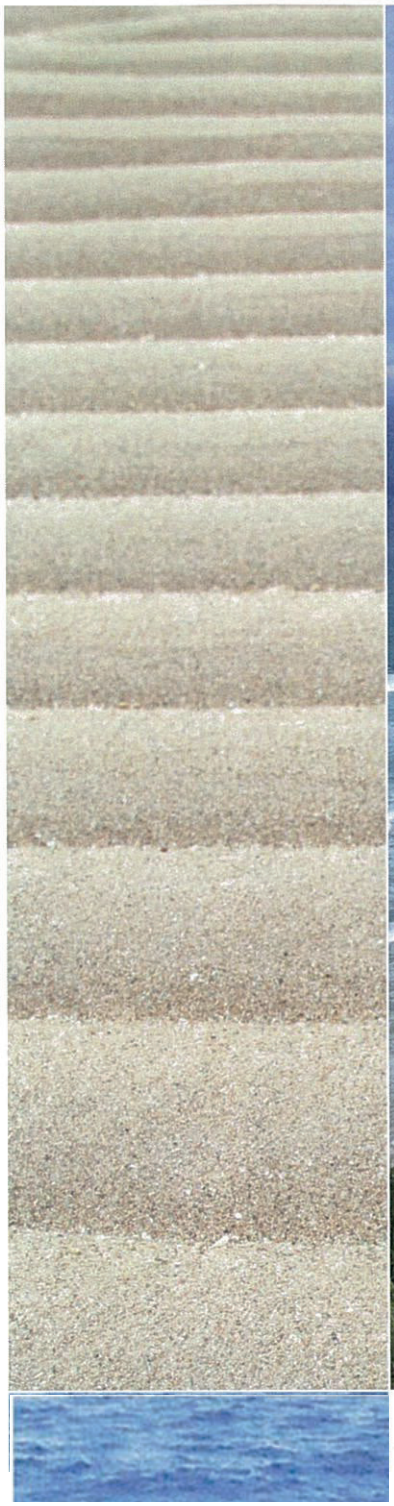

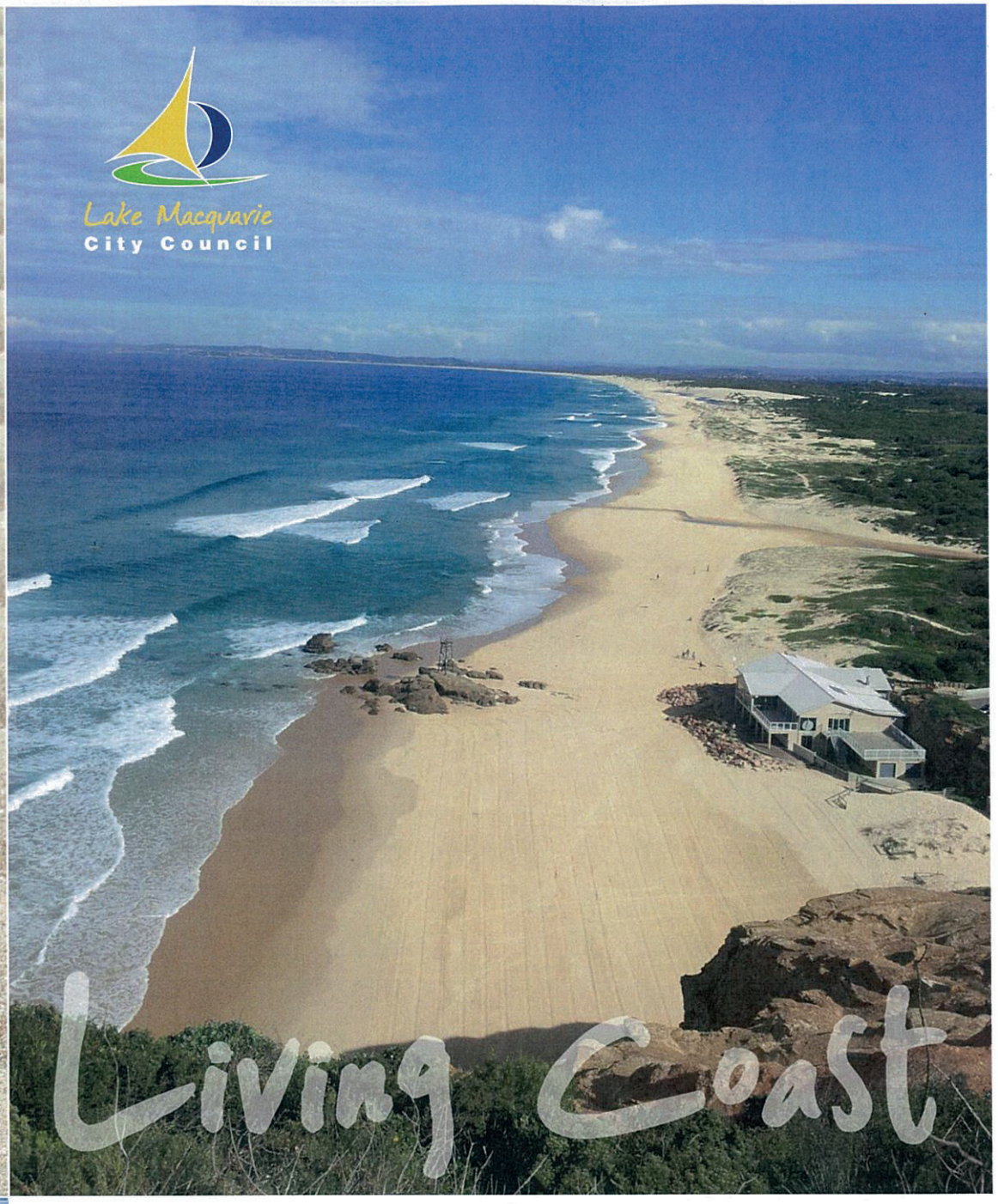

LAKE MACQUARIE COASTAL ZONE

Management Plan - Part A

FINAL

For the Coastline

NOVEMBER 2015

umwelt

LAKE MACQUARIE COASTAL ZONE MANAGEMENT PLAN – PART A

For the Coastline

November 2015

Prepared by
Umwelt (Australia) Pty Limited

on behalf of

Lake Macquarie City Council

Project Director: **Pam Dean-Jones**
Project Manager: **Pam Dean-Jones**
Report No. **3033/R01/FINAL**
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Lake Macquarie City Council has prepared this document with financial assistance from the NSW Government through its Coastal Management Program. This document does not necessarily represent the opinions of the NSW Government or the Office of Environment and Heritage.

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Compliance Information

The *Lake Macquarie Coastal Zone Management Plan - Part A for the Coastline* is prepared in accordance with the statutory requirements set out in the NSW Guidelines for the Preparation of Coastal Zone Management Plans (OEH, 2013). Part A is one of three parts of the Lake Macquarie Coastal Zone Management Plan (CZMP). The other two parts are Part B for the Estuary and Part C for Swansea Channel.

The guidelines require that a CZMP complies with the requirements of three key pieces of NSW legislation and policy:

- **Part 4A of the *NSW Coastal Protection Act 1979***

  Table 1 shows how the requirements of Part 4A of the Coastal Protection Act 1979 are considered in Part A of the CZMP. .

