA. This CMP will therefore dovetail and integrate with the CMPs for the Richmond River System, North Creek, and Lake Ainsworth.

This Scoping Study represents the first of five stages in the CMP Process. The purpose of this study is to review the history of managing the coastal zone, develop a shared understanding of the current situation, identify the focus of Council's new CMPs and outline a forward program for the remaining stages, which comprise:

- Stage 2: A detailed assessment of risks, vulnerabilities and opportunities;
- Stage 3: Identification and evaluation of management actions;
- Stage 4: Preparation, exhibition and adoption of the CMP; and
- Stage 5: Implementation, monitoring and evaluation.

Community and Stakeholder Engagement

The development of the CMP includes extensive engagement with the local community and user groups, relevant government agencies.

As part of this Scoping Study, a Community and Stakeholder Engagement Strategy has been prepared for the remaining stages of the CMP, in accordance with the requirements of the NSW Coastal Management Manual. The local community and key stakeholders have also been directly consulted as part of this Scoping Study, particularly in relation to the perceived values, threats and risks to the study area.

The Values of the Ballina Coast

The Scoping Study identified a range of environmental, social and economic values provided by the coastal zone. Some of the key ones identified by the community survey included preserving the natural environment, sustaining biodiversity, maintaining the region's scenic amenity and providing for a variety of recreational uses.

The coast supports biodiversity that is important from national, regional and local perspectives, and provides a setting for a diverse range of terrestrial and marine ecosystems. It also provides for a range of community uses and recreational opportunities, such as enjoying the beach, walking, surfing, boating and fishing.

It also has cultural significance. Ballina has a rich and continuing Indigenous heritage, with cultural history extending more than 60,000 years. The Bundjalung people are the custodians of the Ballina area, having cared for and lived off the land for thousands of years. Indigenous heritage across the study area catchment abounds, including shell middens and significant campsites, burial sites and ceremonial sites.

The coast is also a major economic resource and contributes to the local economy in many important ways – including as a drawcard within a vibrant local tourism sector. It also provides substantial economic value in the form of its ecosystem services.

Pressures and Threats Facing the Ballina Coast

A review of historical coastal/estuary plans and a first-pass risk assessment has identified a number of priority stressors that impact on the environmental, social, cultural and economic values of the Ballina coastal zone. These include natural hazards, urbanisation and land use intensification, resource use and conflict, public safety, governance ambiguity and information gaps.

Many of these stressors will increase over coming decades due to population growth within the region, and the impacts of climate change. The coastal zone is subject to a range of stressors originating in the wider Richmond River catchment (including agricultural, urban and industrial runoff), and linkages with the Richmond Rover CMP, and the North Creek CMP will be crucial to address these issues. The ecosystems of the study area are also exposed to a range of stressors including clearing / disturbance of coastal wetlands, and littoral rainforest that result in loss of biodiversity values.

The Ballina coastline is exposed to a range of coastal hazards that include coastal erosion, long term shoreline recession, geotechnical cliff/slope instability, and coastal inundation. These hazards can have significant detrimental impacts on both public and private assets, as well as the local environment. Shoreline recession, erosion and sea-level rise can also affect coastal biodiversity and generate "habitat squeeze" when landward migration of habitat is restricted by barriers such as coastal development.

The impacts of these hazards will become more frequent and intense over future planning horizons due to the impacts of climate change. For example, sea level rise is likely to significantly affect low-lying coastal communities in Ballina in terms of their susceptibility to tidal inundation, coastal inundation and catchment flooding. Inundation of developed and undeveloped low-lying areas can affect access, public safety, recreational amenity and threaten assets and infrastructure.

Furthermore, it is expected that climate change impacts will result in a number of additional or emerging risks to the environment and communities across the study area, including increasing water temperatures, altered salinity profiles, habitat migration and modified storm frequency and severity.

Roles and Responsibilities

The Scoping Study included an audit of historical coastal management arrangements across the LGA. Governance of the Ballina coastal zone is multi-layered, with the beaches and waterways owned and managed by a wide variety of stakeholders across multiple levels of government. Stakeholders include Ballina Shire Council, Department of Planning and Environment (DPE), NSW National Parks and Wildlife Service (NPWS), Crown Lands, the Department of Primary Industries - Fisheries, Transport for NSW, the Jali Local Aboriginal Land Council, and North Coast Local Land Services.

The Way Forward

The Scoping Study developed a business case and forward program for the CMP, which will include the following Stages:

- Stage 2: A detailed assessment of risks, vulnerabilities and opportunities;
- Stage 3: Identification and evaluation of management actions;
- Stage 4: Preparation, exhibition and adoption of the CMP; and
- Stage 5: Implementation, monitoring and evaluation.

It is estimated that each CMP will take around 1.5 to 2 years to progress through Stages 2 to 4. The fifth and final Stage will involve the ongoing implementation of each program over a 10-year period thereafter.

TABLE EX-1 FORWARD PROGRAM AND COST STRUCTURE FOR THE CMP

CMP Stage	Cost Estimate	Indicative Duration	Indicative IP&R Delivery Plan	Indicative IP&R Operational Plan
Stage 2 – Determine Risks, Vulnerabilities and Opportunities	**$270,000**	**6-9 mo.**	**6-9 mo.**	**2022/23**
The Ballina Open Coast Coastal Hazard Study and Risk Assessment	$95,000	4-6 mo.	2021-25	2022/23
The Ballina Open Coast Geotechnical Hazard Study and Risk Assessment	$25,000	2-3 mo.	2021-25	2022/23
The Richmond River Storm Tide and Tidal Inundation Study and Risk Assessment	$85,000	4-6 mo.	2021-25	2022/23
The Ballina Coastal and Estuarine Habitat and Biodiversity Study	$65,000	4-6 mo.	2021-25	2022/23
Stage 3 – Identify and Evaluate Options	**$85,000**	**6-9 mo.**	**2021-25**	**2022/23**
Stage 3 Community and Stakeholder Engagement	$15,000	1 mo.	2021-25	2022/23
Stage 3 CMP Management Actions Report	$70,000	6-9 mo.	2021-25	2022/23
Stage 4 – Prepare, Exhibit, Finalise and Adopt CMP	**$55,000**	**6-9 mo.**	**2021-25**	**2023/24**
Stage 4 Draft Coastal Management Program	$40,000	1 mo.	2021-25	2023/24
Stage 4 Community and Stakeholder Engagement	$10,000	6-7 mo.	2021-25	2023/24
Stage 4 Final Coastal Management Program	$5,000	1 mo.	2021-25	2023/24
Total	**$410,000**	1.5-2yrs	As above	As above

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1 INTRODUCTION

1.1 Background

In adherence with the NSW Coastal Reforms, the management of Ballina Shire Coastline will take the form of a Coastal Management Program (CMP). The purpose of CMP will be to establish an integrated program for the coordinated management of the coastal zone, in order to maintain and enhance its social, cultural, economic and environmental values.

This study has been prepared on behalf of Ballina Shire Council (Council) with funding and technical support from the NSW Department of Planning and Environment (DPE), and in consultation with various state agencies and other relevant stakeholders. The report documents a Scoping Study for the CMP which will cover Ballina Shire's open coastline, including the downstream reaches of North Creek and Richmond River.

The Scoping Study represents the first of five stages of the CMP process and is intended to identify the scope of the program. This report has been prepared in accordance with the requirements outlined in the NSW Coastal Management Manual (OEH, 2018a).

1.2 The NSW Coastal Management 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 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 coastlines (OEH, 2018a).

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, 2018a).

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 new 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.
- Coastal Management State Environmental Planning Policy 2018 (CM 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 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.
    - In December 2021, the Minister for Planning and Public Spaces announced that the 45 existing State Environmental Planning Policies (SEPPs) will be consolidated into 11 new amalgamated SEPPs. As part of this process, the CM SEPP has been rolled into Chapter 2 of the new State Environmental

Planning Policy (Resilience and Hazards) 2021. The SEPP consolidation is administrative, and no policy changes have been made. The SEPP consolidation does not change the legal effect of the existing SEPPs, with section 30A of the *Interpretation Act 1987* applying to the transferred provisions. For clarity, these provisions are still referred to as the CM SEPP in this document.

- The implementation of Coastal Management Programs (CMPs): A five stage coastal management process intended to set the long-term strategy for the coordinated management of the coastal zone for a given area.
- The NSW Coastal Management Manual (The 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: which is responsible for advising the Minister on coastal management issues, as well as reviewing and approving CMPs.
- The NSW Coastal and Estuary Grants Program: which provides technical and financial support to local councils to help manage the coastal zone.

A schematic of the NSW Coastal Management Framework is provided in Figure 1-1.

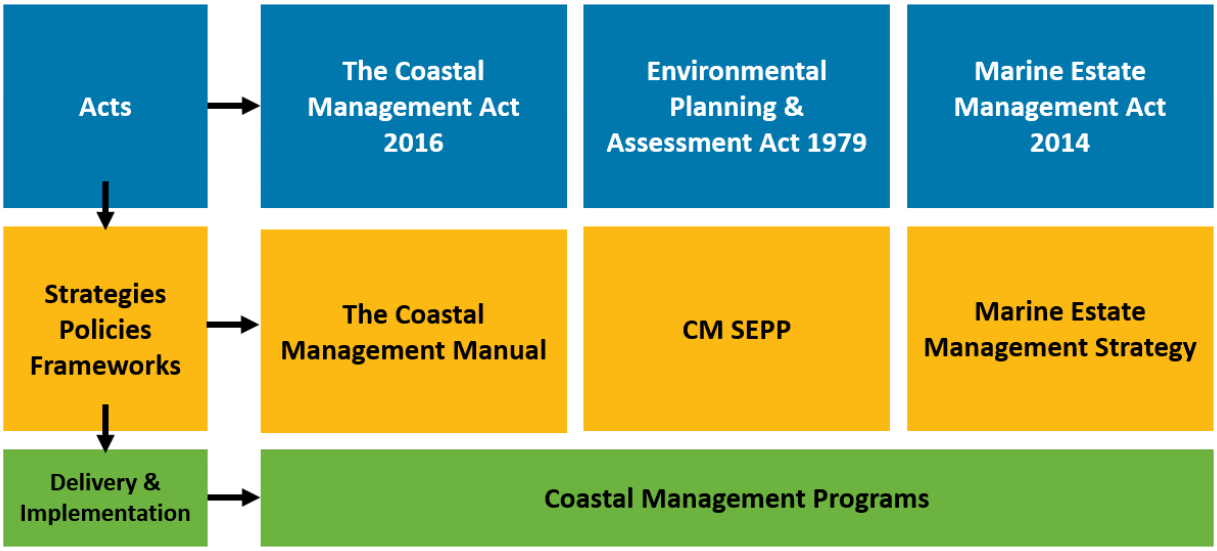


FIGURE 1-1 THE NSW COASTAL MANAGEMENT FRAMEWORK

1.3 Coastal Management Programs

The purpose of a CMP is to set the long-term strategy for the coordinated management of the coastal zone of a given area. It should focus on achieving coastal management objectives at a local level, whilst also achieving the broader objects of the CM Act (OEH, 2018a). A CMP provides an opportunity for councils, public authorities and local communities to clearly identify and balance competing interests and priorities in the coastal zone.

A CMP is prepared through a five-stage risk management process, as described in the NSW Coastal Management Manual and depicted in Figure 1-2. This process is intended to help councils and their communities to identify and manage risks to the environmental, social and economic values of the coast (OEH, 2018a). The Manual sets forth mandatory requirements for CMPs, and provides guidance regarding their preparation, development, adoption, implementation, and review.

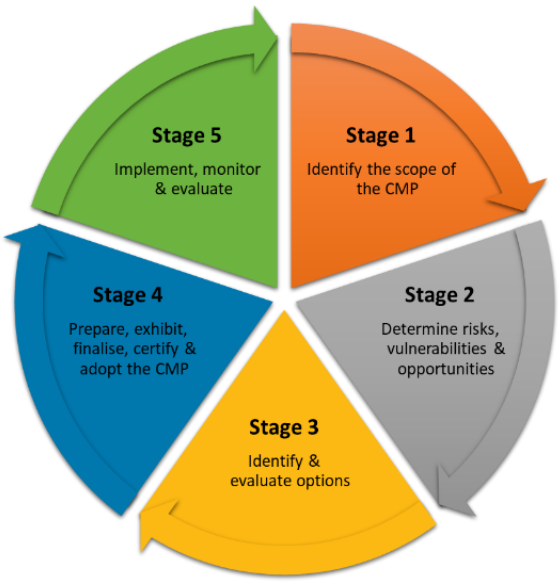


FIGURE 1-2 THE CMP PROCESS

Ballina Shire Council is commencing the CMP process for its open coastline, and this Scoping Study is the first stage. The primary purpose of a Stage 1 Scoping Study is to:

- Review the history of managing the coastal zone;
- Develop a shared understanding of the current situation; and
- Identify the focus of the new CMP.

Stage 1 builds on and integrates with previous work, including existing plans and strategies, technical studies and stakeholder input. It guides Council in formulating appropriate strategies and actions in later stages of the process (Stages 2 to 5).

1.4 The Study Area

The spatial extent of the CMP comprises the 30 km of Ballina Shire LGA open coastline and the downstream reaches of North Creek and the Richmond River. Lake Ainsworth and Shaws Bay are excluded and not a part of this study area (as those area's will have their own CMPs developed) - however it is noted that this CMP may influence the outcomes of those programs and vice versa. The study area for the CMP (including the upstream boundaries within the Richmond River system) is depicted in Figure 1-5 and Figure 1-6.

The primary open coast areas as designated in the Ballina Shire Coastal Hazards Definition Study (WBM Oceanics, 2003) covered by this CMP include:

- **Patches Beaches to Beswick Beach:** This extends from the southern Shire boundary to Beswicks Beach, south of the Richmond River, and includes the fully exposed open coast Patches, Robins and Beswick beaches. There is limited development in this area.

- **South Ballina**: This includes South Ballina Beach located on the southern bank of the Richmond River mouth. Training walls were constructed on the Richmond River entrance between 1889 and 1912 (WBM Oceanics, 2006).

  As a result of the trained estuary entrance, the local coastal topography has been reshaped and there has been accretion to the south of the walls. South Ballina is set back from this part of the coast, along the southern bank of the Richmond River.

FIGURE 1-3 ESTUARY ENTRANCE (SOURCE: WBM, 2006)

- **Ballina Pocket Beaches:** To the north of the Richmond River and south of Lennox Head, there are several small pocket type beaches along the coast. They are embayed by several headlands including Ballina Head, Black Head, Flat Rock, Whites Head, Skennars Head and Lennox Head. The beaches include the popular Lighthouse Beach, which was formed between the northern Richmond River training wall and Ballina Head, and where land reclamation has been carried out in the hind dune area for urban development. North of Lighthouse Beach are Shelly Beach, Angels Beach, Sharpes Beach, Boulder Beach and Skennars Beach. There is urban development in this area between North Creek and the coast, including East Ballina and Skennars Head.
- **Lennox Head to Seven Mile Beach:** The northernmost coastal unit extends north of Lennox Head to the Ballina Shire boundary along Seven Mile Beach. Lennox Head township is at its southern end, which is a major tourist destination and is forecasted to have the greatest increase in development in the Shire. Lake Ainsworth is located immediately north of the town. This area has historically experienced significant erosion, which prompted various protection works since the 1940s including rock revetment walls and a dune levee.

FIGURE 1-4 SEVEN MILE BEACH

The CM Act requires CMPs to take a “systems” approach to coastal management. This means that the study area for the CMP needs to recognise that important ecological and hydrological systems extend across the catchment, coastline, estuaries and foreshore of the study area. There are several issues that exist on a system wide scale, including water quality, ecological processes, estuarine ecology and biodiversity, coastal and catchment flooding, development pressures and local and regional planning initiatives. In order to identify the values, pressures and risks related to these systems and to develop a coordinated approach to their management, the spatial extent of the CMP should include the contributing catchment areas that extend outside of the traditional “coastal zone” defined by the CM SEPP mapping.

1.5 The Ballina LGA Suite of CMPs

Whilst this CMP sets out a management program for Ballina Shire's open coastline, it is important to note that this is only one of several CMPs to be implemented across the Ballina Shire.

In order to effectively manage its coastal zone, Council has determined to undertake a suite of four (4) discrete, but interlinked CMPs that collectively cover the coastal zone of its LGA - as depicted in Figure 1-7. They comprise:

- ***The Ballina Open Coast CMP (This CMP):*** which covers the open coastline, the downstream reaches of North Creek and Richmond River.
- ***The Shaws Bay CMP:*** which will cover the Shaws Bay inlet and its contributing catchment.
- ***The Richmond River CMP:*** which is intended to cover the Richmond River and its tributaries and estuaries. The estuary spans three local government areas: Ballina Shire Council, Lismore City Council, and Richmond Valley Council. An additional three councils (Clarence Valley, Kyogle and Byron Shire) have jurisdiction in the upper catchment of the river. This CMP is therefore being managed and delivered by Rous County Council.
- ***The North Creek CMP:*** which covers the North Creek estuary and its tributaries.
- ***The Lake Ainsworth CMP:*** which covers the catchment of Lake Ainsworth bordering the northern end of Lennox Head.

This CMP will recognise but exclude detailed consideration of coastal zone areas that are already the subject of an existing or in-progress CMP.

Figure 1-7 provides a broad indication of the CMP study area – however the exact study area is defined by the CMP SEPP Mapping for each of the respective coastal management areas - provided in Section 5.

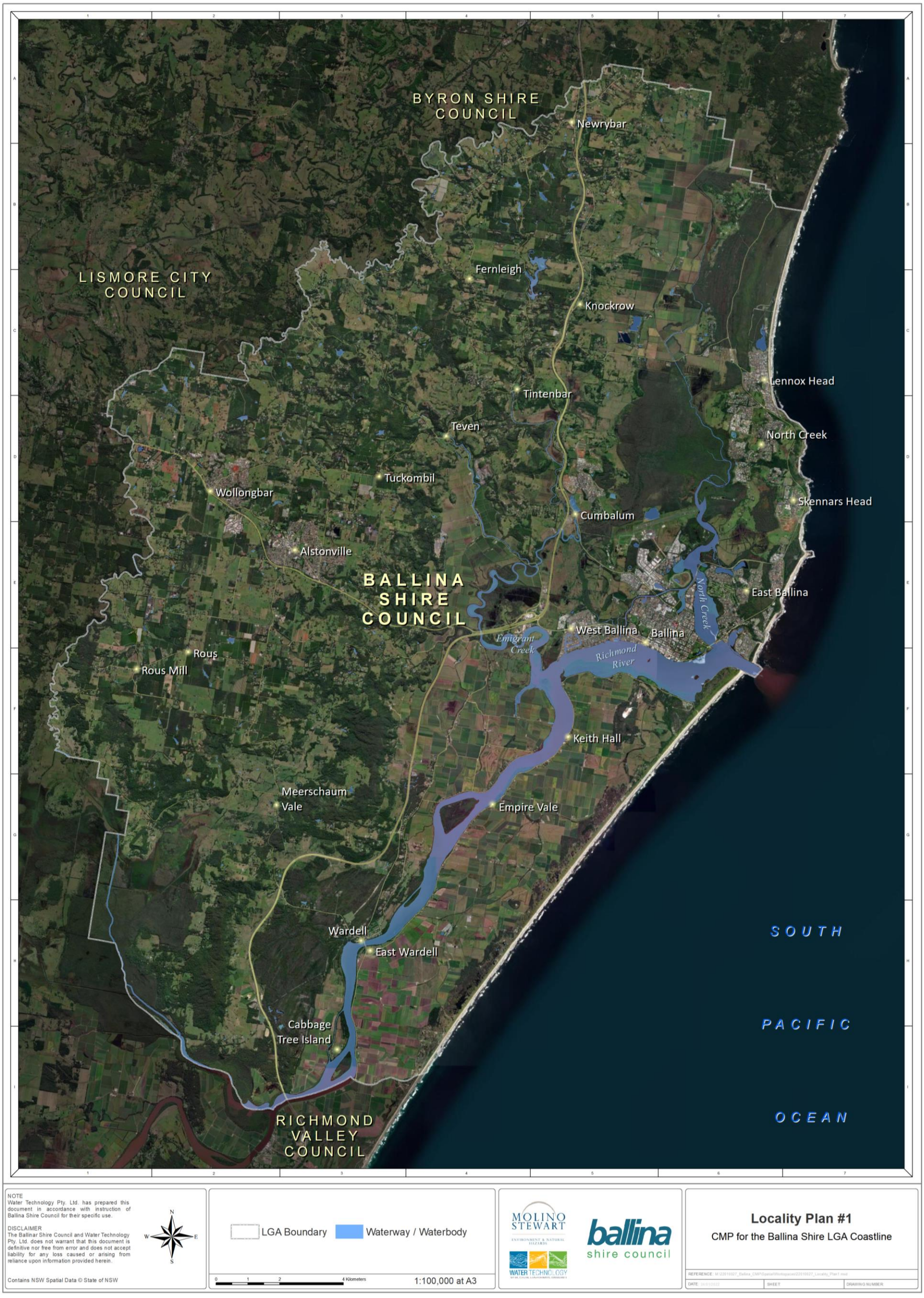


FIGURE 1-5 BALLINA LGA AND KEY LOCATIONS

FIGURE 1-6 CMP STUDY AREA

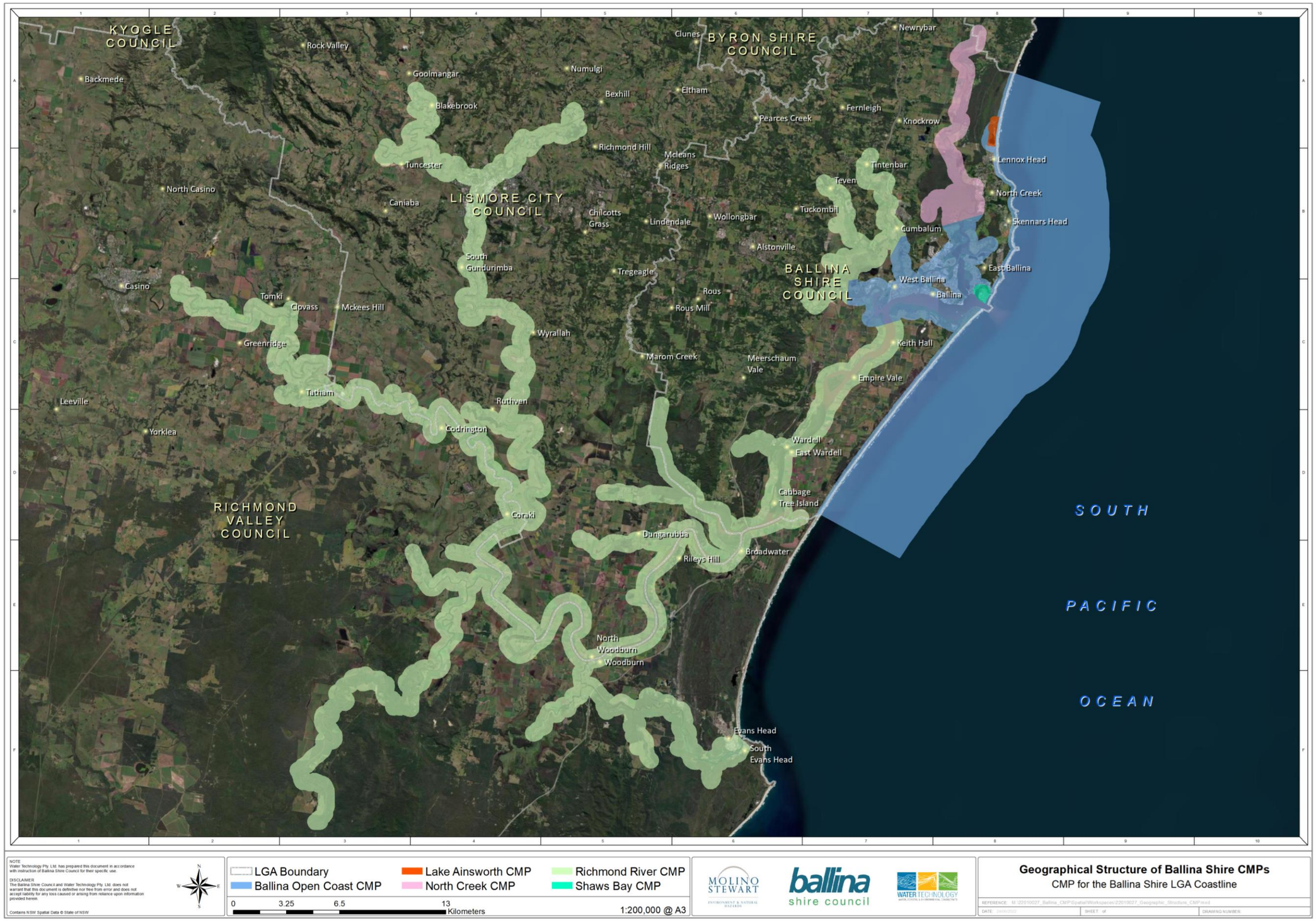


FIGURE 1-7 THE SUITE OF BALLINA SHIRE LGA CMPS

1.6 Structure of this Report

This report meets the requirements of a Stage 1 Scoping Study set out in the NSW Coastal Management Manual. It includes the following components:

- Section 2 outlines the purpose, vision and objectives of the CMP;
- Section 3 provides the strategic context for the CMP, including background information regarding the local environmental processes, governance, applicable policy and management plans, as well as the social and economic use of the study area;
- Section 4 provides an overview of the community and stakeholder engagement activities undertaken during Stage 1, and those required during the remaining stages of the CMP;
- Section 5 provides an overview of the study area for the CMP;
- Section 6 summarises the existing coastal zone management plans in place across the estuary;
- Section 7 details a first-pass risk assessment which identifies the major threats and pressures facing the study area;
- Section 8 provides a gap analysis and recommends further studies required to fill key knowledge gaps during Stage 2 of the CMP; and
- Section 9 outlines a business case and a forward program for completion of Stages 2 to 4.

Effective engagement and communication are important aspects of a successful CMP. A key component of this Scoping Study is the development of a Community and Stakeholder Engagement Plan (provided in Appendix A). This Strategy outlines which organisations and community stakeholders should be involved in the review, preparation and implementation of the CMP, how they will be offered engagement opportunities, and how their input will be incorporated into the planning process.

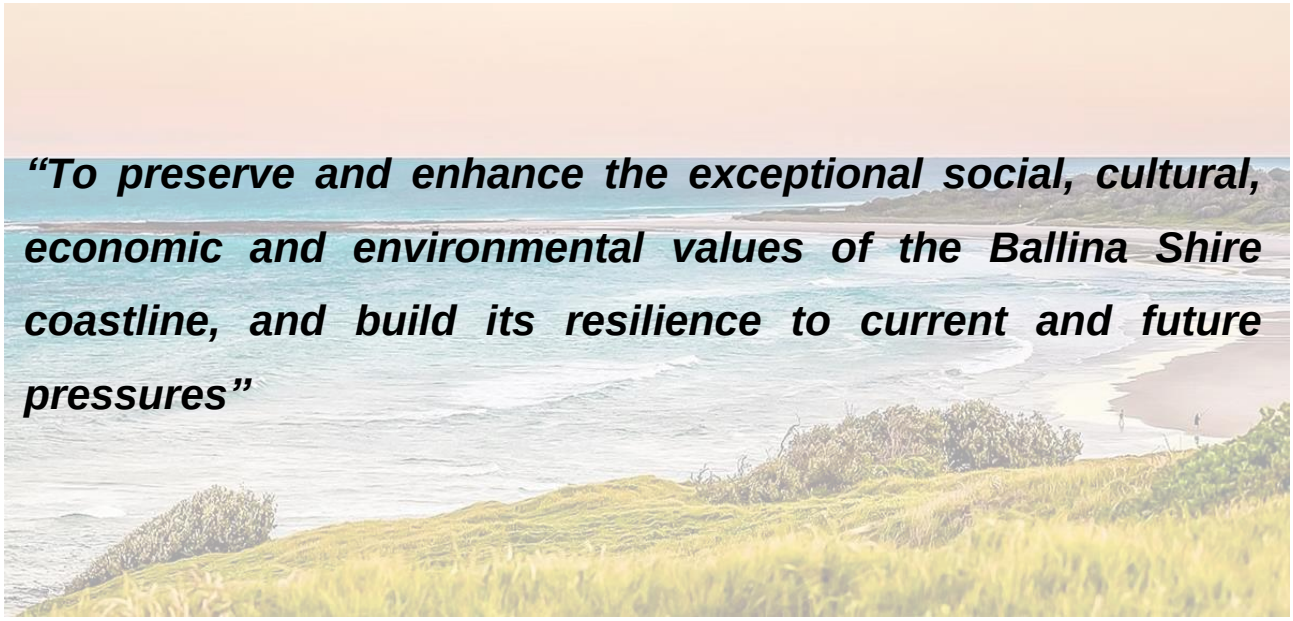
2 PURPOSE, VISION AND OBJECTIVES

2.1 Purpose

The purpose of preparing this CMP is to set the long-term strategy for the coordinated management of the Ballina LGA coastal zone. The CMP seeks to achieve the objects 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. This approach brings together relevant stakeholders and local communities to achieve its management objectives.

2.2 Vision

A local vision statement has been developed to help stakeholders identify with the future of the coastal zone, encourage a sense of community ownership of the actions in the CMP, and foster commitment to its preparation and implementation. The following Vision Statement for this CMP has been developed in consultation with Council, and is consistent with the Vision Statements prepared for the other CMPs across the study area. The Vision for the CMP is:



2.3 Objectives

The CMP seeks to achieve the objects of the CM Act through a program to identify a broad range of coastal management issues. A suite of objectives has been developed for the CMP, in order to ensure that the outcomes are consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the LGA – and to ensure that the CMP meets the objectives of the CM Act. They have been developed ensuring consistency and compatibility with the objectives set forth in the following earlier works:

- The *NSW Coastal Management Act 2016*;
- The Coastal Management State Environmental Planning Policy (2018);
- The North Coast Regional Plan 2036 (DPE, 2017);

- The North Coast Local Land Services Local Strategic Plan 2016-2021 (LLS, 2016);
- Ballina Community Strategic Plan 2022-2032 (Ballina Shire Council, 2017);
- The objectives put forth for existing CMPs within LGA, including North Creek CMP, Lake Ainsworth CMP, and the Richmond River CMP.
- The NSW Water Quality and River Flow Objectives (NSW Government, 1999);
- The Marine Quality Objectives for NSW Ocean Waters (DEC, 2005);
- The Marine Estate Management Strategy (MEMA, 2018)
- The NSW Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions (OEH, 2017); and
- The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000)

Further information regarding these strategic plans, regional plans, and other legislation in provided in Section 3.

The objectives of the CMP have been outlined in broad terms, to establish the overall strategic direction of the program. It is anticipated that these objectives will undergo further refinement in consultation with the local community during the later stages of the CMP. The objectives of the CMP are:

a) Protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience of the Ballina Shire Coast for current and future generations;

b) Mitigate and manage current and future risks from coastal hazards, taking into account the effects of climate change;

c) Maintain and protect water quality across the coastal zone – and its impacts on environmental, social and economic values;

d) to protect and restore environmental values of the coastal zone.

e) to maintain and preserve the unique scenic amenity and natural character of the coast;

f) to acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the study area and to protect local indigenous cultural heritage;

g) Provision and maintenance of safe public access and recreational amenity, health and wellbeing;

h) to recognise the Ballina Shire coastal zone as a vital economic resource for the region and to support sustainable coastal economies;

i) 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;

j) to mitigate and manage current and future risks from population growth, urbanisation and coastal hazards, taking into account the effects of climate change;

k) to ensure co-ordination of the policies and activities of the relevant government and public authorities relating to the coastal zone - and to facilitate the proper integration of their management activities across all levels of government;

l) to maintain meaningful engagement with the community, and to support public participation in coastal management and planning, and to foster greater public awareness, education and understanding of coastal processes and management actions;

m) to support the objects of the *Marine Estate Management Act 2014*; and

n) to facilitate the identification of land for the future protection, enhancement, maintenance and restoration of the environment of the coastal zone.

3 STRATEGIC CONTEXT

As part of this Scoping Study, a review has been undertaken of the strategic context for coastal management – in order to ensure that subsequent stages of the CMP address relevant management issues, and that the overall direction of the program is carefully considered. This task has been based on a review of existing information and data, and information supplied by project stakeholders via workshops undertaken during the study.

The strategic context for the CMP has been broken down into a series of categories which are outlined in Table 3-1 . Whilst these issues will be studied in further detail at later stages of the CMP, it is important to have a broad understanding at the project outset.

TABLE 3-1 ESTABLISHING THE STRATEGIC CONTEXT OF THE CMP

Context	Description of Strategic Context Drivers
Environmental	*What are the environmental features and processes affecting the coastal zone?* ▪ Regional geology and coastal geomorphology ▪ The predominant land use across the catchment and projected future development ▪ Local coastal and estuary processes, including waves, water levels, winds, extreme events, sediment transport, erosion, storm tide inundation and water quality ▪ Coastal zone ecology, habitat extent and health, terrestrial biodiversity and catchment characteristics ▪ Potential and current climate change impacts
Governance	*What is the governance context of the CMP?* ▪ The political and governance context and the relationships between Council and other public authorities, including stakeholders from state government, the community, and NGOs.
Policy	*What is the relevant legislation and policy governing the coastal zone?* ▪ The relevant local, state and federal legislation and policies, land tenure and land managed as national park or crown reserve
Management and Planning	*What is the strategic planning framework that the CMP must fit within?* ▪ The relevant coastal and estuary management plans in place across the study area ▪ Relevant state, regional and local plans and strategies
Economic	*What is the economic importance of the coastal zone?* ▪ The economic value of the coastline – including the value of ecosystem services and the economic activity dependant on the coastal zone, such as tourism and agriculture
Social and Cultural	*What are the social and cultural values of the coastal zone?* ▪ Indigenous and non-indigenous heritage values of the study area ▪ Social and recreational uses of the study area ▪ Recreational infrastructure and coastal protection infrastructure
Population and Demographics	*What is the local population in the coastal zone, and how may this change over future planning periods?* ▪ Population growth and demographic changes ▪ Major developments planned for the study area catchments

3.1 Environmental Context

3.1.1 Coastal Geomorphology

Geological Context

There are four main landscape types along the Ballina Coastline: headlands, beaches, alluvial and estuarine deposits, and sand sheets or sandplains.

The headlands between Lennox Head and Ballina are basalt outcrops from the Mount Warning Shield Volcano. Ballina Shire beaches are predominantly Holocene beach and dune siliciclastic and calcareous sands, with the exception of Boulder Beach which is dominated by rounded basalt small boulders and cobbles (WBM Oceanics, 2003).

FIGURE 3-1 BROAD DEPOSITIONAL PLAIN AT THE RICHMOND RIVER ENTRANCE

The Richmond River Catchment is an accumulation of Quaternary alluvium, and these sediments have created a mature infilled barrier-type estuary. North of Lennox Head, adjacent to Seven Mile Beach, is a Pleistocene beach ridge plain called the Newrybar Sand Plain composed of siliciclastic sands

The broad Ballina region coastal plains include the Richmond River floodplain and associated low hills located between the ocean and midland hills landscape, which rises to approximately 25 m above sea level. The coastal plain is primarily composed of unconsolidated sediments and has been formed by deposition and reworking of sediments during past Pleistocene and Holocene sea-level fluctuations (Roy P. , 1975).

During lower sea-level stands, bedrock eroded and valleys filled with alluvial deposits, resulting in an undulating and gently seaward sloping landscape. Successive sea-level highstands resulted in the deposition of marine sediments in the valley embayments, forming a coastal plain. Pleistocene or inter-barrier sands are preserved as wedges in the near-shore, beach and dune areas. In the most recent Holocene marine transgression, which ended approximately 7,000 years ago (Sloss, 2007), marine sands were remobilised and deposited on top of and in front of the older Pleistocene coastal surface as sea level rose. The deposition of these more recent outer barrier sands resulted in the formation of the present coastal barrier and beach complex (Roy P. , 1975). Along most of the NSW coastline, the older Pleistocene tidal and delta deposits are covered by Holocene deposits and may have migrated laterally as a result of tidal activity.

At present, the continental shelf on this part of the coastline is relatively narrow: water depths of 20 to 100 m extend approximately 30 km from the coastline and the shelf sediments are predominantly terrestrially sourced sands (Roy, et al., 2001).

The Ballina coast is characterised by a number of extensive sandy beaches with prominent headlands and river mouths that define coastal units. The primary units in Ballina LGA are:

- South of the Richmond River to Evans Head;
- Richmond River to Lennox Head;
- North of Lennox Head to south of Patches Beach.

While these coastal units experience a similar incident wave climate and regional sediment transport processes, they are also shaped by their unique characteristics such as size, orientation and headland controls.

Sediment Compartments

The CMP study area is situated within the "NSW North Coast" primary sediment compartment, which extends from Yamba in the south to Coolangatta in the north. It spans the Tweed, Byron Bay, Ballina and Richmond Valley LGAs (Geoscience Australia, 2021).

Within this primary sediment compartment, the Ballina coast spans the Broadwater and Cape Byron-Richmond River secondary coastal sediment compartments, as listed in Schedule 1 of the CM Act. These sediment compartments are mapped in Figure 3-2 (Geoscience Australia, 2021).

Sediment Transport

Regionally, the Ballina Coastline is part of a long coastal compartment that experiences a continuous northerly longshore transport of sand. The North Coast Primary Sediment Compartment is characterised by near continuous northerly longshore sediment transport due to the predominance of waves from the southeast (WBM Oceanics, 2003). This transport past the various headlands that compartmentalise the coastline generally occurs in response to high energy wave events that mobilise the sediment transport around these control points.

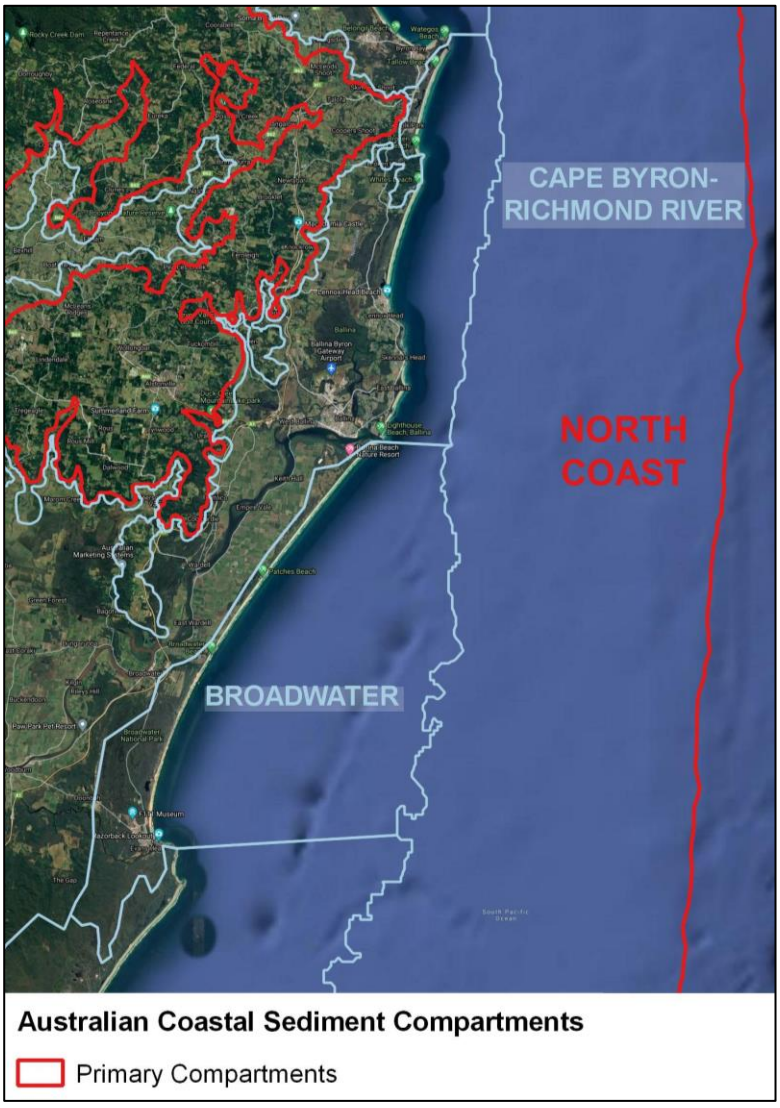


FIGURE 3-2 COASTAL SEDIMENT COMPARTMENTS COVERING THE STUDY AREA (AS PER GA, 2021)

Numerous studies of multiple decades have estimated the rate of longshore transport along the northern coast of NSW, including but not limited to (from north to south):

- Ballina Shire beaches (WBM Oceanics, 2003);
- Byron Shire Coastline Hazard Definition Study (WBM Oceanics, 2000);
- Byron Shire Beaches (BMT WBM, 2013);
- The Byron Bay – Hastings Point Erosion Study (Public Works Department, 1978); and
- Tweed Coastline Hazard Definition Study (WBM Oceanics, 2001);

There have also been a range of morphological studies assessing the region from Letitia Spit to Gold Coast beaches – many of which are associated with the Tweed Sand Bypassing Project.

These studies have resulted in a wide divergence of outcomes from those investigations with respect to rates of net longshore sand transport, gradients in longshore transport and their relationship to shoreline changes along the northern NSW coast. Average annual net longshore transport rates from various previous studies are summarised in Figure 3-3, and indicate that there is a gradient in the net longshore sand transport rate from about 150,000-200,000 m^3/yr at the Clarence River to about 500,000 m^3/yr at the Gold Coast.

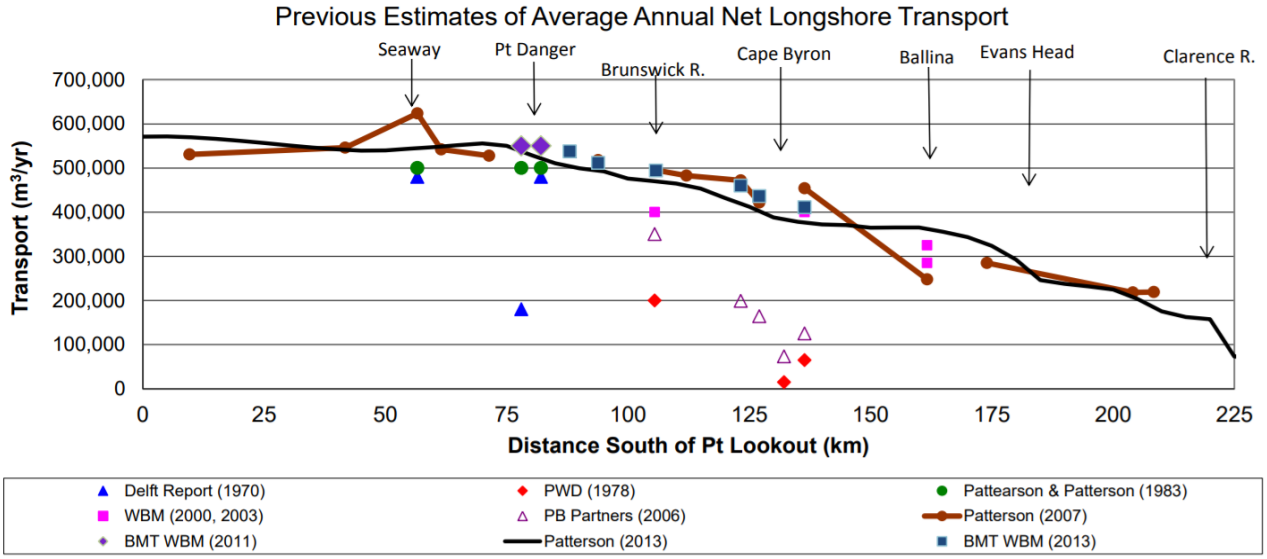


FIGURE 3-3 HISTORICALLY ESTIMATED LONGSHORE TRANSPORT RATES ALONG NORTHERN NSW (BMT WBM, 2013)

Importantly, the regional flow of longshore sediment transport is affected by a number of major control points. These includes large headlands and rocky outcroppings like the Cape Byron Headland, as well as anthropogenic controls such as major river training structures at the entrances, listed south to north:

- The Clarence River;
- The Evans River;
- The Richmond River;
- The Brunswick River;
- Cudgen Creek; and
- The Tweed River.

While the reported average net longshore transport may bypass a headland or control structure over a period of years, there is potential for temporary, shorter-term fluctuations in the supply of sand past such controls to downdrift beaches. These perturbations are typically greater at the more prominent headlands, where periods of strong longshore transport past headlands are usually associated with large powerful swells and storm events with high wave energy (Gordon A.D., 1978). As a result, sand movements past headlands tend to occur as episodic 'slugs' of relatively large quantities of sand during short term events, whereas longshore transport at adjacent beaches tends to be more continuous at lower rates (WBM Oceanics, 2001).

Additionally, recent research shows that there is a net shoreward sand supply into the shore-face from the inner continental shelf of about 0.5-1.0 m^3/m/year, offsetting shoreline recession that would otherwise result from the longshore transport gradient (BMT WBM, 2013). A conceptual model of the regional sediment transport processes is provided in Figure 3-4.

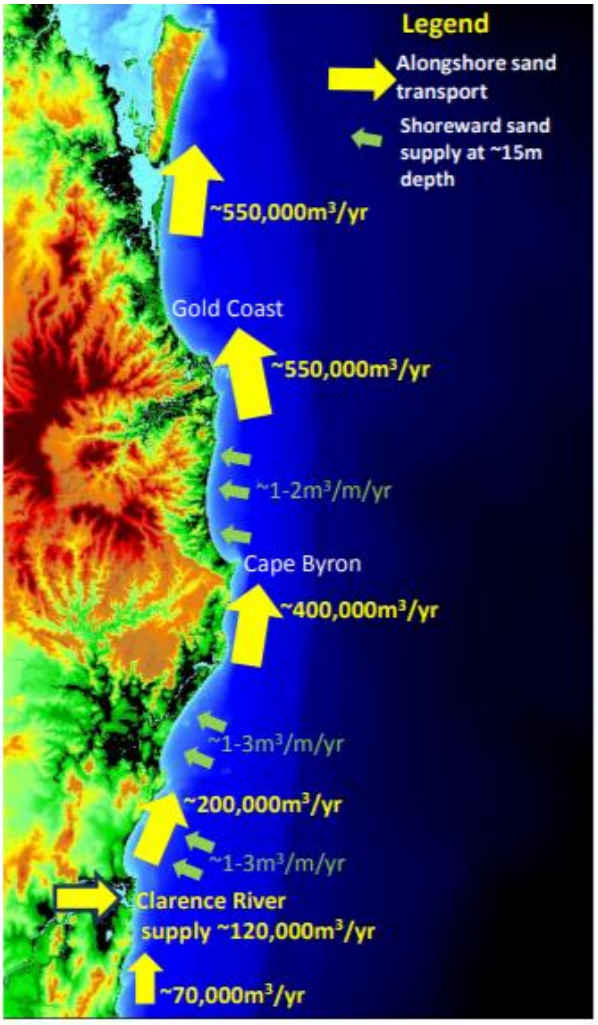


FIGURE 3-4 LONGSHORE SEDIMENT TRANSPORT REGIME (BMT WBM, 2013)

At a more local level, the Ballina Coastline Hazard Definition Study (WBM Oceanics, 2003) identified a differential in the rate of longshore sediment transport between South Ballina Beach and Tallow Beach, which is related to smaller scale changes in beach orientation and the impacts of natural headland controls.

Long Term Shoreline Recession

Where there is a differential in longshore sediments transport, long term shoreline recession may occur. Long-term shoreline recession rates for the study area from the Ballina Coastline Hazard Definition Study (WBM Oceanics, 2003) based primarily on historical images from the time period of 1947 to 2000 are shown in Table 3-2. Due to the control of the Richmond River training walls which have been in place since the late 1800s/ early 1900s, shoreline recession is reduced in the north of Patches Beach and in South Ballina. Accretion at South Ballina is attributed to the influence of the training walls, which realigned the shoreline due to the groyne effects. These values are compared to more recent estimates from the Geoscience Australia Digital Earth coastal change data set (Geoscience Australia, 2021).

TABLE 3-2 BALLINA COAST LONG-TERM SHORELINE CHANGE (WBM, 2003) AND COASTAL RETREAT MEASUREMENTS (GEOSCIENCE AUSTRALIA, 2021)

Coastal Section		Long-Term Shoreline Recession from 1947 to 2000 Best Estimate (Lower to Upper Estimates) (WBM, 2003)	Shoreline Change Since 1988 (Geoscience Australia, 2021)
Patches Beach to South Ballina	Patches Beach (South)	-0.2 m/yr (-0.1 to -0.3 m/yr)	Accreting +0.3 m/yr (± 0.2)
	South Ballina Beach	-0.05 m/yr (0 to -0.1 m/yr) Long-term accretion south of training wall	Stable
Ballina Pocket Beaches	Lighthouse Beach	10 m beach rotation Long-term accretion north of training wall	Stable
	Shelly Beach	10 m beach rotation Relatively stable	Stable
	Angles Beach	10 m beach rotation Relatively stable to slightly accreting (substantial realignment if tombolo detaches from Flat Rock)	Stable
	Sharpes Beach	10 m beach rotation Relatively stable	Stable to accreting by +0.4 m/yr (± 0.3)
	Boulder Beach	-0.2 m/yr (-0.1 to -0.3 m/yr)	Stable to receding by -0.3 m/yr (± 0.1)
Lennox Head-Seven Mile Beach	South	-0.5 m/yr (-0.3 to -0.7 m/yr)	Stable to accreting by +0.5 m/yr (± 0.3)
	Centre	-0.5 m/yr (-0.3 to -0.7 m/yr)	Stable
	Shire Boundary	-0.3 m/yr (-0.2 to -0.45 m/yr)	Stable
	North	-0.1 m/yr (-0.05 to -0.2 m/yr)	Stable

Cross-Shore Sediment Transport and Storm Erosion

Cross-shore sand transport may also occur by several mechanisms including:

- Storms and cyclones that remove sand from the beach and dune areas and deposit it offshore, typically as longshore bars. This contributes to beach erosion. During storm events, beach sediments become suspended by breaking wave action and are directed offshore by undertow and rip currents and deposited in offshore bars.
- Onshore sand migration due to swell waves which build the nearshore beach profile and contribute to beach accretion. During ambient wave conditions, this sediment is then directed back onshore by wave action, specifically due to asymmetry in wave orbital motions.
- Aeolian sand drift by wind, generally transporting sand from the shoreline towards the coastal dunes.

Generally, beaches will experience cyclic periods of erosion and accretion driven by cross-shore transport depending on the prevalence of storms and ambient conditions. Figure 3-5 shows a conceptual model of sediment transport processes along the coast.

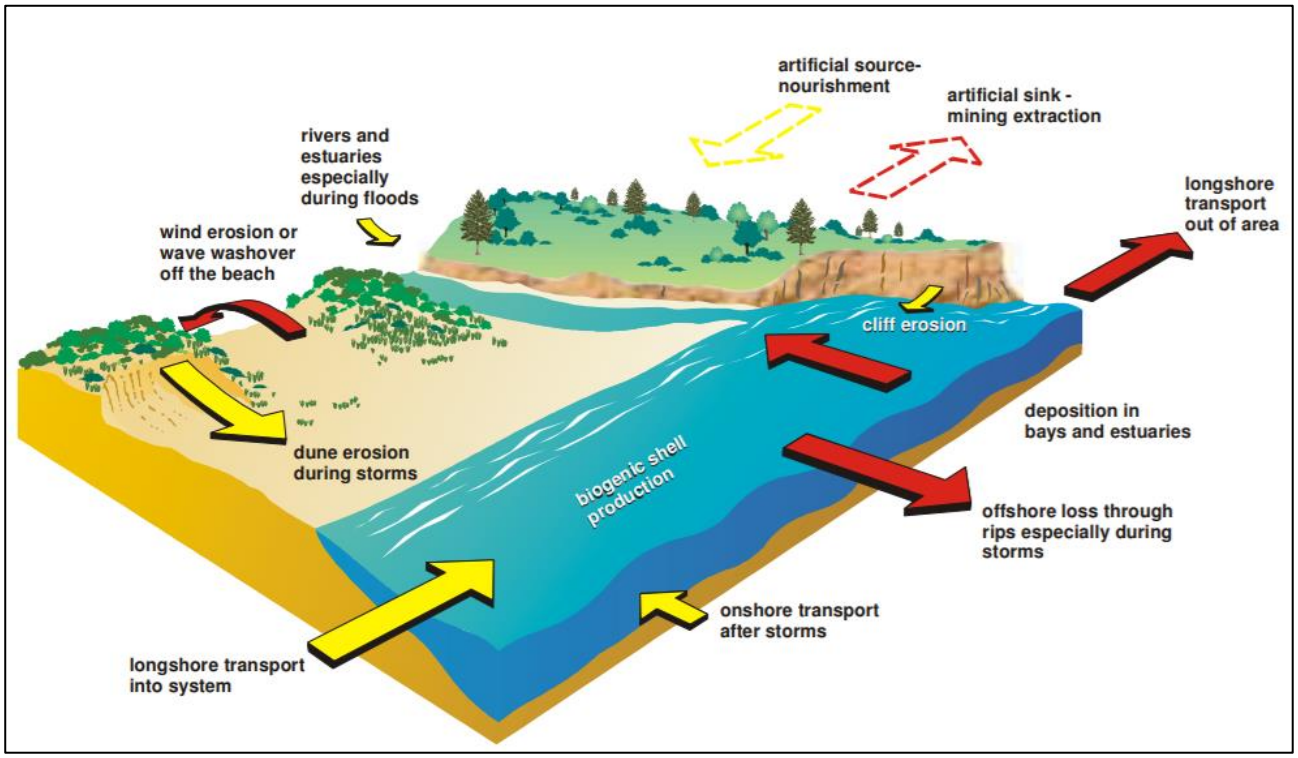


FIGURE 3-5 MODEL SEDIMENT COMPARTMENT SHOWING POTENTIAL SEDIMENT INPUTS AND LOSSES (NSW DEPARTMENT OF LAND AND WATER CONSERVATION)

The Ballina coastal zone is periodically exposed to storm activity originating in the sub-tropics of the north and the mid-latitudes of the south. To the north are tropical cyclones, which occur during the summer months, and depressions developing into easterly troughs. Further south, low pressure systems such as cut-off lows, migratory lows and east coast lows are a major source of severe weather, particularly in the colder months. These systems are all capable of generating storm surges, severe wave conditions, storm erosion and catchment flooding across the coastal zone.

There is a long history of storms and resulting erosion in Ballina Shire – and the erosion events of 1954, 1967, 1974 and 2009 were some of the most severe experienced in recent history. The two most notable major erosion events on record for northern NSW and southern Queensland being June/July 1967 and 6th February 1974, occurred in conjunction with spring tides. Detailed coastal assessments of the state-wide impacts of these storms were undertaken by the NSW Public Works Department (PWD) in the late 1970s and early 1980s (Foster, Gordon, & Lawson, 1975).

From February to June 2009, the NSW north coast experienced a cluster of storms that generated significant erosion along the coastline. The combined effects of energetic waves, coastal flooding, spring tides and pre-eroded conditions of the beaches during the May 2009 storm led to the worst erosion seen in the region in many years along the NSW north coast, and severely impacted Lennox Head. Another major erosion event occurred at Lennox Head in August 2001 (Figure 3-6). Coastal erosion and inundation associated with the June 2016 ECL event was reported along the whole NSW coastline. The event produced between a 1- and 10-year ARI wave height at the Byron Bay Waverider Buoy, with a maximum recorded Hs of 5.0 m (Burston, Taylor, & Garber, 2017).

FIGURE 3-6 EROSION AT LENNOX HEAD IN 2011 (DAILY TELEGRAPH, AUGUST 2011)

Gordon (1987) undertook an assessment of beach fluctuations and shoreline change along the NSW coast, assessing storm demand volumes in terms of the loss of sand from above mean sea level (AHD). This study found that storm bite volumes up to 250 m^3/m have been identified but are more typically around 150-200 m^3/m.

Storm erosion for the study area was assessed in the Ballina Shire Coastline Hazard Definition Study (WBM Oceanics, 2003), and Updated Coastal Hazard Mapping for Seven Mile Beach (BMT WBM, 2011). These studies are discussed in Section 8.

Estuary Entrance Processes

The Richmond River entrance has been trained since the early twentieth century (see Section 3.6.4). Prior to the construction of the training walls, the position of the river mouth changed over time in response to scouring associated with major floods and reworking of coastal sediments by wave and tidal forces. Shaws Bay and Mobbs Bay, which occur behind the north and south training walls respectively, represent former break-out points of the river (WBM Oceanics, 2006).

3.1.2 Coastal Hydrodynamic Processes

Wave Climate

The regional wave climate is a dominant factor amongst local coastal processes. The deep-water wave climate of the northern NSW coast comprises a highly variable wind wave (local seas) climate, combined with a persistent long period, moderate to high energy east to south-easterly Tasman Sea swell.

The range of offshore wave heights and directions are presented in Figure 3-7. Modal offshore significant wave heights

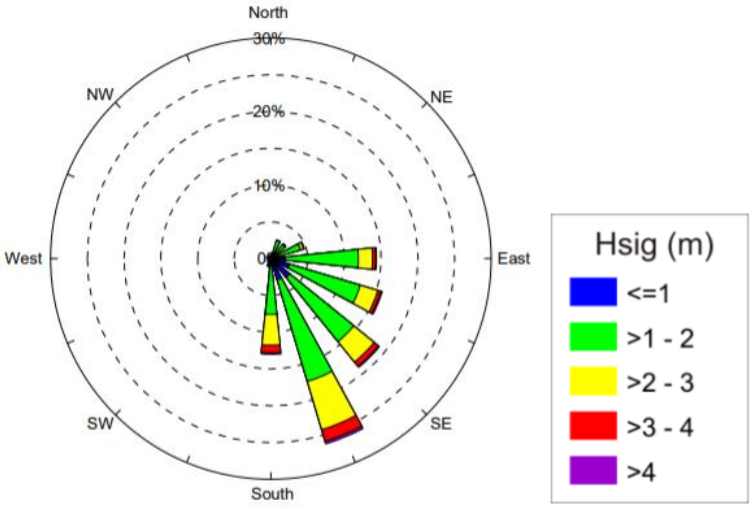


FIGURE 3-7 BYRON BAY WAVE ROSE (SOURCE: KULMAR, 2013)

are in the range of 0.5-2.0m, with spectral peak periods predominantly in the range 7-12 seconds (Shand, et al., 2011).

There is seasonal variability in the wave climate, with summer and autumn months generally being the most energetic. During winter months, the wave climate is mostly influenced by swell. Consequently, the average peak wave period is longer during these months and the energy-weighted wave direction is more southerly compared to other seasons. Prevailing wind waves are incident from a wider range of directions, consistent with the wind climate for the region, and range from small, short period local 'sea' conditions to larger waves in excess of 6-7 m. Significant wave heights are generated by tropical cyclones and east coast lows (Jacobs, 2017).

Tides

The tides at the study area are semi-diurnal with diurnal inequalities. This means there are two high tides and two low tides per day that are generally at different levels in any one day. The tide range is around 2 m at the Richmond River Entrance. The tidal range data is reproduced from OEH (2012) in Table 3-3.

TABLE 3-3 TIDAL PLANES FOR THE RICHMOND RIVER AT BALLINA (OEH, 2012)

Astronomical Tidal Plane	Level (m AHD)
Higher High Water Springs Solstice (HHWSS)	0.91
Mean High Water Springs (MHWS)	0.52
Mean High Water Neaps (MHWN)	0.27
Mean Sea Level (MSL)	-0.07
Mean Low Water Neaps (MLWN)	-0.39
Mean Low Water Springs (MLWS)	-0.65
Indian Spring Low Water (ISWL)	-0.92

Low lying areas of Ballina Island and West Ballina are known to experience inundation caused by tidal backflow through the stormwater drainage network during twice annual seasonal high astronomical tide conditions. This can and does occur without coincident local rainfall runoff or coincident riverine or creek flood events (GHD, 2021). During such events, media releases are issued to warn the public of flood affected roads and inundated areas.

Additionally, elevated water levels occur during storms as a combination of storm tide (tide plus surge due to barometric pressure and wind setup), wave setup and wave runup. The wave run up mechanism can result in the overtopping of coastal barriers. Wave set up occurs at beaches and in estuaries with shallow entrances where wave breaking occurs.

Design storm tide levels for the study area are provided in the Richmond River Flood Study Update (BMT WBM, 2008). Storm tide inundation dominates in the lower reaches of the Richmond River and North Creek, thus affecting parts of West Ballina and Ballina Island. These areas constitute the most concentrated urban development, which highlights the importance of this form of flooding in Ballina (GHD, 2021).

The risk associated with tidal inundation, and combined coastal catchment flooding are addressed further in Section 7, as part of the First Pass Risk Assessment.

Currents

The nearshore current regime along the Ballina coastline comprises a complex interaction of meteorological conditions, tides, shelf/ocean currents and waves. Wave-driven longshore currents are generated when waves break in front of the shoreline at an angle. These surf-zone currents may reach up to 1 m/s and generally occur in a zone of up to about 2-3 metres water depth (Gordon et al, 1978). Tidal currents along the coast are generally low, and less than 0.1 m/s. The East Australian Current (EAC) which brings tropical waters to the south and has an influence on currents in the region, tends to intensity around the Cape Byron headland.

3.1.3 Coastal Land Use

Land Usage

Ballina Shire is approximately 480 km^2 of coastal-rural landscape with over 30 km of coastline, divided roughly in half by the mouth of the Richmond River. Large areas are agricultural or undeveloped, and several urban centres punctuate the coastline. Crown lands occupy 93% of the immediate coastal foreshore to the north of the Richmond River (Department of Land and Water Conservation, 2003).

There is increasing urban land use in the Shire. Major towns include Ballina, Alstonville, Lennox Head, Wollongbar and Wardell with a dispersion of villages and hamlets including Teven, Tintenbar and Knockrow. Tourism is an important industry for Ballina as well as the neighbouring coastal LGAs. Tourists are drawn to the coastal and estuary waterways, such as the Shaws Bay foreshore area which has a caravan and holiday park.

The major industries in Ballina Shire include tourism, retail, health, and a diverse range of agricultural industries including beef, sugar, dairy, fruit, and nuts. The majority of land in the Shire is used for agricultural purposes. The Richmond River and North Creek catchments have extensive agricultural land uses, including sugar cane, grazing and macadamia production (Hydrosphere Consulting, 2011). By value the largest horticultural commodity produced in Ballina Shire are macadamias nuts, which account for almost half of the Shire's agricultural output in economic terms (CommunityID, 2021).

There is also undeveloped bushland in the study area, including the Richmond River Nature Reserve, which is approximately 254 hectares along the southern bank of the lower Richmond River at south Ballina. It contains significant wetland and coastal vegetation communities including mangroves (NPWS, 2005).

Most of the Richmond River estuary catchment (particularly the upper and middle reaches), has been degraded by past catchment clearing, poor land management and changes to natural flooding and drainage regimes as a result of physical works and structures. This has altered catchment inputs to the estuary and has resulted in dramatic changes to many estuarine processes. Based upon 1996 land use mapping data the broader Richmond River catchment area consisted of the following primary land uses (ABER, 2007):

- Grazing or grasslands – 54% of study area;
- Timbered or forested lands – 26.2% of the study area;
- Cropping – 11.2% of the study area;
- Waterbodies – 5.3% of the study area; and
- Urban – 1.8% of the study area.

Agricultural land uses and management practices (i.e., cropping, grazing and horticulture) in the broader catchment area are known to be impacting significantly on key estuarine processes (ABER, 2007). This is evidenced by poor estuarine water quality (see Section 3.1.4). On a lesser scale existing urban developments (and associated infrastructure) are also impacting on key estuarine processes further exacerbating water quality and ecological impacts.

Key risks associated with catchment land usage pressures are addressed further in Section 7, as part of the First Pass Risk Assessment.

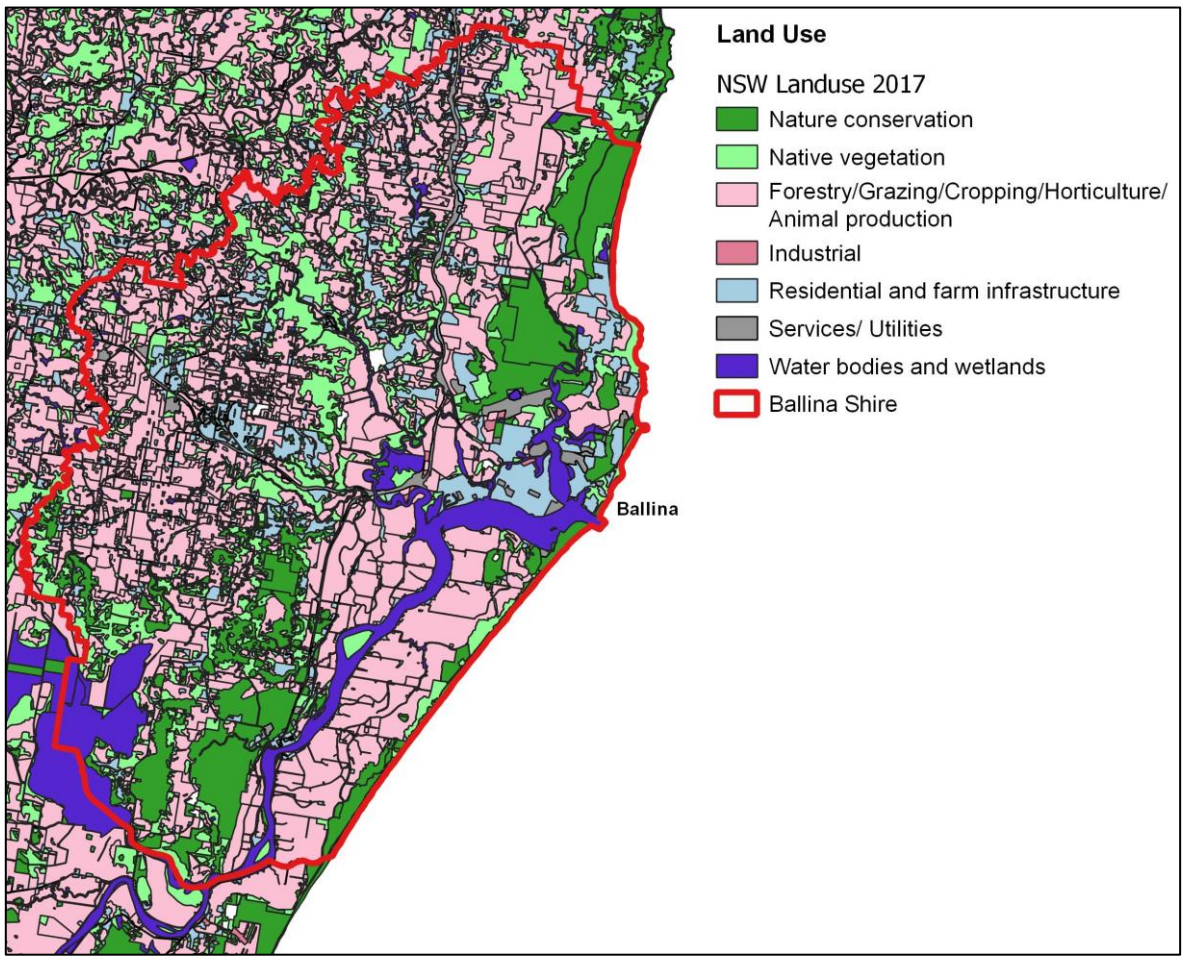


FIGURE 3-8 LAND USE IN BALLINA SHIRE (NSW DEPARTMENT OF PLANNING, INDUSTRY AND ENVIRONMENT, 2020)

3.1.4 Water and Sediment Quality

Estuarine and coastal water quality is affected by a number of complicated and interconnected processes - including inputs into the catchments, land uses, hydrological modifications, soil types, non-point/point source pollution, pressures from increased development, as well increased population. It should be noted that many of these issues can be attributed to stressors that extend across the broader Richmond River catchment Degradation of water quality from diffuse sources or non point sources is identified as one of the highest priority threats within NSW estuaries in the MEMS TARA. Collectively these can contribute to the degradation of water quality which can have detrimental social and ecological impacts.

Relevant studies on the water quality within the study area and surrounds include:

- Richmond River Estuary Process Study (WBM Oceanics, 2006)
- Ballina Coastline Management Study Stage 1 Value Assessment (GeoLINK, 2007)
- Review of water quality data for Richmond River Estuary (ABER, 2008)
- Coastal Zone Management Plan for the Richmond River Estuary (Hydrosphere Consulting, 2011)

There are also a number of water quality monitoring programs in pace across the study area – and these are discussed in Section 6.

Modification and degradation of water quality of the Ballina Shire Coastal zone is generally the result of direct pollution inputs from three main sources, comprising sewage discharge, stormwater point source discharges and agricultural runoff and land clearing activities within the Richmond River Catchment. Within the Richmond River, the estuary and upstream waters have a history of poor water quality compared to the lower reaches and the coastal waters due to tidal exchange and regular flushing of water. The poor water quality has caused sporadic fish kills. Although fish kills are a natural phenomenon, how often and how severe is greatly influenced by the quality of water. The overall water quality is affected by the issues described below.

- *Agricultural Land Usage*: Agriculture is major component of Ballina LGA and comprises a large portion of the Richmond River catchment. Local industries include macadamias, nurseries, sugar cane, and avocadoes (CommunityID, 2021). Agricultural runoff has long been regarded as a major cause of poor water quality, which brings in significant sediment, chemical and nutrient loads into the waterways (WBM Oceanics, 2006).
- *Urban and industrial inputs*: Catchment runoff and associated urban stormwater discharge are a major source of water quality issues at various locations in the study area. Urbanisation results in the removal of greenspace and the increase in impervious surfaces. Consequently, the volume of stormwater runoff increases and may contain a range of pollutants including sediment, nutrients, heavy metals, hydrocarbons, chemical compounds and gross pollutants. Stormwater is directly discharged on to the rocky shores at Ballina Head, which could have localised impacts to the flora and faunal community.
- *Wastewater discharges*: Ballina Shire Council operates several wastewater treatment plants including Ballina Wastewater Treatment Plant (WTP), Lennox Head WTP, Alstonville WTP, and Wardell WTP. Water discharged from these WTPs into the local coastal and estuary waters can bring excessive nutrients, sediment, oxygen-depleting substances, hydrocarbons and faecal coliforms. The excessive nutrients pumped into the waterways can lead to algal blooms causing hypoxia in the water which may also result in fish mortality due to poor water quality. The presence of faecal coliforms can result in bad water quality posing a potential risk to human health where the water can be unsuitable for swimming and other recreational activity.
- *Hydrological Changes*: Historical hydrological modification to the river drainage system to mitigate flooding or saltwater intrusion in the catchment have caused significant environmental impacts - subsequently adding pollutants and acid sulphate soils, and changing the natural tidal flushing regimes, ecological process and water quality.
- *ASS & MBO soils*: Acid sulfate soils (ASS) is the common name given to naturally occurring soil and sediment containing iron sulfides (Stone, Ahern, & Blunden, 1998). ASS are found in every coastal estuary in NSW, and commonly occur in coastal wetlands as layers of marine muds and sands which are deposited in protected, low-energy environments such as barrier estuaries and coastal lakes. Generally speaking, ASS materials do not pose a problem if left undisturbed in the subsurface. However, they pose a risk if exposed to air by excavation or the lowering of the water table, as the iron sulfides they contain react with oxygen to create and release sulfuric acid and acid leachates in toxic amounts. Acid runoff from disturbed ASS in agricultural, urban and general drainage works on lands adjacent to the estuary can have potentially harmful impacts on ecology and recreational amenity. Similarly Mono-sulfidic Black Ooze (MBO), occurs when there is high supply of organic matter in ASS with combination of stagnant water. This quickly develops conditions of low oxygen levels. ASS and MBO are known to occur in the Richmond River estuary. Although this mostly occurs upstream, during flow events these are disturbed and are mobilised rapidly causing deoxygenate waters and drastic changes to the surrounding ecology of waterways. This is a major factor resulting in fishkills within the Richmond River catchment.

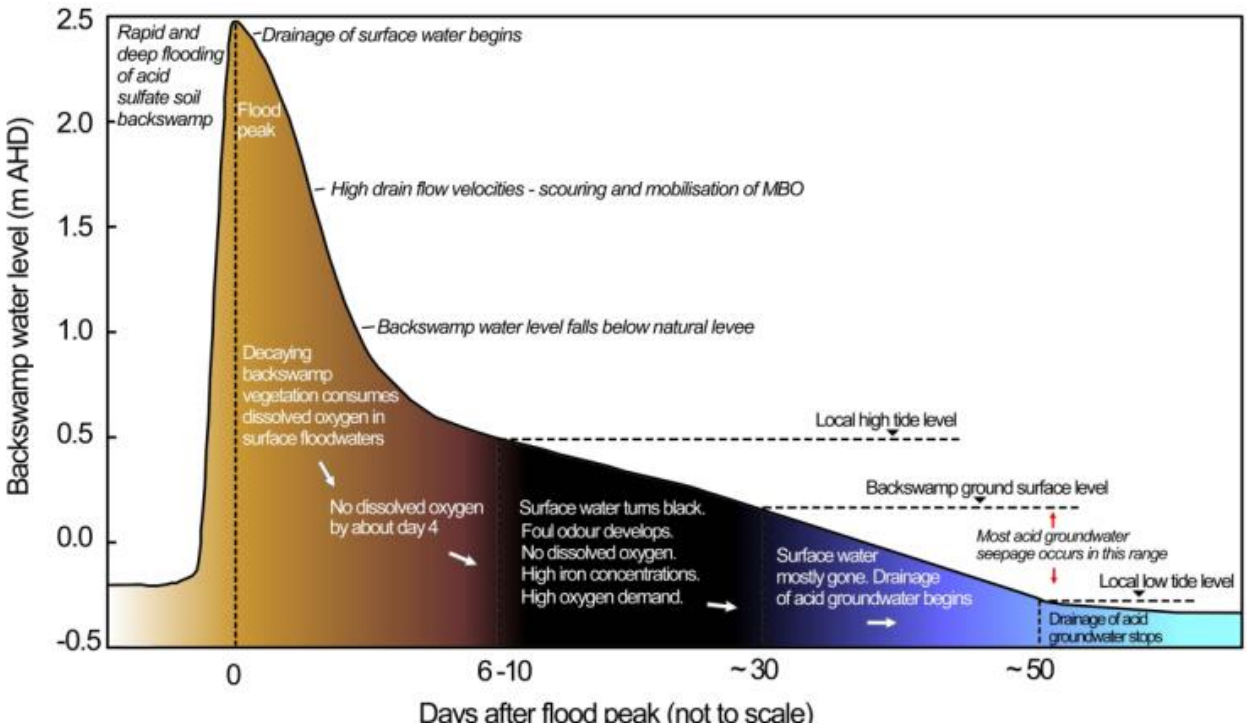


FIGURE 3-9 WQ PROCESSES POST FLOOD EVENTS (SOURCE: JOHNSTON ET AL., 2003)

A map of ASS probability of occurrence is shown in Figure 3-10, as sourced from the NSW SEED Portal (NSW Government, 2021).

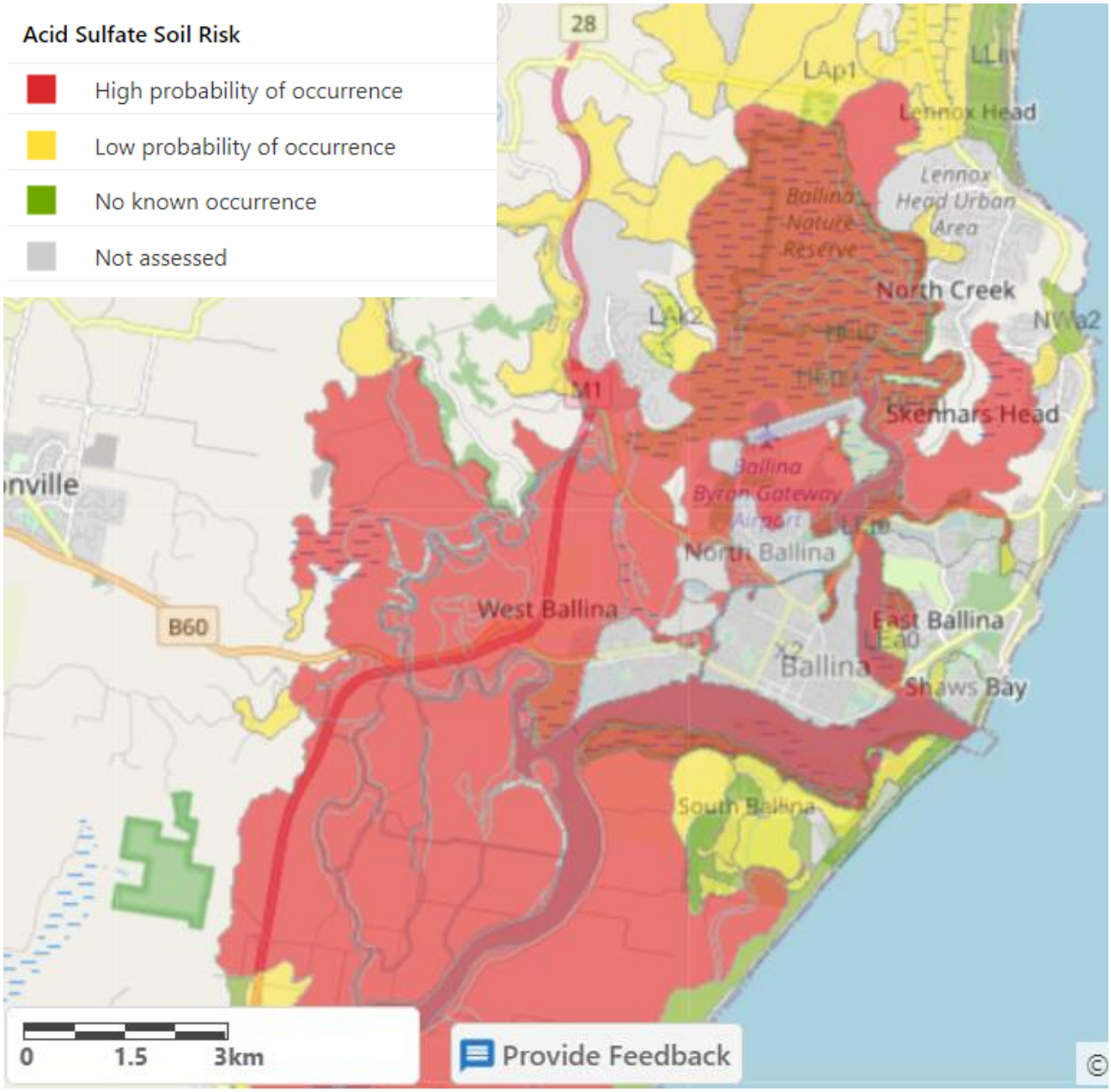


FIGURE 3-10 ASS MAPPING FOR THE STUDY AREA

3.1.5 Cape Byron Marine Park

Cape Byron Marine Park (CBMP) on the NSW far North Coast extends approximately 37 km along the coastline from the Brunswick River entrance the north to Lennox Head in the south – see Figure 3-11. It covers approximately 22,000 hectares of NSW state waters from the mean high-water mark to three nautical miles offshore (DPE 2018).

Local marine habitats include a range of exposed and sheltered sandy beaches, rocky shores, rocky reefs, submerged pinnacles, small rocky islands, coral communities, riverine estuaries, coastal creeks and lakes, and a variety of sandy seabed habitats.

Marine parks play an important role in conservation of our marine life for future generation and provide opportunities for research, education and a great opportunity to improve public appreciation and understanding of the marine environment.

The CBMP is a multiple use marine park with a number of zones designed to conserve environmental values while supporting social, cultural and economic values. The four zone types used in the park are given in Table 3-4 as per DPE (2018).

TABLE 3-4 CBMP MANAGEMENT ZONES

Zone	Total CBMP Area	Description
Sanctuary Zones	(6,118 ha, 27.5 %)	Or "no-take" areas provide the highest level of protection to habitat, animals, plants and areas of cultural significance by prohibiting all forms of fishing and collecting activities, and anchoring on reefs. The installation of structures or alterations to habitat of any type is strictly prohibited without a permit. Activities that do not harm plants, animals and habitats are permitted.
Habitat Protection Zones	(4,271 ha, 19.2%)	Conserve marine biodiversity by protecting habitats and reducing high impact activities. Recreational fishing, some forms of commercial fishing, tourist activities and fishing competitions are permitted in habitat protection zones. Only species listed in Table 1 may be taken from habitat protection zones. The installation of structures or alterations to habitat of any type is strictly prohibited without a permit. Restrictions apply in the following habitat protection zones: Tyagarah Beach (south), East Cape Byron, Mackerel Boulder, Wilsons and Bait Reef, and Lennox Head Boulder Foreshore.
General Use Zones	(11,847 ha, 53.2%)	Provide for a wide range of activities including both commercial and recreational fishing. General use zones complement other marine park zones and provide an integrated approach to the management of the Marine Park. All standard NSW fishing regulations and bag limits apply. However, all forms of setline/ dropline, longline and purse seine net fishing are prohibited in the Marine Park.
Special Purpose Zones	(39 ha, 0.2%)	Five special purpose zones are included in the Marine Park and provide for: management of oyster leases in Marshalls Creek; a boat harbour in the Brunswick River; protection, traditional use and rehabilitation of Belongil Creek and Tallow Creek; and fishing from the board-walk at Lennox Head for people with a disability. Note, the Brunswick River Boat Harbour Special Purpose Zone is the only special purpose zone where fishing is permitted without a Marine Parks permit.

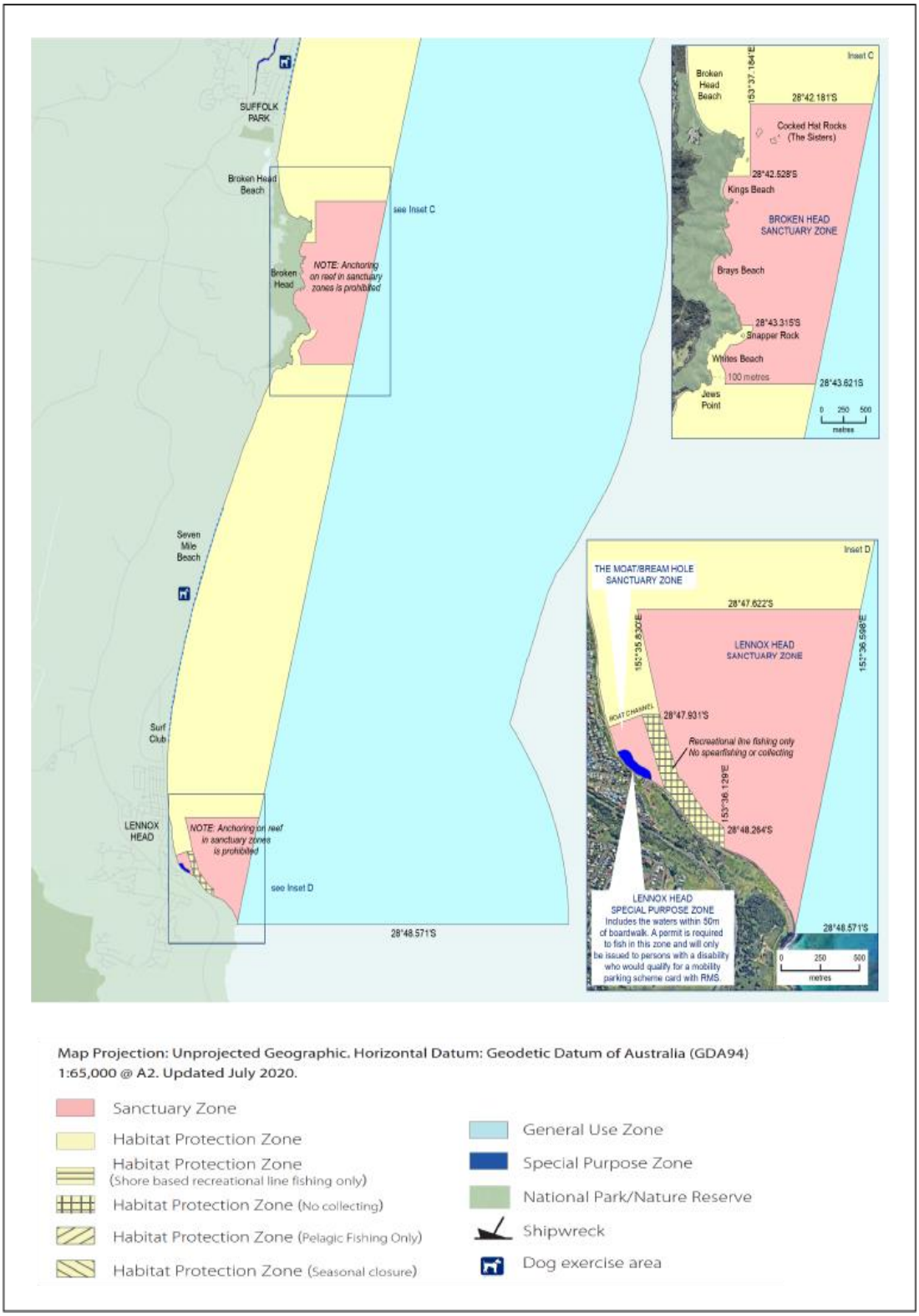


FIGURE 3-11 CAPE BYRON MARINE PARK (MODIFIED, SOURCE DPE)

3.1.6 Coastal Zone Ecology and Biodiversity

Ballina Shire is part of the most biologically diverse region in New South Wales and the third most diverse in Australia (Ballina Shire Council, 2010), which incorporates the sub-tropical and temperate climates, the Macleay-Mcpherson overlap. This unique setting supports a range of ecosystems from coastal heath to littoral rainforest and mangroves on the floodplain to the sub-tropical rainforest. Although these rich and diverse ecological values are very much a part of Ballina Shire, practices of the past approximately 150 years of vegetation clearance, agricultural practices and flood mitigation have had direct or indirect effects, and these could be exacerbated with urbanisation within the study area. The impacts should be carefully managed to curtail future risk to biodiversity of Ballina Shire.

The majority of Ballina Shire lands are classified as a rural, excluding Ballina Nature Reserve (North Ballina), Richmond River Nature Reserve (South Ballina) and other areas classified as National Parks estate. Previous studies such Ballina Coastal Zone Management Plan present details about the dominant vegetation and animals in the terrestrial, estuarine and marine environments with the Ballina Shire coastline.

The coastline has unique flora and fauna associated with each of its coastal landscapes. Terrestrial vegetation is well supported by the soils derived from the basalts which is largely temperate rainforest or sclerophyll forests. The vegetation on the dunes includes coastal tea tree, wattle, she-oak, snappy gum, blackbutt, dwarf red bloodwood, mahogany, and banksia. Dunes and lagoons are surrounded by heath and paperbark swamps. Littoral forest is also found in nutrient rich soils in the study area.

Sandy Beaches and Dune Systems

Sandy beaches help maintain biodiversity and genetic resources supporting food webs, and provide various ecosystems services and can be functional links between the terrestrial and marine environments (Omar Defeo, 2009). Sandy beaches vary spatially and temporally and are moulded by the physical forces that act on them - particularly waves and currents. Within the sandy granules reside a range fauna that are specific to such systems, commonly referred to a benthic fauna. Consequently, the resident benthic faunal communities vary in accordance with the physical forces acting on the beach.

Benthic fauna play a key role in nutrient cycling and mineralisation within the sandy beach ecosystem. These fauna are also influenced by the food availability on the beaches and littoral zones and form an important source for food supply. But the benthic community abundance, richness and biomass vary depending on the beach morphology and this may vary both spatially as well as temporally. Macroinvertebrates find their home in this unstable physical environment. Fauna such Ghost Crabs, polychaetes (worms) and other crustaceans prefer to occupy this wave energy high, sandy areas. However, to date no studies have investigated the faunal composition in the Ballina Shire in detail.

In intertidal areas of sandy beaches, vegetation is important for foraging and nesting purposes for wading birds and sea bird species. Within the coastal areas of study area such as Cape Byron Marine Park, Moator Bream Hole at Lenox Head is a designated Sanctuary zones, including parts of the Seven Mile Beach (GeoLINK, 2007). However, increasing recreational and anthropogenic activities on sandy environment pose a direct threat to the biodiversity. Potential threats within the open coast environment include 4WD, noise and use of beaches by pet dogs, and outfall from sewage treatment plants and stormwater discharges.

Vegetation types on the undulating dunes and sand plains within the study area include heath, banksia filled forest and woodland, coastal and subcoastal grasses or sedge wet heath, littoral rainforest and eucalypt open forest. Behind the foredunes, between Ballina and Evans Head, dunal swamps are present, the largest of which are at Lake Ainsworth, approximately 13 ha (GeoLINK, 2007). *Banksia ericifolia* dominate the drained dune systems while *Leptospermum spp*. assimilates well in the waterlogged areas. Heavily waterlogged soil

is commonly occupied by *Melaleuca spp*. and sedges. Heath scrubs are interjected with eucalypt woodland and forest.

These communities support high diversity of threatened species endemic to these habitats especially wallum froglet (*Crinia tinnula*) bush curlew (*Burhinus grallarius*), swift parrot (*Lathamus discolour*), regent honeyeater (*Xanthomyza Phrygia*) and squirrel glider (*Petaurus norfolcensis*), long-nosed potoroo (*Potorous tridactylus*), ground parrot (*Pezoporus wallicus*) grass owl (*Tyto capensis*) and pygmy planigale (*Planigale maculata*).

A major threat to this habitat is replacement by invasive species; these would alter the habitat's value for native species and have the most deleterious effect in the region. Other weeds on the coastal zone of the north coast region needing attention are the flame lily (*Gloriosa superba*), *asparagus spp*., bird's eye bush (*Ochna serrulata), Ipomoea spp*., umbrella tree (*Schefflera actinophylla*), Senna spp., rambling dock (*Acetosa sagittata*), Singapore daisy (*Sphagneticola trilobata*), painted spurge (*Euphorbia cyathophora*) and Mossman River grass (*Cenchrus echinatus*).

Rocky Shores

The complex geological conditions within Ballina Shire have produced a range of habitats, which include the rocky shores and platform reefs. These platforms not only house macroinvertebrate fauna, but also provide foraging and refuge areas for terrestrial species such as birds, reptiles, insects, invertebrates and small to medium mammals (Ballina Shire Council, 2003). There are eight main rocky shore identified which are listed below

- Ballina Head;
- Black Head;
- Ponton Rocks;
- Sand Point (Flat Rock);
- Whites Head to Skennars Head;
- Rocky Point;
- Shag Rock; and
- Lennox Head.

FIGURE 3-12 ROCK POOLS AT SHELLY BEACH

The Cape Byron Marine Park has extraordinary marine biodiversity. This park extends down from the North wall of the Richmond River and up to 0.72 nautical miles offshore. The reefs of the park are largely dominated by macroalgae, ascidians and sponges and have less than 1% of coral (GeoLINK, 2007). Such reefs support large fish populations and a range of associated marine species. Pollution, anchors of small vessels and overfishing are a direct threat to these ecosystems.

A detail list of the threatened and listed marine species known or likely to occur within the Ballina Shire coastal area is recorded in (GeoLINK, 2007).

Seagrass

Seagrass beds provide a range of ecosystem services such as providing food and habitat for other organisms, nutrient cycling, improving water quality, and stabilisation of sediments. Seagrass meadows are said to support nearly 20% of the world fisheries. All seagrass beds are considered to have very high ecological and conservation values. Sea grass beds are protected under the *Fisheries Management Act 199*4 due to their rapid decline.

The largest seagrass meadows within the study area occur at Mobbs Bay, Shaws Bay, the mouth of Emigrant Creek and near the main channel in the marine delta zone. The most dominant species is *Zostera capriconi;* other species include the Paddle weeds (*Halophila ovalis, H. decipiens*) and Eelgrass (Zostera *Heterozostera) tasmanica*) (GeoLINK, 2007).

Seagrass is absent on the upper reaches of the estuary due water turbidity reflecting the greater infilling of sediments from the lower flood plain and also large amounts of freshwater inflows. Water quality degradation dues to sulfate soils, stormwater runoff from urbanised areas, dredging, sea level rise and storms are some of the major threats to seagrass beds. In the past, dredging activity with the estuary may have directly or indirectly impacted the seagrass beds with the study area (Richmond River Process study (ABER, 2007).

Mangroves and Saltmarsh

Coastal wetlands such as mangroves and saltmarsh provide a home to an incredible array of species, diverse range of habitats and serve as nursery grounds for a range of organisms, especially fishes. They play a major role in sediment formation and stabilisation, nutrient recycling, and shoreline protection. They are also nesting and breeding habitats for fish and shellfish, sea turtles and migratory birds. Estuarine wetland directly or indirectly contributes to an estimated 80% of global fisheries.

The Ballina Nature Reserve in the mid-section of the North Creek comprises large areas (30%- 60% high native canopy cover) of mangroves, swamp sclerophyll forest and saltmarsh communities (Hydrosphere Consulting, 2011). The fluvial delta zones of North Creek may be rich in nutrients while the lower reaches of North Creek and Richmond River, are highly modified due to urban development. Rock walls form a prominent feature as a shoreline protection, and only fragments of intertidal mangrove forest/saltmarsh remain. These are large inter tidal sand shoals which are critical for roosting sites for migratory birds and an important nursery and feeding habitat.

The lower reaches of Emigrant Creek, Mobbs Bay and the southern shoreline channel are fringed with the largest mangroves trees and are in excellent condition (Australia, 2010). The largest mangrove trees occur in the fluvial delta zones of North Creek (including North Creek Canal), Emigrant Creek, Mobbs Bay and the southern shoreline of the Entrance Channel and Fishery Creek (WBM Oceanics, 2006).

FIGURE 3-13 *AVICINNIA MARINA*

Within the study area, there are well established and populations of the Grey Mangrove (*Avicennia marina*) and the River Mangrove (*Aegiceras corniculatum*), and North Creek also comprises the Red Mangrove (*Rhizophora stylosa*), the Black Mangrove (*Lumnitzera sp*), and the Large-Leafed Orange Mangrove (*Bruguiera gymnorhiza*) (WBM Oceanics, 2006).

Invasion by weeds within the mangroves had also been an issue along the North Creek canal. Invading weeds include asparagus fern (*Asparagus aethiopicus*), cassia (Senna pendula var. glabrata), bitou bush (*Chrysanthemoides monilifera*), madeira vine (*Anredera cordifolia*) and lantana (*Lantana camara*).

Increasing presence of Cockspur Coral tree (*Erythrina Christa-galli),* which is noxious weed (See Figure 3-14) has been recorded on Ballina Island and East Ballina foreshore areas. Large areas of the upper Richmond catchment is heavily infested with this weed. It propagates sexually (seeds floating on the water) and asexually (branch fragment regrowth in trees), flooding along Richmond rivers helps the spread and infestation by placing them in tidal swash zone. The Cockspur Coral tree has not previously been considered a high priority weed as it is not a listed as a Noxious Weed under the NSW Noxious Weeds Act 1993 (Ballina Council , 2018) .

FIGURE 3-14 COCKSPUR CORAL TREE (*ERYTHRINA CHRISTA-GALLI*) (SOURCE:NSW WEEDWISE)

The saltmarsh species within the study area include Salt Couch (*Sporobolus virginicus*), Sea rush (*Juncus kraussii*), Seablite (*Suaeda australis*) and Swamp Oak (*Casuarina glauca*). The northern bank of Richmond River reserve on the east of Emigrant creek is a small area of saltmarsh behind or within the mangroves (WBM Oceanics, 2006). *Phragmites australis* grassland has replaced the saltmarsh in some part north of the Creek and Avicennia mangroves in the south.

These sensitive estuarine vegetation communities are impacted by boating, recreational users, propeller and anchor damage, illegal waterfront structures, clearing of mangroves by landowner, and siltation. Russell, (2005) reported new areas of saltmarsh being established in Fishery Creek and Little Fishery Creek, parts in North Creek and near Pelican Island on the south. Loss of mangroves/saltmarsh were noted from North Creek and Pimlico Island (Russell B, 2005). Loss of mangroves is seen largely in the Richmond River.

Changes in coastal wetlands mapping in between 2004 and 2020 is provided in Figure 3-15 below for the lower Richmond River (as sourced from the NSW Estuarine Habitat dashboard. Its shows an increase in Mangrove Habitat from around 750 ha to 900 ha during this time. It shows that during this period seagrass are (Zostera) decreased from 32 ha to 29 ha, and saltmarsh increased from around 70 ha to 100 ha.

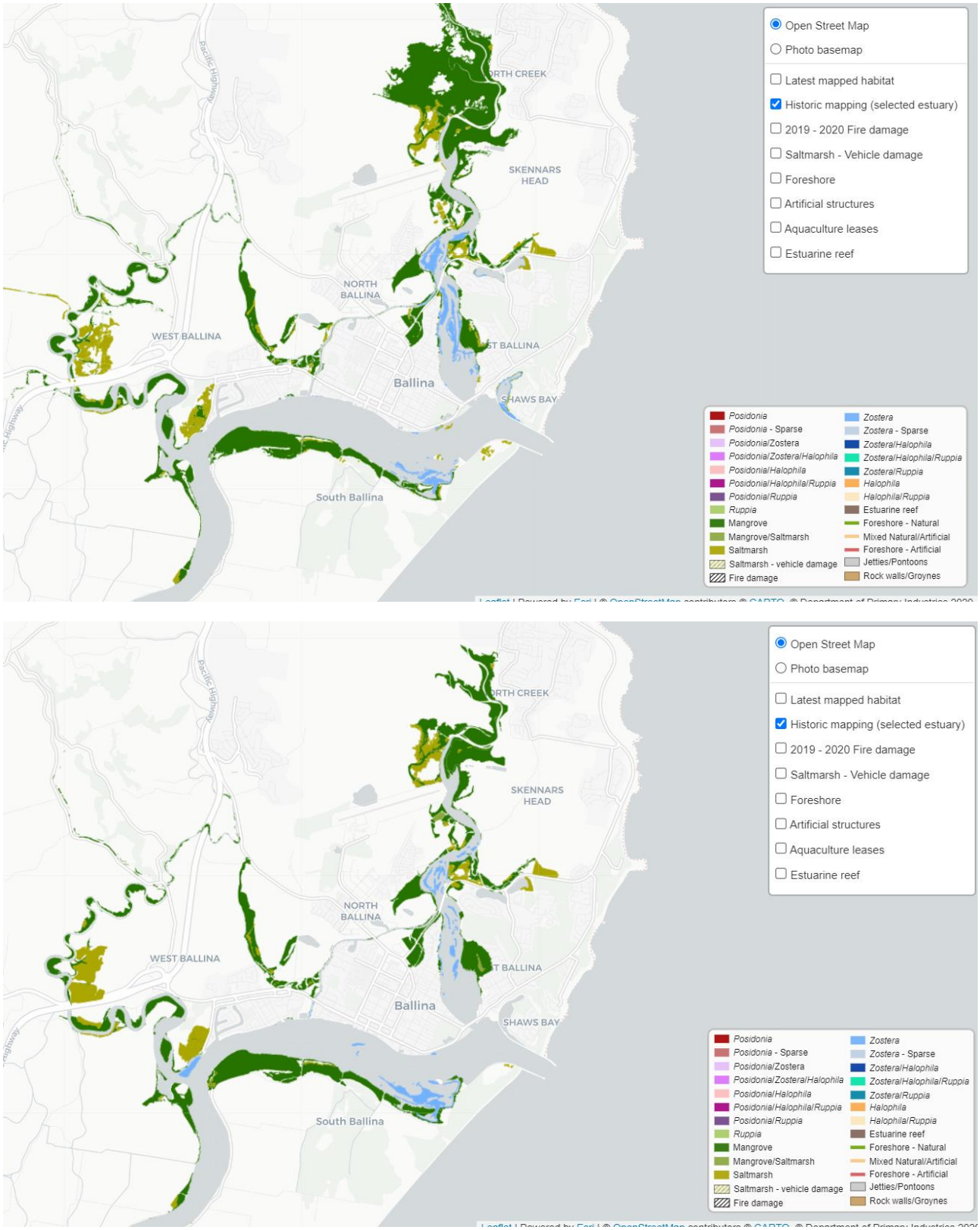


FIGURE 3-15 CHANGES IN COASTAL WETLAND HABITAT IN BETWEEN 2004 (TOP) AND 2020 (BOTTOM). SOURCE: NSW ESTUARINE HABITAT DASHBOARD

Oyster Reefs

The Sydney rock oyster is grown and harvested within the Richmond River. Commercial production records for the Richmond River extend back to the 1930's. Currently there are ten commercial oyster leases that occupy approximately 20 ha of waterway area (ABER, 2007) – and approximately 6 of these are located in the downstream reaches within the CMP study area.

The Richmond River estuary is presently being classified by the NSW Food Authority as part of the Shellfish Quality Assurance Program (SQAP). Water quality concerns in North Creek are likely to prevent harvesting from this area in the future. QX disease is present and active within the estuary and was cited for causing a 70% oyster mortality in the late 2000's.

Littoral Rainforest

The study area contains a number of areas mapped in the CM SEPP as Littoral Rainforest (see Figure 5-3), which on the North Coast, Littoral Rainforest is commonly accepted to comprise an alliance between the Riberry (*Syzygium leuhmannii*) and Blush Satinash (*Acmena hemilampra*) (Ballina Shire Council, 2010). However, at Lennox Head and Ballina, Littoral Rainforest comprises an alliance between Guioa (*Guioa semiglauca*) and Tuckeroo (*Cupaniopsis anacardiodes*). Many other tree species also occur, including species which are also identified as threatened themselves. These include Scented Acronychia (*Acronychia littoralis*), Coastal Fontainea (*Fontainea oraria*), and Rough-leaved Queensland Nut (*Macadamia tetraphyalla*)

3.1.7 Climate Change

As originally recognised as a key goal by the NSW Coastal Policy 1997, management of the coasts requires recognition and accommodation for climate change. Climate change will have a long term and lasting impact on the welfare of NSW (Adapt NSW, 2019).

Mean sea level rise will pose a serious risk to coastal communities due to inundation and erosion. Between 1993 and 2009, the rate of global sea-level rise was estimated to be 3.2 ± 0.4 mm/year (Church & White, 2011). The IPCC Sixth Assessment Report (AR6) outlines regional sea level rise (SLR) projections for a range of future emissions scenarios. SLR projections for the north coast of NSW are provided below in Table 3-5. Under the very high future emissions scenarios local sea level could rise between 0.63 to 1.10 m by 2100.

TABLE 3-5 IPCC AR6 SLR SCENARIOS. BEST ESTIMATE (AND RANGE)

Year	SSP1-2.6	SSP2-4.5	SSP3-7.0	SSP5-8.5
Emissions >	**Low**	**Intermediate**	**High**	**Very High**
2030	0.10 (0.07, 0.14)	0.10 (0.07, 0.14)	0.10 (0.07, 0.13)	0.11 (0.07, 0.14)
2050	0.19 (0.14, 0.27)	0.21 (0.16, 0.29)	0.23 (0.17, 0.30)	0.25 (0.19, 0.32)
2070	0.30 (0.19, 0.41)	0.34 (0.21, 0.47)	0.39 (0.27, 0.51)	0.43 (0.29, 0.57)
2100	0.45 (0.31, 0.65)	0.57 (0.43, 0.80)	0.72 (0.55, 0.97)	0.82 (0.63, 1.10)

In these circumstances, built infrastructure may be potentially at risk, including drainage pathways, abutments, and adjoining roadways. Undeveloped shorelines may be equally vulnerable, with potential significant ecological implications (Glamore, Rayner, & Rahman, 2016).

In terms of inundation, impacts are likely to include the following:

- **Tidal Inundation:** As sea level rise increases it is expected that the frequency and severity of tidal inundation (also referred to as "sunny day flooding") will increase over time. This may lead to the progressive drowning of intertidal environments and freshwater habitats and increase the rate of landward displacement of estuarine shorelines and riparian ecosystems.

- **Estuarine Flooding:** With warmer weather, the storms and rainfall events are predicted to become increasingly intense in both the near and far future (IPCC, 2014). Combined with sea level rise, this will have major implications for the severity of flooding in the estuaries. Typically, closed Intermittently Closed and Open Lakes and Lagoons (ICOLLs) are predicted to have an increase in available water storage volume with the lagoon and creek as the berm height increases in response to sea level rise, increasing the potential for inundation of the estuary fringe as natural entrance breakouts are reduced.

The study area will experience broader impacts, as well as specific local impacts, many of which are inter-related. These are summarised in Figure 3-16 and described below.

- **Estuarine Hydrodynamics:** The resultant changes to tidal hydrodynamics from sea-level rise are likely to influence the water quality and mixing processes of estuaries. Sea-level rise will likely propagate tides and saline water further upstream when the entrance is open, resulting in an increase in the extent of saltwater intrusion. Increased salinity may impact inland soils, freshwater and groundwater resources and nutrient retention (Glamore, Rayner, & Rahman, 2016). Changes in the tidal prism and tidal velocities will also increase the susceptibility of the estuarine foreshores to erosion and influence water quality and geomorphology. Furthermore, variations in rainfall patterns are likely to have a far-reaching impact on the estuary systems, as freshwater flow is a large source of physical variability in the system.
- **Ocean and Estuarine Impacts**: In addition to sea level rise, climate change is expected to result in changes to the water quality (temperature, salinity, turbidity, suspended solids) and chemistry (oxygen, nutrients, pH and alkalinity, Chlorophyll-a) of coastal and estuarine systems. This includes ocean acidification and the impacts of warmer oceans on soft coral and fisheries (Adapt NSW, 2019).
- **Coastal water temperatures**: A recent study has found that estuaries along the NSW coast are warming very rapidly, with average temperatures increasing more than 2 degrees celsius over the past 12 years, which has been accompanied by acidification (Scanes, Scanes, & Ross, 2020). Small coastal estuaries are acidifying and warming the fastest compared to other estuary types. As the study area lies at the boundary between temperate and tropical habitats, the region is also expected to experience a tropicalisation of both marine and coastal environments, as the extent of flora and fauna extends south with the warming climate.
- **Biodiversity:** This can be impacted by increasing air and ocean temperatures, rising sea level, change in ocean chemistry (i.e., due to ocean acidification), and decreasing water quality. In particular, coastal wetlands are particularly sensitive to climate change. These systems are usually unable to migrate inland as the shoreline recedes under sea level rise (as they become squeezed by the presence of existing infrastructure), and are subject to threats caused by changes in the hydrologic and climate regimes.

A summary of projected climate change impacts as supplied by NSW Adapt is provided in Figure 3-16.

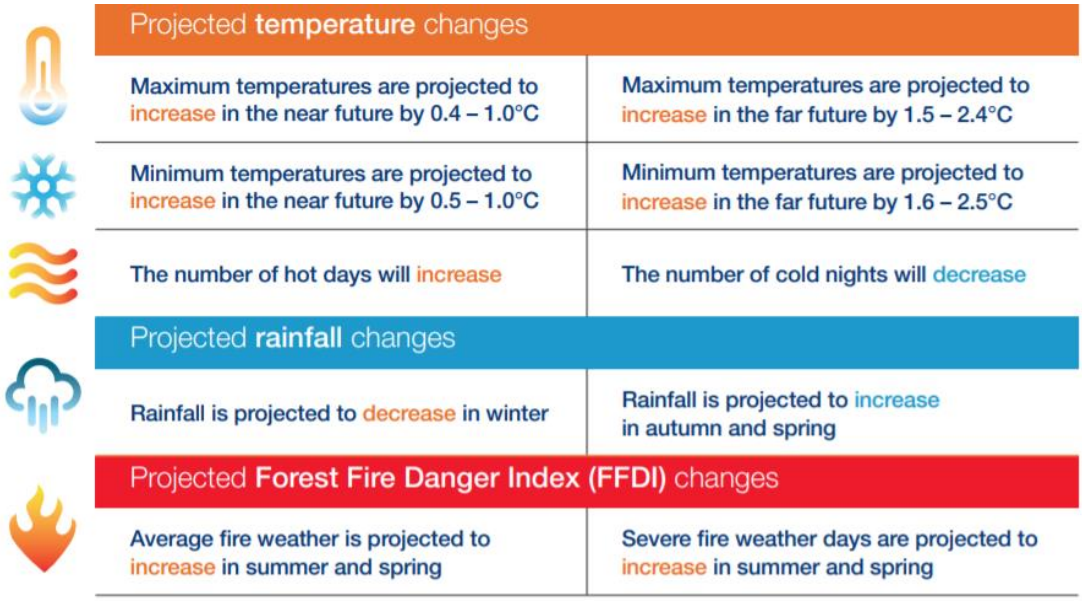


FIGURE 3-16 PROJECTED COASTAL CLIMATE CHANGE IMPACTS FOR THE NORTH COAST REGION (SOURCE: NSWADAPT, 2019)

3.2 Governance Context

One of the objectives of the CMP is to facilitate the integration of management responsibilities across the study area. In order to develop a robust CMP that achieves its intended objectives now and into the future, it will be necessary to have an in-depth understanding of historical management arrangements for the Ballina Shire lower estuary and open coast, including the roles and responsibilities of the various agencies managing the different areas of the system.

The current governance of the system is multi-layered, with the catchments, foreshores, and waterways of the study area (and associated assets) owned and managed by a number of stakeholders across multiple levels of government. Maps depicting land tenure across the study area are provided in Figure 3-17 and Figure 3-18 – as per data sourced from the NSW Government Spatial Services Portal (NSW Government, 2021).

A proposed governance structure for the CMP is provided in Section 9.

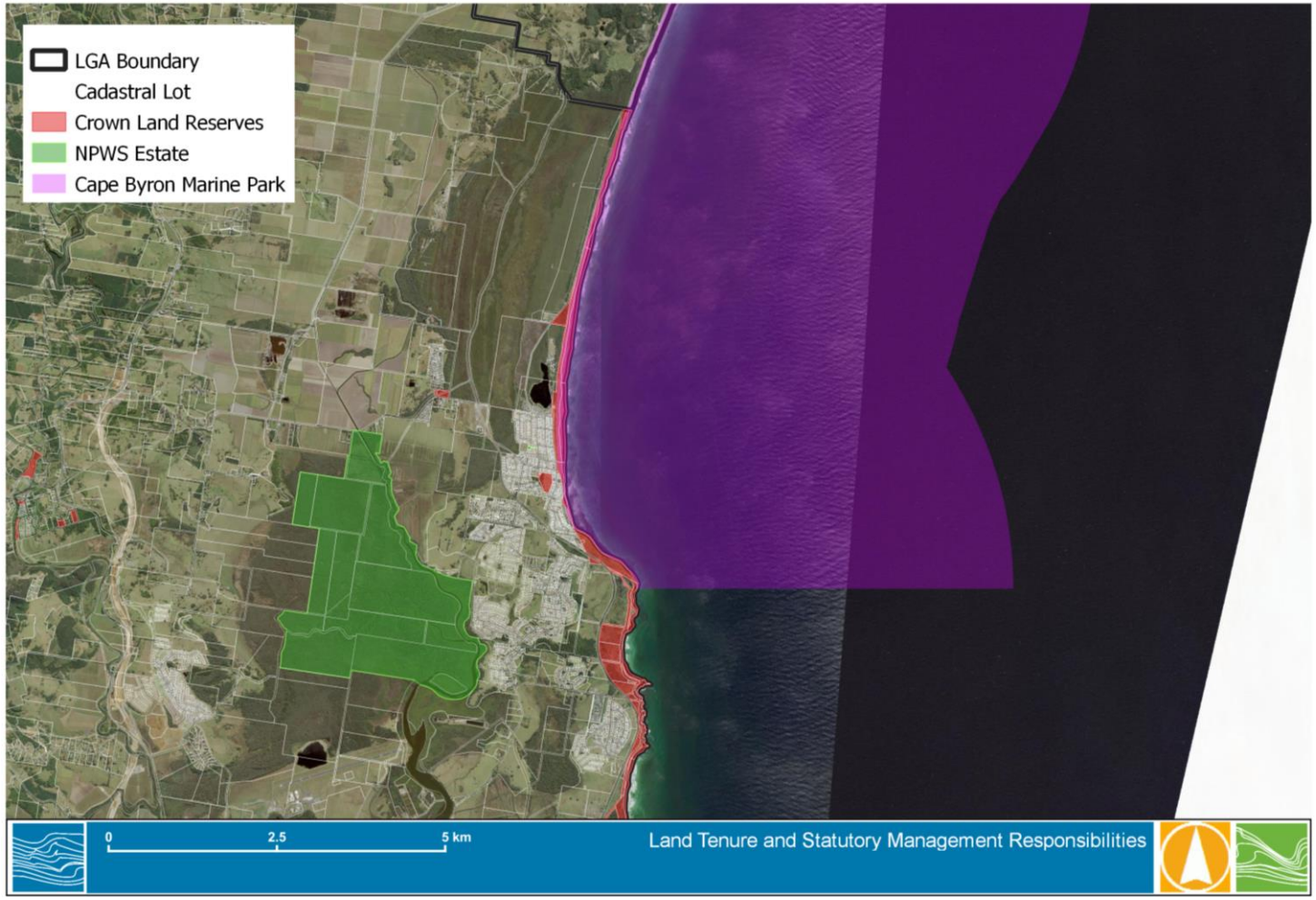


FIGURE 3-17 LAND TENURE AND STATUTORY MANAGEMENT RESPONSIBILITIES – NORTHERN LGA

FIGURE 3-18 LAND TENURE AND STATUTORY MANAGEMENT RESPONSIBILITIES – SOUTHERN LGA

3.2.1 Local Government

Ballina Shire Council has a central role in managing the waterways, foreshore and catchment of the study area estuaries. Council is responsible for preparation of a suite of CMPs that set out the long-term strategy for management of the coastal zone in its LGA.

An overview of the range of council roles and responsibilities as they relate to the CMP is provided in Table 3-6 below. Council responsibilities generally relate to management of catchment and estuarine issues, coastal zone land and assets, and strategic planning.

TABLE 3-6 OVERVIEW OF ROLES AND RESPONSIBILITIES OF COUNCIL ACROSS THE STUDY AREA

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	▪ 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

Council is largely responsible for the management of estuarine and catchment assets that include estuary infrastructure (such as boat ramps and seawalls), stormwater and drainage infrastructure, open space assets and foreshore and estuary access points.

Council also manages a range of issues across the study area including cultural heritage, community events, recreational use of the estuaries and foreshore, estuary and floodplain management, and flora and fauna protection and conservation. Council also undertakes water quality monitoring, as described in Section 6.4.

Council is responsible for development planning and controls across the LGA. The objective of its development planning and controls is to achieve development that is consistent with the social, economic and environmental values of the estuaries and their catchments - and to manage the cumulative impact of development in a sustainable manner.

3.2.2 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 four (4) separate government departments (or clusters). These agencies and their position within the wider NSW state government organisational structure are depicted in Figure 3-19. 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.

Many of the NSW government stakeholders for the CMP sit within the *NSW Department of Planning and Environment* (DPE) cluster. However, there are also a number of other state government agencies and organisations outside of this department that share management and planning responsibilities across the catchment system - including those from Transport for NSW (TfNSW), the Department of Regional NSW, and the Department of Community Services and Justice. A number of state-owned statutory corporations are also active across the study area.

The *NSW Coastal Council* provides independent expert advice to the Minister administering the CM Act on coastal planning and management issues, when requested by the Minister to do so. The Council was appointed under the CM Act, and replaced the NSW Coastal Panel and the Coastal Expert Panel. The Minister can request the NSW Coastal Council to audit a local council's implementation of its coastal management program to determine if it is being effectively implemented.

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. The Authority brings together the heads of the NSW government agencies with key marine estate responsibilities – including DPE (Planning, E&H), DPI-Fisheries, and TfNSW (MEMA, 2019).

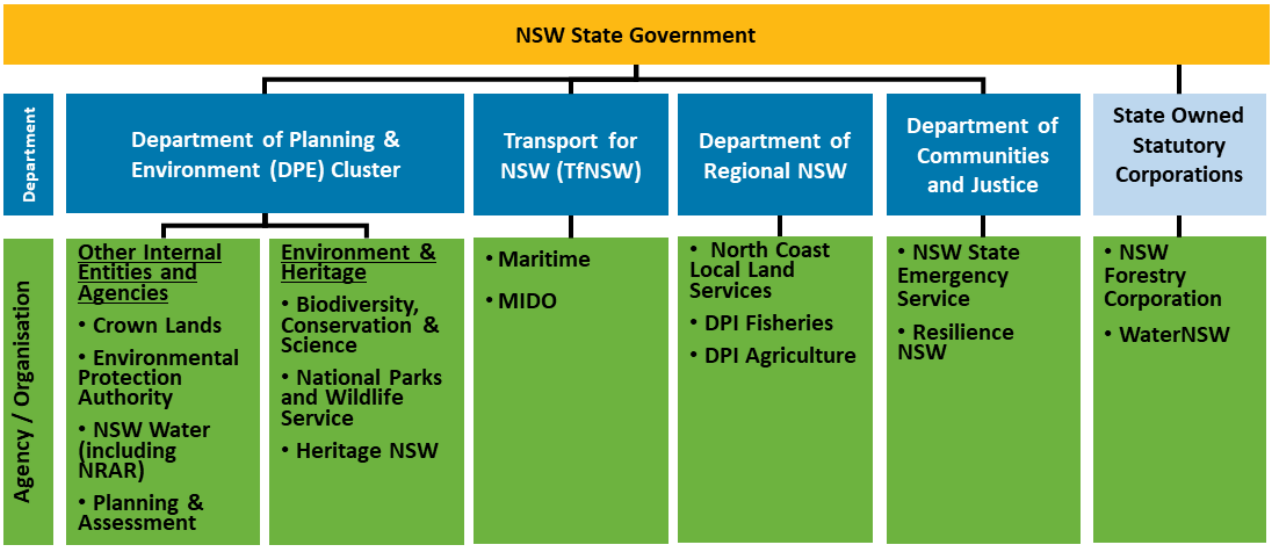


FIGURE 3-19 NSW STATE GOVERNMENT AGENCIES RELEVANT TO THE CMP

The NSW Department of Planning and Environment Cluster

Many of these CMP stakeholder organisations are positioned within DPE, and their responsibilities across the study area relate to land and asset management, issues management, and planning and assessment. Within DPE, the *Environment and Heritage Group* (E&H), has absorbed the responsibilities of the former Office of Environment and Heritage (OEH). DPE (E&H) is responsible for administering the CM Act, and provides oversight of the State's coastal management program. Within the DPE (E&H) 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.

DPE - *Crown Lands* (Crown Lands) is responsible for the administration and/ or management of Crown land under the *Crown Land Management Act 2016*. Crown land includes submerged Crown land, seabed and subsoil to three nautical miles from the coastline of NSW that is within the limits of the coastal waters of the State. Crown land includes much of the submerged land and intertidal areas (below mean high water mark) of the estuaries, as well as several foreshore reserves and beaches.

Within the DPE (E&H) organisation structure, lies the *NSW National Parks and Wildlife Service* (NPWS) – which is responsible for management of the *National Parks and Wildlife Act 1974* and management of national parks and reserves across the study area – including Richmond River, Ballina, and the Broken Head Nature Reserves. NPWS responsibilities across the areas involves a wide range of activities, including active conservation and habitat protection, fire management, management of tourism and visitation, research, and education. It is also responsible for management and protection of Aboriginal cultural heritage and European heritage across its land tenure.

The NSW Environment Protection Authority (EPA) is the primary environmental regulator for New South Wales, and Council holds a number of environment protection licences (EPLs) 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. The storage, use and disposal of pesticides in NSW is administered and enforced by the EPA with oversight of the NSW Environment Minister.

The DPE *Planning and Assessment Group* (DPE – Planning) has a role to assess and determine proposals for development, including state significant projects, to ensure the need for new jobs is balanced with the needs of communities and the environment, and that major developments, infrastructure and industrial sites meet strict conditions. It also has a role in coastal policy and implementation, and Council may need to liaise with this group if it intends to amend any of the CM SEPP Mapping of Coastal Management Areas through a planning proposal.

The Department of Regional NSW

In April 2020, the NSW Government established the Department of Regional NSW. The department was formed to bring together the divisions of Primary Industries, Local Land Services, Resources and Geoscience to form a central agency dedicated to regional issues.

Department of Primary Industries - Fisheries (DPI-Fisheries) is responsible for administering the *Fisheries Management Act 1994* and ensure 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. Fisheries also administer the *Marine Estate Management Act* in coordination with the NSW Marine Estate Management Authority (MEMA). Fisheries is also responsible for the management of the Cape Byron Marine Park, which extends as far south as Pat Morton Lookout and includes the beach area to the mean high tide mark. – see Section 3.1.5.

The Department of Primary Industries – Agriculture (DPI-Agriculture) is responsible for increasing the productivity and resilience of the agricultural sector in NSW. It does this through agricultural productivity research across livestock, plants and natural resource management areas, as well as providing education and training.

North Coast Local Land Services (NCLLS) was established under the *Local Land Services Act 2013* to provide agricultural production advice, biosecurity, natural resource management and emergency management

functions cross the North Coast region (LLS, 2016). NCLLS 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 (LLS, 2016). NCLLS also delivers grant and funding programs to support natural resource management and sustainable agriculture activities. The NCLLS region extends from Tweed Shire Council in the north to Port Macquarie-Hastings Council in the south.

Transport for NSW

The Transport cluster comprises TfNSW and an extended network of other 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 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 councils).

The Maritime Infrastructure Delivery Office (MIDO) sits within Maritime and is a joint initiative between the former agencies of Roads and Maritime Services and the Department of Industry to improve the coordination and delivery of coastal and boating infrastructure programs and projects across NSW that support recreational boating, fishing, tourism and a range of other commercial activities. The MIDO is responsible for delivering key projects and programs including TfNSW's Boating Now Program, DPE's Coastal Infrastructure Program, Boating Access Dredging Program and a number of major projects including the La Perouse to Kurnell Ferry Wharf and Eden Safe Harbour projects.

NSW Department of Community Services and Justice

The NSW State Emergency Service major responsibilities are for provision of emergency and rescue during times of natural hazard emergencies and disasters - including flooding, storms (including storm tide and severe erosion events), and tsunami events.

Resilience NSW (formerly the NSW Office of Emergency Management) leads, coordinates and develops capability in the emergency management sector, and conducts state-wide welfare and recovery operations when disaster strikes (OEM, 2019).

3.2.3 Federal Government

Federal government roles and responsibilities are relatively minimal in the CMP. Across the study area, a major agency is the federal *Department of Agriculture, Water and Environment* (DAWE) which is responsible for development and implementation of national policies and programs to support agriculture, fisheries, and food industries and the productive management of rivers and water resources.

DAWE is the also Commonwealth Government's managing authority for the Solitary Islands Marine Reserve (Commonwealth waters). However, the entire protected area is managed as far as possible as a single entity by the NSW DPI - Fisheries.