  Council will submit Part A of the CZMP to the Minister for the Environment for certification. A certified and gazetted CZMP is a statutory document.

  The LMCC Coastal Zone Emergency Action Sub-Plan is included in Appendix 3 in accordance with Section 55C (1) (b).

- ***NSW Coastal Policy 1997***

  The Coastal Policy stresses:

  - The importance of ecologically sustainable development for resilient coastal systems and communities, where coastal values are protected
  - The value of aligned and integrated management of coastal issues where various organisations share responsibility
  - The important cultural heritage values of the coastal landscape.

- ***NSW and Lake Macquarie Sea Level Rise Policy***

  - The current NSW government policy in relation to future sea level rise is that local Councils should determine sea level rise projections to suit their local conditions, based on widely accepted competent scientific opinion. A NSW Government Sea Level Rise Policy Statement (2009), which set planning benchmarks of 40 cm sea level rise above 1990 levels by 2050 and 90cm above 1990 levels by 2100, ceased to be NSW government policy in 2012. The NSW Government commissioned a report from the Office of the Chief Scientist and Engineer to review the evidence for and projections about sea level rise in NSW. The Chief Scientist concluded that sea levels have risen along the NSW coast over the last 100 years, and found that the science underlying the Sea Level Rise Policy Statement 2009 was adequate. However, the Chief Scientist also found that there is variability in past rates and uncertainty about future rates of sea level rise.
  - Lake Macquarie City Council (Council) adopted a sea level rise policy in 2010 and reviewed it in August 2012. The Policy adopts the benchmarks of 40 cm above 1990 levels by 2050 and 90 cm above 1990 levels by 2100. In determining its sea level rise policy, Council has reviewed expert advice from IPCC (2007), CSIRO (2007) and the NSW Government. The most recent IPCC report (2013) suggests that sea level may rise slightly higher (98 cm, based on the RCP8.5 scenario) than the benchmark set in the Council's policy by 2100.

- The Lake Macquarie Sea Level Rise Policy requires an adaptive and risk based planning and management process. It acknowledges that there is uncertainty about the actual rate of sea level rise over the next century and that projections of sea level rise are likely to be modified as new information becomes available. To assist with managing this uncertainty, risk considerations must also take into account the expected life of assets (community assets and infrastructure, as well as private assets, such as houses and commercial buildings).

This Part A of the CZMP is prepared in accordance with the statutory requirements set out in the NSW Guidelines for the Preparation of Coastal Zone Management Plans (OEH, 2013) and the *Coastal Protection Act 1979* (amongst other key pieces of legislation, policies and guidelines). The follow table is a guide where the relevant information relating to the guidelines and *Coastal Protection Act 1979* is located within this part of the CZMP.

Table 1 a: How Part A addresses the Coastal Management Principles

	Coastal Management Principles (OEH, 2013)	Addressed by this Channel part of the CZMP
Principle 1	Consider the objectives of the *Coastal Protection Act 1979* and the goals, objectives and principles of the NSW Coastal Policy 1997 [1]	Refer to Compliance Information
Principle 2	Optimise links between plans relating to the management of the coastal zone	This document is Part A of the overall Lake Macquarie Coastal Zone Management Plan, which provides consistency and integration in management of the open coast, the lake and Swansea Channel.
Principle 3	Involve the community in decision-making and make coastal information publicly available	Council has elected to undertake community consultation concurrently for all parts of the integrated CZMP (coast, lake and channel). Notwithstanding, stakeholder organisations have been consulted individually, while community consultation undertaken as a part of previous studies has been considered. See also sections 13: Strong Governance and Supportive Partnerships and14: Options for Communication and Collaboration.
Principle 4	Base decisions on the best available information and reasonable practice; acknowledge the interrelationship between catchment, estuarine and coastal processes; adopt a continuous improvement management approach	The risk based approach is an internationally recognised framework for natural resources management because it incorporates the best available information and its uncertainty. Management options recognise the overlap between flooding and oceanic processes through estuaries, streamlining management into one approach. The adopted Risk Management Framework intrinsically requires ongoing monitoring of risks and review and tailoring of risk treatments (management options). See section 6: Coastal processes, hazards and risk studies.

	Coastal Management Principles (OEH, 2013)	Addressed by this Channel part of the CZMP
Principle 5	The priority for public expenditure is public benefit; public expenditure should cost effectively achieve the best practical long-term outcomes	High level cost benefit analysis for management options has recognised the public benefit as priority for management options. See Section 7: Identifying Priority Issues
Principle 6	Adopt a risk management approach to managing risks to public safety and assets; adopt a risk management hierarchy involving avoiding risk where feasible and mitigation where risks cannot be reasonably avoided; adopt interim actions to manage high risks while long-term options are implemented	Risks to public safety and assets have been analysed and mapped. Evaluation of the tolerability of risks has been evaluated. In certain cases risks that cannot be reasonably treated must be accepted. A trigger based approach to implementation has been applied. See section 6
Principle 7	Adopt an adaptive risk management approach if risks are expected to increase over time, or to accommodate uncertainty in risk predictions	The adaptability of management options to future circumstances was a consideration in Section 6: Coastal processes, hazards and risk studies. A triggered based approach has been applied that recognises risks that are expected to increase over time.
Principle 8	Maintain the condition of high value coastal ecosystems; rehabilitate priority degraded coastal ecosystems	Sections10 and 16 discuss and include actions for rehabilitation of degraded coastal ecosystems, and provision to improve resilience of existing high value ecosystems.
Principle 9	Maintain and improve safe public access to beaches and headlands consistent with the goals of the NSW Coastal Policy	See section 11: Options for Sustainable Community Access, Use and Value
Principle 10	Support recreational activities consistent with the goals of the NSW Coastal Policy	Gazettal of the CZMP will provide mechanism to plan for recreational activities within the open coastline zone. See Also section 11: Options for Sustainable Community Access, Use and Value

Table 1 b – Requirements of *Coastal Protection Act 1979* and NSW Guidelines for preparing Coastal Zone Management Plans