Australian government Federal funding opportunities are also available to assist farmers, landholders, Aboriginal communities and other community groups through the Local Land Services, NSW. The funding is

intended to promote sustainable land management and environmental programs to positively influence biodiversity, economic and social outcomes. The project can vary from pest and weed control, river protection, erosion management, sustainable agriculture, habitat establishment, Aboriginal cultural site identification and protection and others (https://www.lls.nsw.gov.au). The Federal Government is also responsible for administering the *Environment Protection and Biodiversity Conservation Act, 1999* as it relates to various federally listed threated species and ecological communities occurring within the study area.

3.2.4 Non-governmental Organisations

There are a number of other non-governmental organisations (NGOs) that operate across the study area. These organisations include local aboriginal land councils (LALCs), educational institutions, industry groups, landcare and bushcare groups, and community and resident groups and businesses.

Jali Local Aboriginal Land Council (JLALC) have a degree of governance and interface with Council, as well as the various State and Federal Government bodies. LALCs have a right to be informed and involved 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 JLALC aims to achieve long term economic and social solutions for the indigenous communities, and to conserve and maintain cultural and heritage land management.

Ballina Coast Care and Lennox Head Landcare are not for profit community organisations acting under the parent group of Richmond Landcare. It is dedicated to restoration and management of the Ballina Coastal Reserve. It conducts regular working bees on weekday mornings and once a month on a Sunday. It assists members and the general public with their natural resource management activities, and pursues funding assistance for projects, practical assistance, and education and training across the study area.

OzFish Unlimited is a not-for-profit organisation dedicated to protect and restore fish habitat and support recreational fishers in these actions. They partner with fishers and the broader community to invest time and money into the protection and restoration of our waterways, counteracting decades of degradation. Through collaboration with the local fishermen in Ballina Harbour and lower Richmond, they have completed projects such as ‘A Taste of The Richmond’, ‘Gone Fishing Day’, and ‘Restoring lost wild oyster reef will add significant habitat to several key finfish species in the estuarine area of the lower Richmond’

3.3 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, and summarised in Table 3-7.

3.3.1 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 (DPE, 2019a).

The CM Act defines the coastal zone, comprising four coastal management areas:

- Coastal wetlands and littoral rainforests area
- Coastal vulnerability area
- Coastal environment area
- Coastal use area.

The CM Act establishes management objectives specific to each of these management areas, reflecting their different values to coastal communities.

3.3.2 State Environmental Planning Policy (Coastal Management) 2018

State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP) 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 CM 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.

State-wide mapping that accompanies the CM 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.

As of March 2022, the CM SEPP has been rolled into Chapter 2 of the new State Environmental Planning Policy (Resilience and Hazards) 2021. The SEPP consolidation is administrative, and does not change the legal effect of the existing SEPPs, with section 30A of the *Interpretation Act 1987* applying to the transferred provisions. For clarity, these provisions are still referred to as the CM SEPP in this document.

3.3.3 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 objective of the MEM Act is to provide for strategic and integrated management of the NSW marine estate, including the marine waters, coasts and estuaries. The key legislative instruments under the act include:

- Marine Estate Management Regulation 2017;
- Marine Estate Management (Management Rules) Regulation 1999; and,
- Aquatic Reserves Notification 2015.

It should be noted that one of the objectives of the CM Act (and of the CMP) is to support the objectives of the MEM Act 2014.

3.3.4 Other Related Legislation

A brief overview of the additional relevant legislation summarised in Table 3-7.

TABLE 3-7 RELEVANT LEGISLATION

Legislation	Abbrev.	Administered By	Summary
Commonwealth			
Environment Protection and Biodiversity Conservation Act 1999	EPB&C Act	Department of Environment and Energy	The Act is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. Commonwealth marine areas are matters of national environmental significance under the Act.
Native Title Act 1993	NT Act	Department of Attorney General Minister for Indigenous Affairs	The Act establishes a framework for the protection and recognition of native title, and enables DPE to enter into indigenous land-use agreements. The parts of the Native Title Act 1993 relating to native title representative bodies and prescribed bodies corporate are administered by the Minister for Indigenous Affairs.
State (NSW)			
Aboriginal Land Rights Act 1983	ALR Act	Minister for Aboriginal Affairs NSWALC DPE (Crown Lands)	The purpose of this Act is to provide land rights for Aboriginal persons in NSW, and to provide for representative Aboriginal Land Councils. The Act makes provision for claimable Crown lands and other dealings by Local Aboriginal Land Councils (LALC). It also provides for agreements to permit hunting, fishing and gathering by Aboriginal groups or persons. It is administered by the Minister for Aboriginal Affairs, but allocates roles, responsibilities and powers to The NSW Aboriginal Land Council (NSWALC) and DPE (Crown Lands). It should be noted that there may be a number of incomplete claims under the ALR Act that have been lodged on Crown land within the study area.
Biodiversity Conservation Act 2016	BC Act	DPE	The Act stipulates how development activities on land are regulated and how the impacts of these activities on the natural environment are managed. It is intended to conserve biological diversity and promote ecologically sustainable development.
Biosecurity Act 2015	BIO Act	LLS	The *Biosecurity Act 2015* came into effect on 1 July 2017. It aims to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants.
Crown Land Management Act 2016	CLM Act	DPE (Crown Lands)	The Act requires that environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown land.
Environmental Planning & Assessment Act 1979	EP&A Act	DPE Council	The act requires relevant planning authorities to take into consideration the impacts to the environment (both natural and built) and the community of proposed development or land-use change.

Legislation	Abbrev.	Administered By	Summary
Fisheries Management Act 1994	Fisheries Act	DPI-Fisheries	The objects of this Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations.
Heritage Act 1977	Heritage Act	DPE (Environment)	The Act provides for the conservation of environmental heritage items in NSW. It is intended to promote understanding and conservation of the state's heritage and provide for identifying and registering items of state heritage significance. The Act is complemented by the Heritage Regulation 2012.
Local Government Act 1993	LG Act	DPE (Planning)	The Act provides the legal framework for the system of local government for New South Wales, and sets out the responsibilities and powers of councils, councillors and other persons and bodies that constitute the system of local government. DPE administers Part 2A of Chapter 6 of the Act, which allows councils to make environmental upgrade agreements with development proponents. The Act is complemented by Local Government (General) Regulation 2005.
Local Land Service Act 2013	LLS Act	LLS	The objective of the Act is to guide the management and delivery of local land services in the social, economic and environmental interests of the State. The Local Land Service Act 2013 requires the development of regional strategies to set the vision, priorities and strategy for the delivery of local land services in each region. The act is also the main piece of legislation for managing and protecting native vegetation.
Marine Safety Act 1998	MS Act	TfNSW	The purpose of the MS Act is to provide an effective framework for the enforcement of marine legislation, and is administered by TfNSW. The objects of the Act are to ensure the safe and responsible operation of vessels in ports and other waterways, so as to protect the safety and amenity of other users of those waters and the amenity of occupiers of adjoining land. It also aims to provide for the investigation of marine accidents and for appropriate action following any such investigation.
National Parks and Wildlife Act 1974	NPW Act	DPE (NPWS)	The Act provides for the management of National Parks reserve land, including the conservation of nature, including habitat, ecosystems and heritage. It is the main piece of legislation for managing and protecting Aboriginal cultural heritage in NSW. The NPW Act is complemented by the National Parks and Wildlife Regulation 2009.
Natural Resources Commission Act 2003	NRC Act	DPE (Planning)	The Act established The Natural Resources Commission - an independent body with broad investigating and reporting functions for the purposes of establishing a sound evidence basis for the properly informed management of natural resources in the social, economic and environmental interests of the State.

Legislation	Abbrev.	Administered By	Summary
Protection of the Environment Operations Act 1997	POEO Act	DPE (EPA)	The key piece of environment protection legislation administered by the EPA. The object of the Act is to achieve the protection, restoration and enhancement of the quality of the NSW environment.
Rural Fires Act 1997	RF Act	NSW RFS Local Councils	The purpose of the is to facilitate the co-ordination of bush fire fighting and bush fire prevention throughout the State. It is intended to enhance the protection of infrastructure and environmental, economic, cultural, agricultural and community assets from damage arising from fires.
State Emergency Service Act 1989	SES Act	Department of Community Services	The Act defines the functions on the NSW State Emergency Service.
Water Management Act 2000	WM Act	DPE Water NSW	The object of the Act is the sustainable and integrated management of the state's water for the benefit of both present and future generations. The act is supported by the Water Management (General) Regulation 2018.
Water NSW Act 2014	Water Act	DPE Water NSW	The object of the Act to ensure that declared catchment areas and water management works in such areas are managed and protected so as to promote water quality, the protection of public health and public safety, and the protection of the environment. The act is supported by the Water NSW Regulation 2013

3.4 Management and Planning Context

A number of coastal and estuary management plans guide management of the Ballina LGA. Furthermore, there exist a number of planning instruments relevant to the broader governance arrangements of study area. These include:

- National / Federal Plans;
- State Level Plans;
- Regional Level Plans; and
- Local Level Plans.

A brief overview of these plans is provided below.

3.4.1 Coastal and Estuary Management Plans

Over the years, several coastal management studies and plans have been developed for the various estuaries of the study area. These have been prepared in various forms, including Coastal Zone Management Plans (CZMPs) and Estuary Management Plans (EMPs). The most relevant, currently adopted studies and management plans are listed in Table 3-9. Further detail regarding the content and implementation of these plans is provided in provided in Section 6.

TABLE 3-8 EXISTING COASTAL AND ESTUARY MANAGEMENT PLANS

Plan	Author	Year	Status
Ballina Shire Coastline Coastal Zone Management Plan	BMT WBM	2016	Complete, not certified
Shaws Bay, Ballina Coastal Zone Management Plan	Hydrosphere	2015	Certified in 2015
Richmond River Estuary Coastal Zone Management Plan	Hydrosphere	2011	Certified in 2012

3.4.2 Flood Risk Management Studies and Plans

There have been a number of studies developed recently to facilitate managing flood risk across Ballina Shire and the lower Richmond River Area. These have been developed through the Ballina Floodplain Risk Management Plan – in line with the NSW Floodplain Risk Management process. The relevant studies and plans include:

- The Ballina Flood Study Update (BMT WBM, 2008)
- Ballina Floodplain Risk Management Study (BMT WBM, 2012)
- Ballina Floodplain Risk Management Plan (BMT WBM, 2015)
- Ballina Island and West Ballina Overland Flood Study and Flood Protection Feasibility Study and Plan (GHD, 2021)

The area covered by the Plan includes the extent of the Richmond River floodplain from Empire Vale in the south to Ross Lane in the north. The major tributaries of North Creek, Maguires Creek and Emigrant Creek are included in the study area, because flooding across Ballina's urban area is influenced by these creeks as well as the Richmond River itself.

3.4.3 National / Federal Plans and Strategies

The National Water Quality Management Strategy (NWQMS) is a federal strategy to protect the nation's water resources through maintaining and improving water quality, while supporting dependent aquatic and terrestrial ecosystems, agricultural and urban communities, and industry (Australian Government, 2018). The purpose of the NWQMS is to develop a nationally coordinated framework (supported by all Australian governments) to facilitate water quality management. The objectives of the strategy are to ensure the productive and sustainable use of Australia's water resources, and to protect community values such as aquatic ecosystems. The CMP will need to ensure broad alignment with the objectives and guidelines of the NWQMS.

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ, 2000) provide authoritative guidance on the management of water quality in Australia and New Zealand and provide a platform for consistent water quality management and planning across the nation. The National Water Quality Management Framework established as part of the guidelines sets out key requirements for long-term management strategies of riverine and estuarine water quality. The framework includes ten (10) steps that relate directly to water/sediment quality decisions and actions, and expands on the approach described in the National Water Quality Management Strategy charter.

3.4.4 State Level Plans

The *NSW State Plan 2021* is a 10-year plan that establishes the vision for state planning and outlines the framework to achieve the state's economic, health, transport, infrastructure and the environmental goals. The overarching goals and objectives of the plan provide direction for the development and implementation of the various regional and local plans and strategies outlined in Section 3.4.5 and 3.4.6 respectively.

The NSW Marine Estate Management Strategy 2018-2028 (MEMA, 2018) provides an overarching, strategic approach to the coordination and management of the marine estate through to 2028. It sets the overarching framework for the NSW Government to coordinate management of the marine estate over the next decade in accordance with the objects of the MEM Act 2014 and the NSW Government's vision for the marine estate (MEMA, 2018). The Strategy responds to the priority threats to water quality, habitats and biodiversity of the State's coastal waters and estuaries that were identified in the NSW Marine Estate Threat and Risk Assessment (TARA) (BMT WBM, 2017). The management of priority threats is grouped into nine (9) management initiatives that summarise the objectives, benefits, threats, stressors and proposed management actions. These initiatives comprise:

- Improving water quality and reducing litter
- Delivering healthy coastal habitats with sustainable use and development
- Planning for climate change
- Protecting the Aboriginal cultural values of the marine estate
- Reducing impacts on threatened and protected species
- Ensuring sustainable fishing and aquaculture
- Enabling safe and sustainable boating
- Enhancing social, cultural and economic benefits
- Delivering effective governance.

An implementation plan (developed by the Authority's member agencies in consultation with key stakeholders) articulates the management actions in more detail. Coastal Management Programs are one of the key delivery mechanisms for the NSW Marine Estate Management Strategy (MEMS).

Progress towards implementing the MEMS and delivering its vision is measured and reported through the *NSW Marine Integrated Monitoring Program* (MIMP). The MIMP sets out a high-level approach for assessing progress against outcomes that management actions are expected to collectively achieve. Indicators will be used to provide quantifiable metrics for tracking performance towards outcomes (Aither, 2019). It is intended to guide monitoring, evaluation and reporting activities over the life of the MEMS. As per Aither (2019), the MIMP has three key purposes to:

- Monitor the condition and trend of environmental assets and community benefits to inform a five-year health check;
- Evaluate the effectiveness of management initiatives and actions that aim to reduce priority threats and risks; and
- Fill knowledge gaps that were identified as part of the state-wide TARA process.

As part of the MIMP, an integrated monitoring and evaluation framework has been developed to assess the effectiveness of the Strategy in reducing priority threats and risks (point 2 above). This Framework was developed in collaboration with Marine Estate Management Authority agencies and the Marine Estate Expert Knowledge Panel (MEMA, 2019).

Recently, DPE has developed the *Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions* (OEH, 2017). This framework presents a structured approach that decision-makers, such as councils and environmental regulators, can use to help manage the impact of land-use activities on the health of waterways in New South Wales. The framework brings together existing principles and guidelines recommended in the National Water Quality Management Strategy and allows decision-makers to determine management responses that meet waterway health outcomes - and reflect the community's environmental values and uses of waterways (OEH, 2017).

The NSW Water Quality and River Flow Objectives (NSW Government, 1999) are agreed high-level goals for surface water flow management in NSW. The objectives set out 12 aspects of flow considered critical for the protection or restoration of river health, ecology and biodiversity. The objectives were subject to extensive public consultation and endorsed by the NSW Government in 1999. The objectives consist of three parts, following the recommended approach in the NWQMS: environmental values and uses, their indicators and their guideline trigger values. The indicators and guideline trigger values are used to help assess whether a waterway will support a particular environmental value (OEH, 2017). These objectives are also complimented by the *Marine Water Quality Objectives* (DEC, 2005) which address coastal and marine waters and aim to simplify and streamline the consideration of water quality in coastal planning and management.

In November 2016, the NSW Government released the *NSW Climate Change Policy Framework*. It outlines the Government's role in reducing emissions, and helping NSW adapt and become more resilient to the impacts of climate change. The policy framework provides the strategic framework for NSW Government action on climate change and sets two objectives: to achieve net-zero emissions by 2050, and to make NSW more resilient to a changing climate.

DPE - Crown Lands has recently released a 10-year vision for Crown land in NSW. The *Crown land 2031 – State Strategic Plan for Crown land* (Crown Lands, 2021) reflects Government and community aspirations to deliver social, environment and economic benefits from Crown land. The strategic plan includes the following agency priorities:

- Accelerating economic progress in regional and rural NSW;
- Commitment to realising Aboriginal land rights and native title;
- Protecting cultural heritage on Crown land;
- Protecting environmental assets, improving and expanding green space, and enhancing climate change resilience; and

- Strengthening and supporting community connections.

The NSW Maritime Infrastructure Plan 2019-2024 (MIP), released in December 2018, sets out a strategic and coordinated approach to prioritising and delivering maritime infrastructure in NSW. The Plan aims to deliver better outcomes for residents, businesses and visitors by facilitating public and private sector investment in maritime infrastructure and facilities that best support the needs of commercial and recreational boaters, and enables broader economic and social benefits for communities. While supporting maritime infrastructure investment and delivery throughout NSW, the plan focuses primarily on key regional coastal ports and waterways. Included in the MIP are the details of several state government and private funding programs and strategies, including the Boating Now Program.

In 2019, the state government released the *NSW Coastal Dredging Strategy 2019-2024*. The purpose of the program is to adopt a strategic and proactive approach to dredging that delivers recreational boating benefits for local waterways in regional NSW. The strategy identifies the funding arrangements to support delivery of dredging projects to improve the accessibility and safety of regional coastal waterways. As dredging is not a legislative responsibility, the Coastal Dredging Strategy has been developed and is coordinated by TfNSW.

The NSW Flood Prone Land Policy is intended to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone property, and to reduce private and public losses resulting from floods, utilising ecologically positive methods wherever possible.

3.4.5 Regional Level Plans

The *North Coast Regional Plan 2036* was developed in 2017 and sets regional planning priorities 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 subsequent and more detailed land use plans, development proposals and infrastructure funding decisions. The NSW Government has established the North Coast Delivery, Coordination and Monitoring Committee to deliver, coordinate and be accountable for achieving the vision and goals of the Plan (DPE, 2017).

The *Local Land Services North Coast Local Strategic Plan 2016-2021* sets the vision, priorities and overarching strategy for LLS on the north coast, with a focus on appropriate economic, social and environmental outcomes. The plan focuses on community engagement, setting and delivering local priorities, and determining how the priorities for Local Land Services are best achieved at local level (LLS, 2016). The plan outlines a series of strategies through which the goals are to be achieved, through the improved management of biosecurity, natural resources, agricultural productivity and emergency management (LLS, 2016). The Strategic Plan is intended to maintain and improve the resilience of the natural systems of the catchment and has a general focus on communities of the catchment and the ecosystem services provided to them by natural resources such as soils and land, native vegetation and aquatic ecosystems. The plan superseded the *Northern Rivers Catchment Action Plan 2013-2023* (CAP2), and whilst the CAP2 is a useful reference document, it is no longer an active planning tool.

The *North Coast Integrated Regional Vulnerability Assessment* (IRVA) was undertaken by the state government to engage regional stakeholders, gain a holistic view and plan collaborative responses to the emerging risks from a changing climate along the North Coast (OEH, 2016). It includes a qualitative assessment of the influence of climate impacts on services and infrastructure for the region and fosters relationships between government sectors and agencies from which regional managers and decision-makers can adapt government services.

3.4.6 The Ballina Shire Council IP&R Framework

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 3-20 and a brief overview of the components is provided below.

The *Our Community Our Future 2022-2032* (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. As per NSW OLG (2019), the Plan essentially addresses four 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 Council (such as CMPs) must reflect and support implementation of the Community Strategic Plan. 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 the Community Strategic Plan.

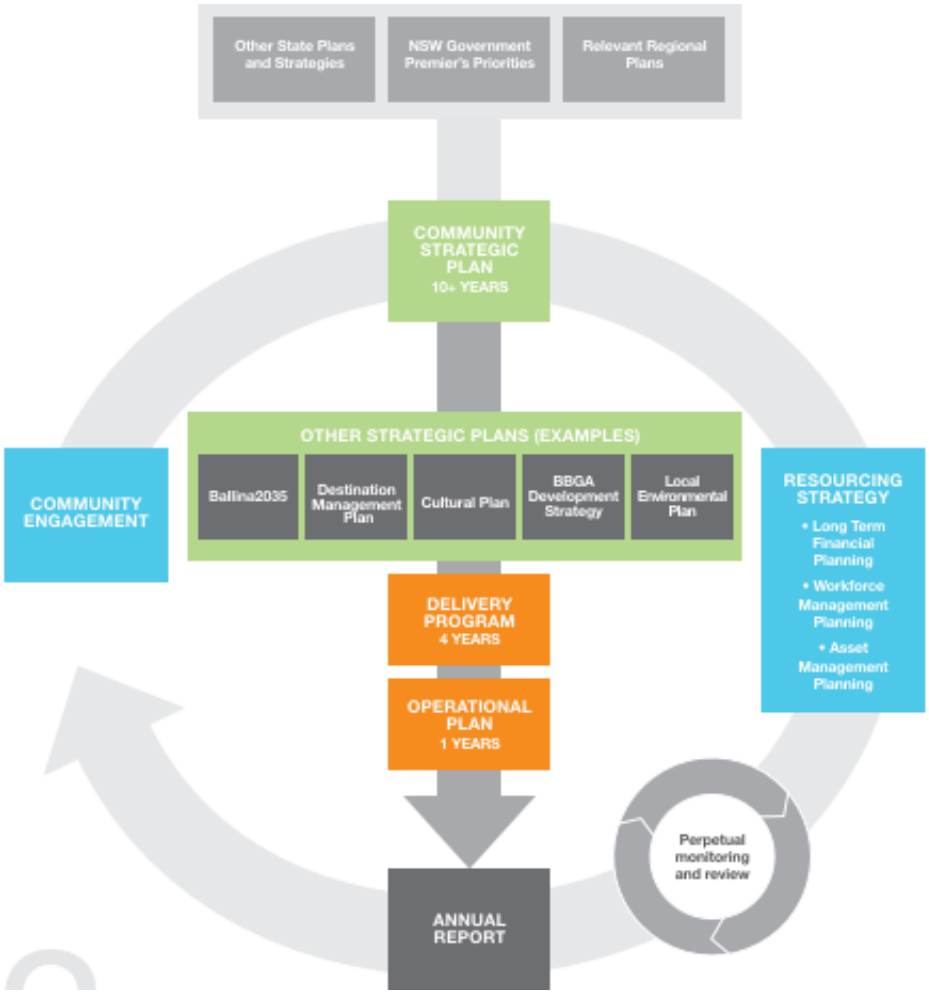


FIGURE 3-20 INTEGRATED PLANNING AND REPORTING FRAMEWORK (SOURCE: NSW OLG, 2019)

The implementation of the CSP is supported by a suite of integrated plans that include actions to support the strategies identified in the CSP.

The Ballina CSP specifically notes that "*We want to continue to find a balance between development and the environment to ensure we preserve what people love so much about living in the Ballina Shire. We want to restore and repair our waterways and areas that have been degraded to maintain aquatic and bird life. We understand the importance of peace, serenity and harmony with nature. We want our built environment to meet our needs but not at the expense of our natural environment or the people who live and work here*".

The *Delivery Program* is a four (4) year program that translates the strategic objectives of the Community Strategic Plan into actions. It identifies all key activities a council has committed to undertake over its four-year life cycle. The *Resourcing Strategy* supports the delivery program and outlines the resources required to implement it. It is therefore a critical link when translating strategic objectives into actions. The Resourcing Strategy generally consists of three inter-related elements: Long-Term Financial Planning, Asset Management Planning and Workforce Planning (NSW OLG, 2020).

The *Operational Plan* is generated over shorter, one-year planning timeframes and provides the detail of the Delivery Program, identifying the individual projects and activities that will be undertaken in a specific year to achieve the commitments of the program.

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.

It should be noted that in the year of Council Elections, Council has an obligation to report on its environmental objectives (including those that relate to the coastal zone) by providing a State of the Environment report

Other strategic planning activities may be undertaken by a council to support the achievement of outcomes in specific areas identified in the Community Strategic Plan (NSW OLG, 2020). These may include, for instance, a Cultural Plan, an Economic and Tourism Strategy, Emergency Risk Management Planning, Climate Change Planning, or even a Heritage Plan.

In March 2018, amendments to the *Environmental Planning and Assessment Act 1979* (the EP&A Act) introduced a new requirement for councils to prepare and make a *Local Strategic Planning Statement* (LSPS). The Ballina Shire LSPS sets out the 20-year vision for land use in the LGA, and how change will be managed into the future (NSW OLG, 2020) This was adopted by the Council in May 2020. The LSPS provides a link between the state government's strategic plans and Council's local land use plans and guidelines, and forms part of Council's IP&R Framework - providing an important link with the SCP.

3.4.7 Ballina Shire Council Local Planning Documents

Other strategic plans include the *Ballina Shire Local Environment Plan 2012* (LEP 2012), which is the primary planning tool for Council, and outlines the local environmental planning provisions for land in the Ballina LGA. The LEP outlines the aims for the use and development of land within the LGA, in accordance with the relevant standard environmental planning instrument under section 33A of the *Environment Protection and Assessment Act 1979*.

The *Ballina Shire Development Control Plan 2012* (DCP 2012) provides detailed planning and design guidelines to support planning controls in the LEP. DCP 2012 was adopted by Council on 20 December 2012 and came into force on 4 February 2013.

The *Ballina City Council Community Participation and Engagement Plan* sets out Council's approach for facilitating community participation and engagement (Ballina Shire Council, 2017). It is based on Council's engagement policy and describes the principles of Council's approach to community engagement and participation, and outlines why, when and how Council will engage with the community and how the community participate in the various aspects of land use planning of the Shire. Council seeks to facilitate transparency in planning decisions and involve the community in the making of decisions having regard for the type and significance of planning matters. The plan is intended to meet the requirements of the EP&A Act, and applies

to all planning functions, including: Development Applications, LEPs, Development Control Plans (DCPs), Locality Plans, Strategic Plans, Contributions Plans, and notably CMPs.

There are several additional local strategies and plans relevant to CMP development, including

- Ballina Floodplain Risk Management Plan (BMT WBM, 2012)
- Richmond River Nature Reserve Plan of Management (NPWS, 2005);
- Ballina Nature Reserve Plan of Management (NPWS, 2003);
- Ballina Coastal Reserve Plan of Management (Ballina Shire Council, 2003) and Coastal Reserve Precinct Plans; and
- Ballina Destination Management Plan (Ballina Shire Council, 2014)

3.5 Economic Context

Ballina Shire's Gross Regional Product (GRP) was $2.19 billion with 17,429 local jobs in the year ending in June 2020 (CommunityID, 2021). This represents 0.35% of the NSW Gross State Product (GSP) and 0.43% of the state's employment.

In recent decades, there has been a gradual shift from traditional economic sectors such as agriculture towards goods and services. In 2020, the household services sector accounted for almost 40% of Ballina Shire's jobs. This sector is generally increasing, particularly in the construction field. Figure 3-21 shows the composition of Ballina's employment by industry from 2010-2020.

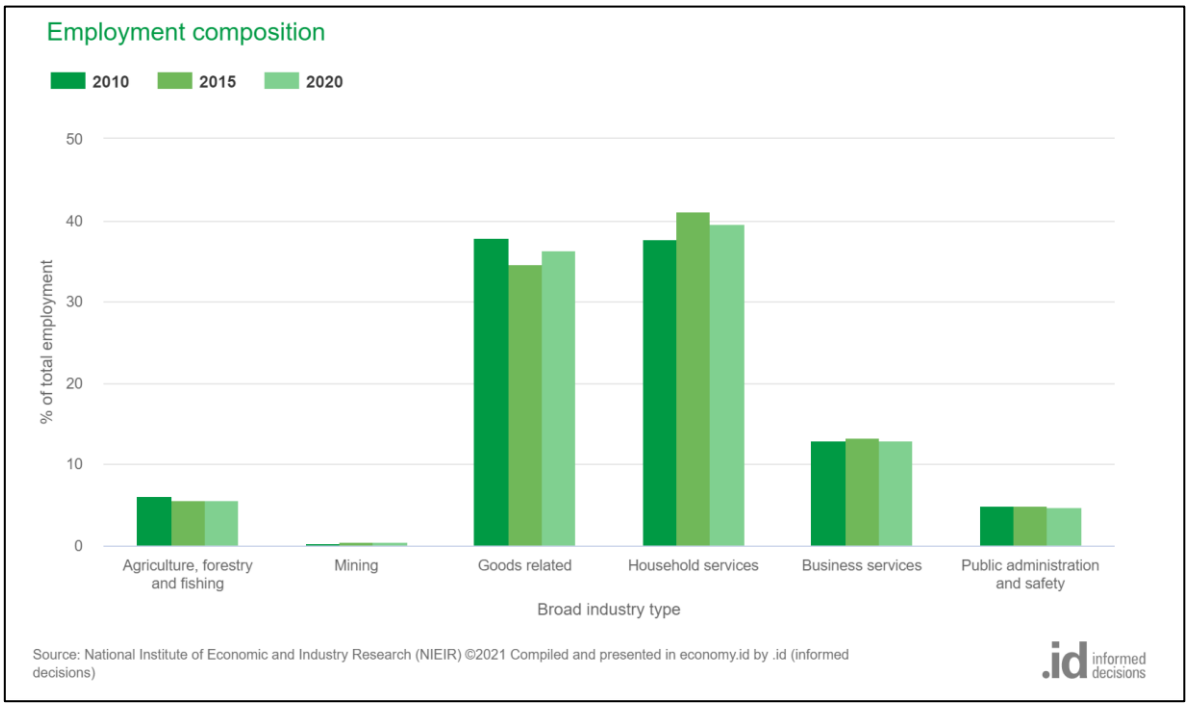


FIGURE 3-21 BALLINA SHIRE EMPLOYMENT COMPOSITION FROM 2010 TO 2020 (SOURCE: COMMUNTIYID, 2021)

The value added to the GRP by various industries directly and indirectly connected to the coastal zone is presented in Table 3-9 – which also shows the change in relative contribution of the various industries over the last 10 years.

TABLE 3-9 BALLINA SHIRE'S ECONOMY BREAKDOWN (SOURCE: COMMUNITY ID, 2021)

Industry Sector	Value added to GRP 2019/20		Full-time equivalent employment	Change in value added since 2014/15
Industry	$m	%.	No.	%
Construction	237	14.7	1,931	+39.7
Health Care and Social Assistance	201.9	12.5	1,930	+14.7
Education and Training	148	9.2	1,279	+20.2
Manufacturing	116.4	7.2	984	+34.3
Retail Trade	115.8	7.2	1,437	-2.1
Professional, Scientific and Technical Services	96.8	6	715	+2.8
Rental, Hiring and Real Estate Services	90	5.6	229	+13.4
Public Administration and Safety	83.6	5.2	693	+18.6
Financial and Insurance Services	76.8	4.8	245	+5.1
Accommodation and Food Services	70.9	4.4	946	-8.5
Agriculture, Forestry and Fishing	57.4	3.6	870	-8

3.5.1 Tourism

Tourism is an important contributor to the growth and character of the North Coast region, and contributes to Ballina's economy. In 2019/2020 tourism and hospitality sales in Ballina Shire contributed $181 million to the economy and provided over 1,144 Full Time Equivalent (FTE) jobs in Ballina (CommunityID, 2021). While tourism levels were down in 2019/2020, Figure 3-22 shows the somewhat cyclical nature of tourism in the region.

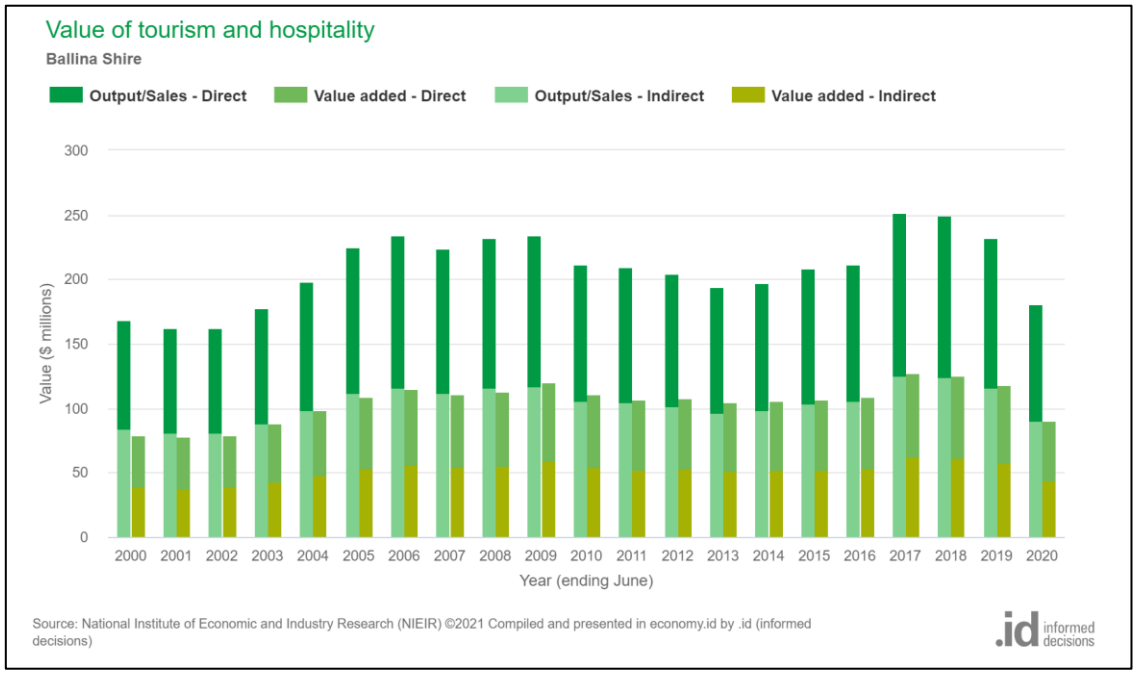


FIGURE 3-22 VALUE ADDED FROM TOURISM SINCE 2000 (SOURCE: COMMUNITY ID, 2021)

Figure 3-23 depicts tourism visitation data for the LGA, in terms of visitor nights and domestic day trips to the LGA between years 2010/11 and 2019/20. The majority of tourists to the Shire are domestic. It shows a general increase in the number of visitors, and particularly in the number of domestic daytrips to Ballina in the past five years (CommunityID, 2021). In the five years up to 2019/20 there was an average of 14,574 international visitors per year to Ballina Shire. The average length of stay for international visitors was nine days. This data is indicative of the potential recreational use pressures experienced by the study area. Tourism is somewhat seasonal in Ballina Shire, with peak seasons generally occurring in the summer months and during NSW School Holidays (Destination NSW, 2021).

FIGURE 3-23 BALLINA SHIRE VISITATION 2010/11-2019/20 (SOURCE: COMMUNITY ID, 2021)

Ballina's coastline will also be affected by an increase in regional tourism. The North Coast of NSW was the most visited region in Australia in 2020 and in June to July 2021, as the COVID-19 pandemic prompted an increase of domestic and in-state tourism (Destination North Coast NSW, 2021). Based on the North Coast Visitor Profile for the year ending in June 2021, the North Coast saw 11.6 million visitors and was the top regional NSW destination for visitors, number of night and expenditure. "Going to the beach" was the second most popular tourist activity, with 55% of domestic overnight visitors stating it was their top activity (Destination NSW, 2021).

It is important to note that the strategic direction of tourism across the LGA is important to consider when developing objectives and actions for the CP. Furthermore, CMP development may assist in a) addressing issues that may impact on CMAs as a result of recreational / tourism activities; and b) assist in identification of threats and opportunities to address impacts to the tourism industry (e.g. user conflicts, water quality, loss of natural habitat, maritime infrastructure, transition of land use (agriculture to eco-tourism, wetlands, surf reserves, surf lakes, eco cruises etc).

3.5.2 Ecosystem Services

As part of this Scoping Study, a preliminary economic valuation has been undertaken of the *ecosystem services* across the study area. This assessment has been undertaken using the method of Costanza et al (2014) which provides approximate unit values for ecosystem services and land usages. It should be noted that the true value of the ecosystem services in the coastal zone is difficult to capture – and this analysis is not intended to be an in-depth economic assessment, but rather is intended as a coarse, *preliminary estimation* in

order to gain a broad understanding of the economic value of the study area ecosystems, and to provide high-level guidance for the Business Case (see Section 9).

The Costanza (2014) method assigns USD unit pricings for biomes - based on overall estimates of economic value and contribution. For example, tidal marsh and mangroves provide value in the form of storm protection, erosion control, carbon storage and waste treatment. This method was applied, with the extents of the various biomes defined by the area of CM SEPP Mapping for Coastal Wetlands and Coastal Environment Area contained with the CMP study area. The table shows that the ecosystem services of the study are estimated at nearly $200 m per year.

TABLE 3-10 APPROXIMATE ECONOMIC VALUATION OF STUDY AREA ECOSYSTEM SERVICES* EST ONLY**

Biome	Approx. Area (ha) in the Study Area	Unit Value (USD/ha/yr)	Unit Value (AUD/ha/yr)	Approx. Annual Ecosystem Services Value (AUD/yr)
Wetlands	530	$190k	$250k	$132m
Estuary Waters	650	$29k	$37k	$24m
Coastal Waters	22,100	$1.5k	$2k	$42m
			Total	***$198m***

3.6 Social and Cultural Context

3.6.1 Indigenous Heritage

Aboriginal cultural heritage sites are important to the local indigenous community for cultural, historic and spiritual reasons. Indigenous cultural heritage consists of places and items that are of significance to indigenous people because of their traditions, observances, lore, customs, beliefs and history. It provides evidence of the lives and existence of indigenous people before European settlement through to the present. Indigenous cultural heritage is dynamic and may comprise physical (tangible) or non-physical (intangible) elements. Ballina Shire is rich in Aboriginal sites and archaeological records indicate they go back to at least 60,000 years.

The Bundjalung people are the custodians of the Ballina area, having cared for and lived off the land for thousands of years. They have lived harmoniously with nature, the land providing them with wide variety of foods such as fish, crustaceans, mammals, birds, reptiles vegetables and fruits. The Bundjalung peoples' culture and traditions evolved over many thousands of years with the passing down of knowledge from previous generations and adapting to environmental change.

Coastal waters, its catchments and resources have been used not only for food, but to pass social and cultural knowledge, kinship systems and strengthen social bonds. Fishing is an essential part of the Aboriginal culture, traditionally this was either carried through hand gathering, traps, rods and spears. Fish was used both for food, medicine or bait. Fish, crabs, oysters, pipis and worms were collected for consumption. “Pipis gathering” was a community affair and an important aspect of the Bundjalung people (WBM Oceanics, 2006).

There are many sites associated within Ballina natural coastal landscapes. Previous estuary processes studies and CZMPs have included searches of the NSW State Government Aboriginal Heritage Information Management System sites register (WBM Oceanics, 2006). Additionally, there are numerous significant sites and places associated with dreamtime stories that have been documented for example, areas between Ballina Head and Lennox Headland and Chickiba Creek (also linked to fish and Birds stories) are linked to the stories of the sand goanna. Evans Head and Lennox Head are also associated through Dreaming. Land clearance, drainage of swamps, roads, fencing and associated demarcations between public and private land would have

radically affected Aboriginal peoples' access to favoured hunting grounds and resources and in many instances, important ceremonial places.

There are 76 Aboriginal sites recorded with the study area; 37 are shell middens, 32 are stone artefact scatters/open campsites, 5 burial sites, one bora/ceremonial site and one stone quarry. Many of the sites occur in subcoastal dunes and estuary banks in the Ballina area (WBM Oceanics, 2006). Lennox Head has two burial sites, stone quarry and boral/ceremonial site each, while the remaining burial sites are located at South Ballina and Patchs Beach.

Massacre sites are found in Black Head and North Angels Beach, and Shelly Beach; these sites are highly significant to indigenous people.

TABLE 3-11 DISTRIBUTION OF REGISTERED ABORIGINAL SITES IN VARIOUS COASTAL LANDSCAPES. SOURCE: BALLINA COASTLINE CZMP 2016.

Landscape context	Artefact scatter	Midden	Burial	Quarry	Bora/ ceremonial	Total
Coastal foredune	4	6	1	0	0	11
Coastal hind Dune	7	0	1	0	1	9
Sand plain	7	0	1	0	1	9
Subcoastal dune/field	13	14	2	0	0	29
Estuary bank	5	15	0	0	0	20
Coastal headland	0	0	0	1	0	1
Total	32	37	5	1	1	76

Present Day Management

The careful management of Aboriginal cultural heritage sites in the shire is important to Aboriginal people, culture and identity today, as well as understanding the past for the benefit of all community members. The Aboriginal Heritage matters are overseen and managed within the Ballina LGA by the Jali Local Aboriginal Land Council. The indigenous sites of significance are legally protected and supported by the *National Parks and Wildlife Act 1974* and the *NSW Heritage Act 1977*.

As of the 2016 National Census, the Aboriginal and Torres Strait Islander population of Ballina Shire in 2016 was around 1,300 persons – about 3.3% of the LGA population. Council and the JLALC have a cultural responsibility to protect culture and heritage within its boundary. The *NSW Aboriginal Land Rights Act 1983* is the legislative framework that supports the JLALC in carrying these cultural obligations.

Recently, Ballina Shire Council has worked with Jali Local Aboriginal Land Council and members of Ballina Shire's Aboriginal community on the Aboriginal Cultural Ways project - interpretive signage is located on the Coastal Recreational Path at the declared Aboriginal Place at Angels Beach, East Ballina stretching north along the coastline to Sharpes Beach. The project includes a series of 22 panels to recognise the special significance of this path to Aboriginal people. Stories along the path provide a mix of themes including historical events, cultural stories, landscape, language and significance of place. Members of the Aboriginal community have chosen to share their stories with users of the path to provide an insight into the cultural significance of this landscape and maintain their connection to Country.

3.6.2 Non-Indigenous Heritage

Ballina Shire was the settlement for the families of cedar cutters in the early 1840s and the economic opportunities hub for the ship-owners and shipwrights and cedar supporting industry. Much of the timber was

transported through sea through the Ballina estuary mouth. There are 29 listed Australian Historic shipwrecks dated between 1844- 908 (WBM Oceanics, 2006).

A heritage study was undertaken in preparation for the identification of all the buildings in Ballina Shire that dated back to 19th Century including the State Heritage Register, the National Trust of Australia (NSW) Register, the Register of the National Estate, and heritage schedules of the North Coast Regional Environmental Plan and the Ballina LEP. Twenty-three items of historical significance are listed within the study area and are documented in WBM (2007).

Another unique coastal European heritage site is the two tea tree fences installed on the Seven Mile Beach built in 1967. A community project installed hundreds of metres of fencing to prevent the beach erosion following several severe storms. The fence still remains buried by beach sand in the present times. It is located on the frontal dune beside Lake Ainsworth. The second fence was installed later on the south end of the beach and is occasionally visible near Rayner Lane.

3.6.3 Community Uses and Values

The Ballina Shire coastline has long provided an attractive natural setting for a range of outdoor recreation activities, to both the local community and a regional population that extends beyond the boundaries of the LGA. The coastal waters, foreshore and estuaries of the LGA are highly valued by the local community for the social and recreational amenity that they provide.

The Ballina Shire coastline features some of the most pristine and stunning beaches in NSW. Popular activities include water sports, swimming, pet exercise and nature observation. The Ballina Coastline has two Surf Life Saving Clubs (SLSCs):

- Ballina Lighthouse & Lismore SLSC
- Lennox Head-Alstonville SLSC.

The Ballina LGA coastline is hugely popular among surfers, and the Lennox Point headland is renowned as world class point break (see Figure 3-24). In February 2009, the Lennox Head National Surfing Reserve was declared to formally recognise the environmental, cultural and historical significance of the reserve area to Australian surfing culture.

FIGURE 3-24 THE LENNOX HEAD SURFING RESERVE

Water-based recreation in the lower estuaries primarily comprises swimming and use of non-powered watercraft such as canoeing, kayaking, and paddle boarding.

3.6.4 Coastal Infrastructure

The study area contains a range of coastal infrastructure, comprising both coastal protection structures as well as recreational infrastructure.

Richmond River Training Structures

A major feature of the Ballina LGA Coastline and the Lower Richmond River estuary are the rock armoured training wall / breakwater structures located at the estuary entrance. As with many trained river entrances, the civil works were undertaken in the late nineteenth century and early twentieth century as a means of provided a shipping route and associated facilities to northern NSW. The works were constructed over a period of 20 years beginning in the 1890s (WBM Oceanics, 2003). The northern training wall was also extended by around 200 m between 1965 and 1968, and periodic maintenance and repair works have been undertaken in the decades since. This includes the installation of precast concrete *Hanbar* units on the northern breakwater circa 2013. The location and extent of the river entrance training works are depicted in Figure 3-25.

The lower Richmond River Estuary downstream of Wardell has been stabilised by some form of rock protection – both formal and informal. The foreshore of Ballina Island and West Ballina generally comprise an ad hoc combination of public and private seawalls of variable structure types - including rock armoured seawalls, vertical concreate and sandstone block structures, and sheet piled structures.

Lennox Head Seawalls

The shoreline at Lennox Head has a number of coastal protection structure that have been developed in an ad hoc manner over numerous decades.

In 1942, residents constructed a rock armoured seawall, using rock obtained from the nearby reef and headland - in response to the perceived threat from coastal erosion.

Additional erosion protection works began at Lennox Head in 1967 after severe storms and coastal erosion impacted the shoreline. Initial protection structures in the late 1960s were comprised of a ti-tree fence and ad hoc dumping of rock and soil on the eroded dune face (BMT WBM, 2016). The rock work was undertaken over the ensuing decade with no clear design standard.

A ~1,000 m long rock armoured seawall was constructed by Council and NSW Public Works between 1977 and 1980 from about Byron Street to north of Ross Street. The plan in Figure 3-26shows a summary of defensive works that had been undertaken up until 1989 (BMT WBM, 2016).

In 2016, Ballina Shire Council undertook an investigation of competency of the existing historical seawall between Byron Street and the Lennox Head, and an assessment of potential options for upgrading the structure. That study indicated that the existing historical seawall had little structural capacity and needed to be replaced by a new terminal structure. It recommended that the future seawall upgrade be undertake in three stages:

- Stage 1 – Seawall from Byron Street to Foster Street;
- Stage 2 – Steps and seawall for a distance as defined by trigger distances at the time; and
- Stage 3 – Completion of the seawall to link up with the recent seawall at the Lake Ainsworth Sport and Recreational Centre including steps and associated carparks at the Lennox Head – Alstonville SLSC and approximately 300 m to the south.

Boating Infrastructure

Ballina boat harbour is located on the northern side of the river about 3 to 4.5 kilometres upstream from the river entrance. The harbour contains around 36 moorings, and facilities for commercial fishing (unloading and berthing), charter vessels, and recreational and visitors berthing. The site currently includes an operational TfNSW depot, a working harbour with access to Fishery Creek and the Richmond River administered by the Ballina Fisherman's Co-operative and a public boat ramp and associated infrastructure on Fishery Creek. In 2017, The Ballina Marina Master Plan was commissioned by Council to assist government and private interests in considering the site for investment and redevelopment.

There are five (5) boat ramps located across the study area, as depicted in Figure 3-25. These are located at:

- Cawarra Street
- Ballina Yacht Club
- Fishery Creek
- Faulks Reserve
- Emigrant Creek.

FIGURE 3-25 COASTAL INFRASTRUCTURE IN THE RICHMOND RIVER ESTUARY

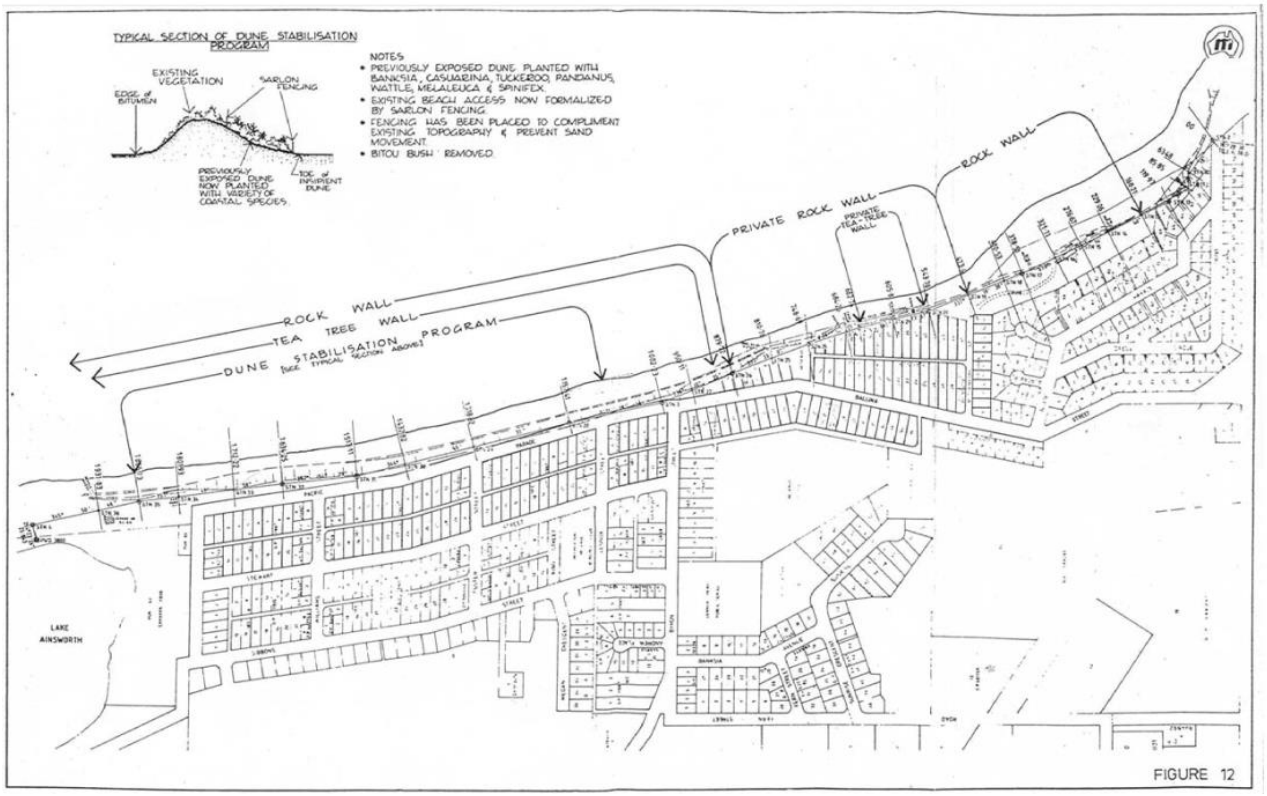


FIGURE 3-26 EARLY LENNOX HEAD SEAWALLS (ARDILL & ASSOC. 1989)

3.7 Population and Demographics

3.7.1 Ballina Shire Overview

A snapshot of the Ballina LGA population demographics is provided in Table 3-12. Analysis of the age groups of the LGA in 2016 compared to Regional NSW shows that there was a lower proportion of people in the younger age groups (0 to 14 years) and a higher proportion of people in the older age groups (65+ years). Notably, 25.2% of the population are aged 65 years and over, compared with the Regional NSW average of 21.5% (CommunityID, 2021). This data demonstrates the popularity of the Ballina LGA as a retirement destination.

TABLE 3-12 COMMUNITY PROFILE ACROSS THE BALLINA LGA (SOURCE: COMMUNITYID, 2021)

Indicator	Ballina LGA
Population (2021 Estimate)	45,773
Population (2016 Census)	41,790
Median age (years)*	48
0-14 years (%)*	16.6
65 and over (%)*	25.0
Indigenous (%)*	3.3
Born Overseas (%)*	11.0
% English at home*	89.1

Indicator	Ballina LGA
% Uni degree*	18.8
Median weekly household Income *	$1,156

**Data as of 2016 census*

The distribution of the local population centres is provided in Table 3-13 and corresponding areas shown on the map in Figure 3-27. The data in this table shows that around 63% of the LGA population as per the 2016 Census is located in, or adjacent to, the study area (CommunityID, 2021).

The LGA's population is forecast to grow to over 51,200 by 2036 (CommunityID, 2021), an increase of around 20% from 2016 Census numbers, with an equivalent increase across the study area "small areas" of 14% (around 3,800 persons). However, this population growth is not evenly distributed across the study area. Table 3-13 shows that some areas (such as the small areas of Ballina and West Ballina) will experience only modest population growth over the coming decades, with East Ballina experiencing a population decline. Other areas will experience significant growth including Skennars Head, which is expected to almost double in population between 2016 and 2036. Figure 3-27 shows where the forecast population percentage growth will occur throughout the Shire.

TABLE 3-13 POPULATION CENTRES ACROSS THE STUDY AREA (SOURCE: COMMUNITYID, 2021)

CommunityID Small Areas (see Figure 3.25 below for corresponding area on map)	2016 Census Population	Estimated 2036 Population	Estimated Change 2016 to 2036 (% change)
Alstonville	5,825	6,217	392 (+6.7%)
Ballina (Island)*	7,110	7,655	545 (+7.7%)
Ballina (North)	1,695	2,320	626 (+36.9%)
Cumbalum - Tintenbar	2,364	4,227	1,863 (+78.8%)
East Ballina*	5,674	5,548	-127 (-2.2%)
Lennox Head*	6,515	8,613	2,098 (+32.2%)
Skennars Head*	1,269	2,401	1,133 (+89.3%)
Teven - Newrybar - Rural North*	2,391	2,563	172 (+7.2%)
Wardell - Rural South*	3,716	3,680	-36 (-1%)
West Ballina	3,082	3,252	170 (5.5%)
Wollongbar - Mcleans Ridges	2,988	4,761	1,773 (59.3%)
***Total for areas in the study area**	**26,675**	**30,460**	**3,785 (+14.2%)**
Ballina Shire Total	**42,629**	**51,238**	**8,609 (+20.2%)**

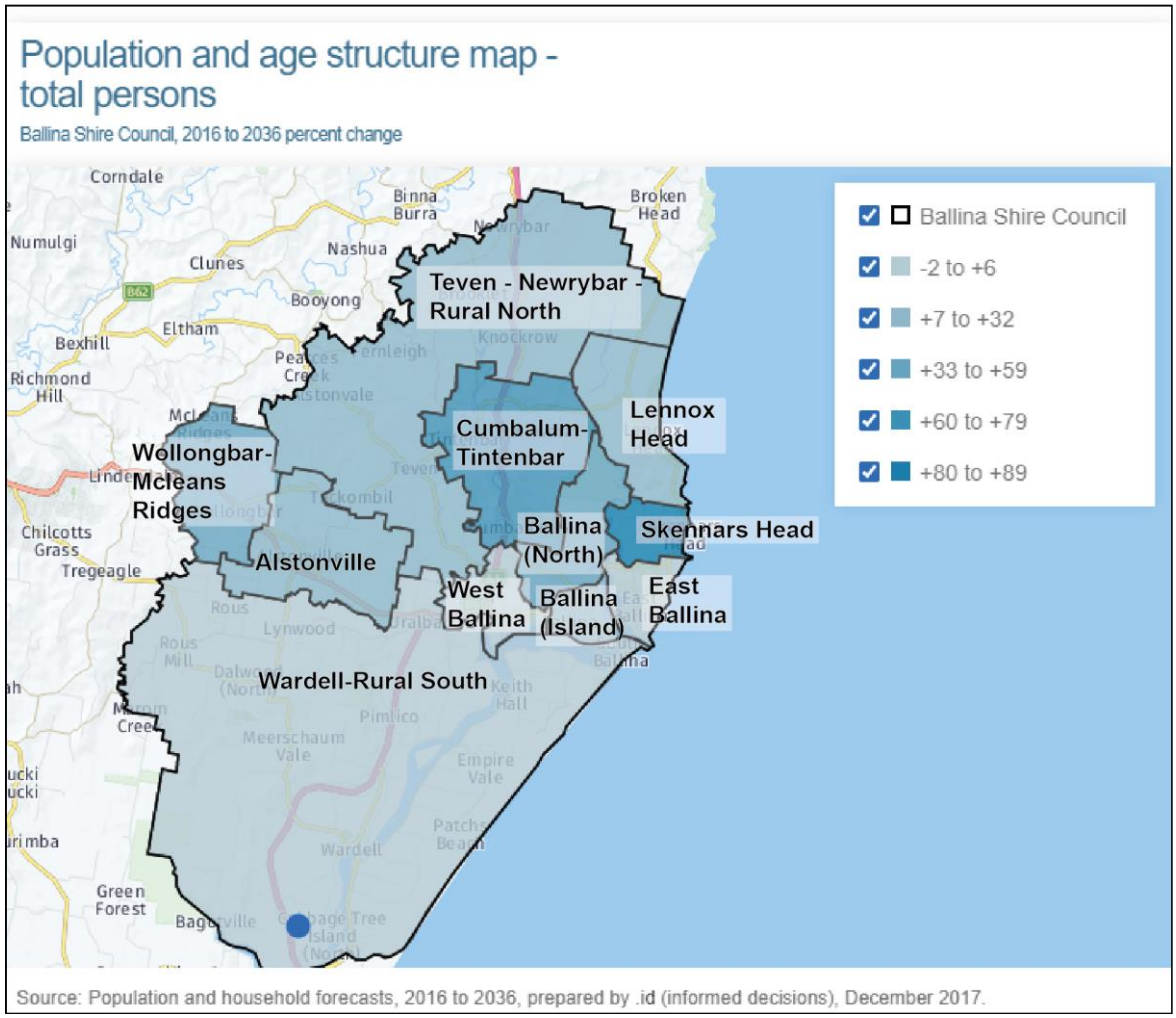


FIGURE 3-27 FORECAST POPULATION GROWTH PERCENT CHANGE 2016-2036 (SOURCE: COMMUNITYID, 2021)

3.7.2 Planned and Recent Development

The population growth described above will require significant changes to the built environment and place additional pressure on the estuaries. An assessment of proposed new dwellings over the period 2016-2036 has been undertaken using the Ballina Shire Council ID portal (CommunityID, 2021). It is noted that many of these developments are either already under construction or have been recently completed. Some areas will be experiencing significant growth in new dwellings, either through greenfield development or densification and renewal. A summary of forecast and recently completed/ under construction developments is provided in Table 3-14. The LGA is projected to see an increase of over 4,300 residential dwellings between 2016 and 2036. Some major residential developments are planned to impact upon coastal areas, particularly in Lennox Head and Skennars Head.

TABLE 3-14 FORECAST MAJOR DEVELOPMENT 2016-2036 ACROSS THE STUDY AREA (SOURCE: COMMUNITY ID, 2021)

ProfileID Area	Forecast Development Increase 2016-2036	Major Developments / Release Areas (note: some have recently been undertaken or are under development)
Alstonville	119 dwellings	▪ 209 Ballina Road Dwellings - 19 dwellings (2017-2019)
Ballina (Island)	296 dwellings	▪ Reside Living Ballina - 34 dwellings (2018-2019)
Ballina (North)	302 dwellings	▪ Ferngrove - 217 dwellings (2012-2026) ▪ Sovereign Gardens - 267 dwellings (2012-2030) ▪ River Oaks - 52 dwellings (2018-2027)
Cumbalum-Tintenbar	736 dwellings	▪ Ballina Heights - Eastern Precinct - 200 dwellings (2012-19) ▪ Ballina Heights - Balance - 490 dwellings (2019-2036) ▪ Cumbalum Views - 170 dwellings (2020-2036)
East Ballina	80 dwellings	▪ Angles Beach North - 63 dwellings (2012-2021) ▪ Rainforest Ridge Estate - 15 dwellings (2012-2021)
Lennox Head	1,128 dwellings	▪ Tallow Wood Place Subdivision - 14 dwellings (2012-2019) ▪ Aspect - 16 dwellings (2012-2021) ▪ Elevation (Lennox Heads) - 23 dwellings (2012-2027) ▪ Gibbon Street (LH3) - 31 dwellings (2013-2020) ▪ Development Control Plan (LH7) - 36 dwellings (2013-2021) ▪ Coastal Grove - 41 dwellings (2014-2025) ▪ Epiq - 437 dwellings (2017-2036) ▪ The Outlook Lennox Head - 183 dwellings (2020-2036) ▪ 44-52 Blue Seas Parade - 13 dwellings (2021-2025) ▪ Amber Drive - 15 dwellings (2021-2026) ▪ Lennox Heights - 148 dwellings (2021-2036) ▪ Tara Downs - 14 dwellings (2022-2026) ▪ Greenwood Place - 25 dwellings (2024-2031) ▪ Small sites - 54 dwellings
Skennars Head	566 dwellings	▪ Elevation (Skennars) - 59 dwellings (2012-2027) ▪ Skennars Head Village Expansion - 525 dwellings (2020-36)
Teven - Newrybar - Rural North	80 dwellings	▪ None identified
Wardell - Rural South	80 dwellings	▪ None identified
West Ballina	126 dwellings	▪ Riverbend Village - 104 dwellings (2012-2023) ▪ 6 Burns Point Ferry Road - 21 dwellings (2020-2024) ▪ West Mews - 39 dwellings (2020-2029)
Wollongbar – Mcleans Ridges	800 dwellings	▪ Wollongbar Park Estate (North) - 130 dwellings (2013-2024) ▪ Avalon Estate - 235 dwellings (2013-2034) ▪ Rancher Ct - 14 dwellings (2015-2018) ▪ Spring Creek Place Estate - 36 dwellings (2015-2022) ▪ Wollongbar Estate (Lot 3) - 15 dwellings (2016-2018) ▪ Killarney Park Estate - 82 dwellings (2016-2028) ▪ Woolongbar Expansion Area - 30 dwellings (2021-2026) plus 347 dwellings (2022-2036)
Total	***~4,350 new dwellings***	

In addition to the development planned within the Shire's boundaries, Ballina's coastline will be affected by increased development and population growth in the North Coast region. Byron Shire, to Ballina Shire's north, is growing rapidly. Between 2019-2020 population growth in Byron Shire was 1.99%, double the average population growth for all of Regional NSW (CommunityID, Byron Shire Community Profile, 2022). The population is expected to increase by 4,550 people between 2016 and 2041, from 33,400 to 37,950 people, including a significant proportion of retirement-aged residents (NSW Government, 2019). Byron Shire has significant planned development to accommodate the projected increase in population, including the Byron Bay Town Centre Masterplan.

Richmond Valley LGA to Ballina's south is also projected to continue growing and developing in the coming decades, albeit at a lower rate than Byron and Ballina. From 2018 to 2019, the population grew by 0.38%, which slowed to 0.12% between 2019 and 2020 (CommunityID, Richmond Valley Council Community Profile, 2022). Planned development includes major areas along the coast in Evans Head.

4 STAKEHOLDER ENGAGEMENT

4.1 Stage 1 Community and Stakeholder Engagement

Community and stakeholder engagement undertaken during Stage 1 comprised the following:

- An online community survey regarding study area values and threats; and
- A stakeholder workshop involving representatives from relevant government agencies;

A summary of these tasks is provided below.

4.1.1 Community Consultation

Community consultation was undertaken during the Scoping Study in the form of an online community survey. The purpose of the survey was to obtain a snapshot of:

- How often locals visit the coastline and what activities they engage in whilst there;
- What the local community considers to be the most important ecological, social, cultural, aesthetic, recreational, and economic values of the study area; and
- Community perceptions of key issues and attitudes towards potential management options.

The survey was accessed via by a Survey Monkey form that was established for the project. The survey comprised 12 questions and took approximately 10 minutes to complete. The survey method used a combination of tick box and Likert scale response options to gain a detailed insight into community attitudes, knowledge and experiences.

The survey was open from the 8 November 2021 to 5 December 2021. A total of 348 responses was received. A brief summary of results is provided herein:

- Approximately 36% of the respondents were from Lennox Head, whilst 33% were from Ballina/East Ballina. Respondents tended to use the coast for recreation such as swimming and walking/jogging, and for nature observation (see Figure 4-1).
- According to respondents, the most important values of the coastline are:
  - Natural systems and biodiversity;
  - Scenic amenity;
  - Recreational amenity: and
  - Cultural heritage.
- Respondents rated the impacts of climate change as the greatest risk to the Ballina coastline. When making decisions about coastal management, most respondents believed maintaining the natural ecosystems and scenic amenity are the most important considerations.

A more comprehensive summary of the community survey results is provided in Appendix D. The results were used to inform the first-pass risk assessment for the project (see Section 7).

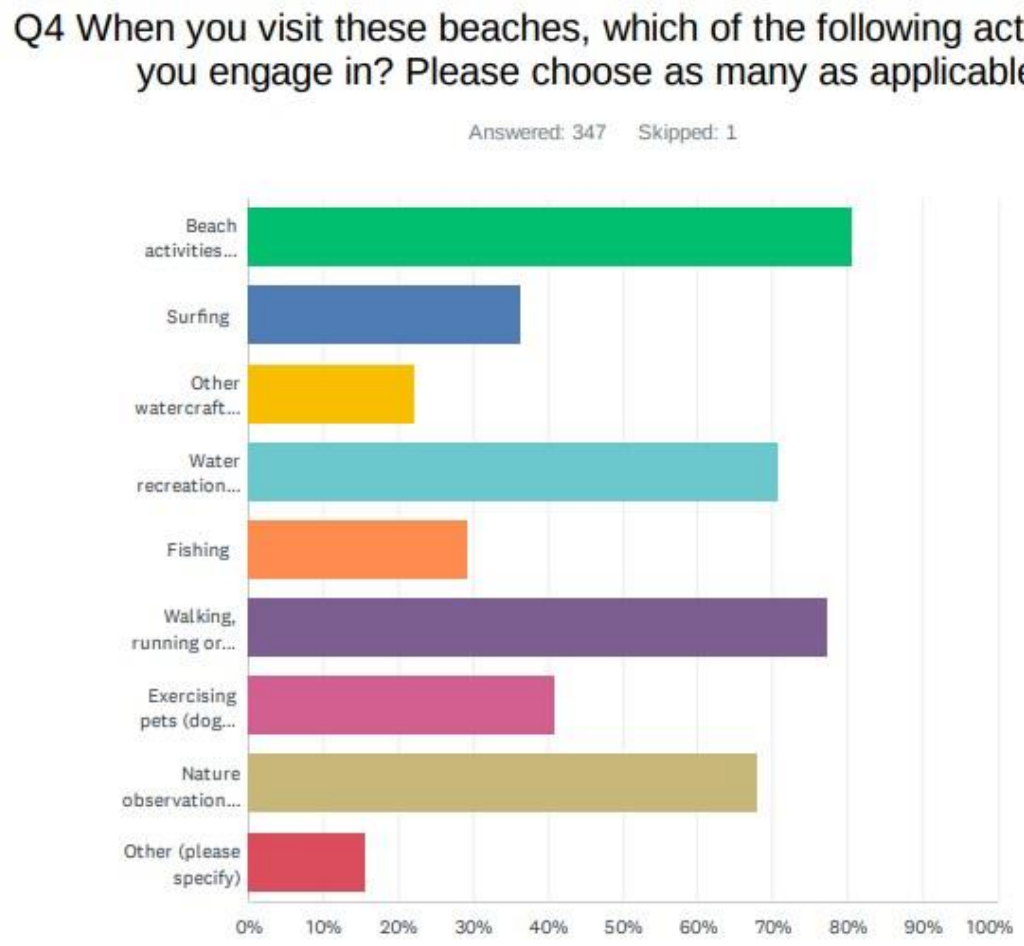


FIGURE 4-1 HOW PEOPLE USE THE COAST

4.1.2 Stakeholder Workshop

A stakeholder workshop for the CMP was held on 10 December 2021 using virtual means (Microsoft Teams). The workshop was an opportunity for stakeholders to contribute and have their say regarding the planning for, and implementation of, the CMP. The objectives of the workshop were to:

- Communicate the strategic context and drivers of the CMP;
- Identify key coastal management threats and risks across the study area, including historical, present day and emerging/future; and
- Identify any tacit knowledge or non-documented issues and/or risks.

Sixteen stakeholders attended the workshop, from a number of different organisations, including Ballina Shire Council, DPE (E&H, Crown Lands), NPWS, DPI (Fisheries), NSW SES, Byron Shire Council, and Richmond Valley Council.

The workshop included an initial presentation to the participants in order to provide background and context, and was then followed by a group and individual session. These sessions involved an assessment by the various stakeholders of the potential risks, threats and stressors acting across the study area. The results were used to inform and verify the first-pass-risk assessment for the project (see Section 7).

4.2 Historical Context of Stakeholder & Community Engagement

As part of the Stage 1 Scoping Study, a review of the outcomes of previous community and stakeholder engagement activities was conducted. This approach was adopted as a way of providing a "stocktake" of community values and issues that have been established during previous direct community engagements.

According to the engagement guidelines (OEH, 2018a), 'plans, such as an existing coastal zone management plan or flood risk management plan or community development plan, may document issues and priorities that have previously been identified by stakeholders and the community'. The plans and accompanying studies analysed were:

- Ballina Shire Coastline Coastal Zone Management Plan (GeoLINK, 2016);
- Shaws Bay Coastal Zone Management Plan (Hydrosphere Consulting, 2015);
- Richmond River Coastal Zone Management Plan (Hydrosphere Consulting, 2011);
- North Creek Coastal Management Program Stage 1 (Alluvium, 2019); and
- The NSW Marine Estate Management Strategy (MEMA, 2018).

A summary of the community values informed (in part) from this review is provided in Section 7. That Section also provides an overview of key threats and risks which were also informed (in part) by previous stakeholder and community consultation activities.

4.2.1 Ballina Shire Coastline CZMP

During preparation of the CZMP, detailed consultation was carried out with the relevant stakeholders as well as local communities. The consultation was designed to identify the aspects of the coastline that are valued, and any issues that are currently compromising these values, or may compromise them in the future (GeoLINK, 2016).

The preparation of the study and plan was underpinned by regular consultation with the project Community Reference Group (established specifically for this project), the Ballina Shire Council Civil Committee, the NSW Office of Environment and Heritage, and the general public. Key steps were also reported to open meetings of the elected Council.

The Community Reference Group included representatives of the following groups:

- Office of Environment and Heritage;
- Department of Lands;
- Lennox Head Residents Association;
- Ballina Environment Society;
- Lennox Head Landcare;
- Ballina Chamber of Commerce and Industry;
- Cape Byron Marine Park;
- NSW State Emergency Service;
- East Ballina Landcare; and
- Jali Local Aboriginal Land Council.

The public had the opportunity to discuss the project by means of open days whereby project material was placed on display boards in a prominent location. One of these open days discussed coastline values.

Many ecological, cultural, social, recreational and economic values were ascribed to the Ballina coastline by the community. Threats to ecological values include the impacts of coastal erosion and sea level rise.

Indigenous and non-indigenous values were identified by the community. Of particular note is the East Ballina Aboriginal Place, which was declared a place of special significance to Aboriginal culture and people in 2012, under the *National Parks and Wildlife Act 1974*. Several indigenous sites are threatened by coastal erosion.

The coastline is undoubtedly one of the key recreational attractions of the Ballina LGA, according to the local community. Whilst coastal erosion was not seen to threaten the recreational values, it may add stress by reducing beach size.

Tourism, commercial and recreational fishing, and recreation activities are the main contributors to the value of the Ballina coastline. Threats to the economic value include the impacts of coastal erosion and sea level rise on coastal infrastructure.

4.2.2 Shaws Bay CZMP

Shaws Bay is a small, enclosed embayment adjacent to the mouth of the Richmond River, Ballina. Consultation undertaken for this CZMP included a community survey, project webpage, community drop-in sessions, targeted consultation with key stakeholder groups, Council and agency consultation. The information collated during the consultation program was used to develop management objectives, identify management issues and establish community desires for future management of Shaws Bay.

The community consultation identified the following main values:

- Shaws Bay is primarily a recreational asset with the most popular activity being swimming, followed by walking/exercise, picnicking and fishing;
- There is considerable community interest in maintaining the health and amenity of the Bay as well as enhancing the recreational experience of the area;
- The recreational experience at Shaws Bay creates strong links to the need to protect ecological values through water quality, vegetation management and protection of fish stocks; and
- The overlap between recreational activities and ecological values creates some management conflict. For example, there was concern among many stakeholders regarding a perceived decline in amenity resulting from seagrasses and mangroves at waterway access points, whereas some respondents noted the value of the marine vegetation for habitat and water quality.

Risks/threats identified by the community as most important were:

- Litter (88% of survey respondents ranked this as very important or important);
- Siltation/shoaling (78% of respondents ranked this as very important or important);
- Poor water quality (for water-based activities) (77% of respondents ranked this as very important or important);
- Slicks on the water surface (74% of respondents ranked this as very important or important);
- Shoreline erosion (72% of respondents ranked this as very important or important); and
- Changes to foreshore vegetation (71% of respondents ranked this as very important or important).

4.2.3 Richmond River CZMP

Consultation activities were conducted for this CZMP with particular groups representing specific interests in the estuary, community focus groups made up of interested individuals, as well as the canvassing of the broader community through local radio, newspapers and information stalls.

The groups involved in community consultation were:

- Estuary Management Committee;
- Floodplain Committee;
- Northern Rivers Catchment Management Authority;
- Local Government (Ballina Shire Council, Richmond Valley Council and Lismore City Council);
- Indigenous Groups (Bundjalung Elders, Ngulingah Local Aboriginal Land Council, other key Aboriginal stakeholders);
- Community Focus Groups (lower catchment and upper catchment groups);
- General Community communication (ABC radio, newspaper, information stalls at public events); and
- Far North Coast Weeds.

The local community was surveyed for its opinions on the estuary, its condition, issues and possible means to improve the condition. Their values were recorded and a list of estuary values developed.

Healthy water quality was the highest priority overall. The feeling from the community was that if the water quality was good then ecologically, economically, socially and aesthetically the river would benefit. Other issues raised included a need to address governance issues and identifying who takes responsibility for implementing and funding the actions. There was also a view from the community that the local, state and federal departments relevant to natural resource management are fragmented and do not interact efficiently.

4.2.4 North Creek CMP Stage 1

Council has begun a CMP for North Creek, a coastal tributary of the Richmond River. Consultation actions during this scoping phase of the CMP included:

- Establishment of an Agency Reference Group, and initial meeting to launch the CMP process;
- Identification of stakeholders and key interests;
- Phone / email interviews with key stakeholders;
- Landholder workshop;
- Online survey and information stand at two community markets; and
- A focus on gathering community and stakeholder feedback on catchment values and perceived issues/threats.

From the community survey, the primary areas of interest were:

- Overall catchment health (37%);
- Urban areas, boat ramps, swimming areas (20%); and
- Ross Lane & the Ballina Nature Reserve (12 %).

Important values identified were:

- 76% of respondents identified Native Vegetation as a ‘very important’ catchment value
- Other key values include Biodiversity, Waterbirds, Swimming and Fishing.

The community considers the following to be the top six threats to catchment values:

1. Rubbish
2. Urbanisation
3. Agriculture
4. Stormwater discharge
5. Loss of riparian vegetation
6. Poor drainage

Only 15 % listed climate change as a top 5 threat.

4.2.5 The Marine Estate Management Strategy (2019)

As part of the Marine Estate Management Strategy (MEMA, 2018), around 1,700 NSW residents were surveyed regarding their values and attitudes in relation to the marine estate. The survey revealed that the NSW community considers the health of the marine estate as a core value. Diversity and abundance of marine life and natural beauty of the marine estate are key economic values for nature-based and regional tourism. Overall, the MEMS survey found that the marine estate is integral to the social and cultural wellbeing of the community.

4.2.6 Other Plans and Studies

It should also be noted that a vast amount of community and stakeholder engagement activities have been undertaken over the last 15 years for a range of other plans and studies that are relevant to the development of the CMP. The community and stakeholder engagement undertakings of the following plans were also analysed for relevant engagement insights, content and methods:

- The NSW Water Quality and River Flow Objectives (NSW Government, 1999);
- The NSW Marine Water Quality Objectives (DEC, 2005);
- The North Coast Regional Plan 2036 (DPE, 2017);
- Ballina Shire Council Community Consultation Policy (Ballina Shire Council, 2017)
- Ballina Our Community Our Future Community Strategic Plan 2017-2027.

4.3 Stakeholder Engagement Strategy

The Coastal Management Manual recommends that a coastal community and stakeholder engagement strategy is prepared in Stage 1 to assist in identifying how Council and project partners will engage with the community and stakeholders during the preparation of the CMP. A community and stakeholder engagement strategy has been developed and is provided as Appendix A. It has been developed based on:

- An analysis of CMP stakeholders (see Section 3.2);
- A community profile (see Section 3.7);
- Previous engagements undertaken during CZMPs and associated studies (see Section 4.2);
- Ballina Our Community Our Future Community Strategic Plan 2017-2027;
- Ballina Shire Council Community Consultation Policy (Ballina Shire Council, 2017);
- The NSW Coastal Management Manual - Guidelines for community and stakeholder engagement in coastal management (OEH, 2018a); and
- The International Association of Public Participation (IAP2) documentation.

The strategy outlines which groups and organisations should be involved in the preparation and implementation of the CMP, how they will be offered engagement opportunities, and how their input will be incorporated into the planning process. It should be noted that the community and stakeholder engagement strategy be considered as a living document and should be refined throughout the CMP process.

5 CMP SCOPE AND SPATIAL EXTENT

5.1 Spatial Extent

5.1.1 Coastal Management Areas

As discussed in Section 3.3.1, the CM Act defines the area of land to be covered by a CMP – which may include any of the following four (4) coastal management areas. Each area has different characteristics and objectives - and may overlap. These are discussed in Section 5.2 and include:

- Coastal environment area;
- Coastal use area;
- Coastal wetlands and littoral rainforests area; and
- Coastal vulnerability area.

The CM SEPP includes adopted maps for three (3) of these zones. The CM SEPP mapping of coastal environment, coastal use, and coastal wetlands and littoral rainforests areas are provided in Figure 5-1 and Figure 5-3. Mapping for the coastal vulnerability area has not been provided from the SEPP, and no such coastal vulnerability area map yet exists for the Study Area.

All four coastal management areas identified above are applicable to the development of this CMP.

Two points are noted with regards to the CM SEPP mapping:

- The intent of Ballina Shire Council is to propose, by way of a planning proposal, the adoption of a map indicating a Coastal Vulnerability Area (CVA) for coastal erosion and tidal inundation hazards.
- The existing CM SEPP mapping for coastal environment area, coastal use area, and coastal wetlands and littoral rainforests area may be amended or replaced based on the outcomes of the CMP – also through the process of making a planning proposal.

5.1.2 Sediment Compartments

Information regarding the sediment compartments of the study area is provided in Section 3.1.

5.2 Coastal Management Areas

5.2.1 Coastal Environment Area

The CM Act defines the coastal environment area as land containing coastal features such as the coastal waters of the state's, estuaries, coastal lakes, coastal lagoons, and land adjoining those features including headlands and rock platforms. Beaches, dunes and foreshores are included in this area. Within estuaries, the coastal environment area extends upstream to the extent of tidal influence.

The area of land adjacent to the open coast, estuary or coastal lake/lagoon is also included in the coastal environment area. This is to ensure nearby development considers potential impacts on the coastal environment. The CM SEPP mapping for the coastal environment area therefore includes the following buffers around these coastal features:

- For estuaries and coastal lakes: a 500 m landwards buffer
- For beaches, dunes, headlands, rock platforms and foreshore: a 250 m landwards buffer.

5.2.2 Coastal Use Area

The CM Act defines the coastal use area as being 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.

In regional NSW, the coastal use area is defined as the 500 m landward extent from the open ocean boundary of LGAs, and a 250 m landward extent from the boundaries of estuaries.

5.2.3 Coastal Wetlands and Littoral Rainforests Area

The CM Act defines the coastal wetlands and littoral rainforests area as the 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 wetlands mapped in NSW for the development of the CM SEPP include those that are dominated by the following vegetation types: mangroves, saltmarshes, melaleuca forests, casuarina forests, sedgelands, brackish and freshwater swamps, and wet meadows.

Littoral Rainforests are defined by their dominant vegetation which include riberry broad leaved lilly pilly, tuckeroo, brush box, yellow tulip, baurela, red olive plum, plum pine, cabbage palm and various figs.

The mapping for these areas includes a 100-metre proximity area, applying to all land zones around coastal wetlands and littoral rainforests.

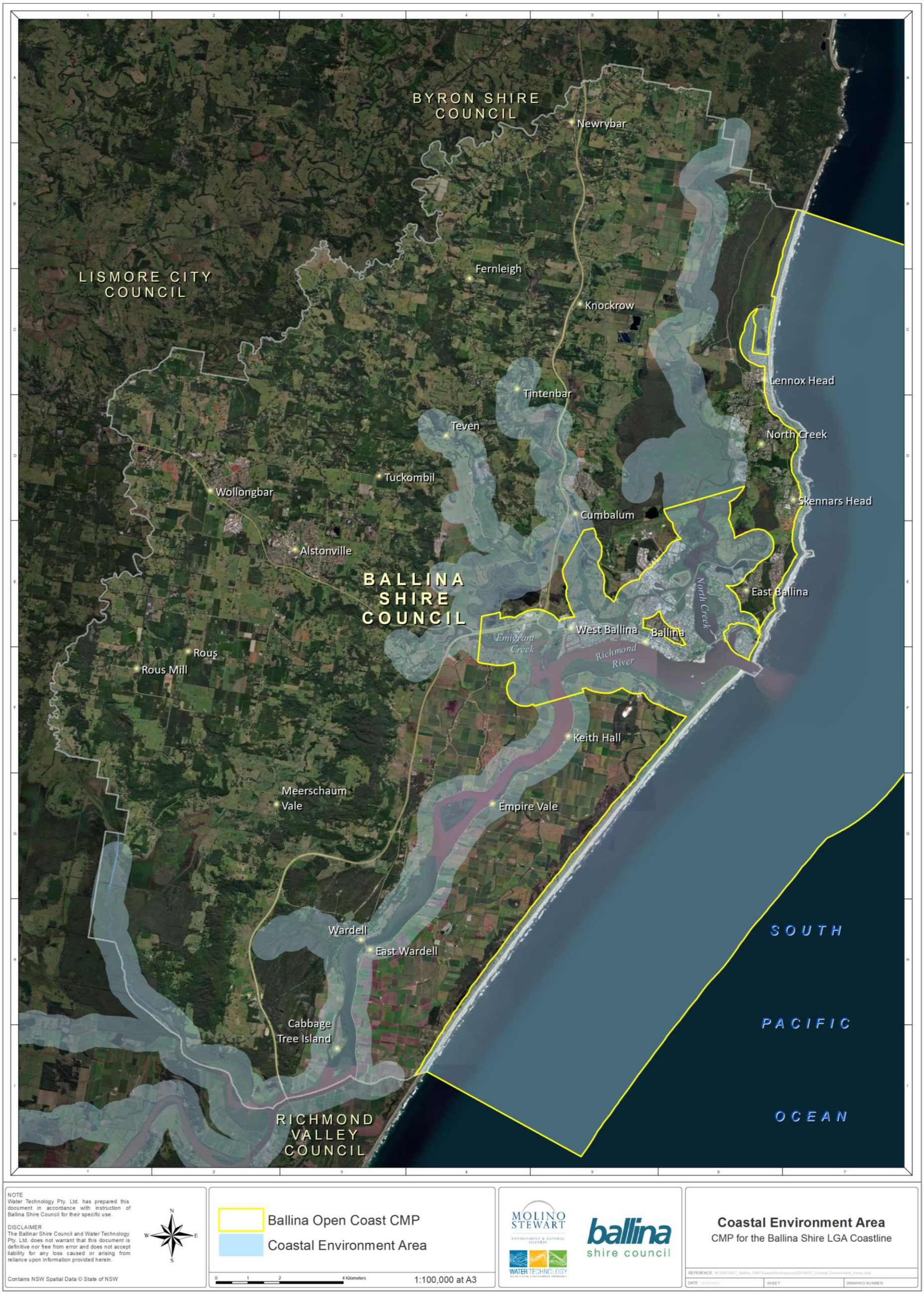


FIGURE 5-1 CM SEPP COASTAL ENVIRONMENT AREA

FIGURE 5-2 CM SEPP COASTAL USE AREA

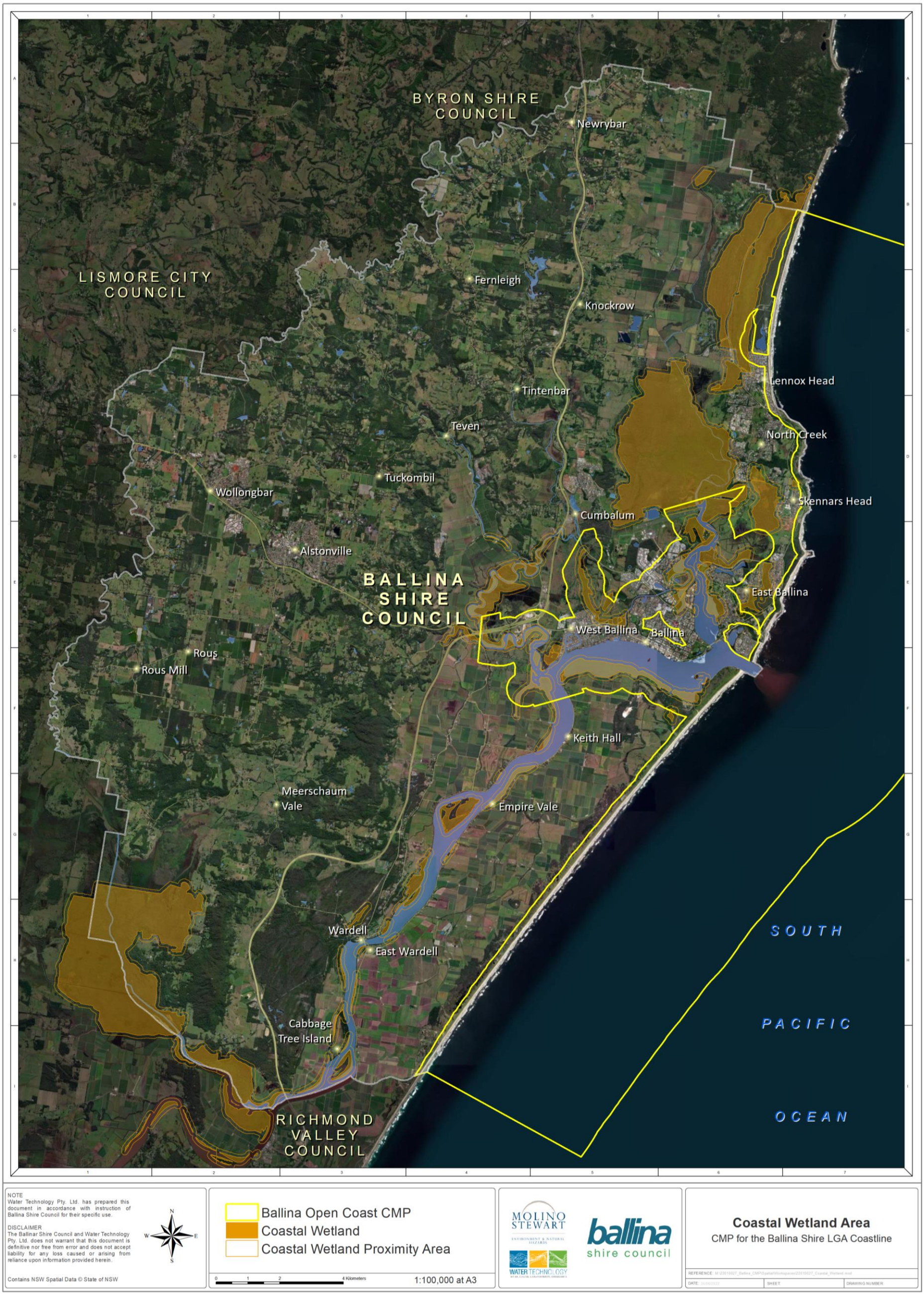


FIGURE 5-3 COASTAL WETLANDS MAPPING

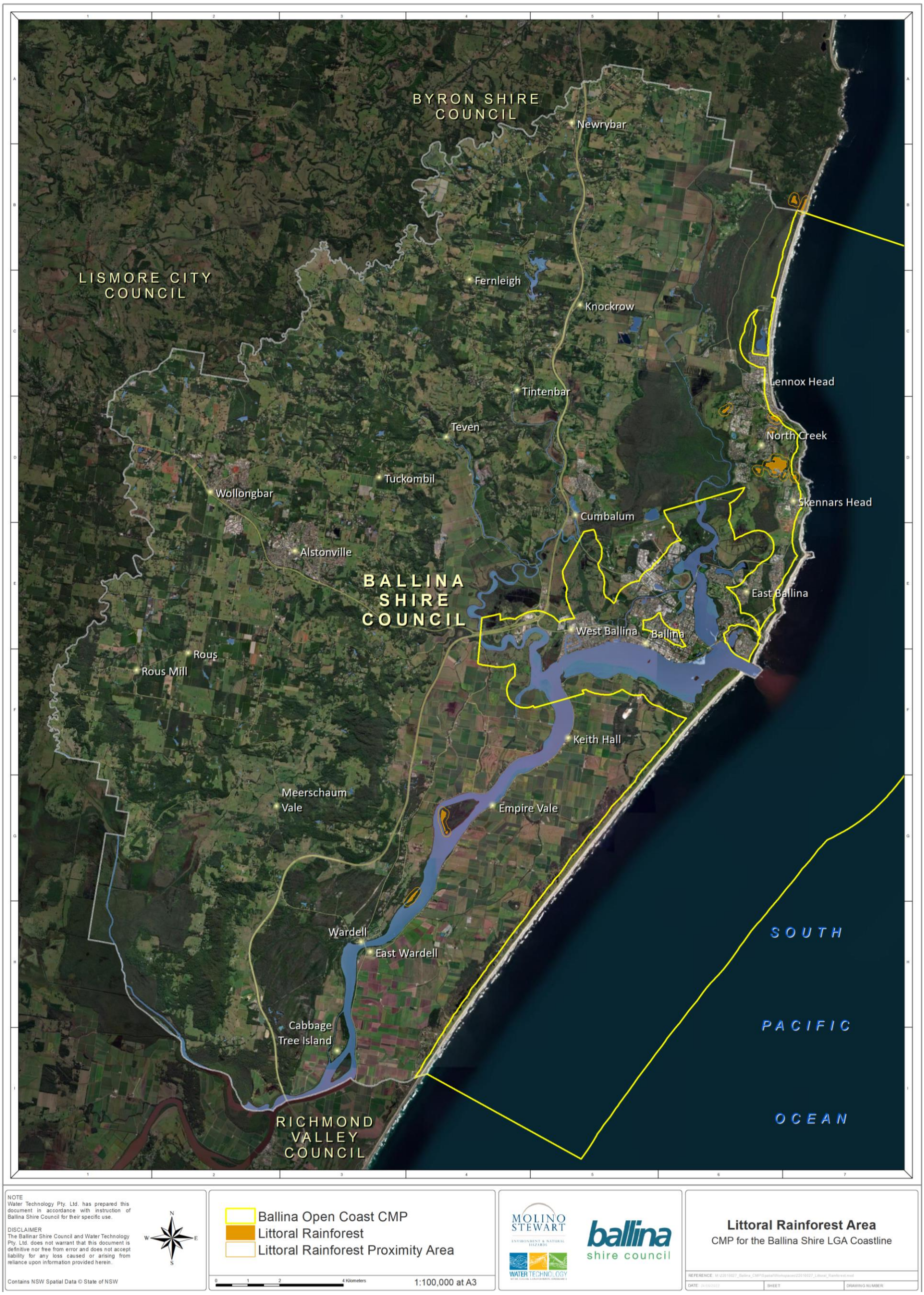


FIGURE 5-4 LITTORAL RAINFORESTS

5.2.4 Coastal Vulnerability Area

The coastal vulnerability area (CVA) is defined in the Act as land which is subject to coastal hazards. The area focusses on identifying land subject to current and future coastal hazards, and to ensure land use management and development undertaken in these areas recognise coastal risk and is subsequently appropriate. The Act provides for the management of seven coastal hazards:

- Beach erosion;
- Shoreline recession;
- Coastal lake or watercourse entrance instability;
- Coastal inundation;
- Tidal inundation (often referred to as “sunny-day flooding”);
- Coastal cliff or slope instability; and
- Erosion and inundation of foreshores caused by tidal water and waves, including the interaction of those waters with catchment floodwaters.

At the time of preparing this Scoping Study, there was no map published under the CM SEPP to identify the CVA across the study area. Therefore, a planning proposal will be required to prepare a LEP which declares a map (based on the outcomes of the CMP) to be the CVA for the study area. Mapping of the coastal vulnerability area needs to be informed by local coastal hazard modelling and mapping undertaken by or on behalf of councils when preparing their CMP.

5.2.5 Adequacy of CM SEPP Mapping and Planning Proposals

As part of this Scoping Study, a review has been undertaken of existing mapping of the coastal management areas - in order to identify locations where further refinement may be required. For this task, the CM SEPP Mapping has been analysed against comparative datasets such as aerial photographs, vegetation and waterway mapping and cadastral/land use mapping. However, this will be assessed in more detail in Stages 2 to 4 of the CMP process.

This undertaking has not identified any Coastal Management Areas that presently require revision.

6 EXISTING MANAGEMENT ARRANGEMENTS

The roles and responsibilities across of various stakeholders with a role in management of the coastal zone is provided in Section 3.2. The purpose of this Section therefore is to summarise existing coastal zone management plans and programs – as they relate to the study area for the CMP.

6.1 Existing Coastal and Estuary Management Plans

Over the years, a number of coastal management studies and plans have been developed for the Ballina estuaries and their contributing catchments in the form of CZMPs and EMPs These plans, outlined below, have been prepared over the last 20 years and together cover most of the CMP study area. The development of these plans followed the multi-phased structure of the previous NSW Estuary Management and Coastal Zone Management planning processes – see Figure 6-1. The plans are described in more detail in Sections 6.1.1 to 6.1.2. Since the finalisation of these plans, the NSW Coastal Reforms have changed the way estuary and coastal management plans are prepared and implemented.

Whilst it is noted that a separate CMP is being prepared for Shaws Bay, a summary of the historical management of the bay is provided herein for broader context.

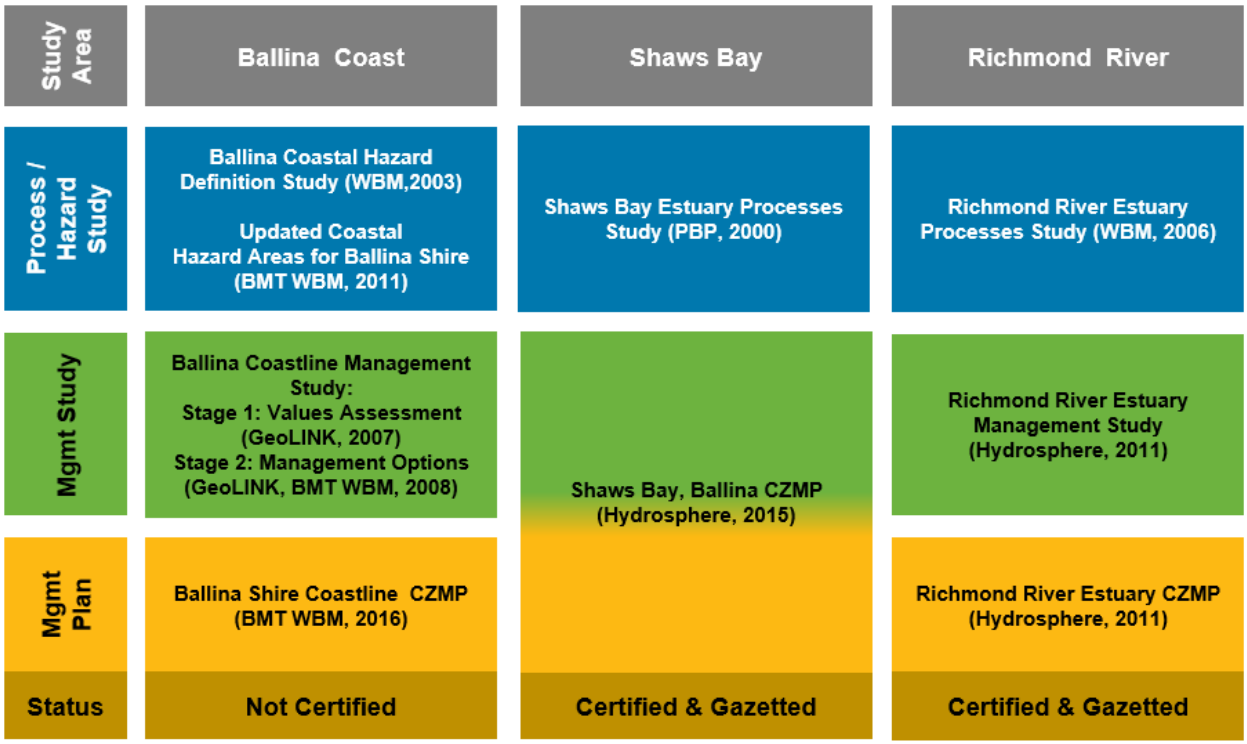


FIGURE 6-1 FRAMEWORK OF EXISTING COASTAL AND ESTUARY MANAGEMENT PLANS

6.1.1 Ballina Shire Coastline Coastal Zone Management Plan (2016)

The coastal zone management for the Ballina Shire Coastline was completed in 2016, with emphasis on maintaining or improving the ecological, cultural, recreational and economic values to coastal hazards such as beach erosion, shoreline recession and coastal inundation. This CZMP was prepared in consultation with government authorities, stakeholder and community. Th Plan was designed to provide clear direction regarding responsibilities for actions and provides information on who is responsible for implementation of these actions and how they can be funded. The coastal hazards considered in the CZMP include:

- Beach erosion;

- Long term shoreline recession; and
- Coastal inundation.

This CZMP is a culmination of the following studies:

- Ballina Coastline Hazard Definition Study (WBM Oceanics, 2003) and the Updated Coastal Hazard Areas for Ballina Shire: Stage 1 – Preliminary Update (BMT WBM, 2011). The study was developed to address risks coastal hazards, community uses of the coastal zone and pressures on coastal ecosystems including projected sea level rise.
- Ballina Coastline Management Study – Stage 1 Values Assessment (GeoLINK, 2007) focuses on values and issues affected by coastal processes and hazards along the full extent of the Ballina Coastline.
- Ballina Coastline Management Study – Stage 2 Management Options Assessment (GeoLINK, 2008); this study identified how coastal hazard would impact the socio-economic, cultural, recreational and ecological values would impacts and how these impacts can be managed and mitigated.

The CZMP also took in account the management of coastal ecosystems and community uses of the coastal zone less susceptible to coastal hazard, in particular the Ballina Coastal Reserve Plan of Management (2003)

Based on the findings of these studies, the CZMP identified a long list of potential management actions to address key issues and maintain the estuary's environmental, social and cultural values. Management actions were then prioritised in order to identify proposed actions which address priority management issues, are reasonable and achieve optimal long-term outcomes for the expected available funding.

The management options for long term were categorised into "Immediate (0-5 years), Short Term (5-10 years), Medium Term (10-25 years) and Long Term (25+ years)". This resulted in an action plan that contained 9 "immediate" actions, 3 "short term" actions, and 6 "medium term" actions and 1 "long term" action. The final draft CZMP was accepted by Council in August 2016 but was not certified or gazetted. The management plan was preceded by Ballina Coastline Management Study – Stage 1 & 2 (GeoLINK, 2007), which investigated and described the physical, chemical and biological processes at play the across coastline. Detailed stakeholder and community consultation was undertaken during the study in order to identify the aspects of the estuary that are valued, and any issues that affect those values. Values of the coastline include a range of ecological, recreational, scenic, heritage, educational and economic benefits.

The stage 2 Study developed a list of long-term management objectives under the broad headings of Water Quality, Bank Erosion / Sedimentation, Ecology, Catchment Development, Waterway Usage, Heritage, and Future Management Mechanisms.

6.1.2 The Shaws Bay Coastal Zone Management Plan (2015)

The Shaws Bay Ballina Coastal Zone Management Plan (Hydrosphere Consulting, 2015) was finalised in 2015. The overarching aim of the CZMP is to "to improve the recreational amenity of Shaws Bay and to ensure that the habitat and ecological values of the Bay are maintained within an acceptable range". To achieve this, the main objective considered were

- Preparation of database with background information on issues
- Analysis of existing studies on coastal hazards, estuary health and community uses and identifying management issues;
- Developing and prioritising of potential options and management issues;
- Developing of a strategic plan to address management issues, actions, timeframes, funding, responsibilities and monitoring requirements; and
- Consultation with stakeholders to obtain feedback on the proposed strategy.

To address the two most significant values identified of the Bay i.e. recreation and ecology, a series of 12 management objectives were developed to with consideration of the feedback from the community. They also were aligned with the NSW Coastal Policy 1997.

A series of 29 management options were suggested. The management strategies were assessed based on expected success on resolving issues, cost of implementation, how they achieved the objectives, how practical they were to implement, community preference and positive and potential environmental impacts.

Subsequently, 24 strategies were selected for implementation. For each strategy, each rationale was provided for what the management strategy is aiming to achieve, the actions involved in its implementation, indicative costs, funding opportunities, responsibility, timing and performance indicators.

The CZMP format was finalised in November of 2015.

6.2 Implementation of Existing Management Plans

As part of this Scoping Study, an audit was undertaken of the recommended actions and strategies put forth in the various management plans described above. This was undertaken in consultation with Council and comprised a review of the 97 discrete management actions recommended in existing CZMPs (see Section 6.1).

The results of the audit are provided in full in Appendix C. For each action item within each plan, information has been provided regarding the current status of that action – with a designation that fits into one of six (6) categories:

- ***Completed (Code: C):*** Where discrete (one-off) actions items have been completed and no further actions is required.
- ***Implemented and Ongoing (Code: O):*** Where actions have an ongoing component and are currently being implemented.
- ***In progress / Incomplete (Code: IP):*** This includes actions that are in progress or not yet finalised.
- ***Not Commenced / Outstanding (Code: NC):*** Where outstanding actions have not yet commenced - but have been marked for future implementation.
- ***No Longer Applicable (Code NLA):*** Where actions are no longer applicable due to changed circumstances or superseding actions from other management plans.
- ***Unknown (Code U):*** Actions where the status is unknown or do not necessarily fit into the above categories.

A summary of the audit is provided in Table 6-1, which provides a breakdown of action implementation across the various management plans. Council has given effect to many of these actions through its IP&R frameworks and are manifest in its delivery program and annual operational plans.

TABLE 6-1 SUMMARY OF CZMP AUDIT

Plan	Total Actions	C	O	IP	NC	NLA	U
Ballina Open Coast CZMP	43	4	11	9	17	0	2
Shaws Bay CZMP	20	7	8	1	1	1	2
Total	**63**	**11 (17%)**	**19 (30%)**	**10 (16%)**	**18 (29%)**	**1 (2%)**	**4 (6%)**

Results in this table and Appendix C show that less than half (47%) of the actions outlined in these plans have been completed (C) or implemented (O), whilst another 16% are currently in progress. Some of the actions from previous CZMP that have been implemented or are in the process of being implemented include those listed below. The CMP should identify opportunities to leverage off the success of these actions:

The implementation of the Ballina Open Coast CZMP includes a series of infrastructure upgrades that were proposed in the CZMP, such as:

- Approval for upgradation of the walking track at the southern end of Boulder Beach is completed
- Investigation is completed for the levee at Lennox Head South to mitigate storm events and shoreline recession hazards;
- Investigation and determination have been made for rock wall between Byron Street and the SLSC and Lake Ainsworth Sport and Recreation Centre.

Among the 20 actions listed in the Shaws Bay CZMP, to assist Council in completing programmed and regular ongoing maintenance activities, the following have been completed:

- Improvement to the Western foreshore at Shaws Bay
- Upgrade and expansion of Pop Denison Park and also improvements to access ways to the eastern foreshore
- Council has upgraded the signage in the foreshore areas
- Dredging of the main section of the Shaws Bay in completed.

However, it should be noted that over 30% of actions have not commenced or are outstanding. There are a number of constraints and limitations that have historically impeded the ability to plan and implement estuary management actions – and these are discussed in Section 6.3.

6.3 Challenges and Opportunities for Coastal Management

A summary of the governance arrangements, and the roles and responsibilities of the various local governments and state agencies is provided in Section 3.2. This section provides a high-level summary of the major challenges and opportunities for implementation of coastal management. It is intended as a broad overview of the major themes and overarching issues provided by the project stakeholders.

Funding and Resources

As a regional Council, the Ballina Shire has a relatively low population and hence a limited ratepayer base with which to fund the implementation of coastal management actions – and the funding provided for coastal management is typically weighed against the many other competing demands on Council as a service provider to its community. As a result, Council is generally limited by the funding and resources (such as staffing) available and is reliant on other sources of revenue such as state government grants and subsidies.

Therefore, the NSW Coastal Reforms (and the implementation of CMPs) represents an opportunity to develop a more manageable suite of coastal management actions across the LGA. As part of this approach, Council intends to develop CMPs that focus on providing succinct and practical (“implementable”) programs of management actions that are rationalised and prioritised by a robust cost-benefit analysis. The CMP also represents an opportunity to improve the funding and resources available for estuary management through the following mechanisms:

- The CMP can unlock funding made available through the NSW Coastal and Estuary Grants Program. In fact, future grant funding for the implementation of management actions will *require* councils to have a certified CMP. This is discussed further in Section 9.

- The CMP will clearly outline how actions will be implemented through Council's IP&R framework, including Council's Delivery an Operational Programs. This will assist in obtaining internal Council funding for actions by ensuring that financial requirements are adequately linked with Council's budgeting and resourcing mechanisms.
- The CMP will increase coordination and collaboration across the various government agencies that have management roles across the estuary and its catchment. This should allow for more efficient resourcing and reduced efficiencies associated with inter-agency coordination.

Coastal Hazards

Coastal hazards were also identified as a significant barrier to effective coastal zone management and represent a risk to asset management and maintenance of assets. These natural hazards can represent irregular and episodic challenges that often require emergency management and funding. Furthermore, it is expected that increased pressure from related disasters is likely to be incurred in the future, owing to climate change impacts. The frequency and intensity of disasters related to Tropical Cyclones and East Coast Lows – and associated coastal and catchment flooding impacts are likely to create additional pressure to the implementation of effective coastal zone management over future planning horizons. As such, the development of the CMPs can be used to identify high priorities for climate change adaptation measures associated with coastal and catchment risk management.

Population Pressures

Population pressures have also been identified as a significant challenge to the management of the coastal zone. These pressures manifest in several forms, including management of recreational use and user conflicts – particularly during peak periods. In particular, the increase in recreational use intensity owing to the increased patronage from adjacent LGAs such as the Byron Shire Council – which has experienced a population boom in recent decades. Population and recreational use demographics are outlined in Section 3.7. However, population pressure also represents a challenge to coastal management in the form of increased development and associated environmental pressures across the coastal zone. Development pressure and urbanisation is also noted as a major challenge for the coastal zone. Section 3.7 discusses a series of planned major urban subdivisions which are likely to be developed over the CMP planning horizon. These developments will add to the increasing population pressures and may also have impacts with regards to urban runoff into the various estuaries of the coastal zone.

Some of the challenges discussed herein have also been identified as coastal zone threats – and are discussed further in Section 7.

Traditional Owner Engagement

Ballina Shire Council is committed to achieving best-practice engagement with Traditional Owners (TO). The CMP represents a significant opportunity to increase TO communities' participation in the planning and delivery of the management of sea country and the marine estate – as well as create new opportunities for participation by improving collaboration with other coastal zone stakeholders.

6.4 Monitoring Programs

There are a number of coastal and estuary monitoring programs in effect across the study area, and a brief summary is provided below.

6.4.1 Wave and Water Level Monitoring

Manly Hydraulics Laboratory operate a range of physical data monitoring stations across the study area, including an ocean tide gauge, two (2) estuarine water level gauges and an offshore wave rider buoy (WRB), as per Table 6-2.

TABLE 6-2 MHL WATER LEVEL MONITORING SITES

Site Name	Type	Station ID	Latitude	Longitude	Coverage
Ballina Breakwall	Ocean tide	203425	-28.8754	153.5844	2017 - Present
Missingham Bridge	Estuary WL	203465	-28.8687	153.5759	2003 - Present
Byrnes Point	Estuary WL	203461	-28.8738	153.5267	1990 - Present
Byron Bay WRB	Ocean Wave	BYRBOW	-28.8706	153.6942	1978 - Present

6.4.2 Beach Profiles

Periodic monitoring of local beach profiles is undertaken and collated at the NSW Beach Profile database (WRL, 2020). Beach profiles are available for all of the LGA beaches, dating back to 1947.

6.4.3 Water Quality

The recreational water quality monitoring in NSW is carried out by the state government since 2002 through the Beachwatch program. As of 2021, 210 sites within NSW are monitored which included ocean beaches and estuarine areas, lake, lagoons swimming sites and ocean baths.

Beachwatch provides long term assessment of suitability of a site for swimming. Through this program, water quality of beaches is monitored and the community is provided with accurate information on the quality of water to make informed decisions if a site is suitable to swim at any given point in time. Sample sites in NSW are graded as Very Good, Good, Fair, Poor or Very Poor in accordance with the National Health and Medical Research Council's 2008 Guidelines for Managing Risks in Recreational Waters.

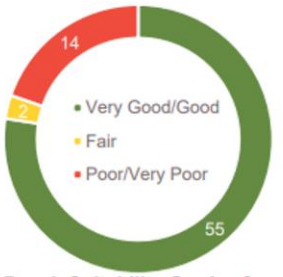
Ballina Shire Council has been a participant in the Beachwatch Partnership program since 2002 – and at present there are thirteen (13) locations monitored within the LGA. Figure 6-2 shows the Beachwatch grading for each of the sites within the LGA as reported in 2021. Samples are collected weekly between November and March of each year. Nine of the 13 swimming sites were graded as Very Good or Good in 2020–2021, a decline in performance from the previous year. The percentage of sites graded from Very Good or Good dropped from 85% in 2019-2020 to 69% in 2020-2021. Seven Mile Beach, Shelly Beach and Lighthouse Beach are considered as sites with excellent water quality and best suited for swimming all through the area.

As per the State of Beaches Report 2020-2021, North Coast region (NSW Govt.), four of the six estuarine swimming locations with Shaw's Bay were graded as Good (2020–2021), which include Shaws Bay East, Shaws Bay East Arm, Shaws Bay East Beach and The Serpentine. While Shaws Bay North and Shaws Bay West were downgraded to Poor in 2020–2021 from Good. The grading is based on recorded elevated enterococci levels after light rainfall and more often after heavy rainfall. Water quality at these sites is directly impacted by upstream sources and is always influenced due to lower levels of tidal flushing.

Swimming site	Site type	Beach Suitability Grade	Change
Ballina Shire Council			
Seven Mile Beach	Ocean beach	VG	●
Lake Ainsworth North	Lake/Lagoon	P	●
Lake Ainsworth East	Lake/Lagoon	G	●
Lake Ainsworth South	Lake/Lagoon	G	●
Lake Ainsworth West	Lake/Lagoon	P	●
Shelly Beach	Ocean beach	VG	▲
Lighthouse Beach	Ocean beach	VG	●
Shaws Bay North	Estuarine	P	▼
Shaws Bay East	Estuarine	G	●
Shaws Bay East Arm	Estuarine	G	●
Shaws Bay East Beach	Estuarine	G	●
Shaws Bay West	Estuarine	P	▼
The Serpentine	Estuarine	G	●

Beach Suitability Grade: VG Very Good; G Good; F Fair; P Poor; VP Very Poor

Change: ▲ Improved; ● Stable; ▼ Declined



Beach Suitability Grades for monitored estuarine beaches in NSW

Beach Suitability Grades for monitored lake/lagoon swimming sites in NSW

FIGURE 6-2 STATE OF BEACHES GRADES FOR BALLINA LGA BEACHES IN 2021

7 FIRST PASS RISK ASSESSMENT

7.1 Methods and Limitations

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). To this end, a review has been undertaken to identify the environmental, social and economic values of the coast and to assess the various threats and pressures which may affect these values.

This has included the following components:

- Assessment of community uses and values – see Section 7.2
- Identification of study areas threats and stressors – see Section 7.3; and
- Analysis of the level of risk presented by those threats in a first-pass risk assessment (FPRA) – see Section 7.4.

The high-level qualitative FPRA has been undertaken in accordance with the requirements set out in the NSW Coastal Management Manual. This assessment is essentially a tool for the prioritisation of risks, to identify those that need to be further assessed in subsequent stages of the CMP. It should be noted that this is intended as a broad scale, semi-qualitative assessment – and should be refined and developed in significantly greater detail during Stage 2 of the CMP.

The High Risk stressors identified by the FPRA are discussed in Section 7.5

7.2 Values

As part of this Scoping Study, a review was undertaken of the community uses and values of the study area. This was undertaken through several mechanisms:

- Review of historical community and stakeholder engagement activities across the study area (see Section 4.2); and
- The application of community and stakeholder engagement for this Scoping Study (Stage 1 of the CMP) in the form of an online community survey (see Section 4.1). The results of this engagement are summarised in Appendix D.

First, a review was undertaken of historical community and stakeholder engagement activities across the study area. There have been several past community and stakeholder engagement exercises undertaken across the study area over the last 10 years designed to ascertain community values and uses of the coastal zone, marine estate, and adjacent catchments. These have been undertaken by multiple tiers of government to inform a range of different plans and strategies and are summarised in Section 4.2.

Second, a contemporary assessment of community values was undertaken through the application of an online community survey. This exercise is described in Section 4.1 and the results of the survey are summarised in Appendix E.

A summary of responses from Question 11 from the survey: "*What words or phrases would you use to describe what you value about the Ballina coastline?*" is provided in Figure 7-1 in the form of a word cloud. Descriptors including "beauty", "natural", and "pristine" were common across the respondents, indicating the high importance that the local community places on the natural environment of the area. Furthermore, words such as "accessible", "family", "walking" and "surf" were also common, indicating the high recreational and social values that the coastal area provides to the public.

Additionally, Table 7-1 summaries community responses to Question 6, asking *"When you think about the coastal zone (that is: the coastline, beaches and coastal waterways of the area) - how important are the following values to you?*". It shows that natural systems and biodiversity, scenic amenity, and recreational amenity are highly valued by the local community.

A brief overview of relevant community values is provided in Table 7-2 . The values listed should be considered as a starting point that will be expanded upon during subsequent stages of the CMP.

FIGURE 7-1 A WORD CLOUD DEPICTING COMMUNITY RESPONSES TO WHAT THEY VALUE ABOUT THE ESTUARIES

TABLE 7-1 COMMUNITY RESPONSES FOR QUESTION 4: "*WHEN YOU THINK ABOUT THE COASTAL ZONE (THAT IS: THE COASTLINE, BEACHES AND COASTAL WATERWAYS OF THE AREA) - HOW IMPORTANT ARE THE FOLLOWING VALUES TO YOU?*"

Value	Not Important (Score of 1-3)	Somewhat Important (Score of 4-7)	Very Important (Score of 8-10)
Scenic amenity	1%	6%	**93%**
Natural ecosystems and biodiversity	2%	6%	**92%**
Recreational amenity	3%	18%	**79%**
Cultural heritage values	10%	20%	**70%**
Research and education values	5%	29%	**66%**
Economic values	12%	32%	**56%**

TABLE 7-2 VALUES OF THE BALLINA COASTAL ZONE

Category	Value	Description (and relation to community survey questions)
Environ-mental Values	Natural Ecosystems and Biodiversity	Survey Question 6 demonstrated that natural ecosystems and biodiversity are highly valued by the community. Over 92% of respondents to the survey ranked natural ecosystems and biodiversity as very important (i.e. a score of 8 or above out of 10), with over 75% of respondents giving a score of 10 (Extremely important) and less than 4% giving it a score of 5 or less. This indicates that Ballina's coastal zone is highly valued for the healthy and diverse ecosystems they provide. The coasts are home to a wide range of flora and fauna that are valued by the community, including many protected under State and Commonwealth legislation.
Social and Cultural Values	Scenic Amenity	Over 92% of survey respondents ranked scenic amenity highly, with 70% ranking it as 10 (Extremely important) in Question 6. Very few respondents (less than 4%) ranked this as 5 or below out of 10. Based on survey Question 4, 68% of survey respondents engaged in "nature observation (enjoying the scenery)" while visiting beaches. This is in line with survey responses showing that the "beauty" of the coast is highly valued by the community, and an essential component of community benefit.
	Social and Recreational Amenity	Recreational amenity was ranked as the third most highly valued, with 79% of survey respondents giving it a score of 8 or above out of 10 in Question 6. Half of the survey respondents ranked its importance at 10 out of 10. This is supported by the responses regarding coastal values in Question 11, which included "surfing", "fishing", "walking", and "swimming". The most popular activities based on survey Question 4 are: a. Beach activities (running, sitting, relaxing on the sand etc) (81% of respondents engaged); b. Walking, running or other exercise (77% of respondents engaged); c. Water recreation (swimming, snorkelling etc) (71% of respondents engaged).
	Cultural Heritage	Over 70% of respondents stated that cultural heritage very important (i.e., a score of 8 or above out of 10) in Question 6. Half of the survey respondents ranked its importance at 10 out of 10. Only 10% of survey respondents ranked its importance as 3 or below out of 10. Cultural importance was mentioned several times as a key value in in in Question 11. The Ballina coast has a rich and continuing Indigenous heritage, high cultural and spiritual significance to Traditional Owners and the broader community - both in terms of its ongoing importance to communities and because of the links to the original owners of the area.
	Research and Education	Two thirds of respondents to Question 6 indicated that research and education values were very important to them (i.e. a score of 8 or above out of 10), and another 29% ranked it as somewhat important (i.e. a score of 4 to 7 out of 10).
Economic Values	Economic Prosperity	Around 56% of survey respondents stated that economic value is very important (i.e. a score of 8 or above out of 10), with another 32% stating that is somewhat important (i.e. a score of 4 to 7 out of 10). Ballina Shire's coast provides direct economic value through supporting industries such as tourism – which is a major contributor to the regional economy. As discussed in Section 3.5, the coast also provides indirect economic value in the form of ecosystem services.

7.3 Threats

Threats to community benefits arise from a range of stressors, and can have impacts on the environmental, social and economic values of the study. The various threats and stressors have been identified through stakeholder engagement, a review of previous coastal and estuary studies and management plans, and the Marine Estate Management Strategy Threat and Risk Assessment (BMT WBM, 2017).

Based on this preliminary review, a total of 56 threats has been initially provided, across five (5) threat categories. A brief overview of the various study area threats is provided in Table 7-3, which also provides an outline of the potential environmental and socioeconomic impacts of these threats.