Requirements from the Guidelines for Preparing CZMPs (OEH, 2013)		Where within this report?	How this relates to the *CPA 1979*?
The CZMP must contain a description of:	How the relevant Coastal Management Principles have been considered in preparing the Plan	All sections	**55D(1)** - preparing a draft Plan in accordance with the Ministers guidelines
	The community and stakeholder consultation process, the key issues raised and how they have been considered	**Section 4** - Community and stakeholder issues - new and ongoing	**55E and F**- public consultation and consideration of submissions
	How the proposed management options were identified, the process followed to evaluate the management options, and the outcomes of the process	**Sections 4, 5** and **6** present the Consultation, Ecological Resilience and Coastal Hazard studies respectively. These, and the review of the previous management plans, have sourced the management options	**55C(1) d,e,f** management of hazards and risks
The CZMP must contain proposed management actions over the CZMPs implementation period in a prioritised implementation schedule which contains:	Proposed funding arrangements for all actions, including any private sector funding	The implementation tables (**Section 16**) show whether options are Council's, a partnering agency or private land owner. An indicative budget will be included where required	**55C(1) g** - funding responsibilities for works
	Actions to be implemented through other statutory plans and processes	The implementation tables (**Section 16**)	**55D(1)** - preparing a draft Plan in accordance with the Ministers guidelines
	Actions to be carried out by a public authority or relating to land or other assets it owns or manages, where the authority has agreed to these actions	The implementation tables (**Section 16**)	**Section 55C(2) b**
	Proposed actions to monitor and report to the community on the plans implementation, and a review timetable	The implementation tables (**Section 16**)	**55D(1)** - preparing a draft Plan in accordance with the Ministers guidelines
CZMPs are to be prepared using a process that includes:	Evaluating potential management options by considering social, economic and environmental factors, to identify realistic and affordable actions	**Section 8** details the appraisal processes	**55D(1)** - preparing a draft Plan in accordance with the Ministers guidelines
	Consulting with the local community and other relevant stakeholders. The minimum consultation requirement is to publicly exhibit a draft plan for not less than 21 days, with notice of the exhibition arrangements included in a local newspaper	**Section 4** presents the details of the engagement process. This will be updated after the document has been exhibited	**55E (a)(b)** - public consultation
	Considering all submissions made during the consultation period. The draft plan may be amended as a result of these submissions	After the draft Plan is exhibited submissions will be considered	**55F (1)(2)(3)** - submissions
CZMPs are to achieve a reasonable balance between any potentially conflicting uses of the coastal zone			**55F (1)(2)(3)** - submissions

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Glossary

This glossary explains a range of technical or planning terms that are used in Part A of the CZMP. The definitions are drawn from several different sources, including the First Pass National Assessment on Climate Change Risks to Australia's Coast (Department of Climate Change, 2009a), definitions in NSW legislation, policy and guidelines (released by Office of Environment and Heritage in 2009, 2010 and 2011) and standard coastal engineering or coastal planning manuals.

Accretion	Growth of coastal shorelines by steady addition of sediments.
Adaptation	Adjustments in natural or human systems in response to climate stimuli or their effects, which moderates harm or exploits beneficial opportunities.
Adaptive capacity	Ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.
Authorised Location	Defined in the current proposed amendments to the NSW Coastal Protection Act as a place that has at least five houses or a public road in the immediate coastal erosion hazard zone. No Authorised Locations exist along the Lake Macquarie Coast.
Average Recurrence interval (ARI) and annual exceedance probability (AEP)	Both of these terms are a measure of the rarity of a rainfall event, but can also be used to refer to the rarity of a storm event. The ARI is the average, or expected, value of the periods between exceedances of a given rainfall total accumulated over a given duration. The AEP is the probability that a given rainfall total accumulated over a given duration will be exceeded in any one year.
Bathymetry	Refers to the depth of the ocean. A bathymetric chart will show the depths to the sea floor (and therefore the shape of the sea floor) at different locations.
Beach	A wave deposited accumulation of sediment, usually sand, but also cobbles and boulders, lying between the upper limit of wave swash and extending out across the surf zone to the depth at which average waves can move sediment shoreward. Short (2007) notes that on the high wave energy NSW coast, this means that beaches extend seaward to water depths of 15 to 20m and as much as 1 to 3 kilometres offshore.
Biodiversity	The numbers and relative abundances of different genes, species and ecological communities in a particular area.
Bluff or cliff	Coastal cliffs (especially steep and precipitous cliffs), steep rock and weathered rock slopes, headlands, indurated and cemented sand coastal slopes.
Climate	Climate in a narrow sense is usually defined as 'average weather'. The usual period for calculating the 'average' is 30 years.
Climate projection	A projection of future climate based on simulation by climate models.
Coast	Generally used, with 'coastline', to refer to the actual shoreline where the sea meets the land.
Coastal hazard zone	The shoreline and hinterland areas determined to be at risk from coastal erosion or inundation. The zone is divided up as the Zone of Wave Impact and Slope Adjustment and Zone of reduced foundation capacity for a given time period.
Coastal inundation	This is flooding that occurs when waves overtop the frontal dune system, so that on or landward of low dunes is inundated by sea water. Some of these areas can also be flooded by rising lake waters. High lake water levels are influenced by catchment rainfall, accommodation capacity on local floodplains and the size/capacity of the lake entrance.
Coastal Risk Area	Any coastal area that that is subject to coastal erosion, inundation or geotechnical hazard that has potential to negatively impact people or property. Coastal risk areas are generally identified in NSW for immediate, 2050 and 2100 planning periods.
Coastal zone	Extends from the continental shelf to as far inland as coastal processes (tides, wind-blown coast dunes) dominate. The NSW Coastal Policy defines this as including 3 nautical miles seaward of the mainland, one kilometre landward of the open coast high water mark, one kilometre around the shores of all bays, estuaries, lakes and lagoons and all tidal waters upstream to the limit of mangroves.
Coastal geomorph-ology	The physical structures, processes and patterns associated with the coast, including landforms, soil and geology and the factors that influence them.
East Coast Lows	Intense low pressure systems which occur on average several times each year off the east coast of Australia. Severe East Coast Lows generate extreme water levels and high waves which drive storm bite erosion.
Ecosystem services	Ecological processes or functions having monetary or non-monetary value to individuals or society at large.

Emergency response	Any actions taken during an erosion or inundation event to ensure the safety of people and property.
***El Nino* southern oscillation (ENSO)**	Refers to widespread two to seven year oscillations in atmospheric pressure, ocean temperatures and rainfall associated with El Nino (the warming of the oceans in the equatorial eastern and central pacific) and its opposite, La Nina. Over much of Australia La Nina brings above average rain and El Nino brings drought. A common measure is the Southern Oscillation Index (SOI) which is the normalised mean sea level pressure difference between Tahiti and Darwin. The SOI is positive during La Nina and negative during El Nino events.
Exposure	Refers to the elements of risk which are subject to the impact of a hazard.
Flood hazard	A hazard associated with inundation. Flood hazard generally refers to flooding associated with storm water systems, rivers and estuaries.
Geo-technical processes	Refers to the processes that drive landslides and poor structural integrity of rocks and soils. Landslides are defined as the movement of a mass of rock, debris or earth (soil) down a slope. The definition includes landslides, slips, slumps, rock falls and topples.
Hazard	A source of potential harm or a situation with a potential to cause loss. It may also be referred to as a potential or existing condition that may cause harm to people or damage to property or the environment.
Littoral	In coastal environments, the littoral zone extends from the high water mark to areas permanently submerged.
Mitigation	Refers to those response strategies that reduce the sources of greenhouse gases or enhance their sinks.
Resilience	The ability of a social or ecological system to absorb disturbances while retaining the same ways of functioning, and the capacity to adapt to stress and change.
Risk and Risk Management	Risk is calculated as a product of probability (likelihood) and consequence of a hazard occurring. Risk management involves understanding all aspects of an activity that may have unanticipated consequences and determining which are the significant and unacceptable risks. The process helps identify priority actions that need to be undertaken to ensure that important values are maintained. The Australian Standard for risk assessment and management has adopted ISO 31000 (2009).
Sea level rise	An increase in the mean level of the ocean. Eustatic sea level rise is a change in global average sea level brought about by an increase in the volume of the world ocean (by warming the water – thermal expansion, or by melting of ice caps). Relative sea level rise occurs where there is a local increase of the level of the ocean relative to the level of the land, which might be due to ocean rise or to subsidence of the land. In areas subject to rapid uplift, relative sea level can fall without a change in ocean volume.
Storm surge	Elevated sea level at the coast caused by the combined influence of low pressure and high winds associated with a severe storm such as a tropical cyclone. Includes wave runup and wave set up.
Storm tide	The total elevated sea level height at the coast above a datum during a storm, combining storm surge and the predicted tide height.
Sustain-ability	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Ecologically sustainable development is consistent with intergenerational equity, conservation of ecological functions and services, proper valuation of social, cultural, environmental and economic assets.
Trigger point	Within an adaptive coastal risk management strategy, certain circumstances will trigger a change of management response. A number of trigger points can be used, individually or in combination (cumulative risk), including the proximity of the erosion scarp to existing development, the asset life of infrastructure or Council's capacity (technical and financial) to maintain functional community infrastructure such as sewerage and stormwater systems. Rising sea level will, over time, reduce the functionality of stormwater systems draining to the sea or lake system, so that water backs up and flood risk increases, and it has the potential to cause excessive infiltration of sewer systems or to erode pumping stations.
Uncertainty	An expression of the degree to which a value (such as the future state of the climate system) is unknown. Uncertainty can result from a lack of information or from disagreement about what is known or should be known.
Vulnerability	Degree to which a system is susceptible to or unable to cope with adverse effects of stresses such as invasive species, changes to hydrology, land clearing, all of which may be exacerbated by climate change, including climate variability and extreme weather events. Vulnerability is a function of the character, magnitude and the rate of change and variation to which a system is exposed, its sensitivity and its adaptive capacity.