TABLE 7-3 SUMMARY OF THREATS

Threat	Stressor Category	Stressor (and Stressor ID)	Environmental Impacts	Social, Cultural and Economic Impacts
Coastal and Estuarine Hazards	**CM Act Hazards**	1. Open coast storm erosion 2. Long term shoreline recession (due to ongoing recession trend, and/or sea-level rise) 3. Estuary foreshore erosion and bank erosion 4. Coastal lake or watercourse entrance instability 5. Coastal cliff or slope instability 6. Coastal storm tide inundation 7. Combined coastal and catchment flooding (in the lower Richmond River estuary) 8. Tidal inundation of estuaries (i.e., sunny day flooding) 9. Sea-level rise (SLR)	▪ Coastal erosion may result in loss of dune habitat, and seabed deposition can affect seagrass and other benthic habitats, as well as biodiversity in the short term ▪ Shoreline recession, erosion and sea-level rise can affect foreshore biodiversity and generate “habitat squeeze” when landward migration of habitat is restricted by barriers such as coastal development ▪ Catchment flooding can transport pollutants into the estuary and coastal systems, causing water quality degradation ▪ Ecosystem and habitat disruption can result from potential construction of flood defence measures ▪ Bank erosion can cause increased sedimentation of the waterway and affect benthic/riparian habitat	▪ Sea level rise is likely to significantly affect low lying coastal communities in terms of their susceptibility to tidal inundation, coastal inundation and catchment flooding ▪ Coastal erosion and inundation during storm events are a threat to coastal assets on private and public land, coastline access, and social and recreational amenity values ▪ Erosion and inundation may represent a significant risk to public safety and prevent coastal access ▪ Ingress of tidal inundation to low lying areas can affect access, public safety, recreational amenity and threaten assets and infrastructure ▪ Coastal hazards resulting is loss of tangible heritage items (middens etc) and intangible heritage values ▪ Long term shoreline recession and estuary bank erosion can affect recreational and social amenity through reduction of open coastal space, and undermine foreshore assets and recreational access
	Other Hazards	10. Tsunamis	▪ Tsunamis can cause extensive environmental impact across effected coastal regions and cause inundation that spreads pollutants	▪ Tsunami, whilst rare, can significantly affect maritime assets and infrastructure and low-lying land, and represent a serious risk to public safety
	Climate Change Hazards	11. Altered ocean currents and nutrient inputs 12. Ocean temperature increase 13. Ocean acidification 14. Altered storm frequency and severity 15. Altered hydrological regimes 16. Altered salinity levels / profile 17. Habitat migration and squeeze	▪ Increased ocean temperatures and ocean acidification are expected to have a negative impact on ecological health and biodiversity of the marine and estuarine environments ▪ Sea level rise and rainfall impacts will affect coastal and estuarine processes and dynamics, including erosion ▪ The effects of increased flooding include poor water quality with impacts on terrestrial, aquatic and marine coastal ecosystems ▪ Marine tropicalisation as warmer waters extend further south will result in changes in the distribution of biodiversity	▪ Increased frequency and severity of storm and erosion events will result in economic and possible tangible and non-tangible cultural losses ▪ Climate change impacts on marine and estuarine ecology will affect recreational use of the coastal environment ▪ Climate change stressors such as sea level rise and increased sea temperatures can negatively impact cultural heritage ▪ Warming and salinisation of coastal waters may impact on aquaculture
Urbanisation and Land Use Impacts	**Water Pollution and Sediment Contamination**	18. Urban stormwater discharge 19. Sewage effluent & septic runoff 20. Agricultural runoff 21. Sediment contamination / pollution (including Acid Sulfate Soils (ASS)	▪ Water pollution reduces water quality in estuary and marine environments through input of nutrients, organic matter, toxic contaminants, sediments, pathogens and debris ▪ Nutrient and fertiliser runoff contribution to proliferation of algal blooms and aquatic weeds ▪ High levels of water pollution have negative impacts on aquatic and marine ecology ▪ Acid sulfate soils can seriously affect water and soil quality when exposed, and may release heavy metals and other toxicants	▪ Pollution and poor water quality due to stormwater and sewer discharges, as well as agricultural runoff discharges can impact health, safety and wellbeing of humans using the waterways ▪ Loss of amenity associated with pollution is likely to significantly impact people’s relationship with the coast and their ability to appreciate marine biodiversity ▪ Local businesses that are dependent on the coastal zone for their viability, such as tourist operators, may experience major impacts on viability due to pollution and contamination events ▪ Water pollution can impact on tangible and non-tangible Aboriginal cultural heritage including damage to places of significance
	Habitat Clearing/ Disturbance	22. Clearing / disturbance of coastal wetlands, including riparian and aquatic habitat 23. Clearing / disturbance of littoral rainforest habitat 24. Clearing / disturbance of terrestrial habitat 25. Disturbance of marine and intertidal ecosystems 26. Introduction of invasive flora and fauna (pest) species 27. Loss of biodiversity 28. Stranding of marine mammals 29. Damage, loss or disturbance of indigenous heritage (tangible or intangible) 30. Damage, loss or disturbance of non-indigenous heritage (tangible or intangible)	▪ Clearing and physical disturbance from shoreline infrastructure and development reduces habitat and biodiversity ▪ Benthic habitats are impacted by sediment re-suspension, shading resulting in light limitation, and sediment deposition in waterways caused by habitat disturbance ▪ Biodiversity and habitat may be reduced by loss and “squeeze” of wetland and coastal environments, including endangering species of conservation significance ▪ Introduction of pest species can have negative impact on habitats and protected species by outcompeting native species ▪ Clearing terrestrial vegetation results in increased runoff of sediment into the upper estuary ▪ Marine mammal standings may possibly be instigated by human causes and coastal uses	▪ Environmental impacts may reduce recreational amenity and social enjoyment of coastal and estuarine areas ▪ Negative impacts on people’s relationship with the coast may harm social connections (i.e. caused by decline in wildlife and depreciation of visual character) ▪ Marine mammal strandings may be distressing and cause public health and safety risks to locals and tourists using the beach ▪ Physical disturbance from human activity can impact and result in permanent loss of Aboriginal tangible and non-tangible cultural heritage

Threat	Stressor Category	Stressor (and Stressor ID)	Environmental Impacts	Social, Cultural and Economic Impacts
	Hydrologic Modifications	31. Modified freshwater flows, including surface and/or ground water extraction 32. Sedimentation and infilling of channels/ waterways	▪ Natural hydrology can be altered through unsustainable surface and groundwater extraction ▪ Changes to hydrological regime can affect habitat and biodiversity ▪ Sedimentation and shoaling impacts on seagrass and benthic communities	▪ Sedimentation can reduce water depth in the bays and estuaries, negatively affecting recreational use of the waterways and navigation of the channels ▪ Turbidity associated with dredging can negatively affect recreational amenity ▪ Modified freshwater flows can impact recreational fishing and Aboriginal cultural heritage by negatively affecting fish stocks
Resource Use and Conflict	**Recreation and Tourism**	33. Recreational fishing (boat and shore based) 34. Commercial fishing 35. Recreational boating 36. Passive recreational use	▪ Uncontrolled recreational uses may cause water pollution due to contaminants being released into the waterway (i.e. through antifouling paint and oil spills, and effluent disposal) ▪ Uncontrolled pedestrian access to the waterways and beaches can generate or exacerbate bank erosion (including resultant loss of foreshore biodiversity) and dune degradation ▪ Physical disturbance of habitats (i.e., seagrass and other benthic communities) may result from recreational use and recreational infrastructure	▪ Environmental degradation may reduce recreational and social amenity and reduce appeal for tourists ▪ Recreational pressures on the system may impact amenity and therefore people's enjoyment and relationship with estuarine environmental values
	Access and Availability	37. User group conflict on waterways 38. User group conflict on beaches (4WD, dogs, horses on beaches etc) 39. Limited or lack of foreshore and waterway access 40. Limited or lack of disability access	▪ Overcrowding can result in disturbance of habitats such as dunes and foreshore areas ▪ Estuarine and marine fauna may be disturbed by noise and vessel strike ▪ Nesting shorebirds may be disturbed by dogs, horses and vehicles on the beach	▪ Overcrowding and congestion reduce the recreational and social amenity of the system, resulting in "loss of appeal" ▪ Tangible and intangible Aboriginal cultural heritage is impacted by conflict over resource access and use ▪ Anti-social behaviour is likely to deter community use of the marine estate ▪ Increased conflict between various beach users (i.e. dog owners, 4WD drivers, horseback riders) may occur under higher usage
Public Health and Safety	**Public Health and Safety**	41. Water pollution and contamination affecting human health and safety 42. Public safety risk from coastal processes hazards (from wave overtopping of structures etc) 43. Public safety risk from aging and/or degraded coastal/estuary infrastructure 44. Safe, navigable waterways - Entrance bar 45. Wildlife interactions (sharks, blue-ringed octopus etc)	N/A	▪ Wave overtopping of coastal structures and poor water quality can represent a safety hazard to the general public ▪ Energetic coastal processes represent a significant safety risk to local users, particularly around river entrance currents during opening or flooding ▪ The Richmond River entrance bar can pose a major safety risk to boaters when trying to cross ▪ Wildlife interactions can threaten life and safety, and media and news coverage can have a negative impact on recreational use ▪ Seafood contamination can have major impacts on consumptive use including the viability of fishing and aquaculture industries
Planning and Governance	**Governance**	46. Lack of adequate coordination between adjacent councils, and state government agencies 47. Lack of funding for investigation and action implementation 48. Lack of compliance with regulations (by users) or lack of regulation effort (by agencies) 49. Lack of or ineffective community engagement or participation in governance	▪ Lack of compliance with water management regulations across the upper catchment can result in excessive nutrient and sediment loads entering the estuaries ▪ Inadequate regulations and enforcement for protection can affect threatened and significant species.	▪ Ambiguity regarding roles and responsibilities of the various agencies dealing with the coast creates inefficiencies with regard to management and approvals processes ▪ Environmental impacts may reduce recreational and social amenity and enjoyment of environmental values ▪ Lack of regulation and compliance has the potential to create long-term negative impacts on businesses and employment
	Information Gaps	50. Incomplete coastal process information (including climate change impacts) 51. Incomplete ecological information (including climate change impacts) 52. Inadequate and/or incomplete European and Indigenous Heritage information 53. Inadequate social and economic information	▪ Lack of adequate information hampers the implementation of effective environmental management strategies and plans	▪ The cumulative impacts of socio-economic threats are an area that has received limited research attention to date, and this is recognised as a current data gap in the TARA process ▪ There is a knowledge gap around the views and aspirations of Aboriginal people in regard to the NSW marine estate, and this may affect the cultural and heritage amenity of the area

7.4 First Pass Risk Assessment

The risk assessment was undertaken for the list of threats affecting the environmental, social and economic values of the coastal zones outlined in Section 7.3. The assessment was undertaken in a systematic fashion, in accordance with the following national risk standards and guidelines:

- Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions (OEH, 2017);
- The NSW Marine Estate Threat and Risk Assessment (MEMA TARA) (BMT WBM, 2017);
- ISO 31000:2018 Risk management – Principles and guidelines, provides principles, framework, and a process for managing risk (International Standards Organisation, 2018); and
- AS 5334:2013 Climate change adaptation for settlements and infrastructure – a risk-based approach.

The assessment process was systematic and involved application of qualitative scales of likelihood and consequence. The scales of likelihood and consequence adopted for this assessment have been modified from the MEMA TARA (BMT WBM, 2017) to provide consistency with that wider assessment.

TABLE 7-4 CONSEQUENCE DEFINITIONS, ADAPTED FROM MEMA TARA (BMT WBM, 2017)

Consequence	Definition
Negligible	No or barely discernible negative impacts on the environmental, social, cultural, or economic values
Minor	Discernible and/or temporary negative impacts on the environmental, social, cultural, or economic values
Moderate	Measurable and on-going negative impacts on the environmental, social, cultural, or economic values
Major	Substantial measurable and ongoing negative impacts on the environmental, social, cultural, or economic values
Catastrophic	Significant on-going and/or permanent negative impacts are or are, and where these values are endangered either permanently or irreversibly

TABLE 7-5 LIKELIHOOD DEFINITIONS, ADAPTED AND MODIFIED FROM MEMA TARA (BMT WBM, 2017)

Likelihood	Definition
Rare	This threat is extremely unlikely to be realised at a level that would impact on the environmental, social or economic values within a 100-year period.
Unlikely	This threat is extremely unlikely to be realised at a level that would impact on the environmental, social or economic values within a 20-year period.
Possible	This threat is not expected to be realised at a level that would impact on the environmental, social or economic values every year, but could be expected in a 10-year period.
Likely	This threat is not expected to be continuous, but could be expected to be realised at a level that would impact on the environmental, social or economic values every year
Almost Certain	This threat is expected to be realised at a level that would impact on the environmental, social or economic values frequently throughout a year or more-or-less continuously.

Based on the delineation of likelihood and consequence, a risk rating has been provided based on the risk matrix in Table 7-6, which is again consistent with the MEMA TARA (BMT WBM, 2017). The risk ratings are

based on a range of technical inputs listed in Section 7.1, including the expert judgement applied by the project stakeholders during the first Stakeholder Engagement Workshop (Section 4.6).

It is acknowledged in this Scoping Study that the various threats and stressors are not uniformly distributed across the study area. The first pass-risk assessment provided herein is intended as a broad, first-pass screening to identify the direction and scope of future CMP stages, and is not intended to possess the granularity of a detailed, site-specific analysis, which is to be undertaken during Stage 2. Therefore, this first pass risk assessment has an element of subjectivity when considering the overall level of risk when a stressor(s) may be relatively localised in nature. Subsequently, the assessment has applied a conservative or worst-case approach, and where a threat may be considered as high risk even for a relatively localised area, it has been given a rating of high risk overall, in order to clearly identify the issues and provide direction and clarity for the remaining CMP stages. This approach has been adopted as the FPRA is intended as an initial screening to identify the need for further studies.

TABLE 7-6 RISK ASSESSMENT MATRIX, ADAPTED FROM MEMA TARA (BMT WBM, 2017)

Consequence → / Likelihood ↓	Negligible	Minor	Moderate	Major	Catastrophic
Almost Certain	Low	Moderate	High	Very High	Very High
Likely	Low	Moderate	Moderate	High	Very High
Possible	Low	Moderate	Moderate	High	High
Unlikely	Low	Low	Moderate	Moderate	High
Rare	Low	Low	Low	Moderate	Moderate

For each of the assessed threats, the risk assessment has considered the following factors:

- What are the existing arrangements to address the stressor? Specific attention has been given to where these stressors have been addressed by previous coastal and estuary management plans identified in Section 0. Where stressors are addressed by other plans and strategies (such as state-based), they have also been identified.
- Are existing arrangements working? If so, what is the residual risk? A residual risk rating has been provided.
- How will the risk level change over future planning horizons of 20, 50 and 100 years? Particular consideration has been given to the degree of future risk with the impacts of future development, population pressures and climate change.

The results of the first-pass risk assessment are provided in full in Appendix E. Additional information is provided in Section 7.5 for those stressors that have been assessed as having a risk rating of “High” or “Very High”.

7.5 High Risk Stressors

The purpose of this section is to identify and briefly outline the high risk stressors affecting the study area – including existing issues and future emerging stressors likely to affect the study area over defined management timeframes. A brief snapshot of these stressors is provided in Table 7-7. A key component of this study was also to identify emerging and future stressors to the study area. These are outlined in Table 7-8.

TABLE 7-7 PRESENT DAY HIGH RISK STRESSORS

Stressor 1 - Open Coast storm erosion

Coastal erosion caused by storms is recognised as a current high-risk issue that will be increasing in the future. This refers to the landward movement of the shoreline and/or a reduction in beach total volume that occurs due to the effects of a storm or series of storms, that may cause major beach erosion and formation of escarpments. Ballina is particularly impacted by storms approaching from the East and East-Northeast, and beach profiles can commonly take months to recover from storm erosion. Storm erosion can be compounded by the effects of long-term erosion associated with larger scale longshore sediment transport (i.e., reduction in northbound regional sediment supply associated with the Richmond River entrance training), as well as long-term sea-level rise associated with climate change.

Large stretches of the Ballina coastline are undeveloped, meaning that even if erosion does occur, it does not cause an immediate threat to development or coastal values. However, there are a number of locations in Ballina Shire where there is an immediate erosion threat that is putting property at risk, as discussed in the Ballina Coastal Hazard Definition Study (WBM Oceanics, 2003) including:

- *Lennox Head/ Seven Mile Beach:* This area has experienced significant erosion over several decades (Figure 3-6), likely due to a combination of natural and anthropogenic reasons. Seawalls were constructed in the 1960s and 1970s along the southern part of Seven Mile Beach in response to erosion caused by storm activity. This is expected to mitigate some erosion along this stretch of the beach, however, would also prompt erosion to the seawall's north when exposed. Infrastructure and assets under threat include the Lennox Head Alstonville SLSC, the Lake Ainsworth Caravan Park, Pacific Parade roadway and associated infrastructure, private property on Pacific Parade, European and Aboriginal heritage sites, as well as parklands and the beach itself (GeoLINK, 2008).
- *Patches Beach:* There has been observed long-term erosion at the southern end of the beach, and additional erosion from storms could remove frontal dunes and expose lower hind dune areas to inundation. Dune management is in works to help mitigation erosion risks. The coastal area is largely undeveloped, and there is only a small area of private land under coastal erosion threat.
- *Boulder Beach, Sharpes Beach, Flat Rock and Angels Beach*: Beaches such as Boulder Beach which are dominated by cobbles are more resilient to erosion, however, may still have overlying sand that forms valued sandy beaches eroded away by storms. There is a slight long-term recession on Boulder Beach, and it is vulnerable to storm erosion that threatens its walking path. Storm erosion also threatens Flat Rock tombolo, which is a valuable ecological and recreational area between Sharpes and Angels beaches that also provides coastal protection. Substantial beach erosion is a possibility if this tombolo were to detach in the future.

Across Ballina Shire, storm erosion results in loss of coastal environmental values, as well as beach amenity, which has economic implications. The frequency and intensity of coastal storms is projected to increase due to climate change, which will result in an increase in both the likelihood and consequence of coastal storm erosion into the future.

Stressor 2 - Long term shoreline recession (due to ongoing recession trend, and/or SLR)

Lennox Head and Seven Mile Beach show geologic evidence of long-term recession due to differentials in longshore transport. It is additionally believed to be impacted by a sink in the regional sediment budget caused by the training and dredging of the Richmond River, which has reduced the northbound sediment supply. However, it has been stable to accreting since 1988 (Geoscience Australia, 2021). The built structures also have a long-term impact on South Ballina Beach, which has been accreting over recent decades.

Boulder Beach shows evidence of undergoing long-term shoreline recession, which is supported by more recent data from the past 30 years (Geoscience Australia, 2021). Several of the other Ballina Shire pocket beaches (i.e., Angels and Sharpes Beach) show evidence of beach rotation, as one part of the beach erodes back as another section accretes (WBM Oceanics, 2003).

All of Ballina Shire's beaches are threatened by long-term recession caused by sea-level rise to some degree. Sea-level rise will result in permanent inundation of low-lying coastal areas, which will threaten infrastructure, coastal ecosystems, cultural heritage, and recreational amenity of the coastline. Built infrastructure at risk from shoreline recession includes the Lake Ainsworth Sport and Recreation Centre, Lennox Head Alstonville Surf Saving Club, the Lake Ainsworth Caravan Park, private homes and hotels on Pacific Parade, Pacific Parade roadway and associated infrastructure, European and Aboriginal heritage sites, walkways, as well as parklands and the beach itself (GeoLINK, 2008).

It is also noted that coastal recession could eventually cause oceanic breakthrough of Lake Ainsworth, which would result in a significant ecological shift in the lake system and loss of much of its substantial ecological value (WBM Oceanics, 2003).

Stressor 4 - Coastal lake or watercourse entrance instability

In February 2022, there was a natural breakout of the Boulders Beach freshwater lagoon - which has been attributed to a significant rainfall event, the large tides and coastal erosion of the beach.

Anecdotal evidence suggests that this lagoon was artificially created as a result of past sand mining operations at Boulders Beach and the wetland area may not have existed prior to this activity. It is however feasible a dune swale existed naturally behind the dune pre sand mining. It is also understood that mining activities modified the frontal dune by boulder placement at the entrance berm in order to protect the sand mining plant operations from the ocean - and this was most likely after removing and mining the frontal dune of sand. However, there is presently little historical information available regarding the history of the lagoon.

Furthermore, there are potential long term and ongoing ecological impacts within the lagoon area which are a result of the previous mining activates which could be addressed within this CMP. Restoration activities of the dune vegetation by Lennox Head Land Care group and Ballina Council achieved poor results which may be likely be due to the negative ecological impacts of the historical mining activities. Sand mining may have possibly caused changes to the soil chemistry from dumped tailings.

Stressor 5 - Coastal cliff or slope instability

Coastal headland undercutting by wave action and storm surge can occur both gradually and rapidly from extreme weather events. This can undermine the stability of steep slopes, contributing to mass wasting. Heavy rainfall can also cause saturation of soils, which reduces its sheer strength, causing increased change of slope failure (landslides) (Geoscience Australia, n.d.)

The key locations for potential cliff and slope instability are the prominent headlands along the Ballina coastline, including Lennox Point Headland, Skennars Head, Whites Head, Black Head and Ballina Head. Slow cliff erosion has been noted by stakeholders between Lennox Head to Boulders Beach, impacting the walking tracks (Figure 7-2).

These tracks have had to be moved landwards in recent years due to cliff instability. Two lookouts on Lennox Point Headland also had to be moved landwards because of headland erosion. This poses a risk to not only those recreationally using the headland for shore-based activities, but also for people in the ocean (i.e., fishing and surfing).

FIGURE 7-2 LENNOX HEAD BOARDWALK WALKING TRACK (FROM: BYRON4KIDS.COM.AU)

Stressor 6 - Coastal storm tide inundation

Coastal inundation is flooding of coastal lands by ocean waters. The risk increases when there are high ocean levels due to storm activity combined with high astronomical tides. This risk will be further exacerbated over coming decades by ongoing sea-level rise.

Where the Ballina Shire pocket beaches are backed by low dunes, there is a risk of storm wave runup overtopping the dunes and inundating low-lying coastal areas during high tides. This is a particular concern where the beach is backed by development, such as Lighthouse Beach and Lennox Head village (GeoLINK, 2016).

The Richmond River Flood Study Update (BMT WBM, 2008) identified that an extensive portion of the lower Richmond River foreshores are exposed to storm tide inundation risk – including a large part of the Ballina CBD, West Ballina, South Ballina, and Shaws Bay. The 100 Year ARI flood mapping for the study area (which includes combined coastal and catchment flooding) is provided in Figure 7-3, and shows the extent of the storm tide inundation risk across the study area.

The Shaws Bay CZMP identified addressing inundation risk in Shaws Bay as a key action (Hydrosphere Consulting, 2015).

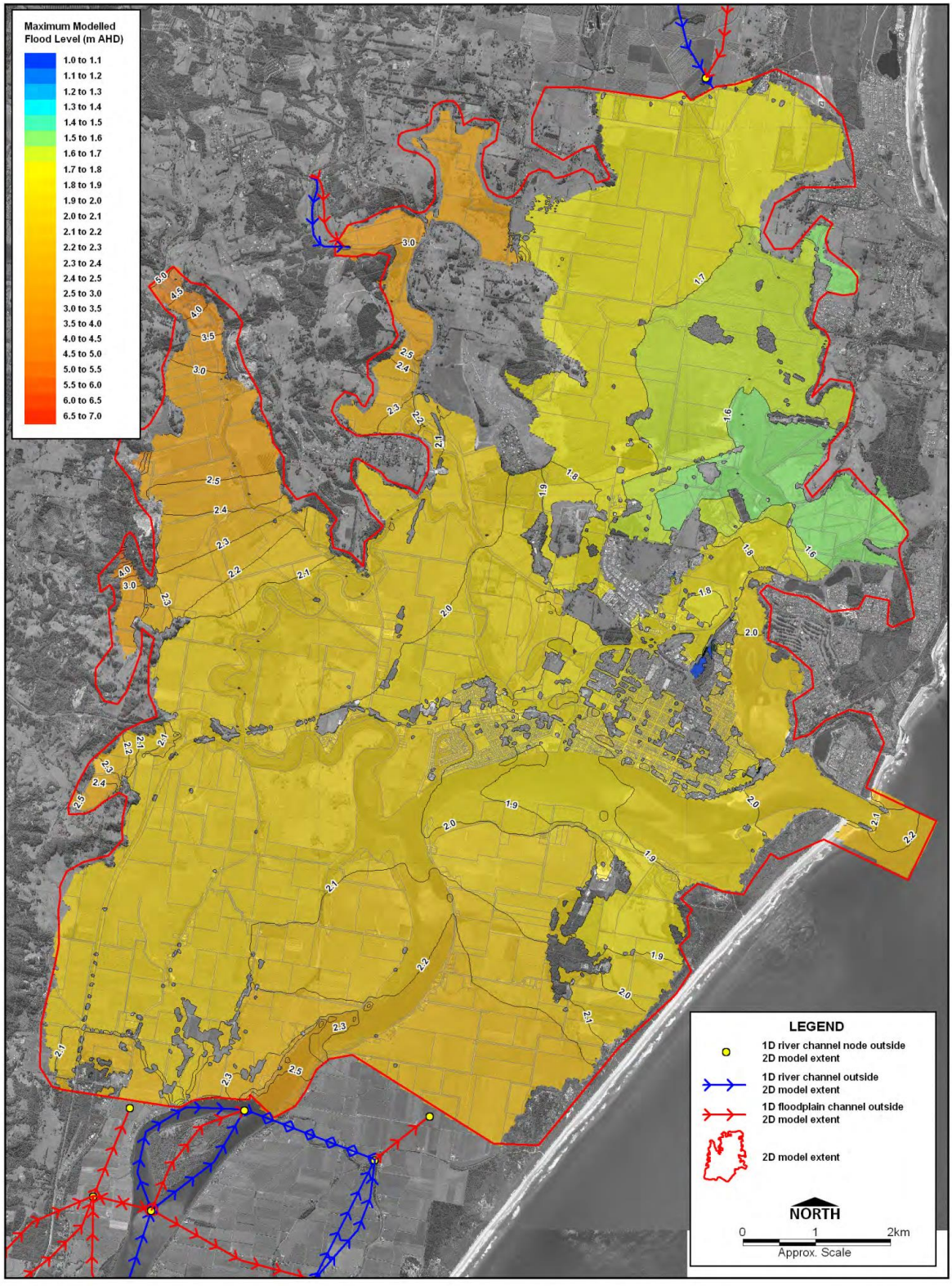


FIGURE 7-3 PRESENT DAY 100-YEAR ARI INUNDATION LEVEL

Stressor 8 – Tidal Inundation

There are a number of communities around the various foreshores of the study area that are likely to be affected by tidal inundation, or "sunny day flooding", over future planning horizons to some degree. A high-level state government assessment (OEH, 2018g) of the total number of affected properties within each catchment is presented in Section 8.2.3.

This assessment indicates that at present there are over 300 residential properties and around 20 km of road impacted by periodic sunny day flooding in the Richmond River catchment – and this this would increase to over 4,000 residential properties and nearly 300 km of impacted road under 1.0 m of SLR.

Associated mapping (which cannot be reproduced in this study) indicates that under a 1.0 m of SLR scenario tidal inundation impacts are vast - with a significant amount of affected infrastructure located in the low lying areas of the Ballina CBD, West Ballina, South Ballina, and Shaws Bay.

Furthermore, the area significant inundation impacts to agricultural land farther upstream within the Richmond River – extending up to the Wilsons River confluence at Coraki. This will have significant impacts on agricultural productivity for the region over the coming decades, and represents a major social and economic risk for the region.

The exposure assessment indicates that out of the 185 estuaries in NSW, the Richmond River has the fifth highest level of exposure to tidal inundation – and the highest exposure of any system in Northern NSW (see Figure 7-4).

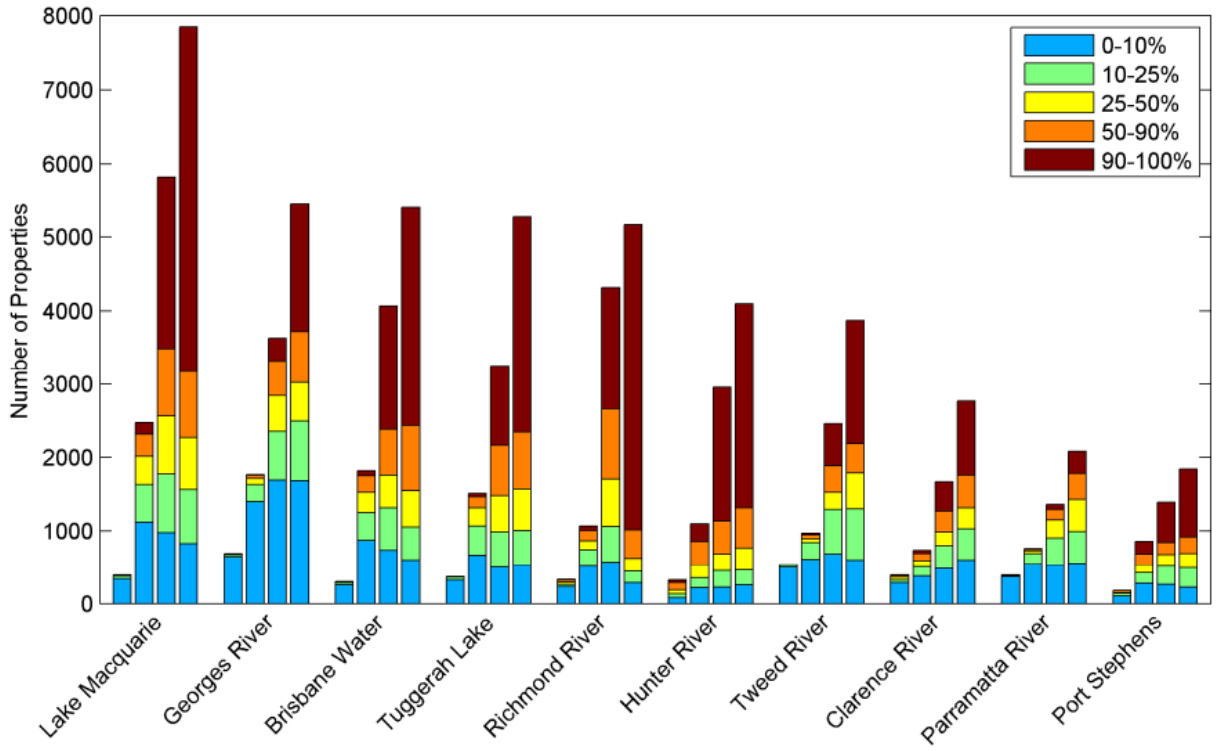


FIGURE 7-4 TOTAL NUMBERS OF PROPERTIES EXPOSED TO INUNDATION (HHWSS) FOR THE 10 MOST EXPOSED NSW ESTUARIES, INCLUDING PROPORTION-OF-LOT, UNDER 0, 0.5, 1.0 AND 1.5 M SLR (SOURCE: OEH, 2018)

Stressor 29 - Damage, loss or disturbance of indigenous heritage (tangible or intangible)

The Ballina coast is the traditional Aboriginal Nyangbul Country of the Bundjalung nation. There are significant sacred historic, cultural and heritage Aboriginal sites along the coast, particularly in the Black Head, Angels Beach and Flat Rock areas. There are numerous recorded Aboriginal heritage sites as per the NSW State Government AHIMS register along the Ballina Shire coast, including shell middens, open campsites, a burial site, and a ceremonial site. The East Ballina Aboriginal Place section of the Coastal Recreational Path runs along Sharpes Beach, Angels Beach and East Ballina (Figure 7-5) and was declared a place of special significance to Aboriginal culture and people in 2012 under the *National Parks and Wildlife Act 1974*. This also includes the East Ballina massacre site. The Lennox Head Aboriginal Area includes a Ceremonial Ring that is of significant cultural value and is located on erosion-prone sandy soils.

Previous studies have recognised that several sites including shell middens and artefact scatters are located seaward of the 50-year and 2100 coastal hazard lines, and are therefore exposed to risk from coastal erosion (Adapt NSW, 2019) and inundation. These sites are also at risk from sea-level rise and local land clearing which has the potential to destroy known and unrecognised Indigenous heritage sites.

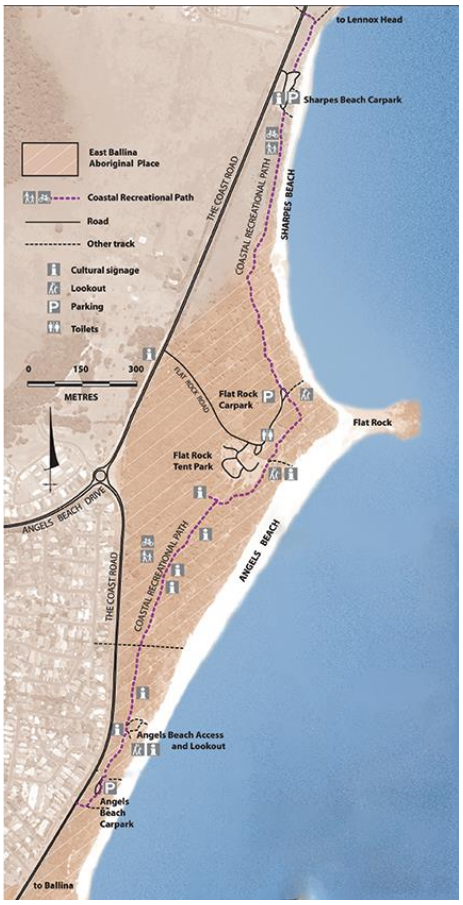


FIGURE 7-5 ABORIGINAL CULTURAL WAYS (SOURCE: DISCOVERBALLINA)

Stressor 18 to 21 – Upper Catchment related issues

The Richmond River system is the primary waterway feeding into Ballina Shire Council coastal waters. The upper catchment of the study area has undergone significant and rapid changes post European settlement. Nearly half of the catchment has agricultural activities and urbanization with residential development. These have caused managements challenges related to poor water quality within the coastal waters. The main pressures that need to be addressed in the upper catchments.

- Urban stormwater discharge, Urban stormwater discharge
- Sewage effluent & septic runoff
- Agricultural runoff
- Sediment contamination / pollution (including ASS) & MBO
- Modified freshwater flows, including surface and/or ground water extraction.

These stressors that derive from the upper catchment have a significant impact upon water quality the estuarine and coastal waters of the study area. However, it is acknowledged that these stressors are more effectively addressed at the source – and therefore will be addressed in the CMPs that span the upper catchment of the Richmond River Estuary – including the Richmond River Estuary CMP, North Creek CMP.

Stressor 22 - Clearing /Disturbance of Coastal Wetlands & riparian & aquatic habitats

The vegetation across the terrestrial and estuarine environment in the study area support numerous endangered ecological communities and sustain highly productive and diverse aquatic species. The vegetation within the Ballina Shire coast has been subjected to high degree of direct and indirect pressures particularly with regards to vegetation clearance, agricultural practices and flood mitigation which has been occurring over the past 150 years (WBM Oceanics, 2006).

Saltmarsh vegetation been impacted in the lower reaches of North Creek as result of cattle disturbance (stock trampling). Freshwater wetlands however are severely fragmented in the study area severely due to past clearing (GeoLINK, 2007).

Overall, seagrass communities within the study area are healthy but have been impacted at lower reaches of the estuary directly either due to dredging, changing hydrology, or through boat activity and mooring (ABER, 2007).

Nevertheless, the coastal wetlands, riparian and aquatic habitats are under pressure within the study area and threatened by land clearing, degradation, flood mitigation and drainage work, landfilling and earthworks, pollution from urban and agricultural runoff, weed invasion, overgrazing, trampling by live stocks, acid sulfate soils and other soil disturbance, waste dumping, uncontrolled burning, sea level rise and climate change.

Stressor 26 - Introduction of invasive species

A number of historical assessments have identified that ecological values are being impacted through the high level of weed invasion, and dominance of exotic species. Weed infestation results in loss of native habitat which provides a home range of species and includes protected vegetation communities. It also impacts on the amenity and environmental values of the Ballina LGA. A review of existing literature indicated that riparian and aquatic weeds have historically been, and continue to be, an issue of concern. Detailed mapping data for riparian vegetation and the extent of weed invasion throughout the study area is not currently available.

Potential weed invasion in the lower estuary has been reported in the lower reaches of the Richmond estuary which included Para Grass (*Urochloa mutica*), Johnsons Grass (*Sorghum halepense*), Honey Locust (*Gleditsia tricanthos*) and Hymenachne sp. (ABER, 2008). Shaws Bay has recorded weed infestation along the northern side of the training wall bordering the southern extremity. A number of weed species are present including Lantana, Bitou Bush, Prickly Pear, Umbrella tree, Siratro, Coastal morning glory, along with other exotic grass species (Hydrosphere Consulting, 2015).

The Ballina Coastal Management Study identified that weed invasion is prevalent in mangroves along North Creek, notably asparagus fern (*Asparagus aethiopicus*), cassia (*Senna pendula var. glabrata*), bitou bush (*Chrysanthemoides monilifera*), madeira vine (*Anredera cordifolia*) and lantana (*Lantana camara*); and within ssaltmarsh areas potential invasion of groundsel bush (*Baccharis halimifolia*) is also recorded.

Given the proximity of study area to urban and agricultural activities, coastal wetlands in the downstream area of the Richmond River are highly threatened by weed invasion, which include, alligator weed (*Alternanthera philoxeroides*), groundsel bush (*Baccharis halimifolia*), barnyard grass (*Echinochloa crus-galli*), water hyacinth (*Eichhornia crassipes*), glush weed (*Hygrophila costata*),primrose willow (*Ludwigia peruviana*), water lily (*Nymphaea capensis*) and kikuyu grass (*Pennisetum clandestinum*).

FIGURE 7-6 COMMON INVASIVE WEED -GROUNDSEL BUSH (*BACCHARIS HALIMIFOLIA*).

Stressor 38 - User group conflict on beaches (4WD, dogs, horses on beaches etc)

Stakeholders have noted that there are ongoing conflicts between the diverse users of the beach, such as dog owners, surfers, horseback riders, and 4WD drivers, particularly on Seven Mile Beach. 4WD vehicles with a permit are allowed on Seven Mile Beach and can access via Camp Drew Road (Figure 7-7). Council implements a policy to regulate 4WDs on the beach, which includes staying at least 10 m from the vegetated sand dunes, remaining within Ballina Shire's boundaries, and only driving on the firm sand below the hide tide mark, except when travelling to and from the beach (Ballina Shire Council, 2022). However, improper or illegal driving can have a negative impact on the coastal dune vegetation.

Additionally, there are several off-leash dog areas including on Seven Mile Beach, north of Lennox Head - Alstonville SLSC, and at the Spit by the North Creek entrance (Ballina Shire Council, 2022). However, dogs are not allowed on Ballina's pocket beaches and in Shaws Bay.

It is expected that there may be increasing conflict as the number of beach users (i.e., tourists and residents) increases, particularly in the areas where restricted uses are permitted in small areas (i.e., 4WDs and dogs).

FIGURE 7-7 4WD ACCESS PERMITTED (SOURCE: BSC, 2022)

Stressor 41 - Water pollution/ contamination affecting human health and safety

Maintaining good water quality of estuarine and coastal waters is essential to human health, the environment, agriculturally based industries and the recreational value of waterways, wetlands and coastal waters.

Water pollution/contamination can arise from several sources, including urban stormwater discharge, agricultural runoff, and sewage effluent and septic runoff across the catchment. These pollutants can affect human health and safety for those coming into contact with water through primary and secondary recreation, particularly following periods of heavy rainfall.

Past studies have recorded a number of water quality issues across the Richmond River, Shaws Bay and North Creek.

Within the Ballina LGA, thirteen swimming sites are part of long term monitoring Beachwatch Partnership program – as discussed in Section 6.4. Only about 69% (2020-2021) of the sites were considered as a "Pass Mark" for human activity - which was downgraded from 85% in the previous year. Seven Mile Beach, Shelly Beach and Lighthouse Beach are considered as sites with excellent water quality and best suited for swimming all through the area.

While in Shaws Bay, most sites are generally complying with ANZECC (2000) guidelines for primary contact recreation with respect to fecal coliform concentrations. Results for two sites (Shaws Bay North and Shaws Bay West) were downgraded to Poor rating in 2020–2021. Besides this there are occasional failures associated with heavy rain events which bring excessive sediments from the upper catchment, polluted runoff and wastewater disposal areas result in its closure for swimming.

Stressor 44 - Safe, navigable waterways - Entrance bar

Ballina Shire is an important location for both recreational and commercial vessels. It provides safe mooring for vessels traveling up and down the NSW coast, particularly when marine conditions are poor. Boaters from the catchment value having short-term ocean access via the Richmond River entrance (Transport for NSW, 2015).

However, despite the presence of the training walls, the Richmond River entrance is strongly influenced by coastal conditions and navigation can be dangerous under certain conditions. This is partly due to dynamic

and shallow entrance bars. The entrance training walls have had the effect of moving the entrance bar to the end of the walls to slightly offshore. The depth of the outside bar is about 3.5 m below the Lowest Astronomical Tide (LAT) and the inner bar, upstream of the Coast Guard Tower, is only 2.5 m deep. These bars have maintained their depth in recent years without dredging, but the location of the bars can shift over time (Hydrosphere Consulting, 2011).

On multiple occasions, small recreational boats have been overturned when attempting to cross the bar under poor conditions (GHD, 2005). Transport for NSW's Regional Boating Plan for Tweed-Clarence Valley Region (Transport for NSW, 2015) states that there were 14 incidents and one fatality on the Richmond River Bar between 2009 and 2013. It states that while the channel is still navigable, boaters need to be cautious during all crossings of the entrance bar, and found that safe ocean access from the Richmond River is very important to boating in the region. The local commercial fishing fleet is also concerned about the ongoing navigability of the entrance bar.

Community members generally support dredging of the lower Richmond River and North Creek to address navigational issues (Hydrosphere Consulting, 2011). The NSW Coastal Dredging Strategy 2019 - 2024 identifies the Lower Richmond River entrance channel and West Ballina boat harbour as key investment locations for dredging (NSW Department of Planning, Industry & Environment, 2019). The Rescuing Our Waterways program has previously allocated $100,000 to dredging works on the North Creek (Transport for NSW, 2015).

However, occasional dredging of a large river entrance is expensive and generally does not provide significant long-term benefits to navigation of the waterways, as the dredged areas infill from the longshore sediment transport (GHD, 2005). Additionally, dredging causes adverse ecological impacts to estuarine, marine and shorebird communities.

Stressor 11.4 - Lack of funding for investigation and action implementation

For both Local and State government agencies, a lack of funding was consistently identified as a barrier to effective estuary and catchment management (see Section 6.3). A lack of funding across Local and State Government inhibits the ability to:

- Collect data and commission technical studies to identify key issues and threats, and assess management solutions;
- this impact also inhibits ability of agencies to effectively fulfil their obligations; and
- Implement effective management actions, including capital and maintenance works;.

An additional eight (8) threats were identified and deemed likely to become high risk over future planning horizons as a result of climate change, population pressures and future development. These are summarised in Table 7-8, and should be assessed in further detail during the Stage 2 Risk Assessment.

TABLE 7-8 FUTURE / EMERGING HIGH-RISK STRESSORS AND KEY ISSUES

Future and Emerging Stressors (and associated ID from Table 7-3)
▪ Stressor 4 - Coastal lake or watercourse entrance instability, particularly for Lake Ainsworth.
▪ Stressor 12 - Ocean/estuary temperature increase
▪ Stressor 13 – Ocean acidification
▪ Stressor 14 - Altered storm frequency & severity
▪ Stressor 15 - Altered hydrological regimes and rainfall patters associated with climate change
▪ Stressor 25 - Habitat migration and squeeze associated with future sea level rise
▪ Stressor 37 - Overcrowding / congestion of waterways and user group conflict
▪ Stressor 50 - Incomplete ecological information (including climate change impacts)

8 KNOWLEDGE GAPS

8.1 Overview

A review of existing information and a knowledge gap analysis was undertaken to identify focus areas for CMP actions, and to assist with planning additional studies to be undertaken in Stages 2 and 3. The *NSW Coastal Management Manual Part B: Stage 2 – Determine risks, vulnerabilities and opportunities* sets out the requirements for the nature and rigour of the information required in Stage 2 to provide information to support decision-making in later stages of the planning process. In that document, information requirements are provided for each of the four (4) coastal management areas. These requirements have been used as a basis for determining the adequacy of existing information and subsequently potential knowledge gaps to be filled. This gap analysis is generally informed by a risk-based approach, as outlined in Figure 8-1.

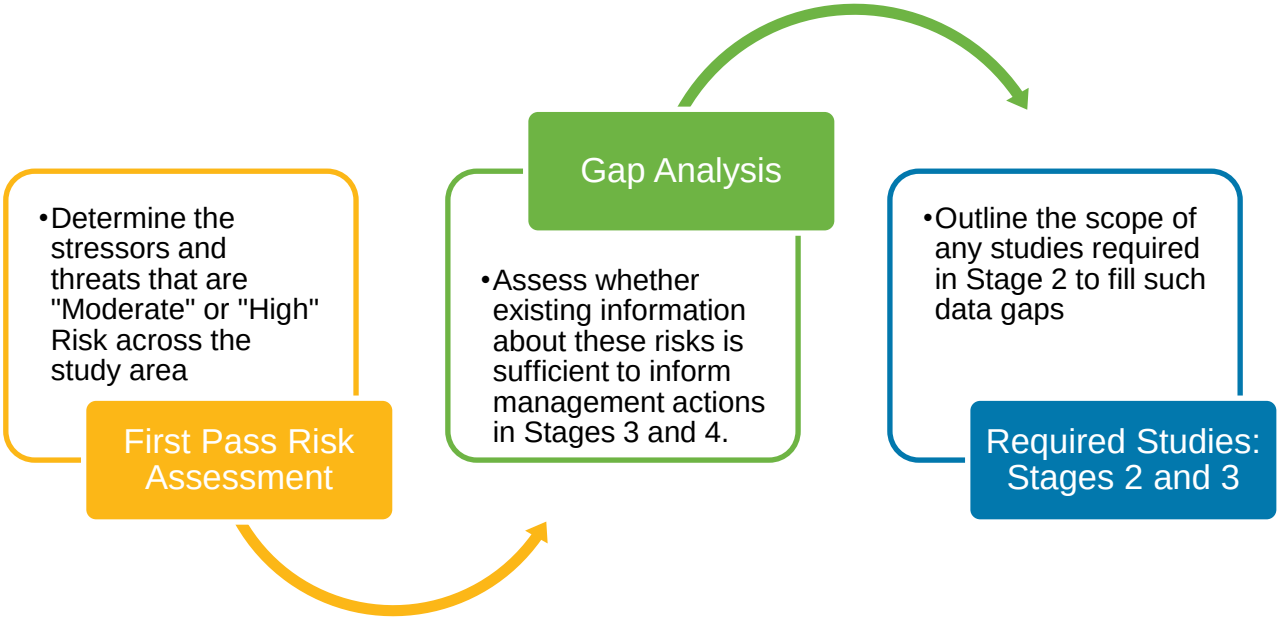


FIGURE 8-1 THE FPRA AND GAP ANALYSIS PROCESS

The adequacy of existing information and datasets has been systematically reviewed. There have been a number of studies over the past 20 years that cover a range of spatial scales and localities. The types of datasets collated as part of this task are summarised in Figure 8-2 below.

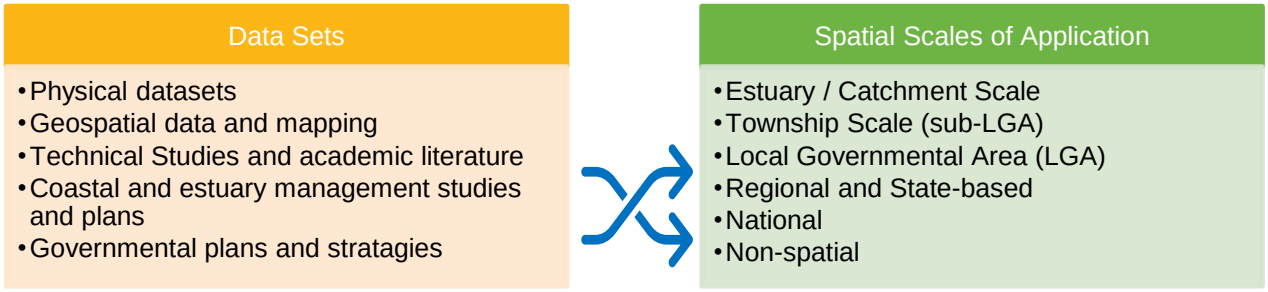


FIGURE 8-2 THE NATURE AND SCOPE OF RELEVANT DATASETS

The major bodies of work relating to *risk, vulnerabilities and opportunities* across the study area comprise a range of datasets, including:

- Coastal and Estuary management plans (and supporting technical studies) described in Section 0, and relevant flood risk management plans;
- Local Coastal and Estuary Hazard Studies. These are described in Section 6.1 in relation to their application to the CMP process;
- Datasets available through monitoring programs across the study area (see Section 6.4);
- State based technical studies and management plans, including (but not limited to):
  - The MEMS Threat and Risk Assessment (BMT WBM, 2017);
  - The NSW Tidal Inundation Exposure Assessment (DPE, 2019);

As part of this literature review, nearly 80 relevant informational studies, management plans, and additional datasets were identified and reviewed in terms of their relevance and application to the CMP. A summary of this data is presented in Appendix B.

Subsequently, a gap analysis framework approach was applied to this study. For each stressor, the adequacy of existing knowledge relating to that stressor was assessed, based on the age of the data and the spatial coverage across each waterway area. For this task, a designation for whether the available data was adequate to inform Stage 3 management decisions was based on the criteria presented in Table 8-1. This assessment of the adequacy was based on technical expertise of the project team, and consultation with key stakeholders (such as relevant stage government agencies).

TABLE 8-1 ASSESSING THE ADEQUACY OF EXISTING INFORMATION

Knowledge Adequacy	Description
High	Existing data regarding the stressor / issue is sufficient and further work does not need to be undertaken during Stage 2 of the CMP.
Moderate	Information regarding the stressor is incomplete and/or may be becoming outdated - Additional studies may be needed in Stage 2 to fill the knowledge gap and improve the effectiveness of management. This is assessed on a stressor-by-stressor basis, and depends on the spatial coverage and veracity of the data, and the overall level of risk presented by the stressor.
Low	There are significant technical or geographical data gaps, and management actions cannot proceed effectively without this knowledge. Subsequently, studies need to be undertaken during Stage 2 of the CMP to fill the knowledge gap.

The need for additional studies has been assessed based on the outcomes of the FPRA, the review of the adequacy of existing information and the stakeholder engagement workshop. For each of the threats listed in Section 7.3, the need for additional studies has been identified based on the following criteria for each stressor:

- *Additional information is required* when the adequacy of existing information is defined as **Low**; **AND** the overall risk associated with the stressor is given as **High**.
- *Additional information may be required* when the adequacy of existing information is defined as **Low**; **AND** the overall risk associated with the stressor is given as **Moderate**. In this case, the need for additional studies has been based on the applicability of existing data - in terms of spatial coverage, age and technical veracity.

This method provides a consolidated list of knowledge gaps across the study area. The results of the gap analysis are presented in Appendix E in full. However, a brief summary is provided below in Sections 7.3 and 7.4.

8.2 Coastal and Estuarine Hazards

Coastal hazards have been assessed and mapped across the coast through a number of historical coastal hazard studies. A summary of the existing coastal hazard investigations undertaken for the study area is provided below.

The risks associated with these coastal hazards are discussed in detail in Section 7, and Section 8 shows the applicability of these existing studies to the seven coastal hazards listed in the CM Act.

8.2.1 Coastal Erosion and Long-Term Shoreline Recession

Ballina Shire Coastline Hazard Definition Study (2003)

The Ballina Shire Coastline Hazard Definition Study (WBM Oceanics, 2003) examines the coastal hazards that impact the open coast beaches of the Ballina LGA. Hazards addressed include:

- Beach erosion;
- Long term shoreline recession;
- Coastal inundation; and
- Stormwater erosion.

The study defines these hazards and determine a projected landward limit of back-beach erosion escarpments due to the cumulative effects of these hazards for various planning periods.

TABLE 8-2 COASTAL HAZARDS ASSESSED IN THE BALLINA SHIRE COASTLINE HAZARD DEFINITION STUDY (WBM OCEANICS, 2003)

Coastal Hazard	Assessment Approach and Utilised Data
Short term storm erosion	The study adopted a design storm erosion volume of 200 m^3/m (measured from above MSL). This was based on analysis of historical photogrammetry data - of which records were available from 1947 to 2000. The analysis focused in particular on those records which encompassed historical storm events - including 1958, 1967, and 1976.
Mean sea level rise	Mean sea level rise projects for the study were based on the findings of the was based on IPCC Projections from 1996. The adopted projections were then considered to be “mid-range” estimated, and comprised: ▪ 50 years (to 2053) = +0.2 m ▪ 100 Years (to 2103) = +0.5 m
Long term shoreline recession	Long term shoreline recession due to potential sediment budget imbalance was assessed through analysis of historical photogrammetric records from 1947 to 2000. Projected long term shoreline recession due to future SLR was determined using the Bruun Rule (Bruun, 1962), and the mean SLR projections outlined above.

Coastal Hazard	Assessment Approach and Utilised Data
Coastal Inundation	The adopted offshore design storm tide levels based on storm tide statistics available for the Gold Coast Region (James Cook University, 1977). Storm tide levels were presented for average recurrence intervals of 20, 50 and 100 years. Nearshore design storm tide levels (including wave set-up) were then calculated by adding a peak wave set-up value of 15% of the design offshore wave height. For this task, design wave heights for south-east Queensland were adopted as reported by the Beach Protection Authority of QLD (Allen & Callaghan, 1999).

Updated Coastal Hazard Mapping for Seven Mile Beach (2011)

In 2011, Council resolved to update its Coastal Hazard Area assessment as part of finalising its CZMP for the Shire. Based on this, a revision was undertaken of the coastal hazard zones for the southern section of Seven Mile Beach, adjacent to the township of Lennox Head (BMT WBM, 2011). The update included:

- Reassessment of the current (Immediate) hazard line based on the (then) most recent photogrammetry and an assumed design storm bite volume of 200 m^3/m; and
- Revision of long-term shoreline recession estimates accounting for (then) updated projected climate change related sea level rise allowances.

These assessment results superseded those previously reported in the Coastline Hazard Definition Study (WBM Oceanics, 2000) for Seven Mile Beach.

Adequacy of Information

The Ballina Shire Coastline Hazard Definition Study (WBM Oceanics, 2003) and subsequent update for Lennox Head (BMT WBM, 2011) and considered to be relatively robust assessments for the time they were developed. However, the adequacy of this information is not considered to be fit for purpose to inform management actions during Stage 3 of the CMP, and therefore will require an update during Stage 2. The rationale for this is as follows:

- **Methodology:** In recent years there has been a shift in the approach used to define coastal hazard lines along the NSW Coastline – to a 'risk-based' or probabilistic approach. This approach recognises the inherent uncertainty of the numerous inputs contributing to the definition of coastal hazard lines (such as storm tide levels, wave height, pre-storm beach condition etc). The probabilistic approach allows input parameters to vary randomly over a range of values which are pre-defined through probability distribution functions. The process of repeatedly combining these randomly sampled values is referred to as Monte-Carlo simulation.

  Given the exposure of the Ballina Shire Coastline to coastal erosion, and the number (and scale) of likely at-risk assets - probabilistic hazard data is considered to be more appropriate to inform a robust cost benefit analysis in accordance with the NSW Treasury Guidelines, and is an appropriate form of hazard information to include in a planning proposal for the purpose of mapping the coastal vulnerability area in the Coastal Management SEPP (2018).

- **Projected Sea level Rise Scenarios:** The SLR scenarios included in the current coastal hazard mapping are based on IPCC projections from 1996. The recent release of the IPCC 6th Assessment Report (2021) indicates that those previously adopted SLR values are in the low to mid-range – and therefore are not sufficient to adequately identify future risks associated with long term shoreline recession.
- **Updated Data and Information:** Since release of the original hazard study – a significant amount of more contemporary data has become available. This information can be used to improve the understanding of local coastal processes and hazards, and includes wave and water level (tide gauge) data, beach profile data (including photogrammetry) and more contemporary assessment of regional coastal and geomorphological processes.

- **Consideration of recent storm events:** In recent years, a number of coastal erosion events have occurred across the north coast of NSW. These include major storms in 2009, 2013, 2016, 2020 and 2021. An updated hazard study provides an opportunity to incorporate data and learnings from these events.

Therefore, it is recommended that updated coastal erosion mapping is completed as part of Stage 2 of the CMP process - in order to define updated, risk-based, coastal hazard lines for use in assessing risks to current and future development. The scope of this assessment is provided in Section 8.4.

8.2.2 Coastal Inundation

The Richmond River Flood Study Update (2008)

BMT WBM Pty Ltd was commissioned by Council and the NSW Department of Environment and Climate Change (DECC) in 2008 to update the 1997 Ballina Floodplain Management Study (BMT WBM, 2008). The objective of the study was to provide a numerical model of the floodplain, and undertake design inundation event modelling and mapping for the Ballina LGA. Six design flood events were modelled as part of the Ballina Flood Study Update, including the 5, 20, 50, 100 and 500 year ARI flood events and the probable maximum flood (PMF). The design flood modelling undertaken for this study accounts for all three sources of flooding:

- Richmond River flooding;
- Local catchment flooding (in Emigrant, Maguires and North Creeks); and
- Flooding from ocean storm tides.

Flooding could potentially occur from any combination of these sources - and a manageable combination of events was assumed for the purposes of that study. In line with the (then) DNR's Floodplain Risk Management Guideline No 5 (Ocean Boundary Conditions):

- Riverine and local catchment flood modelling coincides with a neap tidal cycle and
- Ocean storm surge modelling coincides with 'a small flood', which was adopted as a 10 year ARI event.

An allowance for future sea level rise of +0.2 m incorporated in the model simulations.

The study identified that ocean storm tides dominate the local flood vulnerability in the downstream sections of the Richmond River - extending up the Richmond River and North Creek from the ocean boundary. Local catchment dominance is confined to Emigrant and Maguires Creek floodplains upstream of their confluence and Ballina township. A large area of equal dominance between local catchment and Richmond River flooding is centred on Emigrant Creek and loosely bounded in the south and east by the existing Pacific Highway. The area of equal dominance is based upon less than 20mm difference between the local catchment and Richmond River dominated floods. The balance of the area is dominated by Richmond River flooding.

The Ballina Island and West Ballina Overland Flood Study and Flood Protection Feasibility Study and Plan (2021)

The objective of the Ballina Island and West Ballina Overland Flood Study and Flood Protection Feasibility Study and Plan is to develop a strategic plan to mitigate localised existing and future flood risk in Ballina Island and West Ballina (Study Area) by providing practical information in regard to recommended floodplain management measures such as timing, priority, expense and responsibility, or recommendation for further investigation (GHD, 2021). This project includes the following Stages:

- Stage 1: Data collection including survey of the existing stormwater network of Ballina Island and West Ballina.
- Stage 2: Ballina Island and West Ballina Overland Flood Study.

- Stage 3a: Identification and Preliminary Assessment of Floodplain Management Options.
- Stage 3b: Detailed Assessment of Shortlisted Floodplain Management Options
- Stage 4: Development of a Strategic Plan of Flood Protection.

The study identified flood risk within Ballina Island and West Ballina for a range of flood scenarios – including storm tide inundation events. It also provides an assessment of average annual flood damages (AAD) and net present value (NPV) of damages under Present Day, Year 2050 and 2100 climate conditions in Ballina Island and West Ballina.

A key recommendation of this plan is to *Update the Richmond River and Creek Flood Study* (2008). The main reason required for the update is to include consideration of Australian Rainfall and Runoff (2019) guidelines, use methodologies consistent with the *OEH (2015) Floodplain Risk Management Guide: Modelling the Interaction of Catchment Flooding and Oceanic Inundation in Coastal Waterways*, and to use updated SLR scenarios consistent with the IPCC 6th Assessment Report (2021).

Adequacy of Information

Lower Richmond River Estuary: It is noted that an updated Flood Study for the Richmond River is recommended by the Ballina Island and West Ballina Overland Flood Study and Flood Protection Feasibility Study and Plan (GHD, 2021) – and that this will be undertaken through the NSW Flood Risk Management Framework. That recommended study should provide adequate information to inform flood risk management in relation to coastal storm tide inundation across Ballina Island and West Ballina. However, it should be noted that there would still remain an information gap relating to storm tide inundation impacts elsewhere in the Richmond River catchment – notably the significant portion of floodplain located upstream of West Ballina, where significant areas of agricultural land are located.

Open Coast: As discussed in Section 8.2.1, the assessment of inundation along the Open Coast (WBM Oceanics, 2003) is not considered to be fit for purpose to inform management actions during Stage 3 of the CMP. Notably, the assessment utilised storm tide and wave climate information that has now become significantly outdated. Therefore, updated coastal inundation mapping will be required for the open coastline.

8.2.3 Tidal Inundation

NSW Estuary Tidal Inundation Exposure Assessment (2018)

The NSW Estuary Tidal Inundation Exposure Assessment was undertaken by DPE (then NSW OEH) in 2018 (OEH, 2018g), along with associated mapping of *tidal inundation* extents. This undertaking represents a state-wide assessment of the impact of inundation in estuaries associated with projected SLR on the NSW coast. The aim of the study was to refine estimates of the extent of current exposure of properties and infrastructure to potential SLR to help assess the need for, and prioritisation of, adaptation planning and action. As part of the study mapping was undertaken of the High High Water Solstice Springs (HHWSS) tidal planes for each of the estuaries along the NSW coastline.

For the Richmond River Estuary, the HHWSS tidal planes was assessed based on harmonic analysis undertaken on the Ballina tide gauge data (OEH, 2012). Mapping was also undertaken for three SLR scenarios: 0.5 m, 1 m and 1.5 m. These were selected to be representative of a range of scenarios relevant to infrastructure design and land-use planning (OEH, 2018g).

After completion of the mapping, an exposure assessment was undertaken whereby the inundation mapping was cross-referenced with the Geocoded Urban and Rural Addressing Service (GURAS) assets database in order to identify existing development at risk from inundation for each scenario.

The study identified the total number of properties and length of road within the entire Richmond River Catchment that are affected by inundation under the various sea level rise scenarios, and this data is presented in Table 8-3 and Table 8-4 respectively.

TABLE 8-3 NUMBER (AND %) OF CATCHMENT PROPERTIES AFFECTED BY TIDAL INUNDATION, AS PER OEH (2018)

Estuary	Total Properties in Catchment	SLR=0m	SLR=0.5m	SLR=1.0m	SLR=1.50m
Richmond River	34,317	327 (1%)	1,063 (3%)	4,314 (13%)	5,164 (15%)

TABLE 8-4 LENGTH IN KM (AND %) OF ROAD AFFECTED BY TIDAL INUNDATION, AS PER OEH (2018)

Estuary	Total Length of Road in Catchment	SLR=0m	SLR=0.5m	SLR=1.0m	SLR=1.50m
Richmond River	2,518	20 (1%)	97 (4%)	292 (12%)	438 (17%)

Nonetheless, the study provides a high-level indication of exposure to tidal inundation, and this has been used to inform the First-Pass-Risk-Assessment in Section 7 and the Knowledge Gap Analysis in Section 8.

Adequacy of Information

When considering this data, it should be noted that the DPE exposure assessment is limited to a broadscale assessment of the tidal inundation risk to property and infrastructure – and should not be used to assess risk to individual properties and assets. DPE has indicated that where individual estuaries are identified to contain a high level of inundation risk, that this inundation mapping does not necessarily preclude the need to undertake more detailed flood or inundation studies (OEH, 2018g).

In particular, the DPE mapping is not considered robust in its ability to consider and account for complex hydrodynamic processes that affect tidal inundation in the mid to upper estuary – including the influence of tidal asymmetry, tidal pumping and/or tidal amplification. These upstream reaches of the estuary contain significant area of agricultural land, which will become increasing affected by the saline tidal inundation over the coming decades. Consequently, it is expected that without mitigation measures, significant social and economic impacts would occur to the local agriculture sector.

Furthermore, the DPE tidal inundation mapping assessment does not consider the impacts of the local stormwater network on tidal inundation processes across Ballina Island and West Ballina.

Therefore, an updated assessment of tidal inundation is required for the Richmond River Estuary – in the form of the Richmond River Storm Tide and Tidal Inundation Study discussed in Section 8.4. It should be noted that this study has also been recommended in the Richmond River Estuary CMP Stage 1 Scoping Study.

8.2.4 Coastal Cliff and Slope Instability

Coastal cliff and slope instability have not been investigated as part of any historical hazard studies or management plans. Therefore, it will be necessary to undertake an LGA-wide coastal cliff and slope stability hazard assessment in order to identify areas at risk of coastal cliff instability and landslide hazards.

8.2.5 Estuary Entrance Instability

The morphological processes across the lower estuary were discussed in the Richmond River Estuary Process Study (WBM Oceanics, 2006). That study provided a detailed conceptual model of the morphodynamics of the

lower estuary. The study found that active marine delta extends some 2,200 m upstream of the entrance to the shoal near south-east Ballina (Kingsford Smith Drive). However, the system is very stable with little sediment movement other than fluvial reworking during major floods and some wave stirring and tidal movement near the entrance.

Adequacy of Information

Based on the above, the information pertaining to this hazard for the study area is considered to be adequate for the purposes of informing management actions in Stage 3.

8.2.6 Estuary Foreshore Inundation and Erosion from Combined Coastal and Catchment Flooding

As discussed in Section 8.2.2, combined coastal and catchment flooding for the study area has been assessed in the Richmond River Flood Study Update (BMT WBM, 2008). The study applies sophisticated numerical modelling, and high-resolution mapping of inundation risk. Therefore, it is considered that this information is sufficient to inform management actions Stage 3 of the CMP. Furthermore, any future updates of this flood study (for instance, to accommodate more contemporary SLR scenarios) would likely be undertaken as part of the NSW Flood Risk Management Framework – external to the CMP process.

Bank erosion across the lower estuary was assessed in the Richmond River Estuary Process Study (WBM Oceanics, 2006). The study identified that vessel wake waves from recreational and commercial boating can result in bank erosion in some locations. However, it also identified that most historic bank erosion downstream of Wardell has been stabilized by some form of rock protection – and the overall risk associated with bank erosion across the lower estuary is considered to be low.

Adequacy of Information

Based on the above, the information pertaining to this hazard for the study area is considered to be adequate for the purposes of informing management actions in Stage 3.

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TABLE 8-5 APPLICABILITY OF EXISTING HAZARD INFORMATION FOR BALLINA OPEN COAST

Hazard	FPRA Risk Level	Adequacy of Existing Information	Stage 2 Study Required?
Beach erosion and shoreline recession	**High**	**Low**	**Yes.** Coastal erosion mapping for the Open Coastline should be updated during Stage 2. This can be undertaken in the proposed Stage 2 Study: ▪ **The Ballina Open Coast Coastal Hazard Study**
Coastal inundation	**High**	**Low**	**Yes.** Coastal inundation mapping for the Open Coastline should be updated during Stage 2. This can be undertaken in the proposed Stage 2 Study: ▪ **The Ballina Open Coast Coastal Hazard Study**
Tidal inundation (“sunny-day flooding”)	**High**	**Moderate**	**See Table 8.5.**
Coastal cliff or slope instability	**Moderate**	**Low**	**Yes.** Coastal cliff and slope instability for the Open Coastline should be assessed during Stage 2. This can be undertaken in the proposed Stage 2 Study: ▪ **Open Coast Geotechnical Hazard Study**
Estuary Entrance Instability	**N/A**	**N/A**	**No.**
Erosion/ inundation from combined coastal & catchment flooding	**N/A**	**N/A**	**No.**

TABLE 8-6 APPLICABILITY OF EXISTING HAZARD INFORMATION FOR LOWER RICHMOND RIVER ESTUARY

Hazard	FPRA Risk Level	Adequacy of Existing Information	Stage 2 Study Required?
Beach erosion and shoreline recession	**N/A**	**N/A**	**No.**
Coastal inundation	**High**	**Moderate**	**Yes.** Whilst some information relating to coastal storm tide inundation is available from the Ballina Flood Study (BMT WBM, 2008). Some updates are needed with regards to methodology and future sea level rise projections. This information will need to be assessed as part of the: ▪ **Richmond River Storm Tide and Tidal Inundation Study**
Tidal inundation ("sunny-day flooding")	**High**	**Moderate**	**Yes.** This information will need to be assessed as part of the: ▪ **Richmond River Storm Tide and Tidal Inundation Study**
Coastal cliff or slope instability	**N/A**	**N/A**	**No.**
Estuary Entrance Instability	**Low**	**Low**	**No.** Sufficient information regarding morphological processes in the lower estuary are available in the Richmond River Estuary Process Study.
Erosion/ inundation from combined coastal & catchment flooding	**High**	**Moderate**	**No.** Sufficient information is available in the Ballina Flood Study (BMT WBM, 2008) and Associated Risk Management Plan (BMT WBM, 2015). Furthermore, future updates to this study (to accommodate update SLR projections etc), will be undertaken as part of the NSW Floodplain Risk Management framework.

8.3 Urbanisation and Land Use Impacts

Water Pollution and Sediment Contamination

Water quality datasets from the Beachwatch program provide a strong baseline of water quality data that can be used to assess water quality across the study area and the impacts of catchment land use, urban stormwater runoff and agricultural runoff. The water quality parameters available in this dataset are outlined in Section 6.4. Furthermore, other state-based datasets can be utilised, such as:

- Ballina Urban Stormwater Management Plan.
- The NSW Estuary Health Risk Dataset 2019 (DPIE, 2019b); and
- NSW Estuary Temperature, pH and salinity data 2012-2020 (DPIE, 2020).

Adequacy of Information

The gap analysis indicates that these studies, used in conjunction with the detailed estuary process study information, and available data, should be sufficient to inform Stage 3 management decisions without any additional need for water quality monitoring campaigns. Therefore, no additional water quality data collection is proposed for Stage 2.

Biodiversity and Habitat Disturbance

The FPRA indicates that there are a number of “High” and “Very High” risk stressors across the study area that relate to historical and ongoing disturbance of marine and intertidal ecosystems, coastal wetlands, littoral rainforest, and terrestrial habitat – see Appendix E. It is noted that there is a range of information regarding these stressors contained in previous estuary management studies and plans (see Appendix B and Section 6). Furthermore, additional information regarding these stressors includes:

- Local Land Services North Coast Local Strategic Plan 2016-2021;
- Northern Rivers Regional Biodiversity Management Plan;
- NSW Estuarine Habitat Dashboard (DPI,2022);
- North Coast Regional Strategic Pest Animal Management Plan 2018 – 2023;
- Ballina Coastal Reserve Plan of Management; and
- Northern Rivers Regional Biodiversity Management Plan.

Adequacy of Information

However, information regarding these is relatively ad hoc in nature, and lack the requisite detail to appropriately inform the derivation and assessment of management actions in Stage 3 of the CMP. Stage 2 of the CMP provides an excellent opportunity for undertaking further study to assess historical losses of coastal and estuarine habitat across the study area, identify suitable locations for restoration works, and establish targets for habitat restoration. Therefore, the following Stage 2 study is recommended:

- The Ballina Coastal and Estuarine Habitat and Biodiversity Study

Details of the objectives, scope and outputs of this study are provided in Section 8.5.

8.4 Resource Use and Conflict

Recreation and Tourism

There exists a significant body of information reading the nature and extent of recreational use of the study area. This includes information garnered in the Stage 1 Community Survey (see Appendix D), which can be used to identify community values, and uses of the coastal zone – and subsequently guide the assessment and derivation of management actions in Stage 3. Additio0nal information is available from:

- NSW Regional Boating Plan for Mid-North Coast 2015
- TfNSW Boating registration and licencing data
- DPI Fisheries recreational and commercial fishing licence data
- Destination Management Plan for the Ballina Coast & Hinterland 2014 – 2020

Adequacy of Information

Whilst these datasets provide useful information about nature of recreational/commercial use of the coastal zone – additional information is required regarding the environmental impacts of these uses. Therefore, this information should be gathered during the proposed Stage 2 Study:

- The Ballina Coastal and Estuarine Habitat and Biodiversity Study

8.5 Studies to be Prepared in Stage 2

The recommendations for further detailed studies and associated tasks are described in Table 8-7, which indicates that a number of studies will be required in Stage 2, in order to inform the development and assessment of management actions in Stages 3 and 4.

TABLE 8-7 STUDIES TO BE PREPARED DURING STAGE 2 OF THE CMP

The Ballina Open Coastline Coastal Hazard Study and Risk Assessment
A key component of Stage 2 of the CMP will be to update the existing coastal hazard mapping. This can be undertaken as part of the Ballina Open Coastline Coastal Hazard Study and Risk Assessment. This Stage 2 study should include the following components: ***Coastal Hazard Analysis and Mapping*** This study should include an assessment of hazard mapping suitable for preparing a planning proposal to update the coastal vulnerability area maps in the CM SEPP. The hazard mapping should be undertaken for the entire LGA coastline, and include the following coastal hazard components: ▪ *Short Term Storm Erosion*: The storm bite allowance that determines extent of retreat of the dune scarp during a major storm event or series of storms; ▪ *Long-Term shoreline Recession*: The underlying long-term change in the position of the shoreline due to the prevailing coastal processes (such as imbalances in the net sediment budget) - as well as the long-term response of the shoreline to projected mean sea level rise; ▪ *Coastal Inundation*: This should include the landwards extent of coastal inundation. This should include consideration of storm surge impacts, as well as wave set-up and wave run-up extents. The key component of the study should be the adoption of a probabilistic hazard assessment approach - in order to develop risk-based coastal hazard lines for use in assessing the risks to current and future development. The study should assess these hazards for a range of planning horizons, as required by the NSW Coastal Management Manual. Including: ▪ Present day conditions;

- Future planning horizons of 20 years (2042), 50 years (2072), and 100 years (2122).

The assessment of future planning horizons should consider the most contemporary projections for global and regional mean sea level rise - i.e., those set forth in the IPCC 6th Assessment Report (2021). These sea level rise scenarios should be consistent with those applied in the Richmond River Storm Tide and Tidal Inundation Study.

Risk Assessment

The purpose of the risk assessment will be to utilise the coastal hazard mapping to provide a quantitative assessment of coastal hazard risks to public assets within the Ballina Shire

- *Identification of at-risk assets:* The risk assessment will identify and catalogue those assets at risk in the present day, as well as those will be become exposed to coastal hazard risk over future planning horizons of 20, 50, and 100 Years - in accordance with the process described in the NSW Coastal Management Manual 2018.

  The risks to public assets should be based on Council's GIS database of wastewater, water supply, roads, buildings and other Council owned infrastructure. This geospatial information should be superimposed onto the updated hazard mapping GIS layers and aerial photography – in order to identify at risk assets.
- *Risk Assessment*: The levels of risk to identified assets should be assessed through an established risk-management framework, such as that set out in ISO 31000 (2009). As per the NSW Coastal Management Manual, the risk analysis and evaluation may benefit from consultation with relevant stakeholders so that different perspectives are incorporated in the analysis of consequences and likelihood. The information from the detailed risk assessment will help identify priority issues for response and appropriate risk treatment management options in Stage 3.

Summary Report

The details of the coastal hazard analysis and risk assessment should be summarised in a Technical Summary Report.

The Ballina Open Coastline Geotechnical Hazard Study and Risk Assessment

Geotechnical Instability Assessment and Mapping

This study should include a coastal geotechnical instability assessment and associated mapping for all developed cliff top and bluff locations in the coastal zone, including wave exposed headlands. The main areas of focus would be the coastal cliffs and headlands to the north of the Richmond River Entrance.

A number of these headlands are located in close proximity to areas of high public use and public infrastructure – such as Ballina Head. Other locations, such as Fingal Headland and Hasting Point also have high recreational and cultural heritage value (see Section 3.6). This assessment will involve:

- A desktop review of available data, including any historical investigations, and available topographic data such as LiDAR.
- On the ground field-based inspections at all open coast cliff top and bluff locations across the LGA, carried out by a qualified geotechnical engineer.
- The geotechnical hazard study and mapping should identify a zone landward of the cliff edge considered "high risk" – depending on the geology, LiDAR, and identified features based on local field observations.

Risk Assessment

The purpose of the risk assessment will be to utilise the geotechnical hazard mapping to provide a quantitative assessment of geotechnical hazard risks to public assets within the Ballina Shire LGA.

- *Identification of at-risk assets:* The risk assessment will identify and catalogue those assets at risk in the present day, as well as those will be become exposed to coastal hazard risk over future planning horizons

of 20, 50, and 100 Years - in accordance with the process described in the NSW Coastal Management Manual 2018.

The risks to public assets should be based on Council's GIS database of wastewater, water supply, roads, buildings and other Council owned infrastructure. This geospatial information should be superimposed onto the updated hazard mapping GIS layers and aerial photography – in order to identify at risk assets.

- *Risk Assessment*: The levels of risk to identified assets should be assessed through an established risk-management framework, such as that set out in ISO 31000 (2009). As per the NSW Coastal Management Manual, the risk analysis and evaluation may benefit from consultation with relevant stakeholders so that different perspectives are incorporated in the analysis of consequences and likelihood. The information from the detailed risk assessment will help identify priority issues for response and appropriate risk treatment management options in Stage 3.

Summary Report

- The details of the analysis and risk assessment should be summarised in a Technical Summary Report.

Richmond River Storm Tide and Tidal Inundation Study

A storm tide and tidal inundation study is required in order to identify those areas exposed to coastal inundation, and to assess the associated social, environmental and economic risks.

The study should cover the Richmond River Estuary up to (as a minimum) the Wilsons River confluence at Coraki and the North Creek tidal limit. As part of this study, detailed 2D hydrodynamic modelling should be undertaken in order to assess the frequency and magnitude of the following forms of inundation over the study area:

- *Coastal storm tide inundation:* For a range of average recurrence intervals, including 10, 20, 50, 100 and 500 years ARI.
- *Tidal Inundation:* For a range of tidal places, including MHWN, MHWS, and HAT.

The study should undertake the above assessments for a range of planning periods, in order to assess the impacts of future sea level rise, including:

- Present Day (2022), 20 years (2042), 50 years (2072), 100 years (2122).

The study should utilise the latest sea level rise projections from the IPCC 6th Assessment Report (2021). These sea level rise scenarios should be consistent with those applied in the Ballina Open Coastline Coastal Hazard Study.

The study should include the following components:

Inundation Hazard Analysis and Mapping

- Literature Review and Data Collection: To collate all relevant information necessary for the completion of this tidal inundation study, including bathymetric and topographic survey, tide gauge data, and information relating to the components that comprise storm ides (winds, waves and barometric pressure).
- Hydrodynamic model set-up, calibration and validation: The study should utilise a hydrodynamic modelling software and configuration that can replicate all of the relevant physical processes and is suitable to achieve the required objectives of the study. The model set-up should include, where relevant, the influence of engineering (including flood mitigation protection) structures and hydraulic linkages through stormwater systems and natural drainage paths.
- Modelling of storm tide and tidal inundation scenarios: Detailed, two-dimensional (2D) modelling of storm tide inundation and tidal inundation across the estuaries, for the scenarios outlined above.
  - For tidal inundation scenarios, this should also include identification of potential changes to tidal regime (including tidal planes) and tidal hydrodynamics within the estuaries – and impacts on drainage window(s) across the estuary system.

  - Consideration of potential impacts regarding habitat 'squeeze' and upslope migration of macrophytes across the estuarine coastal zone due to rising sea levels and altered salinity profiles and opportunities for habitat expansion.
  - Consideration of permanent groundwater impacts, including those associated with ecosystem functioning, built asset and infrastructure risks and contamination impacts.
- Mapping: Outputs should include mapping of inundation extent and depth for the full range of scenarios.

Risk Assessment

The purpose of the risk assessment will be to utilise the inundation mapping to provide a quantitative assessment of the risks to public assets and private land within the Ballina Shire LGA.

- *Identification of at-risk assets:* The risk assessment will identify and catalogue those assets at risk in the present day, as well as those will be become exposed to coastal hazard risk over future planning horizons of 20, 50, and 100 Years - in accordance with the process described in the NSW Coastal Management Manual 2018.

  The risks to public assets should be based on Council's GIS database of wastewater, water supply, roads, buildings and other Council owned infrastructure. This geospatial information should be superimposed onto the updated hazard mapping GIS layers and aerial photography – in order to identify at risk assets.
- *Risk Assessment*: The levels of risk to identified land and assets should be assessed through an established risk-management framework, such as that set out in ISO 31000 (2009). The risk assessment process should consider the likelihood, frequency and consequence of inundation impacts to such infrastructure. The information from the detailed risk assessment will help identify priority issues for response and appropriate risk treatment management options in Stage 3.

Summary Report

- The details of the analysis and risk assessment should be summarised in a Technical Summary Report.

It is noted that that an updated Flood Study for the Richmond River is recommended by the Ballina Island and West Ballina Overland Flood Study and Flood Protection Feasibility Study and Plan (GHD, 2021) *– and that this will be undertaken through the NSW Flood Risk Management Framework. That proposed update is to include assessment of combined Storm Tide and Catchment Flooding through the use of 2D hydraulic modelling – however the study area will be limited to West Ballina and Ballina Island.*

Therefore, it is strongly recommended that for efficiency and consistency, these two studies are combined – or at least undertaken concurrently using consistent SLR scenarios, and modelling methods/systems.

Ballina Coastal and Estuarine Habitat and Biodiversity Study

The Ballina Coastal and Estuarine Habitat and Biodiversity Study will be a hybrid Stage 2 / Stage 3 study - and the overarching purpose will be to:

- Undertake a comprehensive assessment of the threats and stressors affecting coastal and estuarine habitats and biodiversity across the study area – in order to understand their respective *causes* and *impacts.*
- To identify and assess opportunities and management actions to address these stressors, and in doing so meet the objectives of the CM Act.

The study should include targeted engagement with relevant stakeholders regarding threats and stressors, and opportunities for action, including:

  - Traditional Owner Groups
  - State Government Agencies (including DPE, DPI Fisheries, NPWS, LLS)
  - NGOs and community groups (Richmond Landcare etc)

Assessment of Threats and Stressors

The focus of the study should be those stressors marked in the FPRA as being "High" and Very "High" identified in the FPRA, however it should also include consideration of all relevant stressors affecting coastal and estuarine biodiversity in the study area.

The study should include analysis of historical, present day, and future / emerging stressors, and the latter should include a detailed consideration of potential impacts associated with climate change over a forward 100 year planning period. The study should be undertaken at a high level of spatial detail, with sufficient granularity to inform the derivation and assessment of potential management actions.

This component should include:

- A detailed literature review and data synthesis
- Consideration of relevant local, state, and federal strategies, policies and plans (including the Northern Rivers Regional Biodiversity Management Plan)
- Identification of importance biological and physical features of the study area, and areas of importance to biodiversity;
- Analysis of historical, present day, and future / emerging threats – through a combination of desktop analysis and site inspections.

Opportunities and Management Actions

The study should identify and assess opportunities to address the stressors to biodiversity. This should include (where applicable):

- Establishing targets for habitat restoration;
- Identifying suitable locations for restoration works, and developing a prioritised schedule of actions;
- Identifying opportunities for collaboration with state government agencies and communities for implementation of on-ground works, etc

The output of the study should include be a prioritised, scoped, and costed management actions that can included in the CMP in Stage 4. These actions should be aimed at ensuring that the final CMP adequately meets the objectives of the CM Act in terms of the protection of coastal and estuarine habitats and biodiversity.

The Stage 2 studies will support the development of a Planning Proposal (PP) to map the coastal vulnerability areas (CVA) for the purposes of the *Coastal Management Act 2016* and State Environmental Planning Policy (Coastal Management) 2018 (the Coastal Management SEPP). The study will provide important information to help the planning proposal meet the Gateway requirements.

9 BUSINESS CASE AND THE WAY FORWARD

9.1 Overview of CMP Stages

9.1.1 Stage 2 – Determine Risks, Vulnerabilities and Opportunities

Stage 2 of the CMP involves undertaking detailed studies that help to identify and evaluate the risks, vulnerabilities and opportunities across the estuary system (OEH, 2018a). This stage will involve the completion of the suite of technical studies listed in Section 8.3. The purpose of these studies is to provide information to support decision-making in later stages of the planning process. The Stage 2 process involves:

- Refining understanding of key management issues;
- Identifying areas exposed to coastal hazards and threats to coastal values;
- Analysing and evaluating current and future risks through a detailed risk assessment;
- Identifying scenarios for social and economic change and related opportunities for coastal communities; and
- Where applicable, provide detailed information necessary for a planning proposal to amend the mapping of coastal management areas.

9.1.2 Stage 3 – Response Identification and Evaluation

Stage 3 of the CMP involves the development and evaluation of potential management options that can address those issues identified in Stage 2 in an integrated and strategic manner (OEH, 2018a). As per the NSW Coastal Management Manual (OEH, 2018a), Stage 3 should contain the following steps:

- *Confirmation of the strategic direction*: This will involve a review of risks and opportunities identified in Stages 1 and 2, in order to ensure that the overall strategic direction of the CMP reflects local values and local/regional strategic planning objectives.
- *Identification of potential management options:* This will involve developing a suite of potential management actions designed to address the issues identified during Stages 1 and 2. This should involve review and collation of options/actions from existing EMPs and CZMPs. Many of these actions are currently ongoing and have been implemented to positive effect, and therefore the derivation of management actions should heavily utilise the foundations laid across the suite of existing management plans. The development of Stage 3 of the CMP should leverage off the significant body of work already undertaken to develop these existing management actions.
- *Evaluation of potential actions:* The various management actions can be prioritised through examining their feasibility, viability and acceptability to stakeholders over a range of timeframes. This should also include clarification of the roles, responsibilities, timing and pathways for the actions. The actions should be evaluated through a detailed cost-benefit analysis and community and stakeholder engagement. As part of this program, relevant stakeholders and the community should contribute to the identification and evaluation of management options, and be aware of responsibilities. The options should be understood by all stakeholders in terms of risks, costs and benefits. The Community and Stakeholder Engagement Strategy in Appendix A provides an outline of the engagement activities to be undertaken during Stage 3.
- *Documenting the rationale for management actions:* A business plan should be developed that demonstrates viable funding mechanisms for implementing proposed CMP actions, ensuring that they are consistent with council's IP&R framework.

9.1.3 Stage 4 – Finalise, Exhibit and Certify the CMP

Stage 4 involves the preparation, exhibition and submission of a draft CMP to the Minister for certification (OEH, 2018g). The draft CMP should include the various components laid out in the NSW Coastal Management Manual (2018g), including:

- Snapshot of issues (coastal processes, coastal hazards, threats to biodiversity, resilience and integrity of coastal ecosystems and ecological values etc);
- Actions to be implemented by Council and other public authorities.
- A business plan identifying the full capital, operational and maintenance costs, and timing, of management actions; and
- Mapping of coastal management areas (including any proposed changes to current coastal management areas, or mapping of new coastal vulnerability areas).

The Draft CMP document should, in essence, provide a clear and succinct *statement of proposed coastal management actions* undertaken to meet state, regional and local coastal management objectives. It will outline how actions will be implemented through Council's IP&R framework and the land-use planning systems. Following the completion of a draft CMP, it is likely that DPE will review the draft CMP prior to public exhibition.

Council will then place the CMP on *public exhibition* to seek feedback from all stakeholders in the form of written submissions. It is a mandatory requirement of the NSW Coastal Management Manual that the draft CMP be exhibited for a period of not less than 28 calendar days (OEH, 2018g).

All submissions will be reviewed, considered and if applicable, incorporated into the finalised version of the CMP. The project steering committee will then review and, if satisfied, endorse the CMP for implementation. This will also need to include approval from relevant agencies identified as having an asset or issue management role in the CMP.

The Steering Committee then submits to the CMP to the Minister for certification. The Minister may seek advice from the NSW Coastal Council during this process.

9.1.4 Stage 5 – Implementation, Monitoring and Reporting

The CMP will be implemented by Council following approval, in accordance with their IP&R framework, land use planning system, and Community Strategic Plan. This framework will guide the implementation of the CMP, ensure all required *monitoring and reporting* is completed and will provide a framework for the review and assessment of CMP outcomes (OEH, 2018a). Council should develop and implement a monitoring program for the delivery of the CMP.

The CM Act (section 18(1)) requires that the CMP is reviewed at least once every 10 years, although it should be noted that this may be undertaken sooner, for any reason, including if there are significant new circumstances which need to be considered (OEH, 2018a).

9.2 The Benefits of Undertaking a CMP

The stakeholder engagement activities undertaken as part of this Scoping Study demonstrated significant support for the development of a CMP across a broad range of Local and State government agencies.

It is anticipated that the ***benefits*** of a CMP will include:

- The CMP will provide an opportunity to develop a strategic and integrated long-term plan. The risk-management process outlined in a CMP promotes the identification of current and future risks across a range of planning horizons – allowing Council to adequately prepare for emerging threats;

- Improved coordination and collaboration across the governmental stakeholders responsible for managing the coastal zone. This includes strengthening relationships, and developing a shared understanding of the values, risks and management priorities for each of those stakeholders;
- The CMP process provides significant pathways for community engagement, and can establish strong working relationships with community networks and stakeholders which are built on mutual trust and respect (OEH, 2018a). This includes providing avenues for collaboration with relevant indigenous stakeholder organisations i.e., Traditional Owners and LALCs;
- The CMP will provide a robust and defensible platform to secure funding for coastal management actions from the NSW Government's Coastal and Estuary Grants Program. The preparation of a CMP will enable the funding and implementation of a number of projects that will provide tangible benefits to the local community by improving and maintaining safe and sustainable access to the coastal zone, and protecting public assets in areas subjected to current and future coastal hazards; and
- The Adoption of a CMP also provides Council with exemption of liability. As detailed under Section 733 of the NSW *Local Government Act 1993*, through adoption of a CMP, Council '*does not incur any liability in respect of any advice furnished in good faith by the council relating to the likelihood of any land in the coastal zone being affected by a coastline hazard (as described in the coastal management manual) or the nature or extent of any such hazard*'.

Additionally, there are a number of *risks* associated with not developing a CMP. These include:

- A lack of understanding of key threats to coastal values and areas exposed to coastal hazards can result in inadequate or ineffective management practices and development controls;
- The lack of an adequate risk management process can result in a diminished ability to effectively evaluate and prioritise management actions - reducing the cost-effectiveness of government efforts and resources;
- A lack of engagement with the local community can result in a lack of support or even opposition amongst the community and key user groups. This can result in a deficit of credibility and trust between Council and the community, and can derail the implementation of future management actions;
- A lack of engagement with the local community around key values and issues can result in an incomplete understanding of local community values – and therefore a misdirection of management effort and resources.

9.3 Funding Mechanisms and Cost Sharing

The costs associated with delivery of the CMP can be partly funded by the NSW Coastal and Estuary Grants Program, administered by DPE. The program supports coastal and estuary planning projects and the implementation of works identified in certified CZMPs or CMPs. Funding is available under 5 funding streams: a planning stream and four (4) implementation streams. Development of the CMP could be partly funded through the planning stream, which provides funding for planning projects that aim to:

- Develop a CMP;
- Transition an existing CZMP into a CMP; and,
- Undertake investigations and designs or cost benefit analyses for infrastructure works recommended in a certified CZMP or CMP.

Furthermore, there is additional incentive for Council to prepare a CMP - in that future Coastal and Estuary Grants Program funding for implementation streams will require councils to have a certified CMP in place.

9.4 CMP Forward Program and Cost Structure

A preliminary work plan has been prepared based on the five-stage process for preparing CMPs outlined in the NSW Coastal Management Manual. The work plan includes an outline of the various tasks to be undertaken for each stage of the CMP, the indicative timing required to complete those tasks, and a preliminary estimate of the required budget.

9.4.1 CMP Costing

It should be noted that there are a number of limitations associated with the cost estimates provided for this business case. Consequently, the costs provided in Table 9-1 should be considered as initial estimates, and indicative only. These costs have been estimated through analysis of the required person-hours needed for each study, based on typical consultancy rates for junior, intermediate, and senior staff. Costs have been cross-referenced with historical project costs across similar environments to ensure robustness (factoring for inflation).

Council will need to consider in-kind costs incurred across the life of the project. Types of in-kind activities may include liaison with internal council departments and councillors, compilation and synthesis of relevant council data, fulfilling data requests, and coordination with the steering committee and consultants – to name just a few. These costs have been estimated at 30% of the projects fees for the various tasks required for Stages 2 to 4. These costs would be absorbed by Council as the project progresses, based on required staff commitment.

9.4.2 CMP Implementation Schedule

A forward program for delivery of the CMP has been developed based on required studies and key milestones. The timeframes provided below consider the following elements:

- The requirements of the community and stakeholder consultation program;
- Timing around Coast and Estuary Grant acquisition; and
- The required timeframes for procurement and facilitation of consultants to undertake the work.

The timing provided herein has assumed that Council will engage a consultant to undertake Stages 2 to 4 as a single package of works – as has been relatively common across the state-wide rollout of CMPs to date. If consultants are to be engaged for Stages 2 to 4 as individual packages of work, additional time will be required in the forward program (for each stage) for the following:

- Preparation of project brief;
- Release of the brief for professional services; and
- The tender process and engagement of a consultant.

Given the uncertainties associated with the above components, the timing provided in the forward program should be considered as indicative only – for the purposes of providing an approximate assessment of where the various project stages are likely to sit within Council's IP&R framework.

9.4.3 CMP Forward Program

The forward program for the CMP is detailed in Table 9-1. This program estimates that the CMP will cost around $410,000 and will require around 1½ to 2 years to develop. The study has not identified any avenues for fast-tracking through the remaining Stages, but rather the existing body of work should provide a basis for the development for Stages 2 to 4.

TABLE 9-1 FORWARD PROGRAM AND COST STRUCTURE FOR THE CMP

CMP Stage	Cost Estimate	Indicative Duration	Indicative IP&R Delivery Plan	Indicative IP&R Operational Plan
Stage 2 – Determine Risks, Vulnerabilities and Opportunities	**$270,000**	**6-9 months**	**6-9 months**	**2022/23**
The Ballina Open Coast Coastal Hazard Study and Risk Assessment	$95,000	4-6 months	2021-25	2022/23
The Ballina Open Coast Geotechnical Hazard Study and Risk Assessment	$25,000	2-3 months	2021-25	2022/23
The Richmond River Storm Tide and Tidal Inundation Study and Risk Assessment	$85,000	4-6 months	2021-25	2022/23
The Ballina Coastal and Estuarine Habitat and Biodiversity Study	$65,000	4-6 months	2021-25	2022/23
Stage 3 – Identify and Evaluate Options	**$85,000**	**6-9 months**	**2021-25**	**2022/23**
Stage 3 Community and Stakeholder Engagement	$15,000	1 month	2021-25	2022/23
Stage 3 CMP Management Actions Report	$70,000	6-9 months	2021-25	2022/23
Stage 4 – Prepare, Exhibit, Finalise and Adopt CMP	**$55,000**	**6-9 months**	**2021-25**	**2023/24**
Stage 4 Draft Coastal Management Program	$40,000	1 month	2021-25	2023/24
Stage 4 Community and Stakeholder Engagement	$10,000	6-7 months	2021-25	2023/24
Stage 4 Final Coastal Management Program	$5,000	1 month	2021-25	2023/24
Total	**$410,000**	1.5-2yrs	As above	As above

9.5 CMP Governance Structure

The NSW Coastal Management Manual Part B, Stage 1 (OEH, 2018a) requires that governance arrangements be established, not only for Stage 1 of the CMP, but also for the subsequent stages. The NSW Coastal Management Framework provides for some flexibility around the structure and governance arrangements of a CMP. As discussed in Section 1.3, a CMP is intended to help local councils and their communities to identify and manage risks to the environmental, social and economic values of the coast.

The *lead applicant* and project manager for the CMP development should be Ballina Shire Council. It is recommended that Council will retain ownership of the process and be responsible for day-to-day management of the CMP. This will include:

- Day-to-day project management of the CMP;
- Managing budgets and financial transactions for the project;
- Reporting on financial and project progress;
- Organising events and other parts of the community and stakeholder engagement plan;
- Monitoring the performance of the project and reporting this regularly to the project steering committee (see below);
- Regular liaison with the consultant(s) to monitor performance; and
- Responding to any enquiries about the project from stakeholders and communities.

Development and implementation of the CMP will require engagement and coordination across a range of relevant agencies and organisations. Therefore, it is imperative that the CMP governance structure foster and facilitate collaboration across these agencies to optimise outcomes.

To this end, a recommended governance structure for the CMP is provided in Figure 9-1. It is recommended that the project is governed by a *Project Steering Committee* which will be comprised of the various stakeholders with management roles and responsibilities across the coastal zone. These stakeholders are discussed in more detailed in Section 3.2.1. The roles and responsibilities of the Project Steering Committee would include:

- Decision making throughout the CMP, and ensuring delivery of project outcomes;
- Provision of input into the technical aspects of the project;
- Exchanging information and data where relevant and available; and
- Informing and supporting decision making with regards to technical and managerial matters.

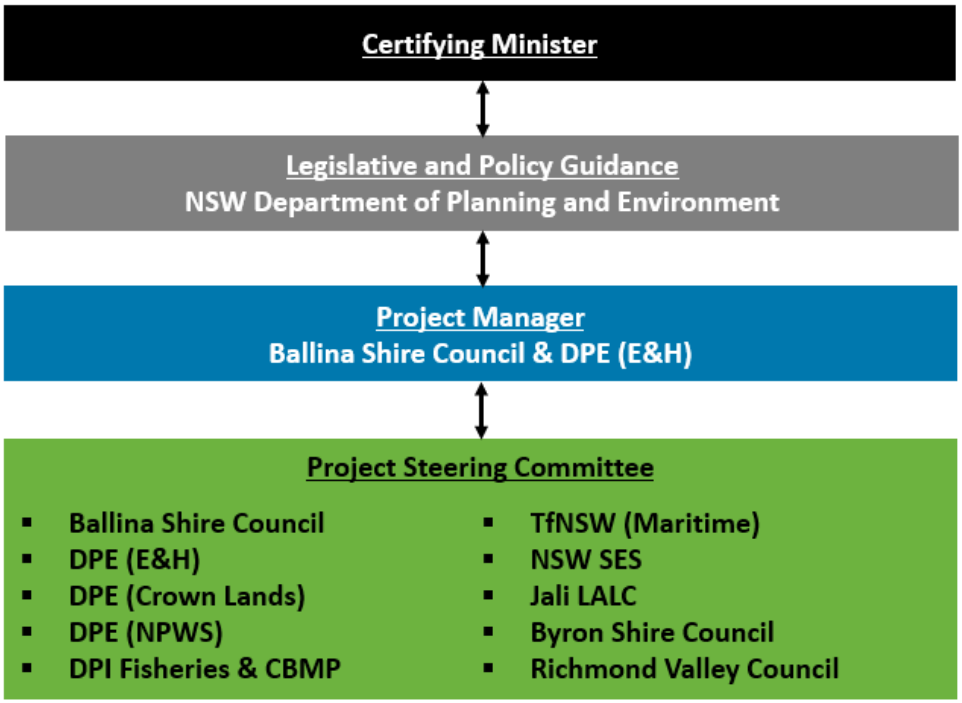

FIGURE 9-1 PROPOSED CMP GOVERNANCE STRUCTURE

The suitability of the governance structure should be reviewed at least after each CMP stage and changes made if deemed appropriate by the Project Steering Committee. Therefore, the make-up of the governance structure should be considered flexible, with the potential inclusion of additional organisations as the CMP progresses, and as future governmental department changes may dictate.

9.6 Implementation

Following approval of the Stage 4 CMP document, Stage 5 of the CMP will be implemented through Council's IP&R framework, and their Community Strategic Plan – with implementation through their Delivery Programs and Operational Plans. This framework will guide the implementation of the CMP and ensure all required monitoring and reporting is completed. It will also provide a framework for the review and assessment of CMP outcomes. Figure 9-2 below shows how the CMP process informs, and is informed by, the elements of the IP&R framework as per the CM Manual.

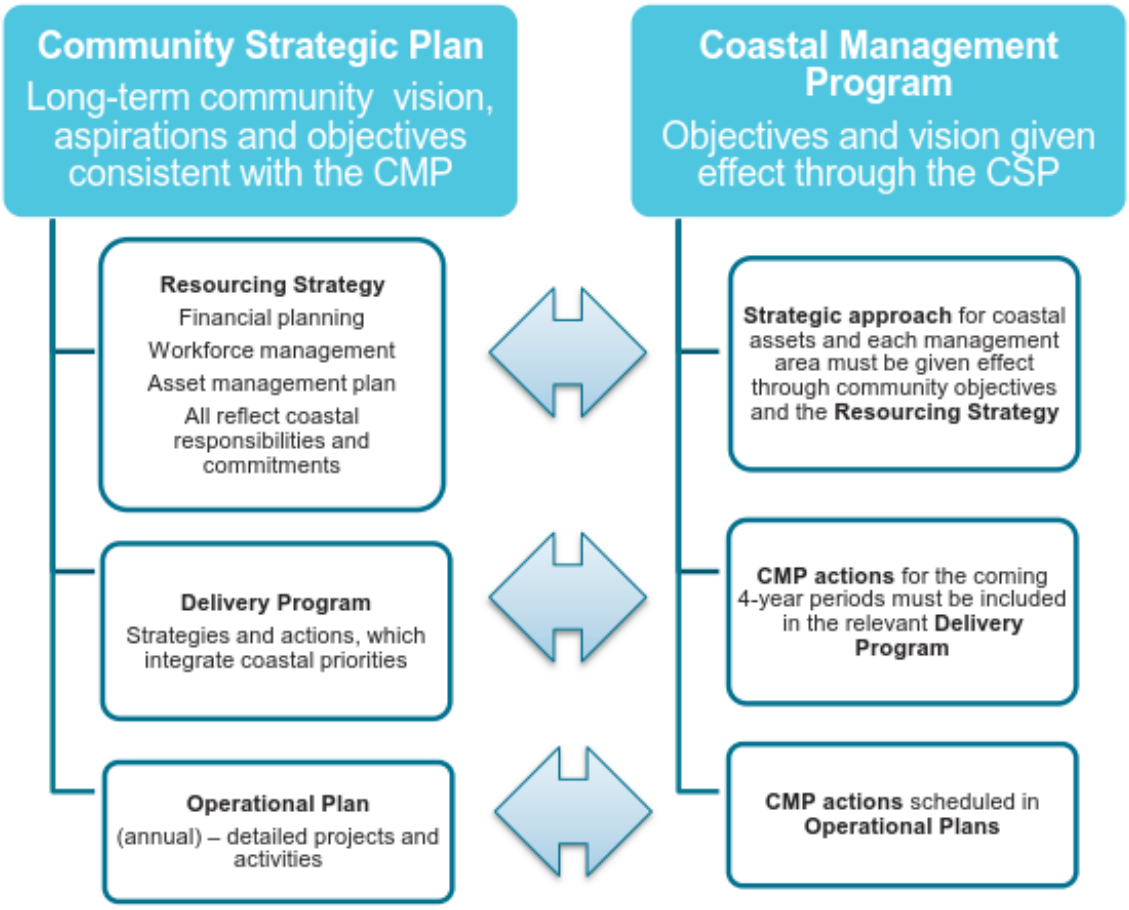

FIGURE 9-2 RELATIONSHIP BETWEEN THE IP&R FRAMEWORK AND THE CMP (SOURCE: OEH, 2018A)

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WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

APPENDIX A
COMMUNITY AND STAKEHOLDER ENGAGEMENT STRATEGY

Ballina Shire Coastline Coastal Management Program

Community and Stakeholder Engagement Strategy

Prepared for Ballina Shire Council

29 June 2022

Document Status

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Project Name	Community and Stakeholder Engagement Strategy
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Water Technology Project Manager	Chris Beadle
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1 INTRODUCTION

1.1 Background

The NSW Government has established a modern and integrated coastal management framework in order to better equip communities to respond to existing and future coastal management challenges (OEH, 2018). As part of this framework, the NSW government is encouraging local councils to prepare Coastal Management Programs (CMPs) to assist in the integrated management of the state's various coastlines and estuaries.

The Ballina Shire coastline, Shaws Bay and the downstream reaches of the Richmond River and North Creek are important social, environmental and economic assets for the North Coast region. They possess ecological and environmental value, and provide a wide range of social and recreational opportunities for the local community and visitors alike. The region also contains a passionate local community, who are heavily invested in the health of the estuaries and their management.

However, the coastline and estuaries are facing increasing pressures from agricultural practices in the catchment, population growth, urbanisation, coastal erosion and climate change. Therefore, the CMP process will set the long-term strategy for the management of the coastline, in order to maintain and enhance its social, economic and environmental values, and promote coordination and collaboration across government agencies (DPIE, 2019).

The Ballina Shire Coastline CMP will be undertaken through a five-stage risk management procedure described in the State Government's Coastal Management Manual, as depicted in Figure 1-1 (Water Technology, 2021). The development of the program will include extensive engagement with the local community and user groups, and relevant government agencies.

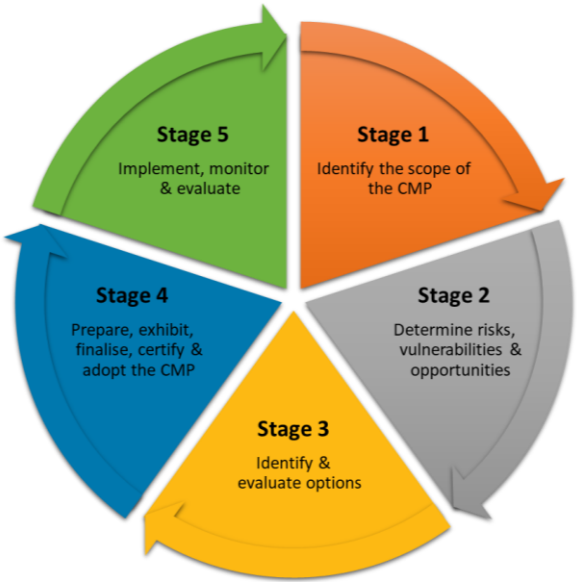


FIGURE 1-1 THE NSW CMP PROCESS

The CMP is presently in Stage 1 of the CMP process, which comprises a Scoping Study. The primary purpose of a Stage 1 Scoping Study is to:

- Review the history of managing the coastal zone;
- Develop a shared understanding of the current situation; and
- Identify the focus of the new CMP.

Stage 1 builds on and integrates with previous work, including existing plans and strategies, technical studies and stakeholder input. It guides council in formulating appropriate strategies and actions in later stages of the process (Stages 2 to 5).

Effective engagement and communication are important aspects of a successful CMP. A key component of this Stage 1 Scoping Study is the development of a Community and Stakeholder Engagement Strategy. This strategy outlines which groups and organisations should be involved in the preparation and implementation of the CMP, how they will be offered engagement opportunities, and how their input will be incorporated into the planning process.

1.2 The Community and Stakeholder Engagement Strategy

Section 16 of the *Coastal Management Act 2016* requires that all NSW local councils engage with local communities and relevant stakeholders before and during the CMP process. In order to ensure an effective and targeted consultation process, a Community and Stakeholder Engagement Strategy is to be prepared during the Stage 1 Scoping Study. The purpose of the strategy is to identify relevant stakeholders, and determine the structure and pathways for their engagement through the multi-staged CMP process.

This strategy has been prepared in accordance with the requirements of, and for consistency with, the following documents:

- Ballina Our Community Our Future Community Strategic Plan 2017-2027;
- Ballina Shire Council Community Consultation Policy (Ballina Shire Council, 2017);
- The NSW Coastal Management Manual - Guidelines for community and stakeholder engagement in coastal management (OEH, 2018)
- The International Association of Public Participation (IAP2) documentation

The overarching objectives of the community and stakeholder engagement strategy for the CMP are:

- To assist Council in gaining internal buy-in for development of the CMP;
- To gain external buy-in from relevant organisations who will be involved in the CMP development and ongoing implementation;
- To ensure all stakeholders have up to date information about the CMP, and the broader coastal management framework that supports the project; and
- To provide the community and relevant stakeholders the opportunity to have direct input into the development and delivery of the CMP.

It is important to note the engagement approach provided in this strategy should be considered adaptive and flexible, and if necessary, can be further refined during later stages of the CMP process.

1.3 Requirements of the Strategy

1.3.1 CM Act Requirements

The CM Act requires local councils to consult with the community and stakeholders before adopting a CMP. Section 16 of the CM Act requires that:

> *(1) Before adopting a coastal management program, a local council must consult on the draft program with:*
>
> *(a) the community, and*
>
> *(b) if the local council's local government area contains: (i) land within the coastal vulnerability area, any local council whose local government area contains land within the same coastal sediment compartment, and (ii) an estuary that is within 2 or more local government areas, the other local councils, and*
>
> *(c) other public authorities if the coastal management program: (i) proposes actions or activities to be carried out by that public authority, or (ii) proposes specific emergency actions or activities to be carried out by a public authority under the coastal zone emergency action subplan, or (iii) relates to, affects or impacts on any land or assets owned or managed by that public authority.*

(2) Consultation under this section is to be undertaken in accordance with the relevant provisions of the coastal management manual.

(3) A failure to comply with this section does not invalidate a coastal management program.

Part A of the coastal management manual includes statutory provisions and mandatory requirements relating to community and stakeholder engagement. These provisions and requirements include:

A draft CMP must be exhibited for public inspection at the main offices of the councils of all local government areas within the area to which the CMP applies, during the ordinary hours of those offices, for a period of not less than 28 calendar days before it is adopted. This mandatory requirement does not prevent community consultation, or other consultation, in other ways.

1.3.2 CMP Engagement Guidelines

The NSW Government has issued guidelines for community and stakeholder engagement related to the CMP process (OEH, 2018). These guidelines provide engagement approaches to help meet the requirements set out above and to enable community and stakeholder feedback to enhance the development of the CMP.

The guidelines recommend the use of the International Association for Public Participation (IAP2) spectrum, which is a widely accepted model to design engagement strategies and plans. The guidelines for Stage 1 of the CMP process recommend the following engagement activities:

1. Identify the various stakeholders that need to be engaged in the CMP process;
2. Conduct a community profile across the study area;
3. Develop a coastal community and stakeholder engagement strategy for all stages in the CMP process; and
4. Establish a coastal management advisory group. This includes the development of a governance structure for the CMP – provided in Section 2.1.

This Strategy has been prepared in accordance with the requirements of CM Act and the Coastal Management Manual.

1.4 Impacts of COVID-19 on this Strategy

During the course of the project, it is possible that governmental guidance and policies regarding the COVID-19 pandemic may present sudden and significant limitations with regards to in-person community and stakeholder engagement tasks. Therefore, the Strategy will need to consider the possibility that social distancing restrictions may affect the engagement activities throughout the project. If this comes to bear, then the engagement strategy may need to be reviewed at the beginning of each CMP Stage in order to adequately align with the current circumstances and government advice.

The likely impact will be the replacement of “in-person” engagement tasks with online and remote engagement methods. Based on this, some remote engagement methods that may be suited to this strategy include:

- The use of “Virtual Town Hall Meetings” through live streaming. This can include broadcasting important events and public consultations, showcasing experts, panels, and live interactive Q&A sessions with stakeholders.
- The use of pre-recorded video “webinars” which can communicate project objectives, methods and/or outcomes. These can be integrated into the *Have Your Say* project web page.
- Interactive online data sharing methods, including use of web-based mapping portals for “drop-pinning” areas of importance and “photo-sharing”. Many of these can be accessed through

Engagement & Public Participation Software such as “Bang the Table” that can be easily integrated into the *Have Your Say* project web page.

- The use of online community surveys.

The appropriateness of these engagement methods should be assessed at the commencement of each CMP Stage, based on state and federal government advice and policy.

2 STAKEHOLDER IDENTIFICATION & ANALYSIS

2.1 Project Governance Structure

The NSW Coastal Management Framework provides for some flexibility around the structure and governance arrangements of a CMP. The lead applicant for CMP development will be Ballina Shire Council. It is recommended that Council will retain ownership of the process and be responsible for day-to-day management of the CMP.

The development and implementation of the CMP will require engagement and coordination across a range of relevant agencies and organisations. Therefore, it is imperative that the CMP governance structure facilitate collaboration across these agencies.

To this end, a recommended governance structure for the CMP is provided in Figure 2-1. It is recommended that the project is managed by a Project Steering Committee – which will be comprised of the various stakeholders with management roles and responsibilities across the coastal zone. These stakeholders are listed in Figure 2-1.

The purpose of the steering committee will be to:

- Provide input into the technical aspects of the project;
- Exchange information and data where relevant and available; and
- Inform and support decision making regarding technical and managerial matters.

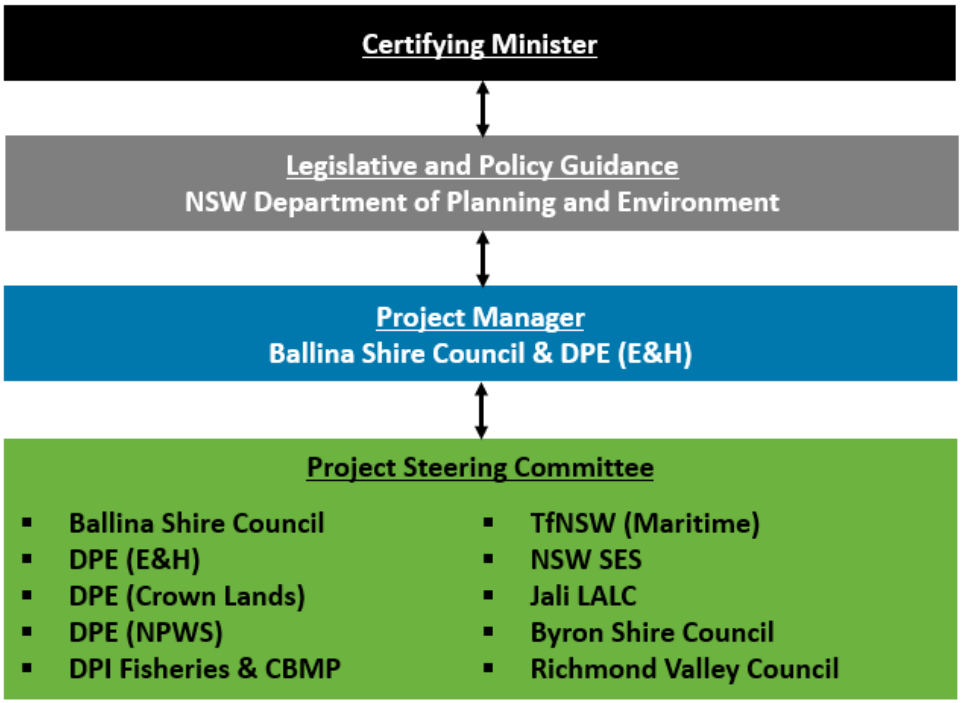


FIGURE 2-1 PROPOSED CMP GOVERNANCE STRUCTURE

2.2 Internal Stakeholders

Internal stakeholders are those who are part of the decision-making team. Members of the steering committee are invited to take part in all engagement activities. Practically, it may be that a subset of members is involved in each, and this is reported back to the group during the steering committee meetings. Outcomes and summaries of each engagement activity would be incorporated into the overall project deliverables and included in progress updates to Council's project manager.

2.3 External Stakeholders

External stakeholders are those that are not decision-makers, but who are affected by the project. They might live near the coast, use an asset or resource located in the coastal zone, or simply have an interest in the estuaries and their contributing catchments. Some external stakeholders have been identified below; each engagement activity will be publicly advertised to ensure those not captured below still have an opportunity to engage.

2.3.1 Indigenous Communities

It will be particularly important to engage with local indigenous communities throughout the CMP process. During the process, Council should liaise with the Jali Local Aboriginal Land Council (LALC) in order to identify appropriate pathways and avenues for engagement.

It should be noted that during Stage 1, the project team was unsuccessful in attempts to reach out to Jali LALC, and therefore this task will be critical in Stage 2 of the CMP. It is suggested that Council should take the lead in this process, and establish a broader working relationship with Jali LALC (and other relevant Indigenous groups) that can extend across its LGA wide suite of CMPs.

However, it is recognised that the LALC may be limited in the extent that it represents the interests of the local indigenous people. Engaging successfully with local indigenous communities will require an appreciation of indigenous history, cultures and contemporary social dynamics (Hunt, 2013). The engagement strategy provided in Section 4 provides for opportunities through one-on-one or small group interviews, where deemed preferable or more appropriate. Further mechanisms to engage with indigenous communities can be drawn from *Sea countries of New South Wales: a benefits and threats analysis of Aboriginal people's connections with the marine estate* (Feary, 2015).

Indigenous values were identified by the local communities in previous consultation. Of particular note is the East Ballina Aboriginal Place, which was declared a place of special significance to Aboriginal culture and people in 2012, under the *National Parks and Wildlife Act 1974*. Several indigenous sites are threatened by coastal erosion.

2.3.2 Community and User Groups

A range of stakeholders have been identified through the Scoping Study analysis, and with reference to the Ballina Community Directory and the NSW Coastal Management Manual (OEH, 2018). These stakeholders are listed in Table 2-1. Please note that this list should be considered non-exhaustive and additional community and user groups may be engaged if considered appropriate.

A community profile for the study area has been provided in Section 3 of the Scoping Study report.

TABLE 2-1 COMMUNITY AND USER GROUPS

Stakeholder Type	Stakeholders
Ratepayers	▪ Individual residents and ratepayers ▪ Non-resident ratepayers

Stakeholder Type	Stakeholders
Resident & Community Advocacy Groups	▪ Ballina Peninsula Residents Association ▪ Lennox Head Residents Association
Indigenous Groups	▪ Jali Local Aboriginal Land Council
Environmental and Conservation Groups	▪ Ballina Coastcare ▪ Landcare NSW ▪ Angels Beach DuneCare Group ▪ Ballina Lighthouse Beach DuneCare Group ▪ East Ballina LandCare Group ▪ Lennox Head LandCare Group
Business and Industry Groups	▪ Ballina Chamber of Commerce ▪ Lennox Head Chamber of Commerce
Agricultural Groups	▪ NSW Farmers Association
Community Recreational Groups	▪ Ballina Lighthouse & Lismore SLSC ▪ Lennox Head-Alstonville SLSC ▪ Lennox Ballina Boardriders ▪ Ballina-Lennox branch of the Surfrider Foundation ▪ Richmond River Sailing and Rowing Club

2.4 Stakeholder Analysis Matrix

A preliminary stakeholder analysis has been undertaken in the development of this strategy, for both internal and external stakeholders. For this task, each stakeholder has been assessed for the following indicators as recommended by the International Association of Public Participation (IAP2):

- The benefits of their involvement – that is, what can the stakeholder bring to the project that is of benefit? This includes:
  - Provision of data and information
  - Understanding of key issues
  - Knowledge and input re: operational & managerial processes
  - Feedback and review
- The level of interest in the final outcomes of the project;
- The level of influence that the stakeholder will have on the final outcomes; and
- The level of impact that the project will have on the stakeholder group.

Results are provided in Table 2-2 below.

TABLE 2-2 STAKEHOLDER ANALYSIS

Stakeholder Group	Benefits of Involvement				Level of Interest	Level of Influence	Level of Impact
	Provision of Data and Information	*Understanding of Key Issues*	*Knowledge and Input regarding Managerial Processes*	*Feedback and Review*			
Project Steering Committee							
Ballina Shire Council	✓	✓	✓	✓	High	High	High
DPE – E&H	✓	✓	✓	✓	High	High	High
DPE – Crown Lands	✓	✓	✓	✓	High	High	High
DPE – NPWS	✓	✓	✓	✓	High	High	High
DPE – Fisheries & CBMP	✓	✓	✓	✓	High	High	High
TfNSW (Maritime)	✓	✓	✓	✓	High	High	High
NSW SES	✓	✓	✓	✓	High	High	High
Jali LALC	✓	✓	✓	✓	High	High	High
Community and User Groups							
Residents / Ratepayers	✓	✓		✓	High	High	High
Resident and Advocacy Groups	✓	✓		✓	High	High	High
Indigenous Groups	✓	✓	✓	✓	High	High	High
Environmental and Conservation Groups	✓	✓		✓	High	High	High
Business and Industry	✓	✓		✓	Low / Moderate	Low / Moderate	Low / Moderate
Agricultural Groups	✓	✓	✓	✓	High	Moderate	High
Community and Recreational Groups	✓	✓		✓	High	Low / Moderate	Moderate

3 ENGAGEMENT APPROACH

3.1 Level of Consultation

As per the Ballina Shire Council Community Consultation Policy (Ballina Shire Council, 2017) and the IAP2 Spectrum of Public Participation, levels of engagement have been defined as the following:

- **Inform** stakeholders about the outcomes of the hazard assessment and the risks identified through the project.
- **Consult** with stakeholders on the draft CMP.
- **Involve** stakeholders in assessing the management actions presented.
- **Collaborate** with stakeholders to determine the level of risk tolerance, community values attributed to coastal assets and to identify potential management actions.

Each phase of stakeholder engagement is assigned a level, allowing the activity to be scoped appropriately. At the commencement of each activity, the level of influence their contribution will have on the overall outcome should be clearly defined. Managing stakeholder expectations regarding their involvement will assist with ownership and acceptance of the CMP.

Levels of impact increase as per Figure 3-1, adapted from IAP2.

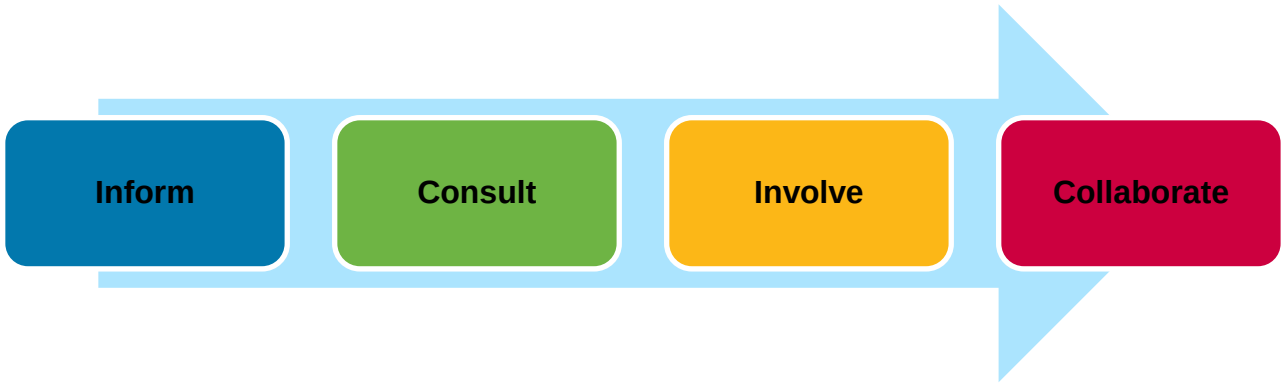
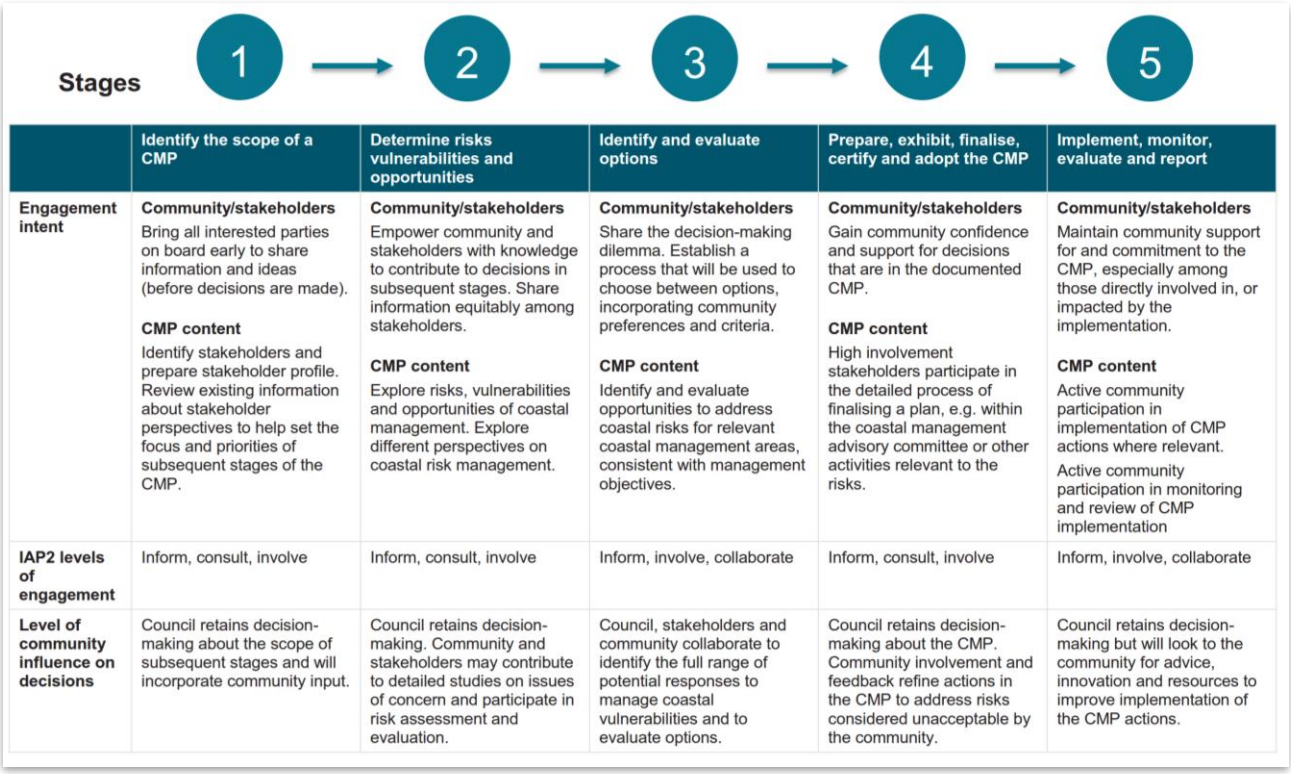


FIGURE 3-1 IAP2 SPECTRUM OF PUBLIC PARTICIPATION; IMPACT ON THE DECISION INCREASES FROM LEFT TO RIGHT

3.2 Coastal Management Manual Guidance

The NSW Coastal Management Manual - Guidelines for community and stakeholder engagement in coastal management (OEH, 2018) provides a generic overview of the requirements for engagement at each of the CMP stages. A summary of these is provided in Figure 3-2 below. The messaging, methods and logistics within this strategy are consistent with this framework.