Wave run up	The ultimate height reached by waves (storm or tsunami) after running up the beach or coastal barrier.
Wave set up	The super elevation in water level across the surf zone caused by the energy expended by breaking waves.
Zone of Wave Impact and Slope Adjustment	The immediate hazard or 'storm bite' that is at risk during a storm. These are the areas a) seaward of the erosion escarpment and b) the part of the eroded dune which may be affected by slumping to its natural angle of repose after a storm event.
Zone of reduced foundation capacity	When extreme scour occurs on the beach face, the outer part of the dune has reduced load bearing capacity.

Abbreviations

BOM	Bureau of Meteorology
CAP	Catchment Action Plan
CERMP	Coastal Emergency Response Management Plan
CSIRO	Commonwealth Scientific and Industrial Research Organisation
LMCZMP[A]	Coastal Zone Management Plan Part A for the coastline of Lake Macquarie City Council (former draft Plan; now Lake Macquarie Coastal Zone Management Plan, Part A for the coastline)
DCC	Department of Climate Change (Australian Government)
DCCEE	Department of Climate Change and Energy Efficiency (Australian Government)
DE	Department of the Environment (Australian Government)
DECCW	Department of Environment, Climate Change and Water (NSW) (now Office of Environment and Heritage)
DoP	Department of Planning (NSW); now the Department of Planning and Environment
DP&E	Department of Planning and Environment (NSW) (formerly the Department of Planning and also the Department of Planning and Infrastructure)
DPI	Department of Primary Industries
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities (now DE)
EEC	Endangered Ecological Community
EPA	Environment Protection Authority
HCRCMA	Hunter-Central Rivers Catchment Management Authority (now part of HLLS)
HLLS	Hunter Local Land Services
I&I NSW	Department of Primary Industries (NSW, includes Agriculture, Fisheries, Tourism and Mineral Resources)
IPCC	Intergovernmental Panel on Climate Change
LiDAR	Light Detection and Ranging
LMCC	Lake Macquarie City Council
L&PMA	Land and Property Management Authority. Relevant sections are now within the Department of Trade and Investment – Crown Lands Division
LHRS	Lower Hunter Regional Strategy
OEH	Office of Environment and Heritage, within Department of Premier and Cabinet. OEH includes most of the functions formerly the responsibility of the Department of Environment, Climate Change and Water
ROC	Regional Organisation of Councils (In the Hunter Region, this is Hunter Councils)
SEPP	State Environmental Planning Policy

1.0 Introducing the Lake Macquarie Coastal Zone Management Plan - Part A for the Coastline

In this section

1.1 Purpose of the Coastline Part of the CZMP

This document is Part A of the Coastal Zone Management Plan for the City of Lake Macquarie and applies to the open coastline of the City. Part A of the CZMP presents the strategies that Council proposes to implement over the next 10 years to manage this dynamic and highly valued landscape.

Part A of the CZMP addresses issues that are important now and prepares Council and its agency and community partners for a period when significant changes and threats to the values of the coastal landscape are expected. **Figure 1.1** shows the Lake Macquarie coastal zone, including the extents of focus areas for local communities along the coastline.

Part A of the CZMP focuses on managing the interaction of open coastal processes with the environmental, social, cultural and economic values of the coast including:

- Community uses of the coastline – community lifestyles and enjoyment of the coastal landscape, including recreation, visual amenity, built assets, businesses and local economic values and community resilience; and

- The health of coastal ecosystems – the resilience of continuing landscape processes and functions.

The healthy functioning of the coast, including coastal processes that shape the landscape and coastal ecosystems, underpins the ways in which the community uses and enjoys the coast.

Part A of the CZMP describes Council's proposals to accommodate the needs of natural systems as they adapt to changes at the interface of land and sea. Part A aims to create the right framework for ongoing adaptation to coastal change and assist Council and its partners to make informed decisions about prioritising management actions for the coastline. Part A is supported by the *Lake Macquarie Coastline Hazard and Risk Assessment* and the *Lake Macquarie Coastline Management Options Study*. Part A of the CZMP should be read in conjunction with these two supporting documents.

The *Coastal Protection Act 1979* and the *NSW Coastal Policy 1997* both stress the importance of 'protecting and preserving beach environments and beach amenity, and ensuring continuing and undiminished public access to beaches, headlands and waterways'. In accordance with these statutory requirements, a CZMP describes current use and access arrangements, including their adequacy and any associated environmental impacts; discusses how access could be impacted by coastal processes; and proposes actions to manage environmental and safety issues arising from current access arrangements.