	Identify the scope of a CMP	Determine risks vulnerabilities and opportunities	Identify and evaluate options	Prepare, exhibit, finalise, certify and adopt the CMP	Implement, monitor, evaluate and report
Engagement intent	**Community/stakeholders** Bring all interested parties on board early to share information and ideas (before decisions are made). **CMP content** Identify stakeholders and prepare stakeholder profile. Review existing information about stakeholder perspectives to help set the focus and priorities of subsequent stages of the CMP.	**Community/stakeholders** Empower community and stakeholders with knowledge to contribute to decisions in subsequent stages. Share information equitably among stakeholders. **CMP content** Explore risks, vulnerabilities and opportunities of coastal management. Explore different perspectives on coastal risk management.	**Community/stakeholders** Share the decision-making dilemma. Establish a process that will be used to choose between options, incorporating community preferences and criteria. **CMP content** Identify and evaluate opportunities to address coastal risks for relevant coastal management areas, consistent with management objectives.	**Community/stakeholders** Gain community confidence and support for decisions that are in the documented CMP. **CMP content** High involvement stakeholders participate in the detailed process of finalising a plan, e.g. within the coastal management advisory committee or other activities relevant to the risks.	**Community/stakeholders** Maintain community support for and commitment to the CMP, especially among those directly involved in, or impacted by the implementation. **CMP content** Active community participation in implementation of CMP actions where relevant. Active community participation in monitoring and review of CMP implementation
IAP2 levels of engagement	Inform, consult, involve	Inform, consult, involve	Inform, involve, collaborate	Inform, consult, involve	Inform, involve, collaborate
Level of community influence on decisions	Council retains decision-making about the scope of subsequent stages and will incorporate community input.	Council retains decision-making. Community and stakeholders may contribute to detailed studies on issues of concern and participate in risk assessment and evaluation.	Council, stakeholders and community collaborate to identify the full range of potential responses to manage coastal vulnerabilities and to evaluate options.	Council retains decision-making about the CMP. Community involvement and feedback refine actions in the CMP to address risks considered unacceptable by the community.	Council retains decision-making but will look to the community for advice, innovation and resources to improve implementation of the CMP actions.

FIGURE 3-2 OEH (2018) RECOMMENDED ENGAGEMENT APPROACH

3.3 Objectives of the Strategy

The objectives of the strategy, as discretised across the various stages of the CMP, are depicted in Table 3-1 below.

TABLE 3-1 OBJECTIVES OF THE COMMUNITY AND STAKEHOLDER ENGAGEMENT (AS PER OEH, 2018)

Stage	Outcomes	Engagement Level
Stage 1: Identify the scope of the CMP	▪ Increase community and stakeholder understanding of the new legislative and planning framework – CM Act, State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP) and manual. ▪ Establish strong working relationships with community networks and stakeholders which are built on mutual trust and respect. ▪ Be clear about the coastal management roles and responsibilities of the council public authorities. ▪ Understand community goals and aspirations for the coastal zone and community views on values, opportunities and priorities. ▪ Understand community motivations for participation and preferred approaches and processes, to encourage increased community interest and willingness to actively participate in coastal management. ▪ Increase community and stakeholder understanding of the dynamic nature of coastal processes, risks and opportunities and the need to set long-term objectives. ▪ Determine the engagement activities that are required during the preparation of subsequent stages of the CMP.	▪ Inform ▪ Consult

Stage	Outcomes	Engagement Level
Stage 2: Determine risks, vulnerabilities and opportunities	▪ A broad, shared understanding of the extent and nature of risks and opportunities, and the types of actions that may be appropriate to address different levels of risk over various timeframes. ▪ Managers within the council are aware of coastal vulnerabilities, opportunities and actions that are relevant to their responsibilities and any potential conflict with other council management responsibilities or priorities. ▪ A shared understanding of the varied perspectives about priorities for coastal management within the community. ▪ Council has a clear understanding of the community's 'risk appetite' – what coastal risks and management outcomes are 'acceptable', 'tolerable' and 'unacceptable' to the local community. ▪ Council has additional information about community social and economic characteristics that will help it evaluate the viability and acceptability of management actions in Stage 3. ▪ Community and stakeholders understand what is involved in vulnerability, risk and opportunity studies, which may include technical aspects such as scenarios for sea level rise, hazards and impacts. This includes an understanding of the assumptions, methods and limitations of the hazard studies. ▪ Increased community trust and acceptance of technical information based on their own input to technical studies.	▪ Inform ▪ Consult ▪ Involve
Stage 3: Identify and evaluate options	▪ A continuing strong working partnership with the community and stakeholders. ▪ An appreciation of the need to prioritise actions and satisfaction with how priorities are to be identified. ▪ A clear understanding of the costs and beneficiaries of management actions and the potential cost-sharing arrangements and other viable funding mechanisms. ▪ Managers across Council have contributed to the evaluation of management options within their area of responsibility and are aware of the interactions of coastal management activities across the divisions of the council. ▪ Public authorities contribute to the identification and evaluation of management options, are aware of their potential responsibilities under the CMP and are willing to work collaboratively with the council to identify practical solutions, relevant to immediate and longer-term timeframes. ▪ Council has a clear understanding of stakeholder views about beneficiaries of coastal management actions and the distribution of costs and benefits, willingness to pay and potential trade-offs. Conversely, communities have a clear understanding of the costs and benefits of management options, and options for funding implementation. ▪ Where a planning proposal is being prepared to amend mapping of coastal management areas in the CM SEPP 2018, the community and affected landholders are aware of the planning proposal and its consequences. ▪ Feasible and viable options, the scope and cost of which is fully understood (in terms of managing the identified risks, cost and benefits to both public and private stakeholders) by all stakeholders.	▪ Inform ▪ Involve ▪ Collaborate

Stage	Outcomes	Engagement Level
Stage 4: Prepare, exhibit, finalise, certify and adopt the CMP	▪ Increased community and stakeholder understanding of, and support for, actions and priorities in the CMP. ▪ Increased awareness about the types of funding that will be pursued to implement the CMP and how CMP funding will be integrated with Council's IP&R framework. This includes an understanding of funding arrangements requiring a new contribution from the public or from private landholders who benefit from investment in coastal management. ▪ A community that is satisfied with its role in the preparation of the CMP and is willing to be constructively involved in its implementation. ▪ Refinement of proposed management actions as necessary, with further feedback from the broader community. ▪ A community that understands the role of the State Government, public authorities and the NSW Coastal Council in the finalisation and certification of the CMP.	▪ Inform ▪ Consult ▪ Involve
Stage 5: Implement, monitor, evaluate and report	▪ Increased community understanding of how actions in the CMP will be implemented through the IP&R framework, the land use planning system and by other public authorities. ▪ The community is informed about progress on implementation of agreed actions. The community is aware of the effectiveness of actions in terms of changes to coastal risk profile, coastal condition and community satisfaction. ▪ Creating opportunities for community involvement in implementing, monitoring, evaluating and reporting the effectiveness of the CMP, such as through citizen science programs. ▪ Agreement about a methodology to accurately monitor and report on progress in the implementation of management actions. ▪ Strengthened partnerships with public authorities including adjoining local councils.	▪ Inform ▪ Involve ▪ Collaborate

3.4 Strategy Messaging

A consistent, central information source will be helpful in managing the consultation process. Council should prepare a webpage of information related to the project as a central repository for the community, and this could be located on a project specific *Ballina Coastline CMP* page. This page would include a brief description of the project, as well as key strategy messaging and content described below.

Messaging

The *Ballina Coastline CMP p*age should contain a set of key messages for the project, including:

- The project is initiated by Ballina Shire Council. The project is funded jointly through Council, and the NSW State Government's Coast and Estuary Grants Program.
- The Project Steering Committee will oversee preparation and completion of the CMP, including review of project deliverables.
- The CMP will provide an opportunity to develop a strategic, long-term approach to management of the Ballina Coastline - and improve coordination across local and state government agencies.
- The CMP will enable the funding and implementation of projects that will provide tangible benefits to the local community - through maintaining healthy ecosystems and biodiversity, protecting public assets from current and future hazards and ensuring safe and sustainable access to the coastline and estuaries.
- The development of the program will include extensive engagement with the local community and user groups, and relevant government agencies.

- Unless otherwise stated, information gathered from stakeholders during the project will only be applied to the project and will remain confidential.

Content

As the project progresses through Stages 2 to 5, the *Ballina Coastline CMP* page should be updated with important content, including:

- Background of the project, and the NSW Coastal Management Framework;
- An overview of the CMP process, and the various stages involved in the development of the CMP;
- Updates on project progress;
- Key project deliverables such as reports available for public consumption and comment;
- Information pertaining to upcoming community consultation events, and avenues for engagement; and
- Links to relevant materials such as the NSW Coastal Management Framework, and the Marine Estate Management Strategy.

Further information on the content for the page is provided in the Strategy in Section 4.

4 ENGAGEMENT STRATEGY

The engagement process has been split into the CMP Stages as described below. It is anticipated these activities will be refined during the scoping of each individual stage and will evolve as the results of the CMP come to light. The timing of the activities outlined herein cannot be determined at this stage, however indicative timing is provided in the Forward Program provided in the Scoping Study report (Water Technology, 2022). Engagement with the steering committee will be in addition to that listed below.

4.1 Stage 1

As outlined in Table 3-1, the main roles of community and stakeholder engagement in Stage 1 is to understand community goals and aspirations for the coastal zone and community views on values, opportunities and priorities. It is also important to develop understanding of the CMP process and Increase community and stakeholder understanding of the dynamic nature of coastal processes, risks and opportunities and the need to set long-term objectives.

A summary of the engagement undertaken during Stage 1 of the CMP is provided in Section 4 of the scoping study report. A brief summary of this engagement is provided here for context; however, the reader is directed to the scoping study report for further detail. Community and Stakeholder Engagement undertaken during Stage 1 comprised the following:

- *Stakeholder Engagement Workshop:* A stakeholder workshop for the CMP was held on 10 December 2021 using virtual means (Microsoft Teams). The workshop was an opportunity for stakeholders to contribute and have their say regarding the planning for, and implementation of, the CMP. The objectives of the workshop were to:
  - Communicate the strategic context and drivers of the CMP;
  - Identify key coastal management threats and risks across the study area, including historical, present day and emerging/future; and
  - Identify any tacit knowledge or non-documented issues and/or risks.

Sixteen stakeholders attended the workshop, from a number of different organisations, including Ballina Shire Council, DPE (E&H, Crown Lands), NPWS, DPI (Fisheries), NSW SES, Byron Shire Council and Richmond Valley Shire Council.

- *An online community survey*: Community consultation was undertaken during the Scoping Study in the form on an online community survey. The purpose of the survey was to obtain a snapshot of:
  - How often locals visit the coastline and what activities they engage in whilst there;
  - What the local community considers to be the most important ecological, social, cultural, aesthetic, recreational, and economic values of the study area; and
  - Community perceptions of key issues and attitudes towards potential management options.

A summary of results is provided in Appendix E of the scoping study report (Water Technology, 2022).

- *Webpage:* A project webpage was established on Council's website to advertise the community survey and provide information about the rationale for the CMP and the CMP Stages.
- *Engagement with indigenous groups:* As traditional owners of the Coastal Country it is critical to engage early with indigenous groups. During Stage 1, the project team was unsuccessful in attempts to reach out to Jali LALC, and therefore this task will be critical in Stage 2 of the CMP.

4.2 Stage 2

The key outcomes of the Stage 2 engagement are building awareness of the project, ascertaining the coastal community values within the LGA, and supplementing the Stage 2 Risk Assessment with stakeholder observations of local threats and risks. However, some of these tasks were transferred forwards to Stage 1 of the CMP for the purposes of efficiency. Specifically, the direct stakeholder and community engagement undertaken during Stage 1 has consulted with the local community regarding their values across the study area, and their perception of threats and risks. It is considered that the information garnered during this task is mostly sufficient to undertake Stage 2 of the CMP (by informing the assessment of risks, vulnerabilities and opportunities). Therefore, it is not anticipated that these tasks need to be undertaken again during Stage 2.

Therefore, the following suite of engagement tasks are proposed for Stage 2.

TABLE 4-1 PROPOSED ENGAGEMENT ACTIVITIES: STAGE 2

Engagement Activity	Engagement Level	Description
Council webpage **Stakeholders:** ▪ All	Inform	The Council page for the project should be updated with the following information: ▪ An update of project progress – including outcomes from Stage 1 and the results of the community consultation online survey. ▪ Background information into Stage 2, including tasks, timing and deliverables. ▪ A succinct summary of technical information relating to Stage 2. This should include an overview of the dynamic nature of the coastal and estuarine environment, and a summary of the key threats and risks identified in the Stage 1 Scoping Study.
Community Information Sheet ---- **Stakeholders:** ▪ All	Inform	A summary sheet will need to be developed that provides: ▪ Background information into the CMP. ▪ Information regarding project progress, and relevant background into Stage 2. ▪ This information sheet will serve a similar purpose to the project web page (and will provide similar information). Its primary purpose will be to provide such information to those with limited internet access, however it should also be made available on the project page as a downloadable summary sheet.
Focus groups / interviews ---- **Stakeholders:** ▪ As needed	Inform, Consult & Collaborate	Some stakeholder groups may respond more effectively through one-on-one or small group interviews. Council can identify such groups at the commencement of the stage, using the Stakeholder analysis in Section 2, they can then be consulted in a more focussed, one-on-one approach in order to ensure their needs are met and views heard. It may also be important to follow up issues with some stakeholders regarding high risks identified in the Stage 1 first-pass risk assessment. It is anticipated that the Jali LALC should be directly engaged at the commencement of this Stage, in order to continue to build trust, identify key issues, and commence discussions around potential management actions to be developed during Stage 3.

4.3 Stage 3

During Stage 3, the engagement process aims to facilitate stakeholder and community involvement in identifying and evaluating the local and regional scale management options (OEH, 2018). To this end, a series

of community and stakeholder workshops should be conducted to communicate, discuss and refine the proposed management options. Feedback on the management options will be sought so that they can be appropriately evaluated and prioritised.

Due to the detailed discussions around costs and responsibility of management options, engagement will be split between internal and external stakeholders. The scope of the engagement of Stage 3 should be revised at the commencement of the Stage, based on the engagement and coastal engineering findings of Stage 2, to ensure all stakeholders are suitably engaged.

To achieve the engagement objectives of this stage, the activities listed in Table 4-2.

TABLE 4-2 PROPOSED ENGAGEMENT ACTIVITIES: STAGE 3

Engagement Activity	Engagement Level	Content and Objectives
Council webpage ---- **Stakeholders:** ▪ All	Inform	The Council webpage for the project should be updated with the following information: ▪ An update of project progress – including outcomes from Stage 2 and any relevant hazard mapping ▪ Background information into Stage 3, including tasks, timing and deliverables. ▪ Mechanisms for involvement, including advertising the upcoming engagement activities.
Community Information Sheet ---- **Stakeholders:** ▪ All	Inform	A summary sheet will need to be developed that provides: ▪ Information regarding project progress ▪ Background information into Stage 3 ▪ Mechanisms for involvement, including advertising the upcoming engagement activities This information sheet will serve a similar purpose to the project webpage (and will provide similar information). Its primary purpose will be to provide such information to those with limited internet access. However, it should also be made available on the project page as a downloadable summary sheet.
Stakeholder Options Workshop ---- **Stakeholders:** ▪ Steering Committee ▪ Additional Referral Agencies (as needed)	Inform & Collaborate	During the development and evaluation of management actions, it will be necessary to engage with Council and the range of relevant public authorities acting across the coastal zone and catchment. Most of these organisations are included in steering committee, but some other organisation may also be invited. The objectives of this engagement will be to: ▪ Develop the criteria for the evaluation of management actions ▪ Inform and collaborate with relevant public authorities, by providing an avenue for them to contribute to the identification and evaluation of management actions. ▪ Discuss the roles and responsibilities of the various public authorities in implementing the proposed management actions. ▪ Identify where proposed management actions may align or dovetail with the management plans and strategies of other public authorities (local, regional, or state).
Ballina Shire Council Internal	Inform & Collaborate	During Stage 3, it will be necessary to brief councillors and liaise with managers of relevant sections of the council, such as land use planning, asset management, community development,

Engagement Activity	Engagement Level	Content and Objectives
Options Workshop ---- **Stakeholders:** ▪ CHCC		communications and natural resource management. Objectives of this engagement will be to: ▪ Raise awareness in Council regarding the CMP, and help foster buy-in across relevant Council departments. ▪ Inform and consult within Council regarding the proposed management actions, including communication of responsibilities, timing and funding mechanisms. ▪ Identify and manage any potential conflicts or opportunities between coastal management actions and other actions to which council managers may be committed. ▪ Raise awareness and drive decisions about how CMP funding will be integrated with Council's IP&R framework.
Community Workshop(s) ---- **Stakeholders:** ▪ Local Community and User Groups	Inform & Collaborate	During Stage 3, it is recommended that in-person community workshop/s be held in order to provide information about the proposed management actions and seek community feedback. Based on the extent of risk identified in Stage 2, this may comprise either one workshop, or a number of workshops split by coastline and estuary spatial segments (e.g. a workshop in Ballina, another in Lennox Head). Objectives of this engagement will be to: ▪ Discuss the relative importance of management objectives. ▪ Provide a description of the potential management actions, and how they will address the risks and opportunities in the study area. ▪ Discuss the costs and benefits of the proposed management actions. ▪ Communicate the funding mechanisms and responsibilities for the proposed management actions. ▪ Solicit in-person feedback regarding community opinions and preferences for management actions. The community workshop(s) should include allowance for informal drop-ins either side of the allotted time.
Community Survey ---- **Stakeholders:** ▪ Local Community and User Groups	Inform & Involve	In parallel with the in-person community workshops, an online survey should be produced to seek further feedback on the management options. The survey can also be used to provide additional educational material. An online survey link will be posted to the website and Council's social media accounts. Hard copies can be made available at Council's offices.
Focus groups / interviews ---- **Stakeholders:** ▪ As needed	Inform & Collaborate	Some stakeholder groups may not respond well to workshops and surveys. Council can identify such groups at the commencement of the stage, using the stakeholder analysis in Section 2; they can then be consulted in a more focussed, one-on-one approach in order to ensure their needs are met and views heard. The Jali LALC and any other indigenous groups should be consulted regarding their views on potential management options. Furthermore, if the Stage 2 Risk Assessment identifies specific at-risk assets that require costly or substantial management actions then

Engagement Activity	Engagement Level	Content and Objectives
		smaller scale focus-groups / meetings may also be required on an as-needed basis.

4.4 Stage 4

Stage 4 involves the preparation, exhibition and submission of a draft CMP to the Minister for certification. As per the NSW Coastal Management Manual, Section 16 of the CM Act requires that before adopting a draft CMP, a council must consult with the community. It also requires the council to consult with other public authorities regarding the draft CMP (as per OEH, 2018):

- Proposes actions or activities to be carried out by that public authority;
- Proposes specific emergency actions or activities to be carried out by a public authority;
- Relates to, affects or impacts on any land or assets owned or managed by that public authority.

To achieve the engagement objectives of this stage, the activities listed in Table 4-3 are proposed.

A key component of Stage 4 will involve the public exhibition of the draft CMP. The exhibition process is an opportunity for the community and stakeholders to provide feedback on the proposed management of the coastal zone. It is a mandatory requirement that a draft CMP be exhibited for public inspection at the main offices of Council (during ordinary office hours) for a period of not less than 28 calendar days (OEH, 2018).

The nature and extent of the public exhibition activities will depend on the extent and complexity of the management actions outlined in the CMP. Where the CMP involves complex, high impact or high-cost management proposals, it may be preferable to include face-to-face consultation, such as information sessions and community conversations. Garnering this level of community involvement can improve the confidence in decision-making (OEH, 2018).

TABLE 4-3 PROPOSED ENGAGEMENT ACTIVITIES: STAGE 4

Engagement Activity	Engagement Level	Description
Council webpage ---- **Stakeholders:** ▪ All	Inform	The Council webpage for the project should be updated with the following information: ▪ Update with outcomes from Stage 3. ▪ Provide information about Stage 4. ▪ Provision of Draft CMP Document.
First Draft CMP Review ---- **Stakeholders:** ▪ DPE (E&H)	Inform & Consult	Submit draft CMP to DPE (E&H) for its review prior to public exhibition
Public Exhibition of Second Draft CMP ---- **Stakeholders:** DPE (E&H)	Inform Consult Involve	It is a mandatory requirement that a draft CMP be exhibited for public inspection at the main offices of Council (during ordinary office hours) for a period of not less than 28 calendar days (OEH, 2018) Depending on the extent of management actions outlined in the CMP, the public exhibition activities associated with this Stage may include a series of drop-in information sessions and/or community workshops. These sessions may include a range of information materials, such as:

Engagement Activity	Engagement Level	Description
		▪ Information sheets (web based and hard copy) ▪ Technical reports and other documents that support the CMP. ▪ Maps of the coastal management areas. ▪ Information on how prior engagement has influenced decision-making to date. ▪ Information about how feedback will be used in finalising the CMP. Public exhibition should also include making the draft report available online at the Council webpage. Community responses and comments on the draft CMP can also be submitted on this page.
Present CMP to Council for Endorsement ---- **Stakeholders:** ▪ CHCC	Inform & Consult	After the exhibition period, Council may find it helpful to collate and review all responses and prepare a submissions report that documents issues raised during the exhibition period (OEH, 2018). The project team should then present an updated CMP post public exhibition to Council and DPE (E&H) for their endorsement.
Final CMP Review ---- **Stakeholders:** ▪ DPE (E&H)	Inform & Consult	Submit final draft CMP to DPE (E&H) for its review
Public Authority	Inform & Consult	Public authorities to confirm support for the final draft CMP
Submission of Final CMP to Minister	Inform & Consult	Council adopts the finalised draft; submits to Minister
Council Gazettes the CMP	Inform	▪ After the CMP has been certified by the Minister, a local council must publish it in the Gazette. ▪ Section 19 of the CM Act requires that a copy of a CMP must be available for inspection by the public without charge at the office of the local council. A copy of the CMP must be available for public inspection on the council's website within seven days of publication in the Gazette (OEH, 2018). ▪ Council should notify the community that the CMP is certified, adopted and gazetted. This should be undertaken through media releases and social media.

4.5 Stage 5

This stage is largely dependent on the outcomes of the CMP. Targeted engagement as management actions roll-out will be defined in line with these actions. As a minimum, the following activities are recommended:

- Informing all stakeholders via email of next steps, and what to expect;
- Keep Council's website up to date with implementation of management actions;
- Encourage the community to be involved in implementing actions such as beach monitoring, dune revegetation and other 'citizen science' programs;

- Consider the use of ‘report cards’ as updates on the status of coastal management across the LGA; and
- Continue to engage with public authorities and adjoining councils.

Part of the CMP will include a plan for monitoring and reviewing the program. At this time, the engagement for Stage 5 should be drafted in more detail.

5 LOGISTICS

5.1 Communications and advertising

The various engagement activities can be advertised to the community and stakeholders through a number of different channels, including:

- *Community Connect* – Council's e-newsletter
- Media releases
- Social media (including Council's channels on Facebook, Instagram and Twitter).
- Advertisements in local media such as the *Ballina Shire Advocate*

Council's communications team will need to set up a Communications Plan related to this Strategy.

5.2 Venues

Venues to display information and hold meetings across the LGA will be decided in liaison with Council.

6 MONITORING & EVALUATION

Monitoring and evaluating the CMP is part of Stage 5 and is described in Section 4.5. This section relates to monitoring and evaluating the engagement activities during the development of the CMP.

Following initial engagement, each subsequent engagement activity will clearly include how previous engagement has been applied. This builds community trust, as stakeholders can see they have been listened to and views were recorded. In addition, transparency of the CMP process will aid community acceptance.

Upon completion of each stage of the CMP, the Engagement Strategy should be revised to ensure it meets requirements.

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WATER TECHNOLOGY
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APPENDIX B
OVERVIEW OF EXISTING INFORMATION

TABLE B-1 EXISTING STUDIES AND PLANS

Ref#	Document	Date	Author
Coastal & Estuary Management Plans & Studies			
1.01	Coastal Management Program Scoping Study for North Creek	2019	Alluvium.
1.02	Lennox Head Seawall Upgrade Study	2016	BMT WBM.
1.03	Coastal Zone Management Plan for the Ballina Shire Council	2016	GeoLINK and BMT WBM.
1.04	Coastal Zone Management Plan for the Ballina Shire Coastline	2016	GeoLINK.
1.05	North Creek Dredging Scoping Study	2016	Hydrosphere Consulting.
1.06	Coastal Zone Management Plan for Shaws Bay, Ballina	2015	Hydrosphere Consulting.
1.07	Ballina Floodplain Risk Management Study	2012	BMT WBM.
1.08	Updated Coastal Hazard Areas for Ballina Shire: Stage 1 – Preliminary Update	2011	BMT WBM.
1.09	Coastal Zone Management Plan for the Richmond River Estuary	2011	Hydrosphere Consulting.
1.1	Ballina Coastline Management Study Stage Two – Management Options Assessment	2008	GeoLINK.
1.11	Review of the Richmond River Estuary Process Study Report for Richmond River County Council	2007	ABER.
1.12	Ballina Coastline Management Study Stage 1 Values Assessment	2007	GeoLINK.
1.13	Ballina Shire Coastline Hazard Definition Study	2003	WBM Oceanics.
Floodplain Management Plans & Studies			
1.14	Ballina Floodplain Risk Management Plan	2015	BMT WBM.
1.15	Ballina Floodplain Risk Management Study	2012	BMT WBM.
1.16	Ballina Flood Study Update	2008	BMT WBM.
Relevant Technical Studies and Data			
2.01	Climate change rapidly warms and acidifies Australian estuaries	2020	Scanes et al
2.02	NSW Beach Profile Database	2020	WRL.
2.03	NSW Estuary Tidal Inundation Exposure Assessment	2018	OEH.
2.04	Changes in the Global Value of Ecosystem Services	2014	Costanza et al
2.05	OEH NSW Tidal Plane Analysis 1990-2010	2012	OEH.
2.06	Examining the potential impacts of sea level rise on coastal wetlands in north-eastern NSW, Australia	2011	Akuma et al
2.07	Long Term Trends in NSW Coastal Wave Climate and Derivation of Extreme Design Storms	2011	Shand et al
2.08	Review of water quality data from the Richmond River Estuary	2008	ABER.
2.09	Holocene sea-level change on the southeast coast of Australia: a review	2007	Sloss et al
2.1	Lower Richmond River Recreational Boating Study	2005	GHD.

2.11	Movement and juvenile recruitment of mangrove jack, *Lutjanus argentimaculatus*	2005	Russell B, D. J.
2.12	Structure and Function of South-east Australian Estuaries	2001	Roy et al
2.13	Tweed Coastline Hazard Definition Study	2001	WBM Oceanics.
2.14	Byron Shire Coastline Hazard Definition Study	2000	WBM Oceanics.
2.15	Extreme Wave Conditions in South East Queensland Coastal Region	1999	Allen et al
2.16	Byron Bay - Hastings Point Erosion Study	1978	Public Works Department.
2.17	Coastal Geology of the Cudgen Area, North Coast of New South Wales	1975	Roy, P.
Local Level Plans, Strategies and Policies			
3.01	4WDs on Beaches	2022	BSC
3.02	Exercising your dog	2022	BSC
3.03	Community Consultation Policy	2017	BSC
3.04	Our Community Our Future, Community Strategic Plan 2017-2027	2017	BSC
3.05	Skennars Head Village Expansion Area: Ballina Shire Development Control Plan 2012	2016	BSC
3.06	Destination Management Plan for the Ballina Coast & Hinterland 2014 - 2020	2014	BSC
3.07	Ballina Shire Council State of the Environment Report 2009-2010	2010	BSC
3.08	Richmond River Nature Reserve Plan of Management	2005	NPWS.
3.09	Ballina Coastal Reserve Plan of Management	2003	BSC
3.10	Ballina Nature Reserve Plan of Management	2003	NPWS.
Regional Level Plans and Strategies			
4.01	Mid Coast Bush Fire Risk Management Plan	2019	MC BRMC
4.02	North Coast Regional Strategic Pest Animal Management Plan 2018 - 2023	2018	LLS North Coast
4.03	North Coast Regional Plan 2036	2017	Determent of Planning & Environment
4.04	Local Land Services North Coast Local Strategic Plan 2016-2021	2016	LLS North Coast
4.05	North Coast Integrated Regional Vulnerability Assessment and Enabling Regional Adaptation	2016	NSW OEH
4.06	Mid-North Coast Regional Boating Plan 2015	2015	TfNSW
4.07	Northern Rivers Catchment Action Plan 2013-2023	2013	Northern Rivers CMA
State Level Plans, Strategies and Policies			
5.01	NSW Coastal Dredging Strategy	2019	MIDO
5.02	NSW Marine Estate Threat and Risk Assessment (TARA)	2019	BMT WBM
5.03	NSW Maritime Infrastructure Plan 2019-2024	2019	NSW Government
5.04	Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions	2019	NSW OEH and the EPA

5.05	NSW Marine Estate Management Strategy 2018-2028	2018	Marine Estate Management Authority
5.06	NSW Climate Change Policy Framework	2016	NSW OEH
5.07	NSW Coastal Management Manual	2018	NSW OEH
5.08	Crown land 2031 – State Strategic Plan for Crown lands	2021	Crown Lands.

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APPENDIX C
CZMP AND EMP AUDIT OF IMPLEMENTATION

Ballina Shire Coastline Coastal Zone Management Plan (2016)						
Code	***Beach units***	***Recommended Coastal Zone Management Actions – Monitoring***	***Responsibility (in bold) and supporting agency***	***Performance measure***	***Status***	***Comments***
M1	LHN LHS	Conduct aerial orthophoto pass and photogrammetric analysis. (Note: next aerial orthophoto passes currently expected in 2016 and 2019.)	**BSC** OEH (support)	Analysis complete	**In progress / Incomplete**	Lidar dataset (undertaken 2016 & 2017) obtained from UNSW project. Not analysed.
M2	SMB BB BPB	Conduct aerial orthophoto pass and photogrammetric analysis.	**BSC** OEH (support)	Analysis complete	**In progress / Incomplete**	Lidar dataset (undertaken 2016 & 2017) obtained from UNSW project. Not analysed. (Ballina beaches only)
M3	SBB	Conduct aerial orthophoto pass and photogrammetric analysis.	**BSC** OEH (support)	Analysis complete	**In progress / Incomplete**	Lidar dataset (undertaken 2016 & 2017) obtained from UNSW project. Not analysed.
M4	LHN	Conduct land-based surveys at locations 5, 6 and 7 (refer Illustration 3.3)	**BSC**	Surveys complete	**Not Commenced / Outstanding**	
M5	All	Review historical data set of land-based and bathymetric surveys and determine value of developing on-going survey program to build on existing data. Based on results of existing data review develop survey program and modify **Management Actions M6** and **M7** accordingly.	**BSC**	Survey monitoring program developed	**Not Commenced / Outstanding**	
M6	LHN LHS	Conduct land-based surveys	**BSC** OEH (support)	Surveys conducted and recorded	**Not Commenced / Outstanding**	
M7	LHN LHS	Conduct bathymetric surveys	**BSC** OEH (support)	Surveys conducted and recorded	**Not Commenced / Outstanding**	
M8	LHN	Conduct low cost beach monitoring at SLSC (refer Appendix C)	**BSC** OEH (support)	Data provided	**Not Commenced / Outstanding**	
M9	All	Conduct visual inspection and compile photographic record (from set locations) of beaches, seawalls (LHN and LHS), dunes, levees and boardwalk (LHS). Concentrate on critical areas such as Lennox Head, Boulder Beach and Flat Rock tombolo.	**BSC** OEH (support)	Data collated, documented and reviewed	**Not Commenced / Outstanding**	Ad-hoc inspections and observations with recurrent erosion and accretion occuring over recent times
M10	All	Analyse all monitoring data and prepare detailed report including a review of currency of existing hazard zones and the need, if any, to have hazards recalculated.	**BSC** OEH (support)	Report prepared	**Not Commenced / Outstanding**	
Code	***Beach units***	***Recommended Coastal Zone Management Action – On-going Works***	***Responsibility (in bold)***	***Performance measure***	***Status***	***Comments***
DM1	All	Continue program to manage foredunes in line with Precinct Plans including the following broad actions: ▪ Conduct regular inspections (coordinated with Emergency Action Subplan) to confirm condition of dunes. ▪ Install and maintain sand capture fencing to complement the natural capacity of foredune vegetation in holding sand that is blown onto dunes, thereby increasing the sediment store and erosion mitigation capacity of dunes. ▪ Locate sand capture fencing based on regular inspection of condition of foredune and shift seaward if sufficiently 'full' or relocate entirely if toe of fore-dune is considered to be adequately seaward; and ▪ Revegetate foredune where practicable to increase rates of natural sand capture and the consolidating influence of root systems. ▪ Inspections and works should be focused on critical areas such as; ○ Between Byron and Foster streets; ○ Adjacent to stormwater outlets at Lennox Head village; ○ Adjacent to beach access points; and ○ Around the base of the Flat Rock tombolo.	**BSC**	**Program continued**	**In progress / Incomplete**	Access to volunteer resources for coastal revegatation works has historically been available through government programs. This is no longer occuring.
		Continue program to manage beach access points in line with all Precinct Plans including the following broad actions:				

DM2	All	▪ Close informal beach access paths over dunes by fencing off, conducting revegetation and installing signage noting the revegetation site and directing people to the nearest formal beach access point. ▪ Monitor beach access points to ensure that any lowering of the foredune or damage to foredune vegetation associated with their installation and use does not occur to such an extent so as to exacerbate coastal hazard threat. ▪ Develop and implement a prioritised program of installing board-and-chain walkways and signage to identify and formalise appropriate beach access points throughout all beaches under Council management (i.e. north of the Richmond River). ▪ Following erosion events, remove sections of board-and-chain walkways that overhang scarps and/or conduct localised beach scraping to maintain suitable grades onto the main body of the beach. Reinstall necessary sections of walkways as the beach and foredune naturally accrete following the erosion event.	**BSC**	**Program continued**	**In progress / Incomplete**	
Action	***Beach units***	***Recommended Coastal Zone Management Action – Longer-Term Works***	***Responsibility (in bold)***	***Performance measure***	***Status***	***Comments***
Immediate (0-5 years)						
I1	LHS	Conduct coastal engineering investigation to determine condition and adequacy of the constructed levee to mitigate against hazards from design storm events and shoreline recession. Investigation to include survey of the levee to inform **Management Action I6,** for returning the levee to a minimum design crest elevation of RL 5.5 mAHD.	**BSC**	Investigation complete and determination made	**Completed**	Survey undertaken and application made under 2021 Coastal and Estuary Implementation Program for upgrade of existing constructed sand levee
I2	LHN	Conduct coastal engineering investigation to determine alignment, condition and adequacy of existing buried rock wall between Byron Street and the SLSC and Lake Ainsworth Sport and Recreation Centre. Investigation is to include survey of the dune to inform **Management Action ST1** to ensure the dune has a minimum crest elevation of RL 6.0 mAHD.	**BSC** OEH (support),	Investigation complete and determination made	**Completed**	Lennox Head Seawall Upgrade Study, Rev 1, Nov 2016. (BMT). Refer CM 17/21915
I3	BB	Conduct survey and investigations, prepare designs and obtain approval for protective works to prevent loss of walking track at the southern end of Boulder Beach.	**BSC**	Design complete Approval obtained	**Completed**	
I4	LHN LHS	Investigate potential to redesign stormwater outlets to minimise adverse effects on foredune, in particular those discharging near ▪ Ross Street ▪ Williams Street ▪ Lennox Street ▪ Foster Street ▪ Rutherford Street ▪ The southern end of the constructed levee at the southern end of Seven Mile Beach	**BSC**	Investigations complete	**In progress / Incomplete**	Studies and projects undertaken/in progress: 1) Tresise Place and Rutherford St stormwater augmentation (2020), 2) Lennox Head Village Vision - CBD upgrade (in progress), 3) Lennox Head stormwater modelling and design (in progress)
I5	LHN LHS	Seek to utilise dredge spoil from the Richmond River on an opportunistic basis to nourish and improve the amenity of Seven Mile Beach if required.	**BSC** OEH (support)		**Unknown**	Council offered co-contribution (2016) to State Govt for trial 'Bar to Beach' project, for Lennox Head beach nourishment
I6	LHS	Upgrade constructed levee on basis of investigation under **Management Action I1**. Upgrade to include importation and stabilisation of additional sand to ensure that the crest elevation of the constructed levee is returned to the design level of RL 5.5 mAHD along its full length and maintained at that level.	**BSC** OEH (support)	Levee core upgraded as necessary Crest elevation of levee is RL 5.5 mAHD	**Not Commenced / Outstanding**	Survey undertaken and application made under 2021 Coastal and Estuary Implementation Program for upgrade of existing constructed sand levee
I7	BB	Install rock revetment, earth backfill and track works to prevent loss of walking track at southern end of Boulder Beach.	**BSC**	Works in place	**Completed**	
I8	LHN LHS	Redesign and install new stormwater drains if investigation determines redesign is feasible. (Note: can be carried over to following years if investigation results in multiple and/or expensive redesigns).	**BSC**	Works in place	**In progress / Incomplete**	Studies and projects undertaken/in progress: 1) Tresise Place and Rutherford St stormwater augmentation (2020), 2) Lennox Head Village Vision - CBD upgrade (in progress), 3) Lennox Head stormwater modelling and design (in progress)

I9	All	Implement Precinct Plans.	**BSC**	As per management actions in Precinct Plans	**In progress / Incomplete**	
Short-term (5-10 years)						
Action	***Beach units***	***Recommended Coastal Zone Management Action – Longer-Term Works***	***Responsibility (in bold)***	***Performance measure***	***Status***	***Comments***
ST1	LHN	Following suitable beach erosion event, upgrade or reconstruct existing buried rock wall, or install a new seawall between Byron Street and the SLSC and Lake Ainsworth Sport and Recreation Centre on the basis of investigations under **Management Action I2**. Upgrade to include importation and stabilisation of additional sand to ensure that the crest elevation of the dune above the existing buried rock wall is at or above RL 6.0 mAHD.	**BSC** OEH (support)	Seawall upgraded as necessary Dune crest is RL 6.0 mAHD	**Not Commenced / Outstanding** **Not Commenced / Outstanding**	Detail design, approvals and securing funding sources not commenced following reporting under I2
ST2	LHN LHS	Seek to utilise dredge spoil from the Richmond River on an opportunistic basis to nourish and improve the amenity of Seven Mile Beach if required.	**BSC** OEH (support)		**Unknown**	Council offered co-contribution (2016) to State Govt for trial 'Bar to Beach' project, for Lennox Head beach nourishment
ST3	All	Implement Precinct Plans.	**BSC**	As per management actions in Precinct Plans	**In progress / Incomplete**	
Medium-term (10-25 years)						
MT1	LHN LHS	Conduct detailed investigations to ensure continuing adequacy of protective measures.	**BSC** OEH (support)	Investigations complete	**Not Commenced / Outstanding**	
MT2	LHN LHS	Implement maintenance measures of dunes, seawalls and levee as required on basis of monitoring program	**BSC** OEH (support)	Implemented as required	**Not Commenced / Outstanding**	
MT3	LHN LHS	Seek to utilise dredge spoil from the Richmond River on an opportunistic basis to nourish and improve the amenity of Seven Mile Beach if required.	**BSC** OEH (support)		**Not Commenced / Outstanding**	
MT4	LHS	Design and install boardwalk on existing seawall between Rayners Lane and Byron Street if public foreshore access is constrained too frequently.	**BSC**	Boardwalk installed	**Not Commenced / Outstanding**	
MT5	LHN LHS	Investigate and determine the feasibility of marine, estuarine and/or terrestrial sources of sand for larger scale beach nourishment in the future in order to provide for beach amenity under projected sea level rise induced long term recession impacts. Investigation to include concept design of beach nourishment works, statutory planning and policy requirements, planning, comparing costs, and social and environmental impacts at source and destination locations.	**BSC**	Identification of suitable source. Design of beach nourishment works.	**Not Commenced / Outstanding**	
MT6	LHN LHS	Conduct nourishment of beach as necessary (if feasible)	**BSC** OEH (support)	Nourishment conducted	**Not Commenced / Outstanding**	
Long-term (25+ years)						
LT1	LHN LHS	Conduct re-nourishment of beach as necessary (if feasible)	**BSC** OEH (support)	Re-nourishment conducted	**Not Commenced / Outstanding**	

The Shaws Bay Coastal Zone Management Plan (2015)				
Action	**Lead**	**Cost ($000)**	**Status**	**Comments**
Action 1: Control of East Arm bank erosion and creation of sandy beach	BSC	**200**	**Completed**	
Action 2: Dredging of Main Section of Shaws Bay*	BSC	**400**	**Completed**	
Action 3: Review and upgrade stormwater treatment controls	BSC	**25**	**Implemented and Ongoing**	
Action 4: Western foreshore improvements	BSC	**200**	**Completed**	
Action 5: Expansion of Pop Denison Park and improvement of access to the eastern foreshore	BSC	**350**	**Completed**	
Action 6: Development of Fenwick Drive foreshore area	BSC	**120**	**Completed**	
Action 7: Refurbishment of breakwall steps	Crown Lands	**150**	**Unknown**	Not a Council Action
Action 8: Modify conditions of mangrove maintenance permit	BSC	**-**	**Completed**	
Action 9: Weed management along northern side of the training wall	BSC	**22**	**Implemented and Ongoing**	
Action 10: Education program – public health	BSC	**3**	**Implemented and Ongoing**	
Action 11: Education program – estuarine vegetation	BSC	**-**	**Implemented and Ongoing**	
Action 12: Education program – recreational fishing	Fisheries NSW	**-**	**Unknown**	Not a Council Action
Action 13: Education program – biological irritants	BSC	**3**	**No Longer Applicable**	
Action 14: Foreshore signage	BSC	**5**	**Completed**	
Action 15: Beachwatch water quality monitoring (modified)	BSC	**10**	**Implemented and Ongoing**	
Action 16: Monitoring, Evaluation and Reporting Program	BSC	**18**	**Implemented and Ongoing**	
Action 17: Hydrographic survey	BSC	**10**	**Implemented and Ongoing**	
Action 18: Development of strategy to address inundation risk	BSC	**-**	**Not Commenced / Outstanding**	
Action 19: Review of CZMP progress and monitoring of KPIs	BSC	**-**	**Implemented and Ongoing**	
Action 20: 10 year review of CZMP	BSC	**50**	**In progress / Incomplete**	

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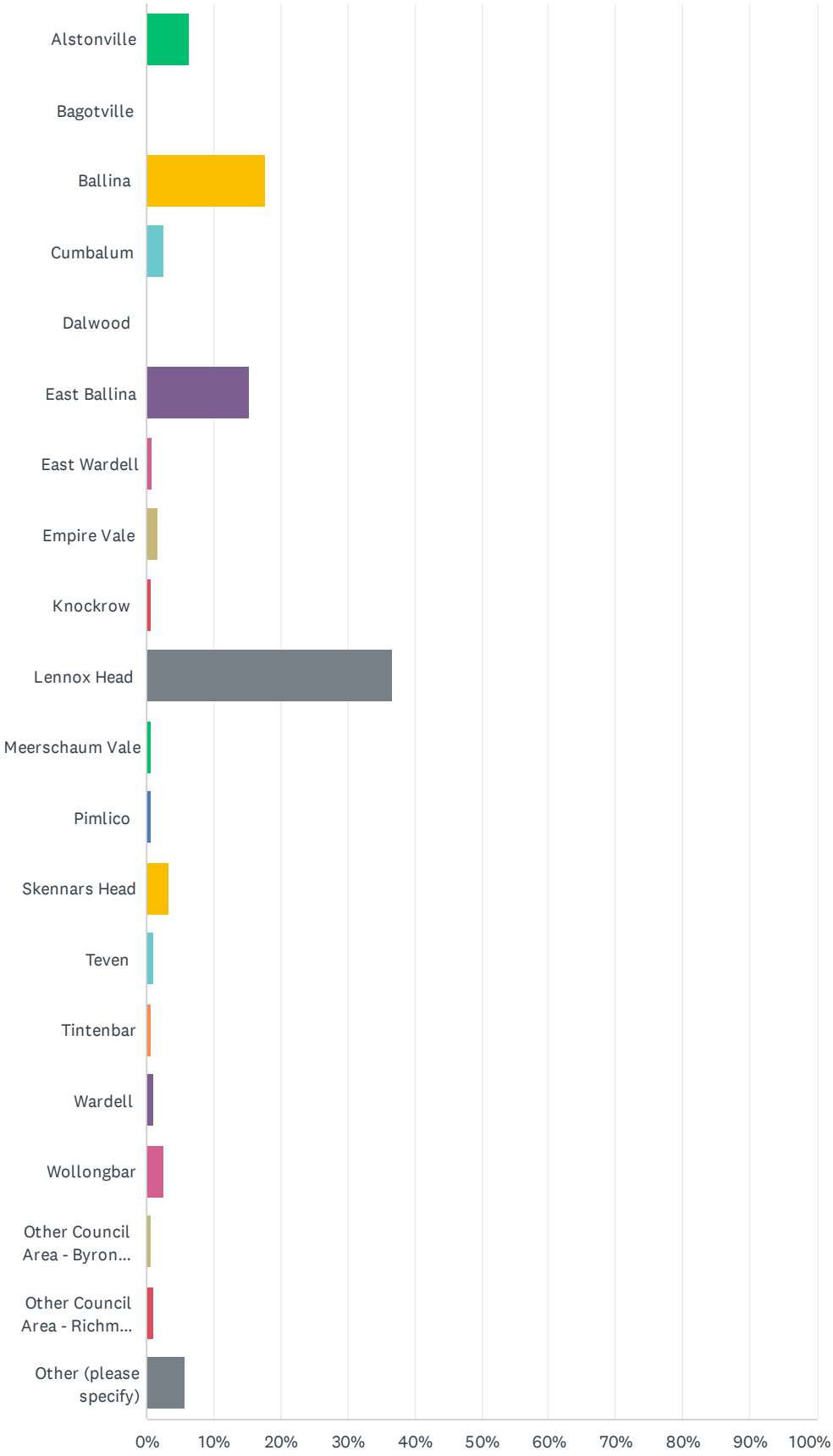
APPENDIX D
COMMUNITY ENGAGEMENT SUMMARY

Q1 What suburb do you live in?

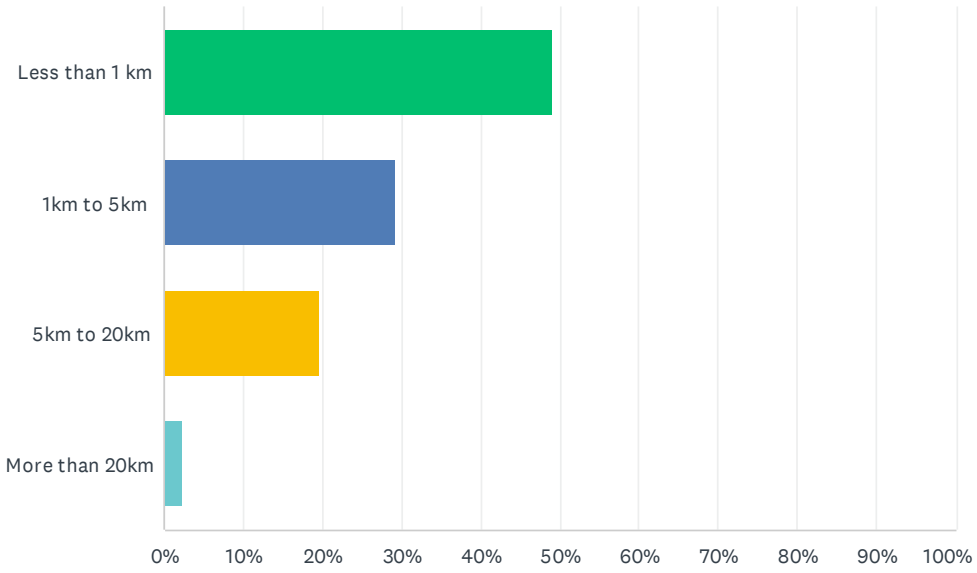
Answered: 346 Skipped: 2



ANSWER CHOICES	RESPONSES	
Alstonville	6.36%	22
Bagotville	0.29%	1
Ballina	17.63%	61
Cumbalum	2.60%	9
Dalwood	0.29%	1
East Ballina	15.32%	53
East Wardell	0.87%	3
Empire Vale	1.73%	6
Knockrow	0.58%	2
Lennox Head	36.71%	127
Meerschaum Vale	0.58%	2
Pimlico	0.58%	2
Skennars Head	3.47%	12
Teven	1.16%	4
Tintenbar	0.58%	2
Wardell	1.16%	4
Wollongbar	2.60%	9
Other Council Area - Byron Shire	0.58%	2
Other Council Area - Richmond Valley	1.16%	4
Other (please specify)	5.78%	20
TOTAL		346

Q2 How far from the coast do you live?

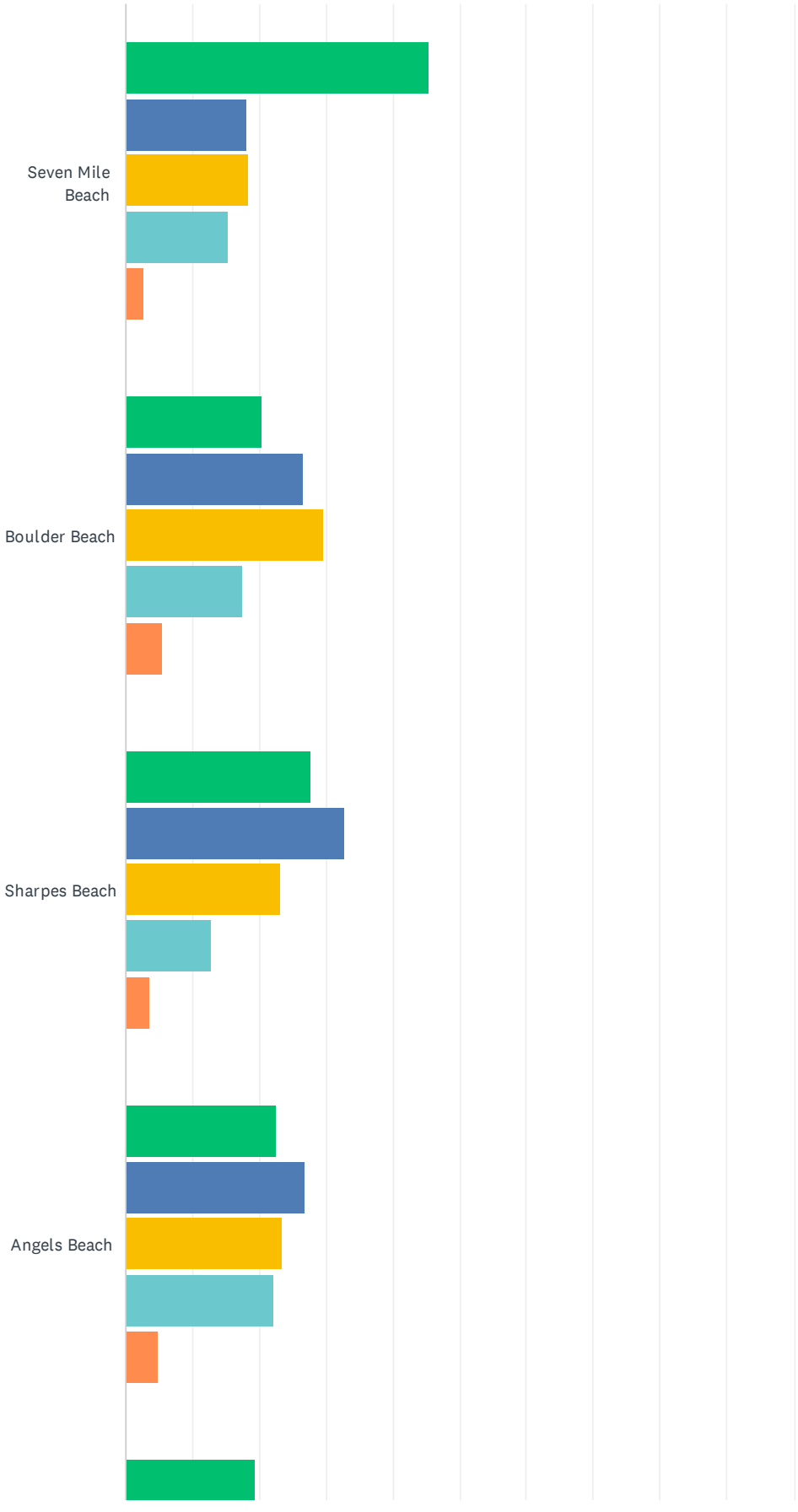
Answered: 347 Skipped: 1

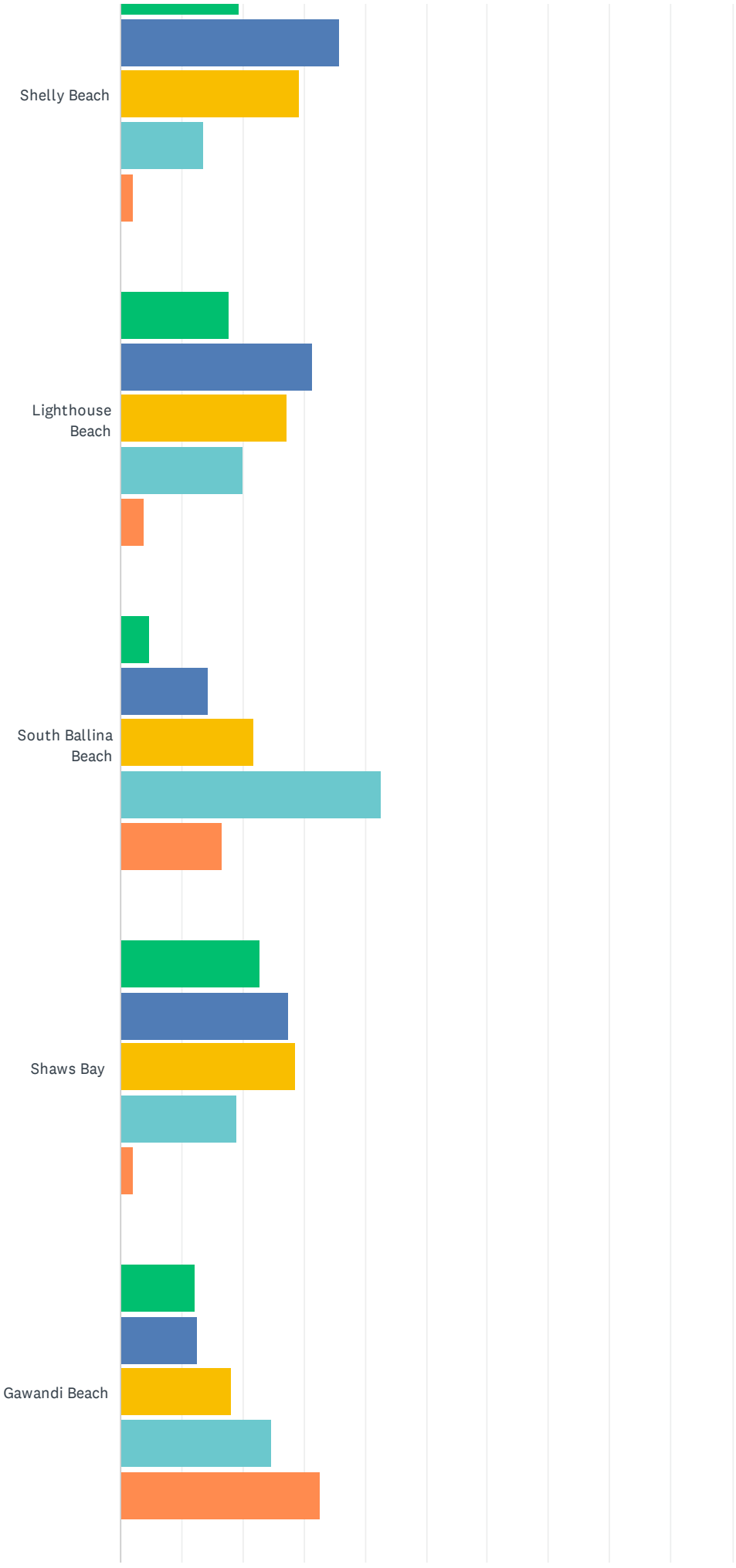


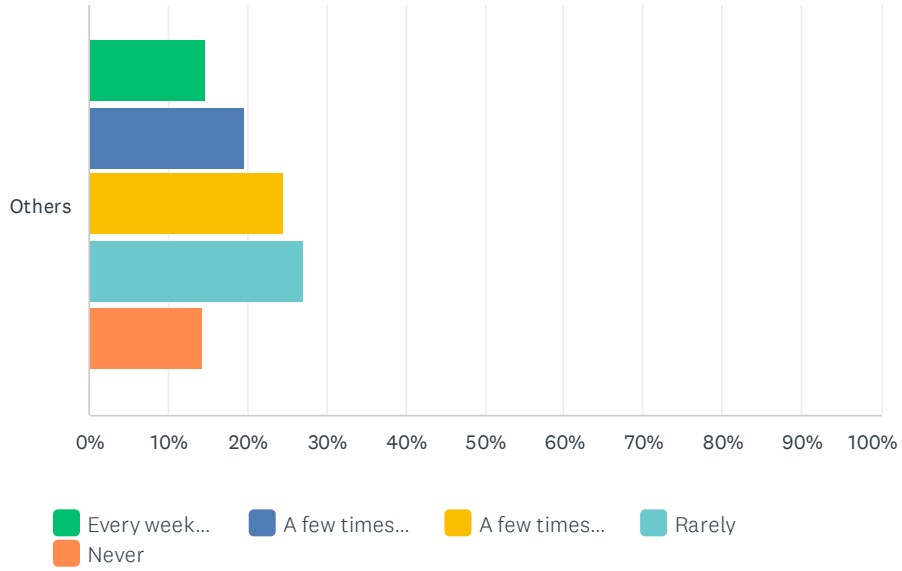
ANSWER CHOICES	RESPONSES	
Less than 1 km	48.99%	170
1km to 5km	29.11%	101
5km to 20km	19.60%	68
More than 20km	2.31%	8
TOTAL		347

Q3 How often do you visit these beaches / foreshores? Please select one answer for each beach.

Answered: 348 Skipped: 0



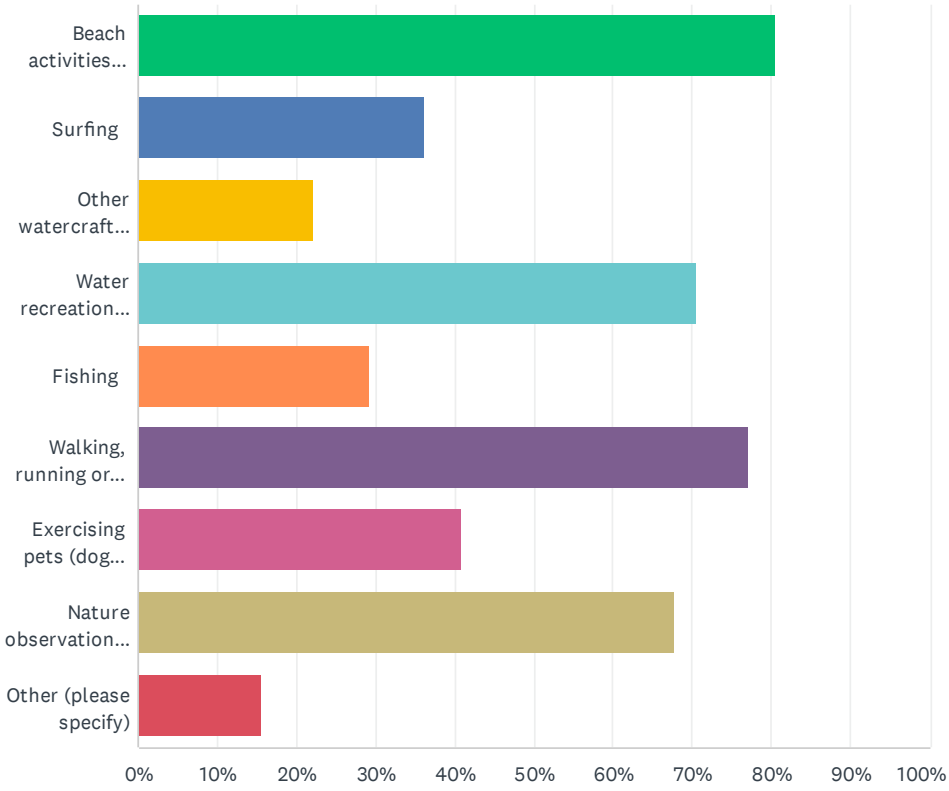

Shelly Beach
Lighthouse Beach
South Ballina Beach
Shaws Bay
Gawandi Beach



	EVERY WEEK, OR EVEN DAILY	A FEW TIMES A MONTH	A FEW TIMES A YEAR	RARELY	NEVER	TOTAL
Seven Mile Beach	45.48% 146	18.07% 58	18.38% 59	15.26% 49	2.80% 9	321
Boulder Beach	20.52% 63	26.71% 82	29.64% 91	17.59% 54	5.54% 17	307
Sharpes Beach	27.65% 86	32.80% 102	23.15% 72	12.86% 40	3.54% 11	311
Angels Beach	22.55% 69	26.80% 82	23.53% 72	22.22% 68	4.90% 15	306
Shelly Beach	19.30% 61	35.76% 113	29.11% 92	13.61% 43	2.22% 7	316
Lighthouse Beach	17.72% 56	31.33% 99	27.22% 86	19.94% 63	3.80% 12	316
South Ballina Beach	4.64% 14	14.24% 43	21.85% 66	42.72% 129	16.56% 50	302
Shaws Bay	22.74% 73	27.41% 88	28.66% 92	19.00% 61	2.18% 7	321
Gawandi Beach	12.15% 35	12.50% 36	18.06% 52	24.65% 71	32.64% 94	288
Others	14.67% 33	19.56% 44	24.44% 55	27.11% 61	14.22% 32	225

Q4 When you visit these beaches, which of the following activities do you engage in? Please choose as many as applicable.