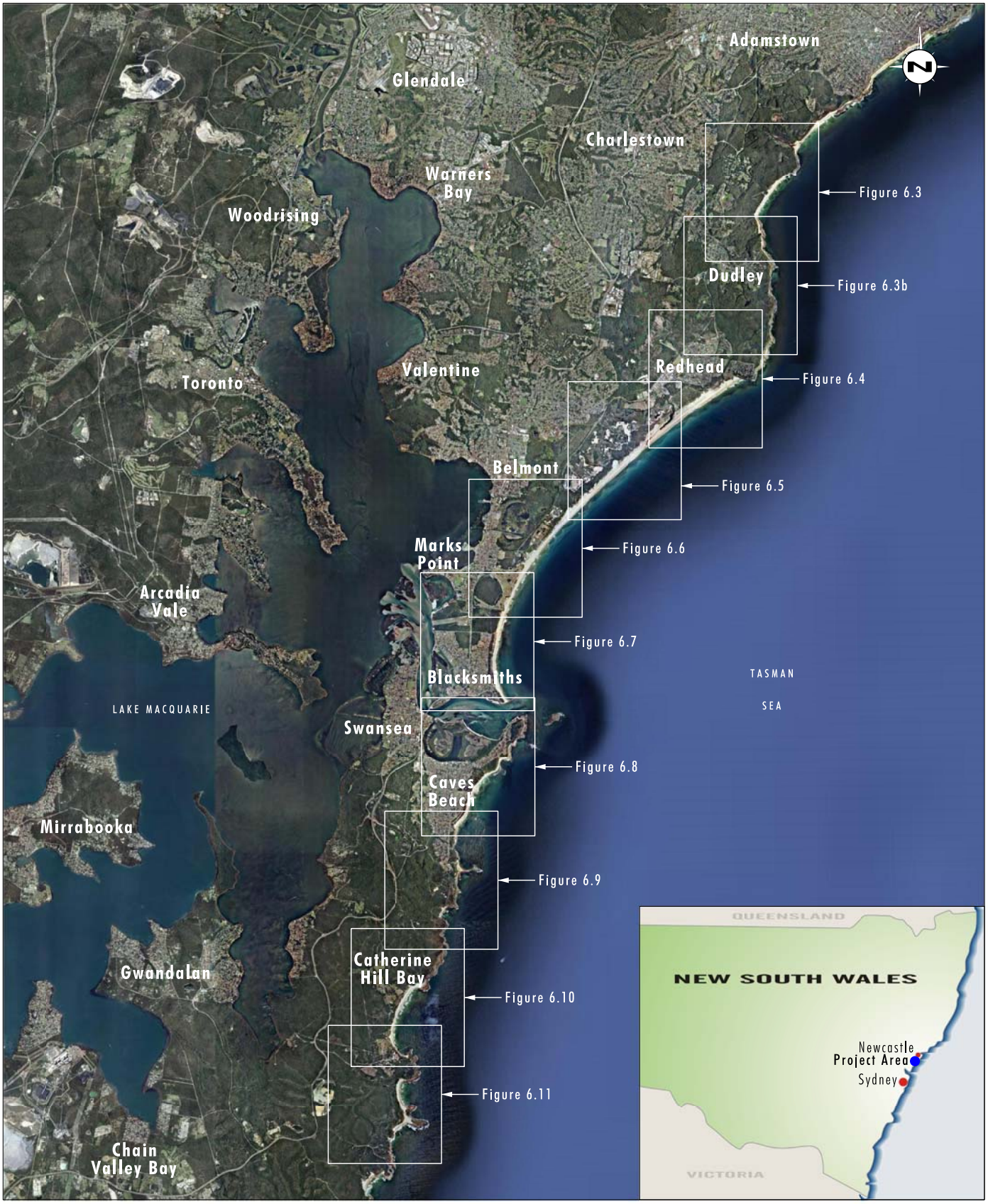


Image Source: Google Earth (2009)

FIGURE 1.1

Locality Plan

1.1.1 Objectives of Part A of the CZMP

In accordance with the requirements of the *Coastal Protection Act 1979*, *NSW Coastal Policy 1997* and the NSW Guidelines for Preparing Coastal Zone Management Plans (OEH, 2013), Part A of the CZMP is intended to meet the following operational objectives and plan outcomes:

- Analyse how currently available knowledge would change actions and priorities in the previously prepared Coastline Management Plan (Umwelt, 1999);
- Adopt a risk management approach;
- Adopt an adaptive management approach;
- Involve the community in preparing the CZMP;
- Position Council to use best available technology and management approaches in future management of the coastline;
- Present a clear strategic direction, with fully justified schedule of priority actions – public benefit, cost effective, robust; and
- A plan structure for easy use by Council and the community.

1.1.2 Outcomes of Part A of the CZMP

To be successful Part of the CZMP should deliver the following outcomes for Council and its community (**Table 1.1**):

Table 1.1 – Outcomes of Part A of the CZMP

Risk Management	Extreme and high coastal risks are identified and mitigated cost effectively
Ecosystem Health	The condition and connectivity of coastal ecological communities is maintained or enhanced
Community recreation and well-being	Locals and visitors enjoy safe and improved access to the coast and are engaged in protecting coastal environments and the amenity of the coastal landscape
Stakeholder partnerships	Successful cross tenure partnerships are fostered to better manage shared issues
Cost effective and adaptive management processes	Sound monitoring practices, record keeping and reporting facilitate ongoing learning and improved management capacity
Awareness and continuing attachment	People can talk about the value of the coast and how the coast changes over time

More detailed performance targets for Part A of the CZMP are included in **Section 8.2**.

1.1.3 Linking Part A of the CZMP to Council's Strategic Direction – Environmental Sustainability

Part A of the CZMP will deliver outcomes identified in the LMCC Community Strategic Plan (2013-2023). These include maintaining and enhancing the health of aquatic ecosystems; supporting community resilience to environmental threats (such as invasive species, erosion, inundation); increased capacity to protect important environmental values and to adapt to climate change; and enhancing the quality of the City's landscape.

Part A of the CZMP will also help to deliver outcomes in Council's Environmental Sustainability Action Plan 2014-2023 (ESAP). Several of the themes, targets and actions identified in the ESAP are relevant to Part A of the CZMP or will be, in part, implemented through this Part. For example, targets in the ESAP include:

- No net increase in exposure of Council and the community to risks from climate change;
- 5% reduction in exposure of Council and the community to risks from natural disasters;
- Maintain or improve the condition of 25% of land with high conservation value under Council's care and control; and
- 20% increase in area of public and/or private land with conservation status (excluding the lake).

The ESAP also includes performance targets, indicators and actions in relation to environmental management issues that have been identified as important to people using the coast. An example is litter and illegal dumping – both of which have been identified by stakeholders as issues requiring improved management in the coastal zone environment.

1.2 Where does Part A of the CZMP apply?

The 1997 NSW Coastal Policy defines the coastal zone to include:

> 'a one kilometre strip along the coastline, three nautical miles seaward and all coastal rivers, lakes, lagoons, estuaries and islands. The definition also includes land within one kilometre of coastal rivers, lakes, lagoons, estuaries and islands'.

Part A of the CZMP, is focused on those areas likely to be affected by open coastal processes until 2100 (including the impact of projected sea level rise), plus a buffer to allow for uncertainty. It principally covers land that is within 400 m of the current mean high water along the city's open coastline. It includes beaches, frontal dunes, rock platforms, headlands/bluffs and several small coastal creeks. **Figure 1.1** shows the Lake Macquarie coastal zone study area, and individual coastal areas.

Part A of the CZMP has been undertaken in conjunction with the Estuary (Part B) and the Swansea Channel (Part C). Parts A, B and C which together make up the Lake Macquarie CZMP. A summary of the first four years of management actions is presented in a 4 Year Action Plan which is designed to be adaptable and reflect the priority coastal actions for Council every for years.