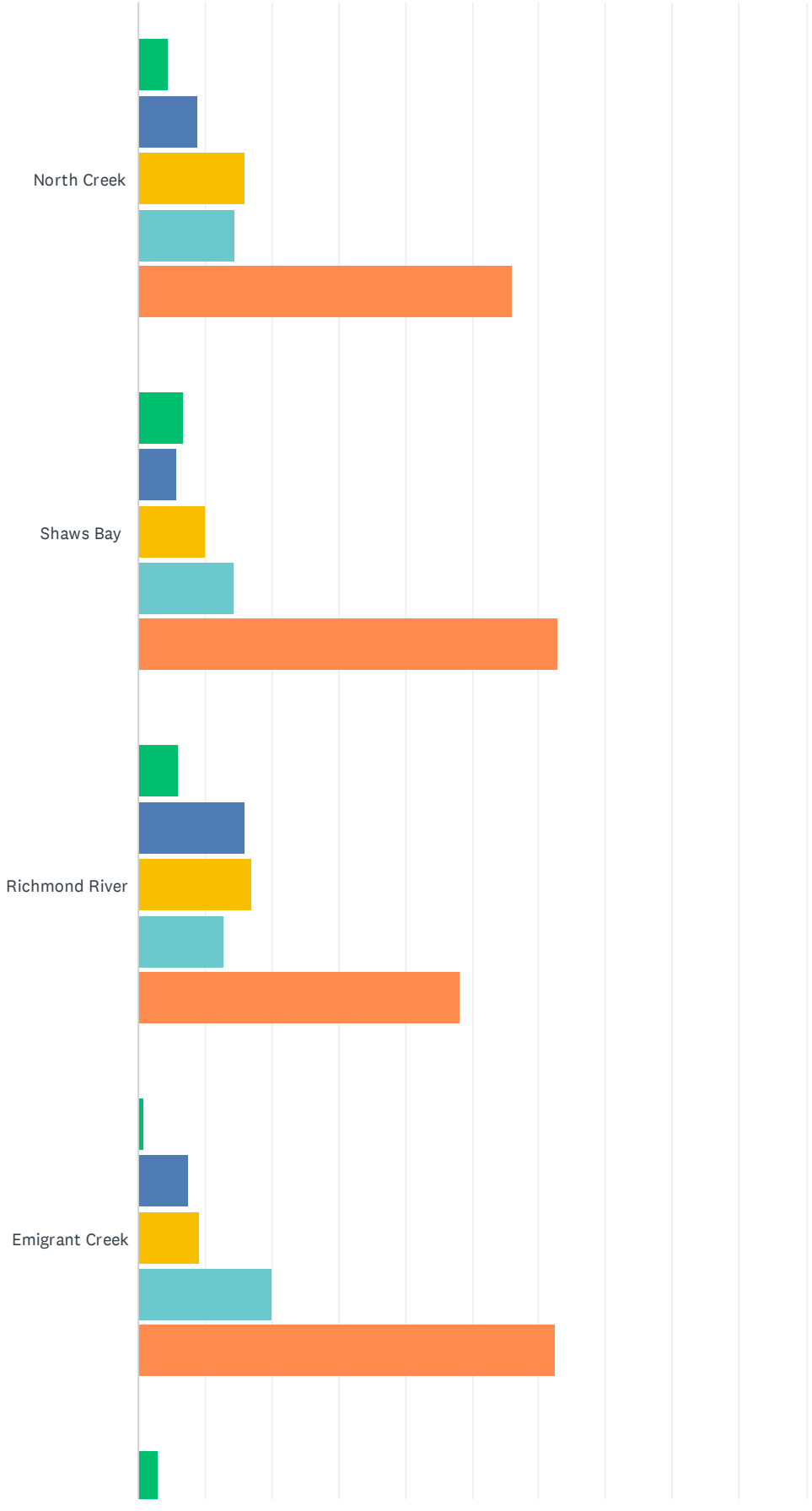
Answered: 347 Skipped: 1

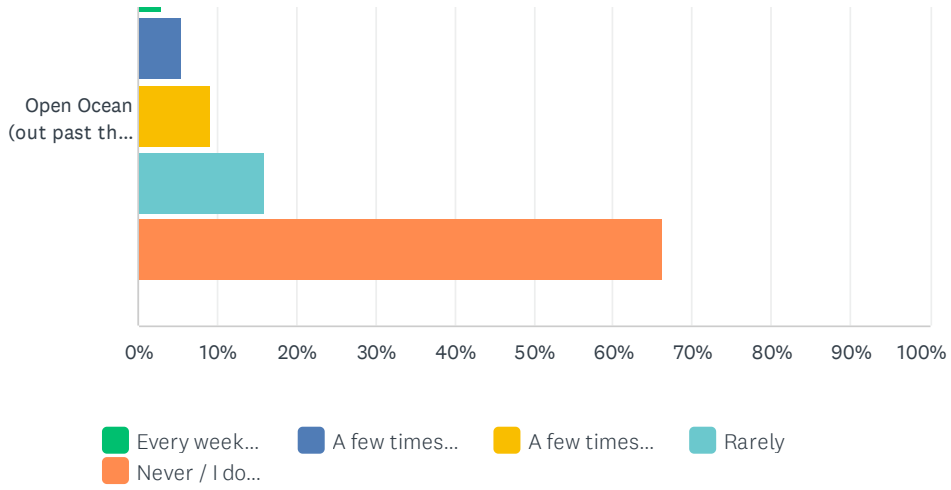


ANSWER CHOICES	RESPONSES	
Beach activities (running, sitting, relaxing on the sand etc)	80.69%	280
Surfing	36.31%	126
Other watercraft activities (kayaking, paddle boarding etc)	22.19%	77
Water recreation (swimming, snorkelling etc)	70.61%	245
Fishing	29.11%	101
Walking, running or other exercise	77.23%	268
Exercising pets (dog walking etc)	40.92%	142
Nature observation (enjoying the scenery)	67.72%	235
Other (please specify)	15.56%	54
Total Respondents: 347		

Q5 How often do you use the following waterways for boating (for recreation or otherwise)? Please select one answer for each waterway.

Answered: 347 Skipped: 1

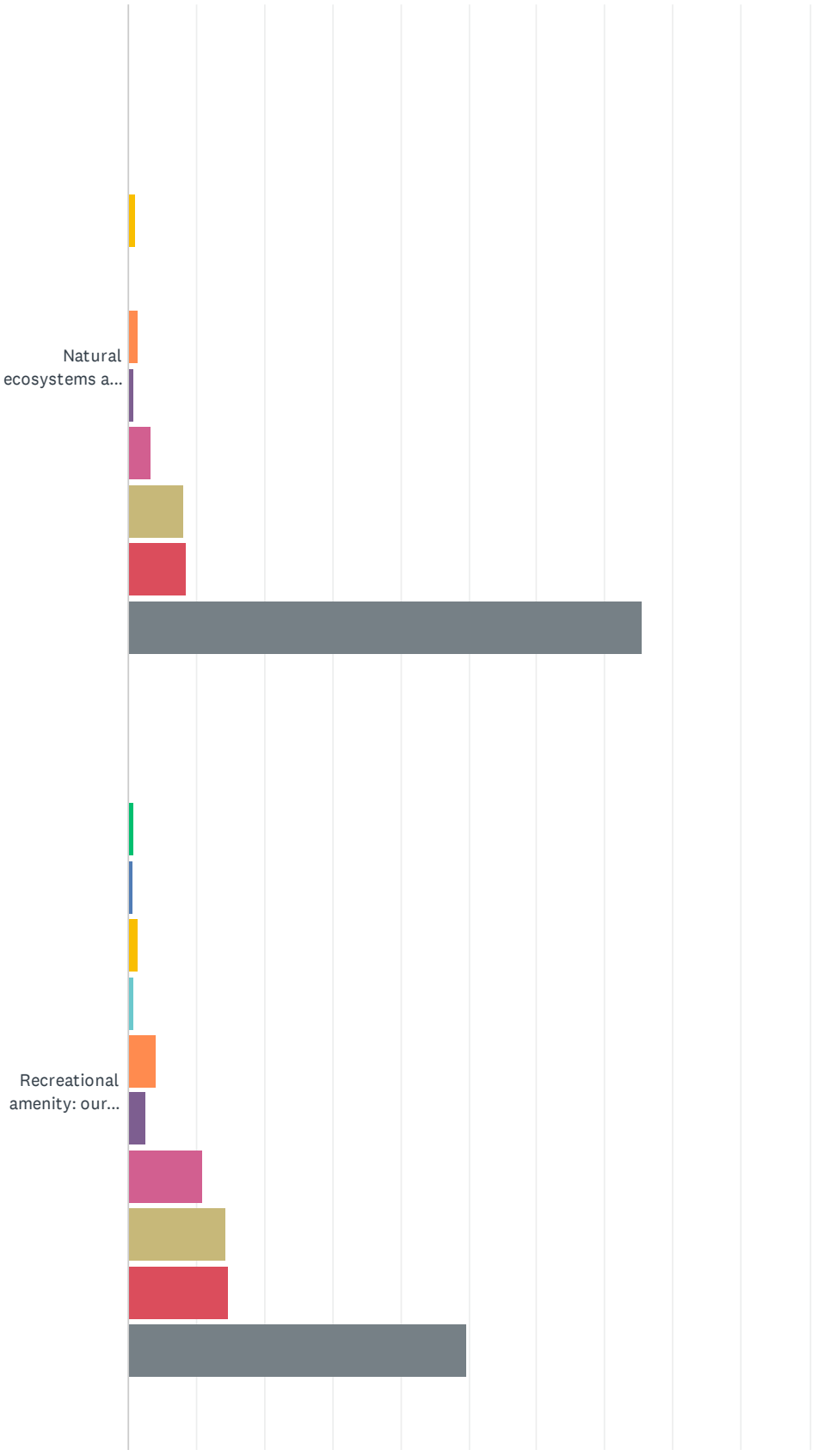


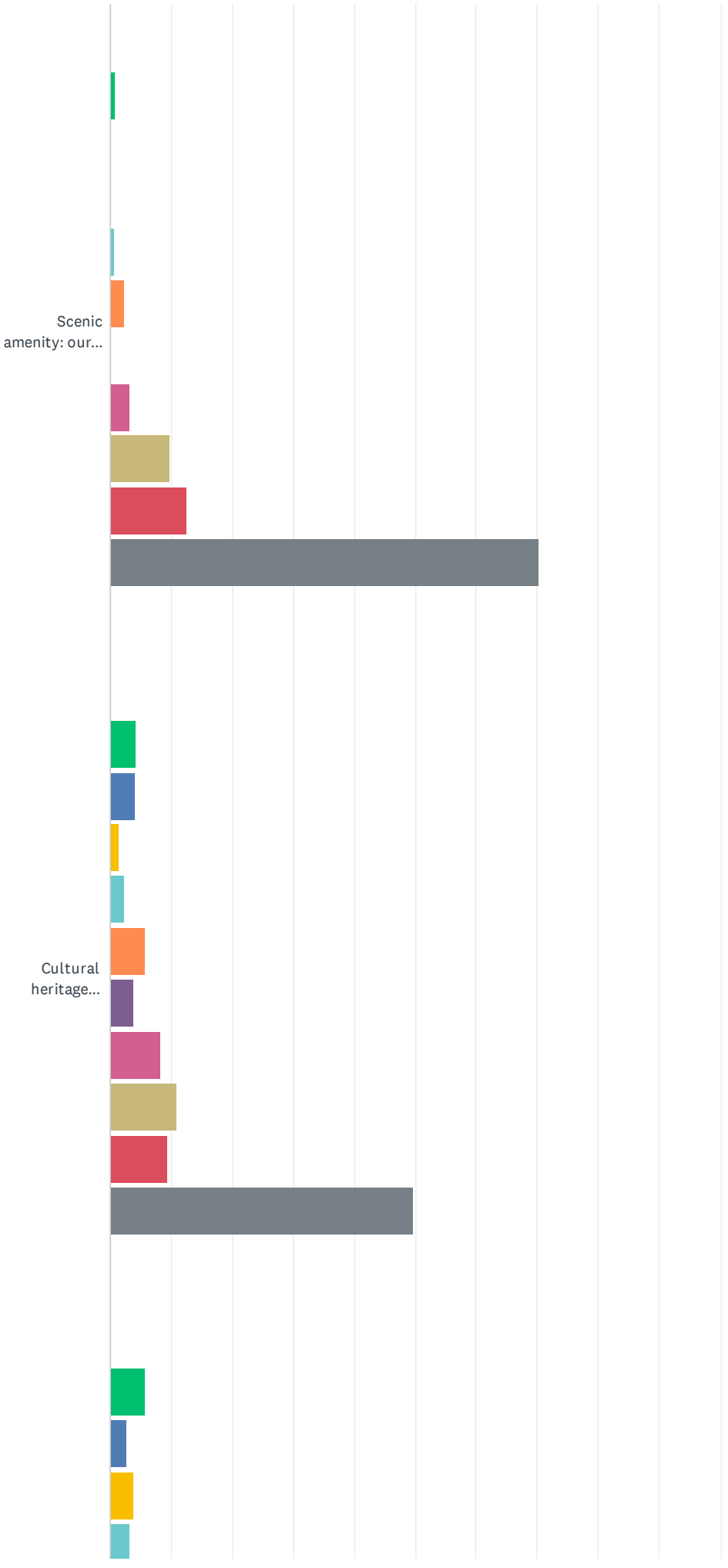


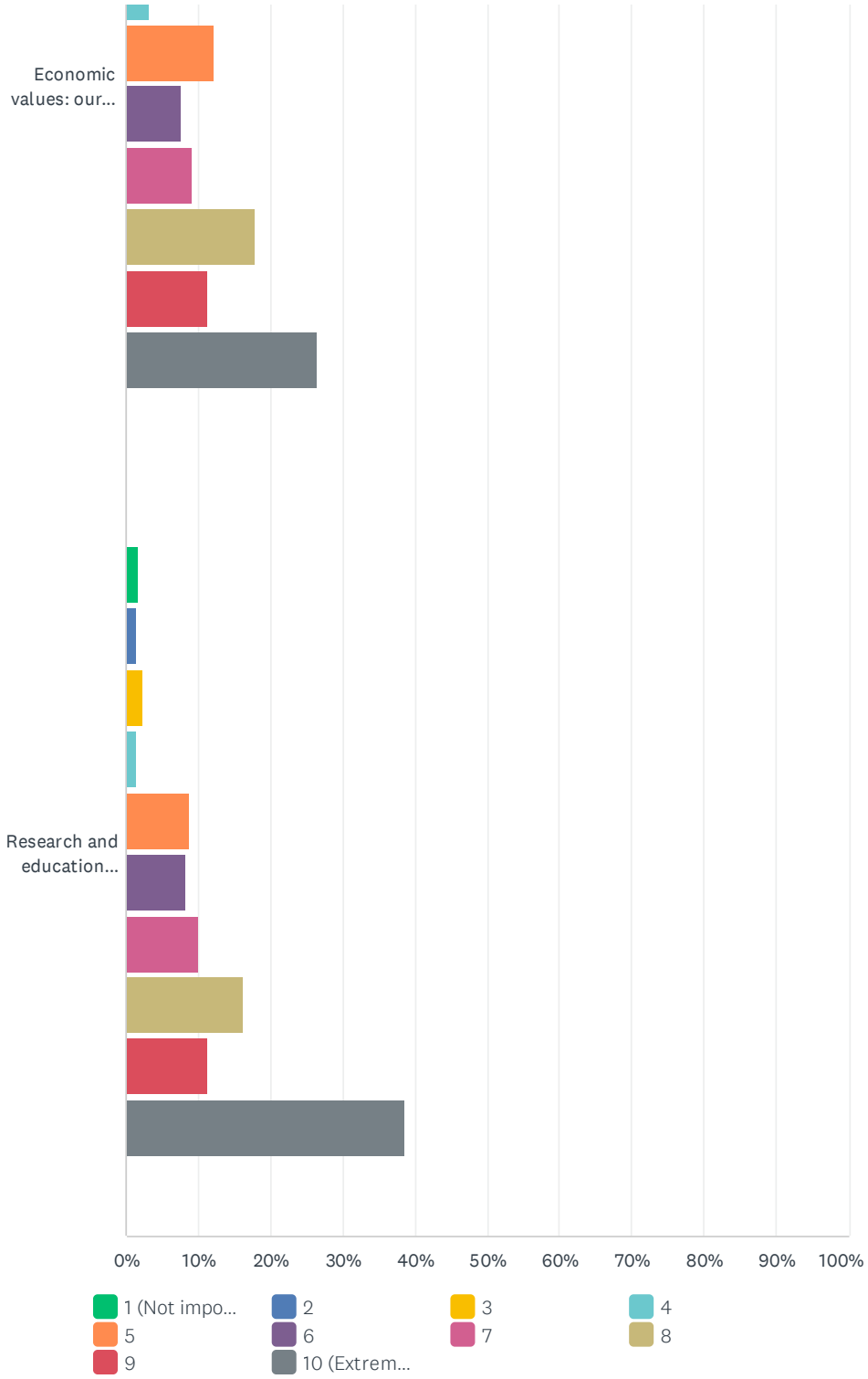
	EVERY WEEK, OR EVEN DAILY	A FEW TIMES A MONTH	A FEW TIMES A YEAR	RARELY	NEVER / I DON'T USE THEM FOR BOATING	TOTAL
North Creek	4.52% 15	9.04% 30	15.96% 53	14.46% 48	56.02% 186	332
Shaws Bay	6.73% 22	5.81% 19	10.09% 33	14.37% 47	63.00% 206	327
Richmond River	5.92% 20	15.98% 54	17.16% 58	12.72% 43	48.22% 163	338
Emigrant Creek	0.92% 3	7.36% 24	9.20% 30	19.94% 65	62.58% 204	326
Open Ocean (out past the break walls and entrance bar)	3.06% 10	5.50% 18	9.17% 30	15.90% 52	66.36% 217	327

Q6 When you think about the coastal zone (that is: the coastline, beaches and coastal waterways of the area) - how important are the following values to you? Please select a number from 1 (Not important at all) to 10 (Extremely important).

Answered: 348 Skipped: 0




Scenic amenity: our...
Cultural heritage...


Economic values: our...
Research and education...
0%
10%
20%
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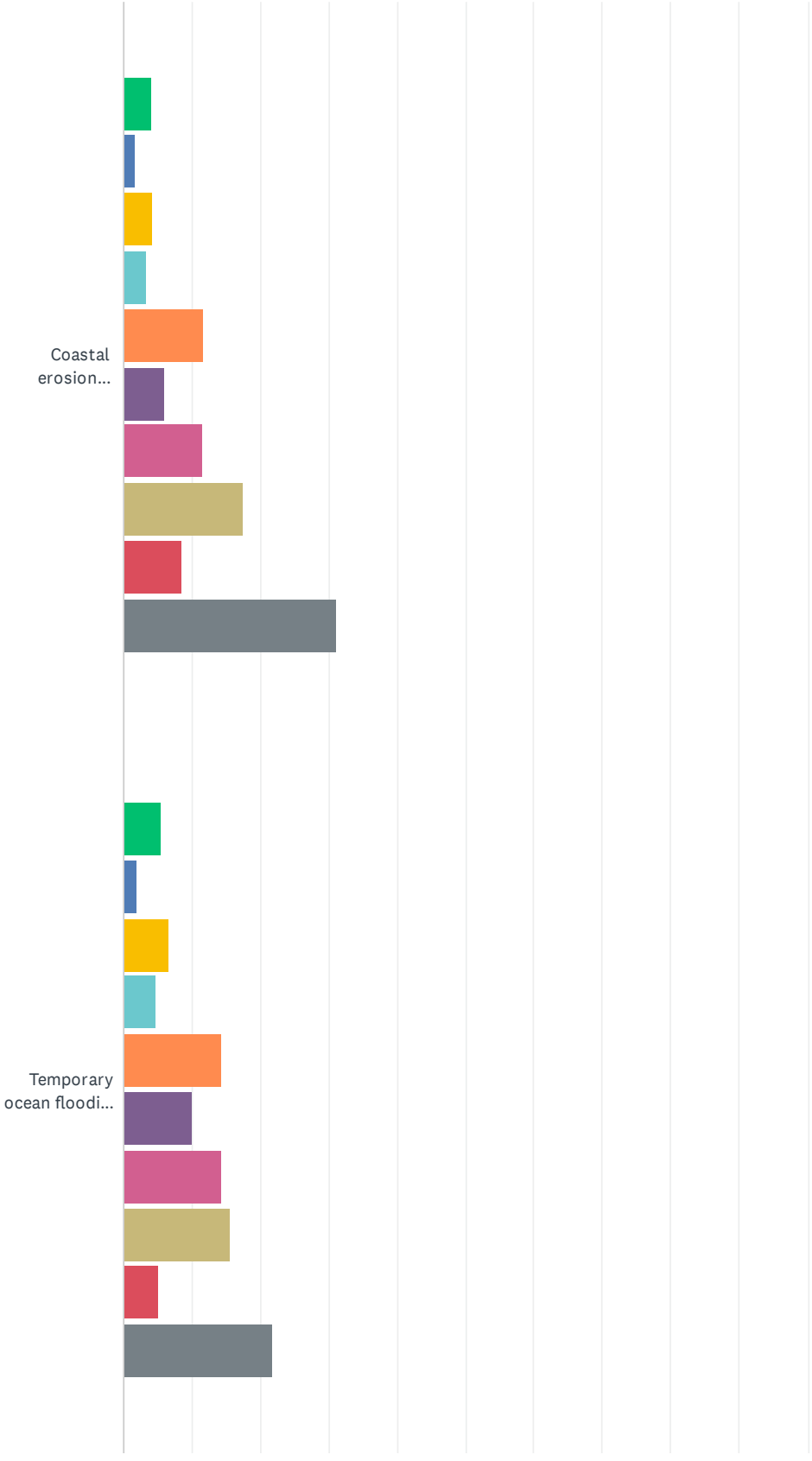
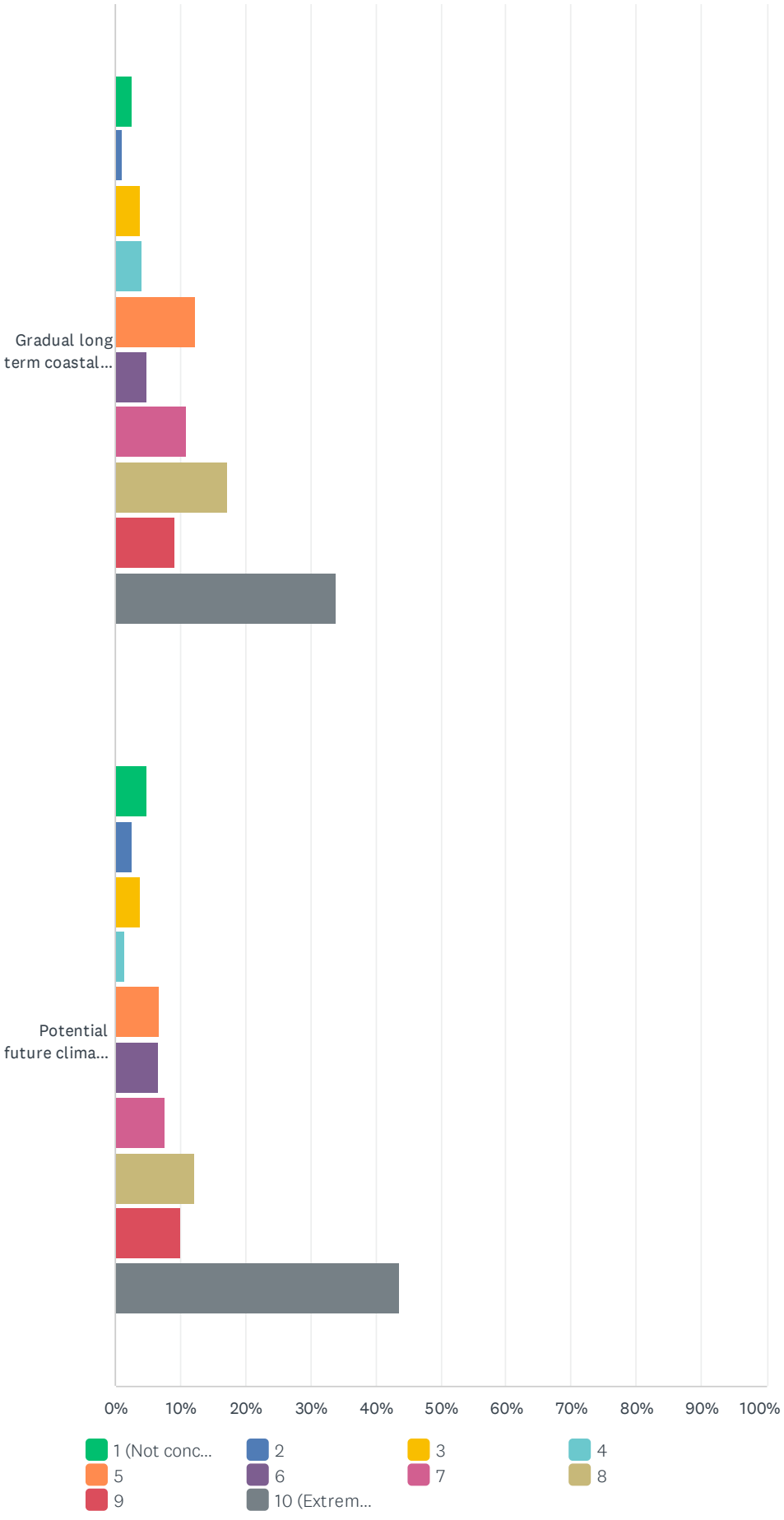
	1 (NOT IMPORTANT AT ALL)	2	3	4	5	6	7	8	9	10 (EXTREMELY IMPORTANT)	TOT
Natural ecosystems and biodiversity: our coast supports a range of natural systems and wildlife	0.29% 1	0.29% 1	1.15% 4	0.29% 1	1.44% 5	0.86% 3	3.45% 12	8.05% 28	8.62% 30	75.57% 263	3
Recreational amenity: our coast provides opportunities for recreational use and activities	0.86% 3	0.57% 2	1.44% 5	0.86% 3	4.02% 14	2.59% 9	10.92% 38	14.37% 50	14.66% 51	49.71% 173	3
Scenic amenity: our coast is beautiful and provides the area with natural character	0.86% 3	0.00% 0	0.00% 0	0.57% 2	2.30% 8	0.29% 1	3.16% 11	9.77% 34	12.64% 44	70.40% 245	3
Cultural heritage values: our coast has historic and spiritual importance, and uses for the traditional owners	4.31% 15	4.02% 14	1.44% 5	2.30% 8	5.75% 20	3.74% 13	8.33% 29	10.92% 38	9.48% 33	49.71% 173	3
Economic values: our coast supports local businesses and tourism	5.75% 20	2.87% 10	3.74% 13	3.16% 11	12.07% 42	7.76% 27	9.20% 32	17.82% 62	11.21% 39	26.44% 92	3
Research and education values: our coast provides opportunities for research and education	1.73% 6	1.44% 5	2.31% 8	1.44% 5	8.65% 30	8.36% 29	10.09% 35	16.14% 56	11.24% 39	38.62% 134	3

Q7 When thinking about the natural features of the coastline (such as the beaches and dunes), how concerned are you about damage from the following coastal hazards? Please select a number from 1 (Not concerned at all) to 10 (Extremely concerned).

Answered: 348 Skipped: 0




Gradual long term coastal...
Potential future clima...
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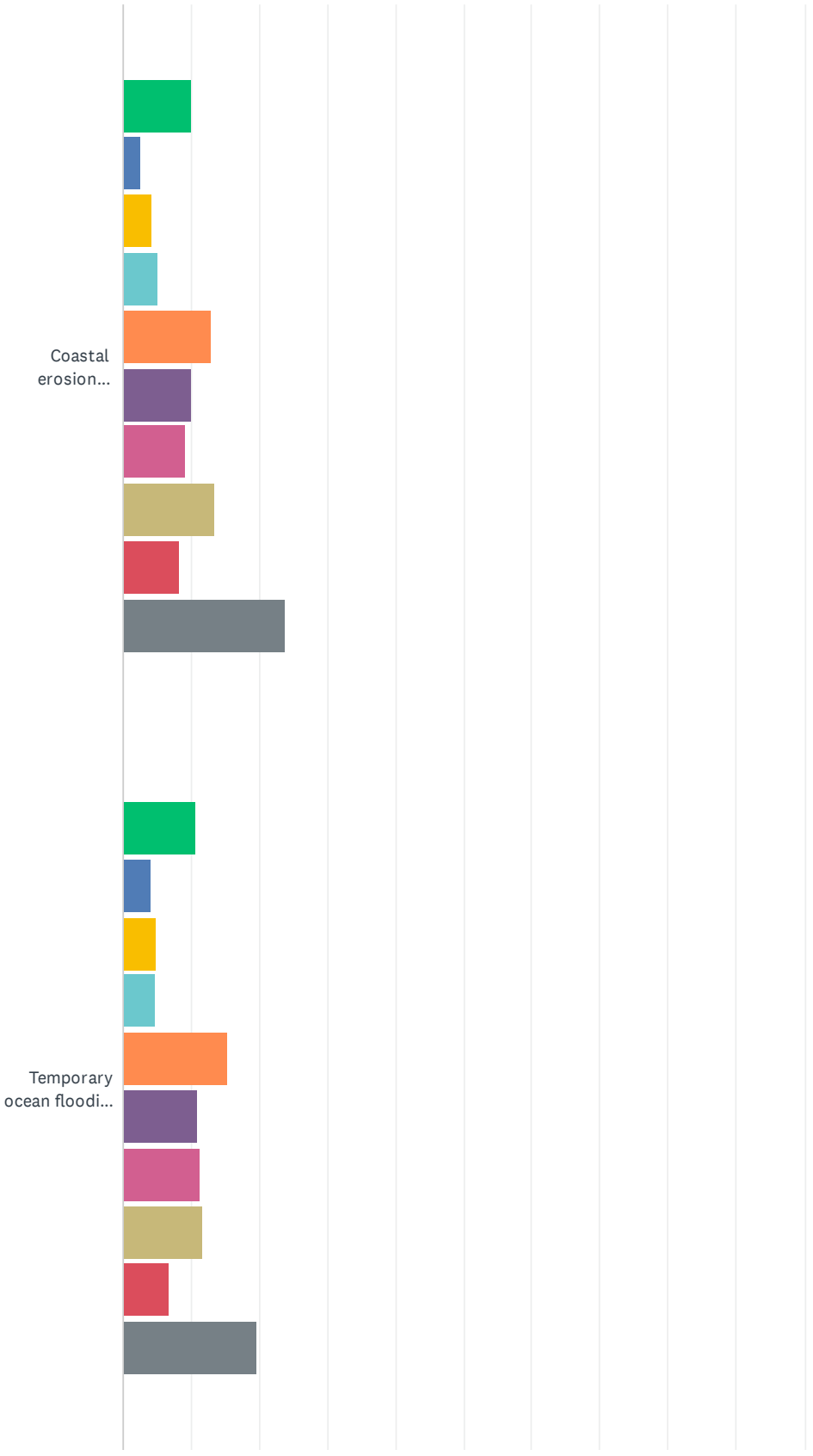
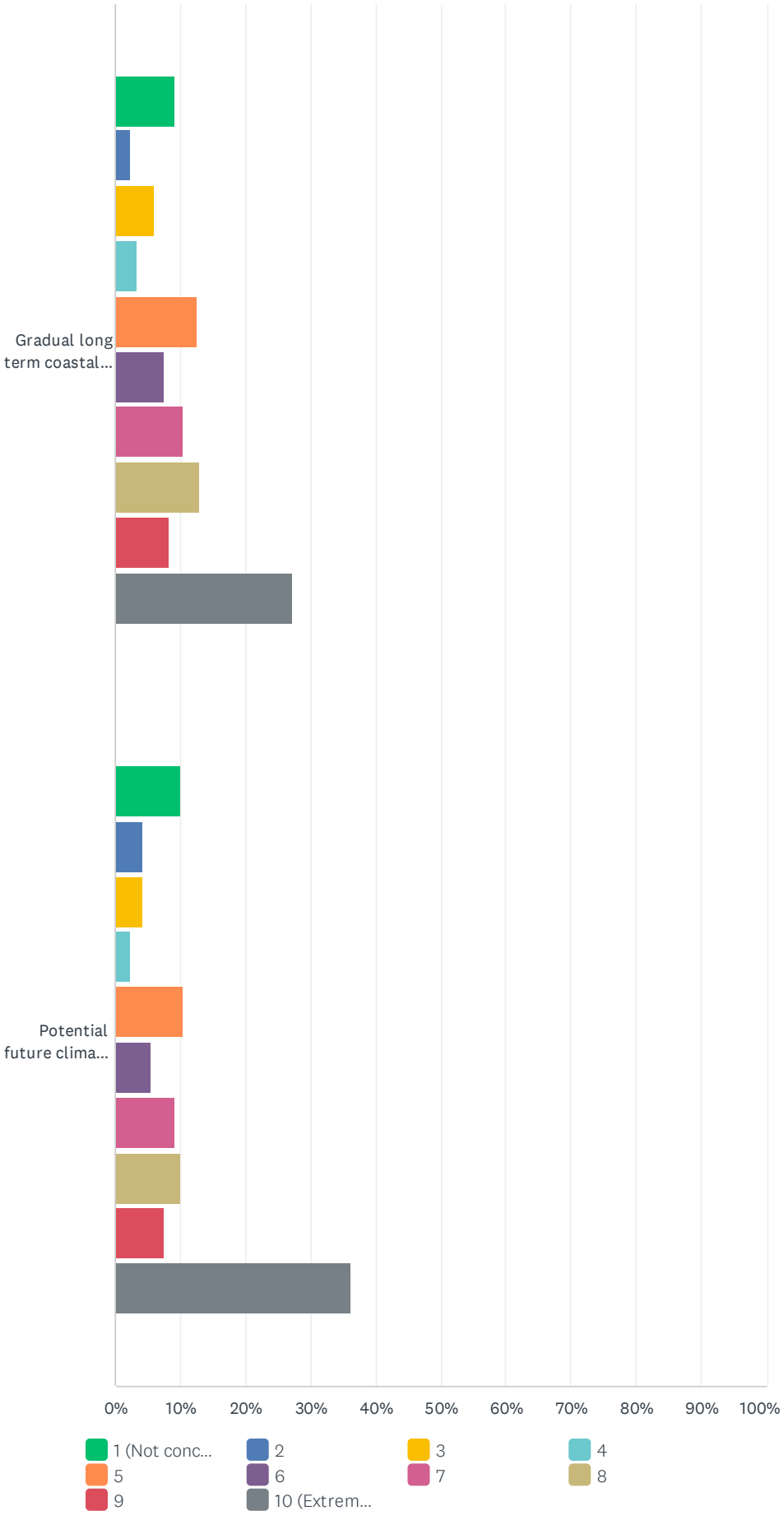
10 (Extrem...

	1 (NOT CONCERNED AT ALL)	2	3	4	5	6	7	8	9	10 (EXTREMELY CONCERNED)	TOT
Coastal erosion resulting from severe storm events	4.02% 14	1.72% 6	4.31% 15	3.45% 12	11.78% 41	6.03% 21	11.49% 40	17.53% 61	8.62% 30	31.03% 108	
Temporary ocean flooding from severe storm events	5.46% 19	2.01% 7	6.61% 23	4.60% 16	14.37% 50	10.06% 35	14.37% 50	15.52% 54	5.17% 18	21.84% 76	
Gradual long term coastal erosion and recession of the shoreline	2.59% 9	1.15% 4	3.74% 13	4.02% 14	12.36% 43	4.89% 17	10.92% 38	17.24% 60	9.20% 32	33.91% 118	
Potential future climate change impacts including sea level rise	4.90% 17	2.59% 9	3.75% 13	1.44% 5	6.92% 24	6.63% 23	7.78% 27	12.10% 42	10.09% 35	43.80% 152	

Q8 When thinking about the property and built infrastructure along the coastline, how concerned are you about damage from the following coastal hazards? Please select a number from 1 (Not concerned at all) to 10 (Extremely concerned).

Answered: 348 Skipped: 0




Gradual long term coastal...
Potential future clima...
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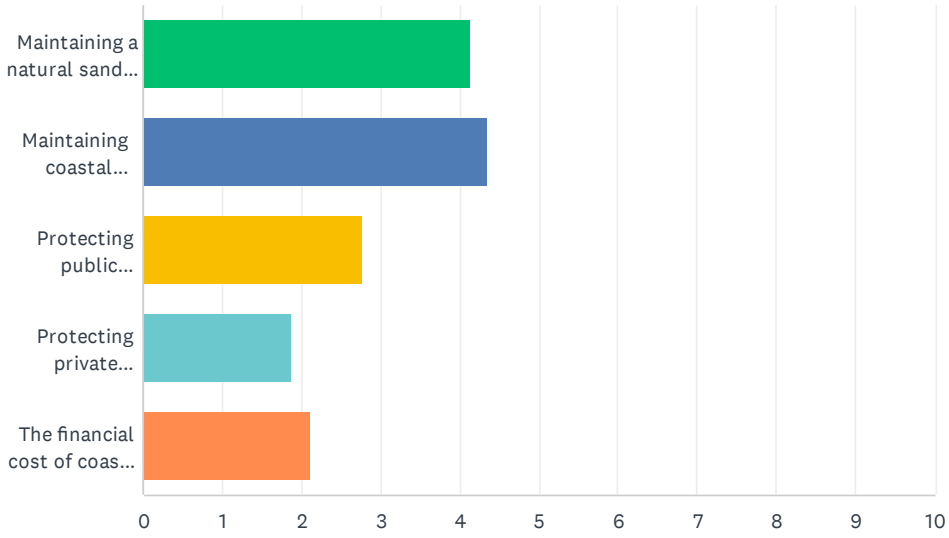
	1 (NOT CONCERNED AT ALL)	2	3	4	5	6	7	8	9	10 (EXTREMELY CONCERNED)	TOTA
Coastal erosion resulting from severe storm events	10.06% 35	2.59% 9	4.31% 15	5.17% 18	12.93% 45	10.06% 35	9.20% 32	13.51% 47	8.33% 29	23.85% 83	3
Temporary ocean flooding from severe storm events	10.66% 37	4.03% 14	4.90% 17	4.61% 16	15.27% 53	10.95% 38	11.24% 39	11.82% 41	6.92% 24	19.60% 68	3
Gradual long term coastal erosion and recession of the shoreline	9.20% 32	2.30% 8	6.03% 21	3.45% 12	12.64% 44	7.47% 26	10.34% 36	12.93% 45	8.33% 29	27.30% 95	3
Potential future climate change impacts including sea level rise	10.09% 35	4.32% 15	4.32% 15	2.31% 8	10.37% 36	5.48% 19	9.22% 32	10.09% 35	7.49% 26	36.31% 126	3

Q9 Overall, which of the following do you believe are the most important factors to consider when making decisions about future coastal adaptation measures? Please rank these factors from (1) most important to (5) least important

Answered: 347 Skipped: 1



	1	2	3	4	5	TOTAL	SCORE
Maintaining a natural sandy beach and coastline for recreational use and amenity	36.81% 113	48.21% 148	8.79% 27	4.89% 15	1.30% 4	307	4.14
Maintaining coastal vegetation and natural ecosystems	55.42% 179	31.89% 103	6.81% 22	4.02% 13	1.86% 6	323	4.35
Protecting public facilities and infrastructure close to the coast	6.21% 20	10.25% 33	45.96% 148	30.75% 99	6.83% 22	322	2.78
Protecting private residences and properties close to the coast	3.60% 12	5.71% 19	15.92% 53	24.92% 83	49.85% 166	333	1.88
The financial cost of coastal management actions	4.41% 15	6.47% 22	22.35% 76	30.59% 104	36.18% 123	340	2.12

Q10 Please provide any observations or advice that could be considered in the preparation of a coastal management program.

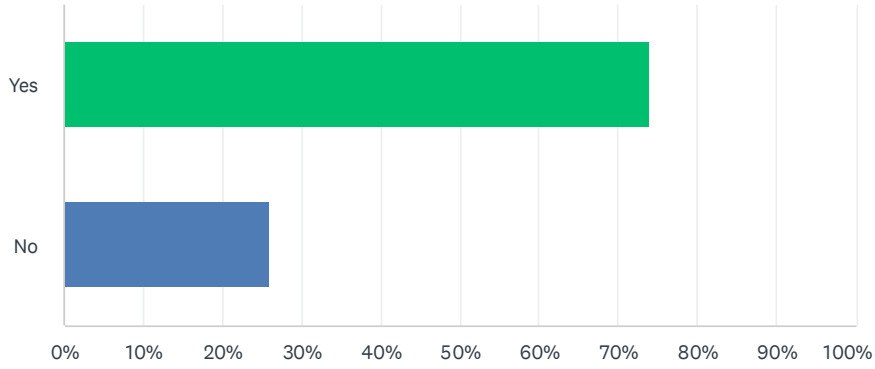
Answered: 286 Skipped: 62

Q11 What words or phrases would you use to describe what you value about the Ballina coastline?

Answered: 311 Skipped: 37

Q12 Finally, would you like to be kept updated on the Coastal Management Program?

Answered: 339 Skipped: 9



ANSWER CHOICES	RESPONSES	
Yes	74.04%	251
No	25.96%	88
TOTAL		339

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

APPENDIX E
FIRST PASS RISK ASSESSMENT AND KNOWLEDGE GAP ANALYSIS

Threat	Stressor Category	ID	Stressor	Open Coast	Lower Richmond River Estuary	Coastal Management Area				Management Plans & Strategies to Address Threat							Comments and Other Management Plans, Strategies and Programs to Address Threat	Present Day Residual Risk			Future Risk			Gap Analysis	
						CUA	CEA	CW	LR	MEMS	Ballina. CZMP	Shaws Bay CZMP	Lake Ainsworth CMP	Richmond River CMP	North Creek CMP	Other→		Likelihood	Conseq.	Present Risk	20 yr Risk	50 yr Risk	100 yr Risk	Adequacy of Existing Information	Comments
Natural Hazards	CM Act Hazards	1	Open Coast storm erosion	✔	✔	✔	✔	✔	✔	✔	✔	✔				✔	DPIE Broadscale erosion hazard mapping (DPIE, 2018) Ballina Shire Coastline Hazard Definition Study (2003) Updated Coastal Hazard Mapping for Seven Mile Beach (2011)	Possible	Major	High	High	Very High	Very High	Low	Stage 2 Study Needed - Ballina Open Coast Coastal Hazard Study
Natural Hazards	CM Act Hazards	2	Long term shoreline recession (due to ongoing recession trend, and/or SLR)	✔		✔	✔	✔	✔	✔	✔		✔			✔	DPIE Broadscale erosion hazard mapping (DPIE, 2018) Ballina Shire Coastline Hazard Definition Study (2003) Updated Coastal Hazard Mapping for Seven Mile Beach (2011)	Almost Certain	Moderate	High	Very High	Very High	Very High	Low	Stage 2 Study Needed - Ballina Open Coast Coastal Hazard Study
Natural Hazards	CM Act Hazards	3	Estuary foreshore erosion and bank erosion		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔			Unlikely	Minor	Low	Low	Low	Low	Moderate	Mitigated by presence of bank protection structures within the lower estuary.
Natural Hazards	CM Act Hazards	4	Coastal lake or watercourse entrance instability	✔	✔		✔	✔			✔	✔	✔	✔	✔		Richmond River Estuary Process Study.	Likely	Major	High	High	High	High	High	Significant information around estuary entrance morphodynamics is available in the estuary process study.However it should be noted that there has been a breakthrough at Boulder's Beach in recent times due to heavy precipitation and and coastal erosion. Council information rgearding this breakout should be used to inform potential management actions in Stage 3.
Natural Hazards	CM Act Hazards	5	Coastal cliff or slope instability	✔		✔	✔		✔		✔							Rare	Major	Moderate	Moderate	High	High	Low	Stage 2 Study Needed - Ballina Open Coast Geotechnical Hazard Study
Natural Hazards	CM Act Hazards	6	Coastal storm tide inundation	✔	✔	✔	✔	✔	✔		✔	✔		✔	✔		Ballina Flood Study (WBM, 2008)	Likely	Major	High	Very High	Very High	Very High	Moderate	Stage 2 Study Needed - Richmond River Storm Tide and Tidal Inundation Study
Natural Hazards	CM Act Hazards	7	Combined coastal and catchment flooding (in the lower Richmond River estuary)		✔	✔	✔	✔	✔			✔		✔	✔		Ballina Flood Study (WBM, 2008)	Likely	Major	High	High	Very High	Very High	Moderate	Adequate information available in the Ballina Flood Study (WBM, 2008)
Natural Hazards	CM Act Hazards	8	Tidal inundation of estuaries (i.e. sunny day flooding)		✔	✔	✔	✔								✔	DPIE Tidal Inundation Mapping (OEH, 2018)	Almost Certain	Minor	Moderate	High	Very High	Very High	Moderate	Stage 2 Study Needed - Richmond River Storm Tide and Tidal Inundation Study
Natural Hazards	CM Act Hazards	9	Sea Level Rise (SLR) **- captured above**	✔	✔																				
Natural Hazards	Other Hazards	10	Tsunami	✔	✔	✔	✔	✔								✔	NSW State Tsunami Plan 2018 (exposure exacerbated by sea level rise)	Rare	Catastrophic	Moderate	Moderate	Moderate	Moderate	Moderate	Current information sufficient to inform management actions in Stage 3
Natural Hazards	Climate Change Hazards	11	Altered ocean currents & nutrient inputs	✔	✔		✔	✔		✔						✔	North Coast IRVA	Almost Certain	Negligible	Low	Low	Moderate	Moderate	Moderate	North Coast IRVA and associated studies provide detail about broader oceanic stressors for the region.
Natural Hazards	Climate Change Hazards	12	Ocean temperature increase	✔	✔		✔	✔		✔						✔	North Coast IRVA	Almost Certain	Minor	Moderate	Moderate	High	Very High	Moderate	North Coast IRVA and associated studies provide detail about broader oceanic stressors for the region.
Natural Hazards	Climate Change Hazards	13	Ocean acidification	✔	✔		✔	✔		✔						✔	North Coast IRVA	Almost Certain	Minor	Moderate	Moderate	High	Very High	Moderate	North Coast IRVA and associated studies provide detail about broader oceanic stressors for the region.
Natural Hazards	Climate Change Hazards	14	Altered storm frequency & severity	✔	✔	✔	✔	✔	✔	✔						✔	North Coast IRVA	Possible	Minor	Moderate	Moderate	High	Very High	Moderate	North Coast IRVA and associated studies provide detail about broader oceanic stressors for the region.
Natural Hazards	Climate Change Hazards	15	Altered hydrological regimes		✔		✔	✔		✔						✔	North Coast IRVA	Unlikely	Minor	Low	Low	Low	Moderate	Moderate	North Coast IRVA and associated studies provide detail about broader oceanic stressors for the region.
Natural Hazards	Climate Change Hazards	16	Altered salinity levels / profile		✔		✔	✔		✔						✔	North Coast IRVA	Unlikely	Minor	Low	Low	Low	Moderate	Moderate	North Coast IRVA and associated studies provide detail about broader oceanic stressors for the region.
Natural Hazards	Climate Change Hazards	17	Habitat migration & squeeze	✔	✔	✔	✔	✔	✔	✔						✔	North Coast IRVA DPIE Tidal Inundation Mapping (OEH, 2018)	Unlikely	Minor	Low	Moderate	High	Very High	Low	Stage 2 Study Needed - Richmond River Storm Tide and Tidal Inundation Study
Land Use Intensification & Environmental Impacts	Water pollution and sediment contamination	18	Urban stormwater discharge	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	Beachwacth WQ Data Ballina Urban Stormwater Management Plan The NSW Estuary Health Risk Dataset 2019 (DPIE, 2019b) NSW Estuary Temperature, pH and salinity data 2012-2020 (DPIE, 2020)	Almost Certain	Minor	Moderate	High	High	High	Moderate	The Beachwatch WQ data provide a strong baseline dataset for decision making in Stage 3. Additional catchment based stressors from farther upstream are to be addressed in Richmond River and North Creek CMPs
Land Use Intensification & Environmental Impacts	Water pollution and sediment contamination	19	Sewage effluent & septic runoff	✔	✔	✔	✔	✔	✔	✔					✔	✔	Beachwacth WQ Data Ballina Urban Stormwater Management Plan The NSW Estuary Health Risk Dataset 2019 (DPIE, 2019b) NSW Estuary Temperature, pH and salinity data 2012-2020 (DPIE, 2020)	Almost Certain	Minor	Moderate	High	High	High	Moderate	The Beachwatch WQ data provide a strong baseline dataset for decision making in Stage 3. Additional catchment based stressors from farther upstream are to be addressed in Richmond River and North Creek CMPs
Land Use Intensification & Environmental Impacts	Water pollution and sediment contamination	20	Agricultural runoff		✔	✔	✔	✔	✔	✔		✔		✔	✔	✔	Beachwacth WQ Data Local Land Services North Coast Local Strategic Plan 2016-2021 The NSW Estuary Health Risk Dataset 2019 (DPIE, 2019b) NSW Estuary Temperature, pH and salinity data 2012-2020 (DPIE, 2020)	Almost Certain	Moderate	High	High	High	High	Moderate	Catchment based stressors to be addressed in Richmond River and North Creek CMPs
Land Use Intensification & Environmental Impacts	Water pollution and sediment contamination	21	Sediment contamination / pollution (including ASS)	✔	✔	✔	✔	✔	✔	✔				✔	✔	✔	The National Water Quality Management Strategy (NWQMS) National Acid Sulfate Soils Guidance: A synthesis	Almost Certain	Minor	Moderate	Moderate	Moderate	Moderate	Moderate	Catchment based stressors to be addressed in Richmond River and North Creek CMPs
Land Use Intensification & Environmental Impacts	Habitat Clearing / Disturbance	22	Clearing / disturbance of coastal wetlands, incl riparian and aquatic habitat		✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	SEPP (Coastal Management) 2018 Mapping NSW Estuarine Habitat Dashboard (DPI)	Likely	Major	High	High	Very High	Very High	Moderate	Stage 2 Study Needed - Ballina Coastal and Estuarine Habitat and Biodiversity Study
Land Use Intensification & Environmental Impacts	Habitat Clearing / Disturbance	23	Clearing / disturbance of littoral rainforest habitat	✔	✔				✔	✔				✔		✔	SEPP (Coastal Management) 2018 Mapping Pre-clearing vegetation (PCT) layer developed as part of the NSW SVTM (June 2022)	Likely	Major	High	High	Very High	Very High	Moderate	Stage 2 Study Needed - Ballina Coastal and Estuarine Habitat and Biodiversity Study

Threat	Stressor Category	ID	Stressor	Open Coast	Lower Richmond River Estuary	Coastal Management Area				Management Plans & Strategies to Address Threat							Comments and Other Management Plans, Strategies and Programs to Address Threat	Present Day Residual Risk			Future Risk			Gap Analysis	
						CUA	CEA	CW	LR	MEMS	Ballina. CZMP	Shaws Bay CZMP	Lake Ainsworth CMP	Richmond River CMP	North Creek CMP	Other→		Likelihood	Conseq.	Present Risk	20 yr Risk	50 yr Risk	100 yr Risk	Adequacy of Existing Information	Comments
Land Use Intensification & Environmental Impacts	Habitat Clearing / Disturbance	24	Clearing / disturbance of terrestrial habitat	✔	✔				✔	✔	✔		✔			✔	BSC vegetation vandalism policy Northern Rivers Regional Biodiversity Management Plan Pre-clearing vegetation (PCT) layer developed as part of the NSW SVTM (June 2022) SEPP (Coastal Management) 2018 SEPP (Vegetation in Non-Rural Areas) 2017	Unlikely	Moderate	Moderate	Moderate	Moderate	Moderate	**Moderate**	Stage 2 Study Needed - Ballina Coastal and Estuarine Habitat and Biodiversity Study
Land Use Intensification & Environmental Impacts	Habitat Clearing / Disturbance	25	Disturbance of marine and intertidal ecosystems	✔		✔	✔	✔	✔	✔						✔	Northern Rivers Regional Biodiversity Management Plan NSW Estuarine Habitat Dashboard (DPI)	Likely	Major	High	Very High	Very High	Very High	**Low**	Stage 2 Study Needed - Ballina Coastal and Estuarine Habitat and Biodiversity Study
Land Use Intensification & Environmental Impacts	Habitat Clearing / Disturbance	26	Introduction of invasive flora and fauna (pest) species	✔	✔	✔	✔	✔	✔		✔					✔	North Coast Regional Strategic Pest Animal Management Plan 2018 - 2023	Likely	Moderate	Moderate	Moderate	Moderate	Moderate	**Moderate**	Stage 2 Study Needed - Ballina Coastal and Estuarine Habitat and Biodiversity Study
Land Use Intensification & Environmental Impacts	Habitat Clearing / Disturbance	27	Loss of biodiversity	✔	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	Ballina Coastal Reserve PoM Northern Rivers Regional Biodiversity Management Plan	Likely	Moderate	Moderate	High	High	High	**Low**	Stage 2 Study Needed - Ballina Coastal and Estuarine Habitat and Biodiversity Study
Land Use Intensification & Environmental Impacts	Habitat Clearing / Disturbance	28	Stranding of marine mammals			✔	✔			✔							NPWS Policy for strandings DAWE National Guidance on the Management of Whale and Dolphin Incidents in Australian Waters	Unlikely	Minor	Low	Moderate	Moderate	Moderate	**High**	Risk is relatively low - no additional studies required.
Land Use Intensification & Environmental Impacts	Habitat Clearing / Disturbance	29	Damage, loss or disturbance of indigenous heritage (tangible or intangible)	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	AHIMS database Cultural Ways project.	Almost Certain	Major	Very High	Very High	Very High	Very High	**Moderate**	Further engagement with Traditional Owners should be undertaken during Stage 2 and 3 to determine if additional information gaps should be filled through Stage 4 actions.
Land Use Intensification & Environmental Impacts	Habitat Clearing / Disturbance	30	Damage, loss or disturbance of non-indigenous heritage (tangible or intangible)	✔	✔	✔	✔	✔	✔		✔		✔	✔	✔	✔	State and National Heritage Databases - shipwrecks etc	Rare	Moderate	Low	Moderate	Moderate	Moderate	**High**	Risk is relatively low - no additional studies required.
Land Use Intensification & Environmental Impacts	Hydrologic Modifications	31	Modified freshwater flows, including surface and/or ground water extraction		✔	✔	✔	✔	✔	✔			✔	✔	✔			Almost Certain	Moderate	High	High	High	High	**Moderate**	Catchment based stressors to be addressed in Richmond River and North Creek CMPs
Land Use Intensification & Environmental Impacts	Hydrologic Modifications	32	Sedimentation & infilling of channels/ waterways	✔	✔		✔	✔	✔		✔	✔		✔	✔			Likely	Major	High	High	High	High	**Moderate**	Additional studies to inform a dredging business can case be commissioned in CMP Stage 4
Resource Use & Conflict	Recreation & Tourism	33	Recreational fishing (boat and shore based)	✔	✔	✔	✔	✔		✔	✔	✔					Stage 1 Community Survey Byron Shire Recreational Impacts Stage 2 Study	Unlikely	Minor	Low	Moderate	Moderate	Moderate	**Moderate**	Risk is relatively low - no additional studies required.
Resource Use & Conflict	Recreation & Tourism	34	Commercial fishing	✔	✔	✔	✔	✔		✔						✔	FM Act 1994 and Regulation Byron Shire Recreational Impacts Stage 2 Study DPI-Fisheries commerical fishing licence datbase MEMS TARA	Possible	Moderate	Moderate	Moderate	Low	Low	**Moderate**	Risk is relatively low - no additional studies required.
Resource Use & Conflict	Recreation & Tourism	35	Recreational boating	✔	✔	✔	✔	✔		✔							NSW Regional Boating Plan for Mid-North Coast 2015 Destination Management Plan for the Ballina Coast & Hinterland 2014 - 2020	Almost Certain	Minor	Moderate	Moderate	Moderate	Moderate	**Moderate**	Risk is relatively low - no additional studies required.
Resource Use & Conflict	Recreation & Tourism	36	Passive recreational use	✔	✔	✔	✔	✔	✔	✔	✔						Destination Management Plan for the Ballina Coast & Hinterland 2014 - 2020	Almost Certain	Negligible	Low	Moderate	Moderate	Moderate	**Moderate**	Risk is relatively low - no additional studies required.
Resource Use & Conflict	Access & Availability	37	User group conflict on waterways	✔	✔	✔	✔	✔	✔								TfNSW Incident database NSW Regional Boating Plan for Tweed-Clarence Valley Region 2015 RMS Maritime Safety Plan 2017–2021 TfNSW Boating Licence and Registrations Ballina Marina Master Plan & Associated Studies 2017	Possible	Moderate	Moderate	Moderate	High	High	**High**	Current information sufficient to inform management actions in Stage 3
Resource Use & Conflict	Access & Availability	38	User group conflict on beaches (4WD, dogs, horses on beaches etc)	✔		✔	✔		✔		✔	✔				✔	Council 4WD on Beaches Policy / Strat / Plan https://ballina.nsw.gov.au/4wds-on-beaches 4WD Beach Permit Seven Mile Beach Lennox Head Policy	Almost Certain	Moderate	High	High	Very High	Very High	**High**	The ecological impacts of dogs and 4WD on beaches should be considered and assessed in the Stage 2 Study - Ballina Coastal and Estuarine Habitat and Biodiversity Study
Resource Use & Conflict	Access & Availability	39	Limited or lack of foreshore and waterway access	✔	✔	✔	✔										Council asset database Stage 1 Community Survey	Unlikely	Major	Moderate	Moderate	Moderate	Moderate	**High**	Current information sufficient to inform management actions in Stage 3.
Resource Use & Conflict	Access & Availability	40	Limited or lack of disability access	✔	✔	✔	✔										Council asset database Stage 1 Community Survey	Possible	Moderate	Moderate	Moderate	Moderate	Moderate	**High**	Current information sufficient to inform management actions in Stage 3
Public Health & Safety	Public Health & Safety	41	Water pollution/contamination affecting human health and safety	✔	✔	✔	✔			✔	✔	✔	✔	✔	✔	✔	Beachwatch Monitoring Program	Almost Certain	Moderate	High	High	High	High	**High**	Current information sufficient to inform management actions in Stage 3
Public Health & Safety	Public Health & Safety	42	Public safety risk from coastal processes hazards (from wave overtopping of structures etc)	✔		✔	✔			✔							Ballina Coastal Hazard Study and CZMP NSW Maritime Infrastructure Plan 2019-2024 BSC Asset Management database	Unlikely	Major	Moderate	Moderate	High	High	**Moderate**	Updated information to be sourced in the Stage 2 Coastal Hazard Study.
Public Health & Safety	Public Health & Safety	43	Public safety risk from aging and/or degraded coastal/estuary infrastructure	✔		✔	✔									✔	NSW Maritime Infrastructure Plan 2019-2024 BSC Asset Management database	Unlikely	Major	Moderate	High	High	Very High	**High**	Current information sufficient to inform management actions in Stage 3

Threat	Stressor Category	ID	Stressor	Open Coast	Lower Richmond River Estuary	Coastal Management Area				Management Plans & Strategies to Address Threat							Comments and Other Management Plans, Strategies and Programs to Address Threat	Present Day Residual Risk			Future Risk			Gap Analysis	
						CUA	CEA	CW	LR	MEMS	Ballina. CZMP	Shaws Bay CZMP	Lake Ainsworth CMP	Richmond River CMP	North Creek CMP	Other→		Likelihood	Conseq.	Present Risk	20 yr Risk	50 yr Risk	100 yr Risk	Adequacy of Existing Information	Comments
Public Health & Safety	Public Health & Safety	44	Safe, navigable waterways - Entrance bar		✔	✔	✔			✔	✔					✔	NSW Regional Boating Plan for Tweed-Clarence Valley Region 2015 RMS Maritime Safety Plan 2017–2021 Crown Lands NSW Coastal Dredging Strategy 2019-2024 TfNSW Boating Licence and Registrations Ballina Marina Master Plan & Associated Studies 2017	Likely	Major	High	High	High	High	**Moderate**	Information already available from historical studies and existing datasets is sufficient to inform Stage 3 management actions without the need for additional stdues in Stage 2..
Public Health & Safety	Public Health & Safety	45	Wildlife interactions (sharks, blue-ringed octopus etc)	✔	✔	✔	✔									✔	NSW Shark Management Strategy & SharkSmart Program	Unlikely	Major	Moderate	Moderate	Moderate	Moderate	**High**	Current information sufficient to inform management actions in Stage 3
Planning & Governance	Governance	46	Lack of adequate coordination between adjacent councils, and state government agencies	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	NSW Coastal Management Manual	Unlikely	Major	Moderate	Moderate	Moderate	Moderate		
Planning & Governance	Governance	47	Lack of funding for investigation and action implementation	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	NSW Coast and Estuary Grants Program	Likely	Major	High	High	High	High		
Planning & Governance	Governance	48	Lack of or ineffective community engagement or participation in governance	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	NSW Coastal Management Manual	Unlikely	Major	Moderate	Moderate	Moderate	Moderate		
Planning & Governance	Governance	49	Lack of compliance with regulations (by users) or lack of regulation effort (by agencies)			✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		Unlikely	Major	Moderate	Moderate	Moderate	Moderate		
Planning & Governance	Information Gaps	50	Incomplete coastal process information (including climate change impacts)	✔	✔	✔	✔	✔	✔									Unlikely	Moderate	Moderate					
Planning & Governance	Information Gaps	51	Incomplete ecological information (including climate change impacts)	✔	✔	✔	✔	✔	✔									Almost Certain	Moderate	High					
Planning & Governance	Information Gaps	52	Inadequate and/or incomplete European and Indigenous Heritage information	✔	✔	✔	✔	✔	✔									Likely	Moderate	Moderate					
Planning & Governance	Information Gaps	53	Inadequate social and economic information	✔	✔	✔	✔	✔	✔									Possible	Moderate	Moderate					

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