Council's existing Plans and Policies relevant to Part A of the CZMP include:

- Lake Macquarie Coastline Management Plan (Umwelt, 1999) focusing on management of the open coast and risks associated with coastal processes;

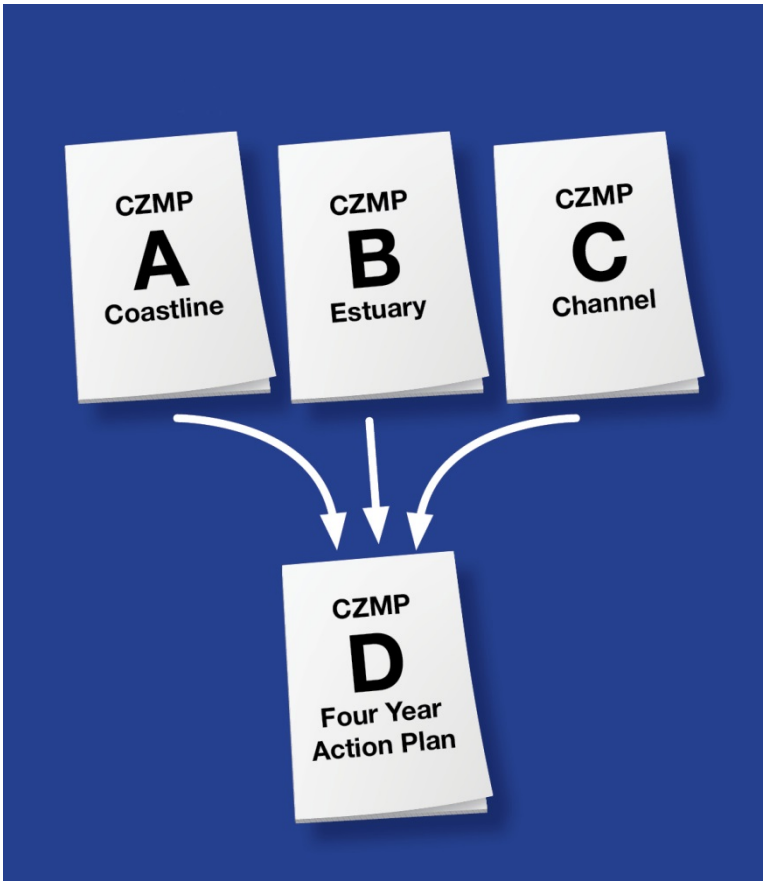
- Lake Macquarie City Council Sea Level Rise Policy (as reviewed in August 2012). This Policy is based on robust scientific studies and opinion. It adopts planning benchmarks for sea level rise of 40 cm above 1990 levels by 2050 and 90 cm above 1990 levels by 2100.

- Lake Macquarie Coastline Ecological Resilience Study (Umwelt, 2010).

- Lake Macquarie Community Strategic Plan 2013-2013.

The NSW Guidelines for Preparing Coastal Zone Management Plans (OEH, 2013) include requirements for open coast and estuarine components of a CZMP, with a view to later integration of plans prepared across the entire coastal zone landscape.

Figure 1.2 –Parts A, B and C that form the integrated CZMP. Part D which is not part of the Certified CZMP, comprises Council's four-year action plan.



1.3 The Lake Macquarie Community in the Coastal Landscape

The sandy and rocky coastline is an important part of the character of the City of Lake Macquarie. As a physical feature, it is the interface between the marine environment and the terrestrial environment. Whilst the Watagan Range forms the western backdrop to the city, the ocean is its eastern landscape context.

Geology and geomorphology create a scenic landscape

Scenically, the open coast of the city is a highly attractive landscape, with high cliffs, sea caves, wide tessellated rock platforms, fossil forests from the Permian period, long swathes of sandy beach, small coves and sheltered lagoons. The sandy coastline and high ridgelines along the coast contain Lake Macquarie itself – the signature feature of the City.

Ecological value

Some of the ecological communities on the Lake Macquarie coastline are rare or endangered, including the *Themeda* grasslands on headlands and the littoral rainforest at Swansea Heads. In addition, many coastal habitats in the City support high biological diversity and rare species such as endangered shorebirds and animals that live off the rock platforms. Importantly the ecological communities combine with the geomorphic structure of the coast in a scenic landscape of beaches, headlands and shore platforms highly valued for recreation by locals and visitors.

The ecological condition and value of the coast has been affected by historical mining and extractive industries, with examples at the dunes at Nine Mile Beach (mined for mineral sand and construction materials), headlands and foreshore south of Caves Beach (modified by extractive industry) and Catherine Hill Bay (coal mining and the mining settlement heritage of the City). Urban development has encroached on coastal headlands at Redhead, Swansea Heads and Caves Beach, as well as behind the coastal dunes at Redhead and Blacksmiths. Old access tracks constructed for these land-uses have opened pathways for walkers, cyclists and off road vehicles. Notwithstanding this disturbance much of the coast is in relatively natural condition, including land managed in National Park, State Conservation Area and by Council as community land.

Awabakal country

Both the open coast and the lake have significant and continuing cultural meaning and value for the Awabakal people. The coastline bears abundant evidence of the traditional economic and cultural value of coastal resources to Awabakal people. Large midden sites of lake and rock platform species occur in the lake entrance area, and on dunes and headlands along the whole coast. Several burials have been discovered, including those now ceremonially reburied in the Swansea Heads reserve. The early European observations of Awabakal people in the lake and along the coast indicate active and prosperous group of several hundred people, with considerable skill in fishing and shell fishing, including with hook and line from canoes, and by diving or with long spears from the shore and rock platforms.

European arrival

The coastline and the lake entrance are the site of the earliest European contact and settlement in the Lake Macquarie area. The lake entrance was accidentally discovered by the British in 1800, just one year after the discovery of the Hunter River and its coal resources. Initially known as ‘Reid’s Mistake’, the channel was first entered by Europeans when Captain Reid of the *Martha*, on his way to fetch coal from the new mines at the mouth of the Hunter River, somehow ended up in the shoaled entrance channel of Lake Macquarie.

> ‘By the master’s account, he had not been in the river, but in a salt water inlet about five leagues to the southward of the river, having a small island at its entrance. He was conducted by some natives to a spot a small distance from the mouth, where he found an abundance of coal (Collins, 1802)’

In fact, Reid is reported to have loaded some of this coal (King, 1800; reported in Clouten, 1967), dating the first coal extraction from the Lake Macquarie district to only a few months after its discovery in the Hunter.

Ownership and access

Council does not manage all lands along the City's coastline. Land tenure and management is shared with the following organisations:

- National Parks and Wildlife Service – Nature Reserves and National Parks. Management of these lands is set out in Plans of Management.
- Crown Lands Division of the Department of Trade and Investment – Belmont Wetlands State Park (managed by a Crown Reserve Trust) and other parcels of Crown Land/Reserve. Management of these lands is set out in Plans of Management and Master Plans.
- Hunter Water Corporation.
- Belmont Golf Course.
- Private owners, such as Coal and Allied at Catherine Hill Bay and multiple residential land owners within the 1km coastal zone.
- Awabakal Traditional Owners organisations who are registered Native Title Applicants for the region.
- Local Aboriginal Land Councils, which own land as freehold or have applications over some parcels of Crown land, made under the NSW *Aboriginal Land Rights Act*.

The NSW Coastal Design Guidelines (Department of Planning 2003) note that the success of many highly urbanised coastal localities is at least in part due to the extent and design of access to the coast and the ways in which the transition from private land to public land are managed for public benefit as well as for cultural, social, environmental and economic purposes. The Guidelines also note that in other sections of the NSW coast, the foreshore comprises 'a sequence of significantly larger public open spaces with complementary characters and functions, including native vegetation and habitat, playing fields, recreation facilities and caravan parks.

This latter type of coastline, less directly affected by intensive urban development, best describes the Lake Macquarie coast, except that parts of the Lake Macquarie coastline, such as the Belmont Golf Club are in private ownership and managed as open space. The remainder of the foreshore area of the open coast is now within National Park or Nature Reserve or Crown Land.

Recreation and social value

Most residents of Lake Macquarie do not live right on the coast. However, there are several distinct local communities with strong attachments to the coast. These are at Catherine Hill Bay, Caves Beach, Swansea, Blacksmiths, Redhead and Dudley. Many residents of these areas use the coast daily.

In summer the beaches along the Lake Macquarie City coastline are enjoyed by families from all over the city and from further afield. Surf Clubs and patrolled beaches are located at Redhead, Blacksmiths, Caves Beach and Catherine Hill Bay.

Within the local community, the open coast is an alternative to the more sheltered waters and foreshore of Lake Macquarie as a meeting place and outdoor recreation space for families and friends. In addition to family recreation, the open coast is associated with particular social groups – surfers, surf clubs, fishermen, off-road vehicle user and beach walkers who all enjoy the natural and constantly changing environment.

The Office of Environment and Heritage (OEH) website reports 'Research by Tourism Australia indicates that, on average each year, more than 780,000 people holiday in Lake Macquarie City Council area and a further 434,000 people make day visits. 'Going to the beach' is listed as a top activity by 66% of international tourists and almost 30% of domestic tourists holidaying in the area (from the RET, 2008; accessed December 2011).' Four of the top 20 tourism destinations listed on the Visit Lake Mac web site (accessed September 2014) are on the open coast – Redhead Beach, Blacksmiths Beach, Caves Beach and Catherine Hill Bay.

The economic contribution of visitors to the City, who are attracted by beach access, makes the beaches and headlands of the coast a significant economic asset.

This combination of cultural, social, economic and environmental values means that healthy, functioning natural systems in the coastal landscape are very important to the sustainable prosperity and wellbeing of the city.

Threats to coastal values

The interaction of people and land uses with the coastal landscape is a source of great social and economic benefit for the city, but also leads to threats to the health of natural systems. The challenges to maintaining the coastline's important values include controlling and reducing well established invasive species, damage to habitats by tracks, fire and clearing, illegal dumping and managing safety concerns and conflicts between users. Over and above these impacts of human use are the changes to the coast that are projected to occur as sea level rises and other climate changes take effect over the next century.

People who have lived on the coast for some time have already seen the effects of elevated water levels and major storms on beaches and dunes and how long it takes the system to recover after a major event. The risks associated with future climate change magnify these existing experiences, leading to recession of the shoreline and reduced capacity to recover from intermittent major storm events. Some small beaches could disappear altogether, rock platforms become permanently inundated, and dunes roll landward over existing vegetation and built assets. For a coastline highly valued for its natural values, recreation and relaxation, these changes are significant.

1.3.1 What's special about the Lake Macquarie coastline?

Table 1.2 provides a summary of key physical, social and institutional factors that influence the management of the Lake Macquarie coastline.

Table 1.2 – Key Features and Factors

Coastline and Coastal Process and Scale
• A diverse coastal landscape with high sandstone and conglomerate cliffs; sea caves; shore platforms; long barrier beaches (up to 13 km); pocket beaches and coastal dune systems of Holocene and late Pleistocene age • Predominantly a high energy coast, with highest waves associated with East Coast Low events • Active frontal dune processes during storm events, but relatively low risk because of set-back of development from the beach. Historical records indicate a stable sandy coastline with periodic erosion and accretion, slight rotation on longer beaches during El Nino and La Nina events • The key coastal risk area is Blacksmiths with potential for interaction of coastal erosion/recession and lake inundation over the next century • Entrance to Lake Macquarie – control structures (training walls) have affected coastal processes since late 19th century • Potential for block failure on coastal cliffs.
Land Use and Recreational Value
• Historical mineral sand, construction sand, rock quarrying and coal mining have contributed to coastal form, coastal access and the heritage value of the landscape. • Four main surf clubs with patrolled beaches focus recreational use by families and visitors; strong surf lifesaving culture and competitive record at these clubs. • The coast is a significant local recreation resource but remains uncrowded when compared with metropolitan beaches; the coastline is undeveloped in terms of access facilities (for instance, compared with Newcastle) – a more natural recreational experience. • Parts of Nine Mile Beach are open to off-road vehicles, used by beach fishermen and other activities. • Significant influx of summer visitors staying in caravan parks and holiday homes. Lake Macquarie coast is in easy travel distance from northern and western Sydney
Community and Stakeholder Attitudes to Change
• Strong community involvement in Dunecare and Landcare over two decades, with evidence of significant improvement in dune condition at key sites. • Management of safe and appropriate beach access by off road vehicles is a challenge for landowners and managers • Community resistance to urbanisation of the coastline; attachment to a natural coastal landscape
Institutional – Track Record and Commitment
• Initial Coastline Management Plan prepared in 1999; many actions implemented • Council has a strong reputation for coastal zone natural resource management achievements, but more lake focused than open coast • Limited resources available for managing significant natural resources issues and landscape remediation in the Belmont Wetlands State Park • Hunter Water and Belmont Golf Course manage ocean frontage land, with Golf Course owning to Mean High Water • Relatively recent transfers of private land to National Park south of Caves Beach, with ongoing investment needed to enhance ecological condition • Potential for stronger partnerships between Council, Golf Club, Land Councils, Surf Clubs and Crown Lands. • Lower risk profile to date, but clear scenario testing and asset management plans required for the future, e.g. for entrance training walls, waste water treatment and discharge infrastructure; coast and beach access; and surf clubs.

1.4 Policy and Plan Alignment

As noted in **Section 1.3**, the ownership of the Lake Macquarie open coast is shared by several public and private organisations. Land tenure maps for the study area (where information is available) are included in **Appendix 1**.

In accordance with the OEH Guidelines for preparing CZMPs (2013) Part A of the CZMP focuses on strategies to be implemented by LMCC and does not duplicate the recommendations contained in regulations or plans made under other NSW legislation. These existing policies and plans include the regulation of commercial and recreational fisheries, pollution control, water management/water sharing plans and boating management plans, as well as plans of management made under the *Crown Lands Act 1989*.

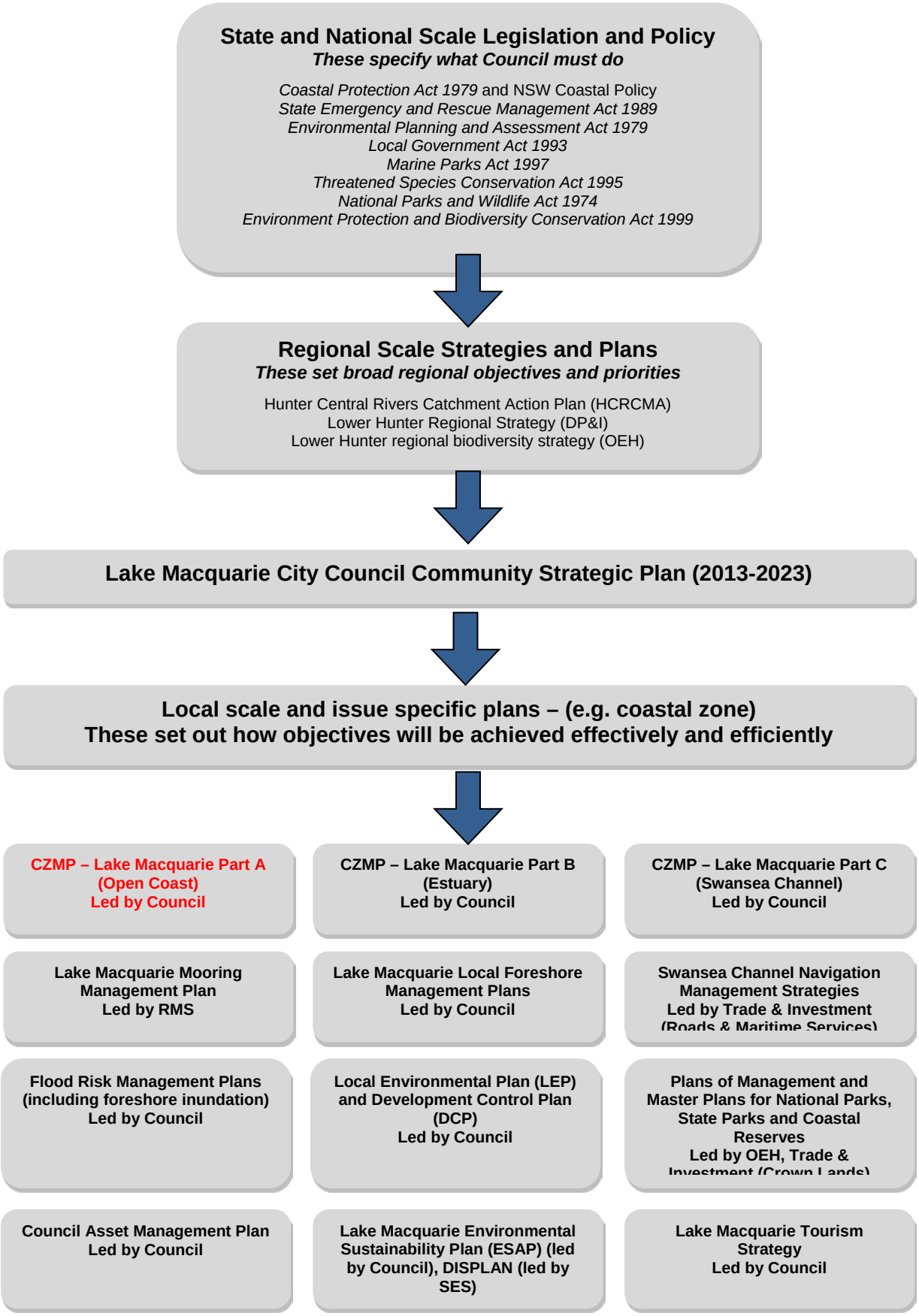
Table 1.3 shows the purpose of land management by organisations that share responsibility for the coast with LMCC. **Figure 1.3** shows how the various management plans prepared and implemented by different levels of government fit together.

Where Part A of the CZMP draws on new knowledge that would inform updates to other existing plans, it makes recommendations about potential changes to the plans to improve the overall management framework and the delivery of coordinated, cost effective and appropriate management for the Lake Macquarie coastline. These recommendations are highlighted in **Section 16**.

Table 1.3 – Management purposes of land management tools along the Lake Macquarie Coastline

Land Management Tool	Management Purpose
Belmont Wetlands State Park Plan of Management	Gazetted for Access and Public Requirements, Tourism Purposes and Environmental and Heritage Conservation 'Provide the community with a sustainable world class, family orientated facility featuring passive and active recreational and educational activities within a rehabilitated and well managed coastal and wetlands park environment.'
Wallarah National Park Plan of Management	Conserve significant cultural features, biodiversity (plants, animals and their habitats) and scenic landscape elements, and to provide public access for enjoyment and education
Glenrock State Conservation Area	Primary purpose is for recreation and conservation. The SCA conserves over 500 ha of natural coastline and supports the last surviving pocket of coastal rainforest in the region
Awabakal Nature Reserve Plan of Management	Recreation and conservation of cultural and natural heritage
Munmorah State Conservation Area	Recreation and conservation of cultural and natural heritage
Hunter Water Corporation – Belmont WWTP	Maintain an asset to treat wastewater and discharge to ocean in accordance with EPA licence conditions.
Council managed coastal reserves – Plans of Management	Conserve natural resources, promote public use and enjoyment, promote multiple appropriate and sustainable uses

Figure 1.3 – Integrating Statutory Policies and Management Plans for the Coast



1.4.1 Who will deliver action – partnerships on the coast

Part A of the CZMP proposes a partnership approach to coastal zone management, where each landholder works cooperatively with others and with people who use and enjoy the coastal landscape, to achieve agreed objectives for the coastal environment and for community access and enjoyment.

Council's coastal zone management responsibilities are shared across several different departments. The discussion of issues and options in **Sections 3** through to **15** and the implementation schedules for Part A of the CZMP in **Section 16,** indicate the sections of Council that would have a role in delivering the Plan to achieve a resilient coastline. Coastal management actions will be implemented through the work plans of these different areas of Council, each working closely with local communities, the private sector and other relevant government agencies as relevant.

In preparing Part A of the CZMP, Council consulted and shared information with other land owners along the open coast. Through this process, the objectives and outcomes of Part A of the CZMP are understood and accepted by other land holders. The key issues raised by stakeholders are discussed in **Section 4** and additional consultation responses (community uses survey) are in **Appendix 2**.

Council will also work closely with the Office of Environment and Heritage (OEH), Department of Trade and Investment (Catchments & Lands) and Land and Property Information (LPI) of the Department of Finance and Services, Hunter Local Lands Services (HLLS), Department of Planning and Environment (DPE) and other agency stakeholders to ensure a consistent approach to coastal risks, to the decisions about coastal access and to the protection of important coastal ecosystem functions by Council and these organisations.

Part A of the CZMP does not duplicate existing management actions in plans made by these partners. It does make strategic recommendations to be considered by coastal management partners, to help deliver a coordinated, integrated, informed and adaptive management approach for the coast.

1.4.2 State and regional natural resources targets

Council's management of the natural resource values of its coastline contributes to the achievement of State and regional objectives, targets and priorities.

Of the 32 goals in the NSW State Plan 2021, the cluster under the 'Strengthen our Local Environment and Communities' heading are relevant to managing the coast. These goals are noted below. Neither the Hunter Regional Action Plan nor the Central Coast Regional Action Plan identifies any state government environment and community priorities in Lake Macquarie.

Goal	Description
22	Protect our natural environment. The coast is not specifically mentioned in targets and priority actions under this goal, but could be included in plans to acquire high conservation value land, reduce rubbish dumping and voluntary landowner agreements.
23	Increase opportunities for people to look after their own neighbourhoods and environment. The coast is not specially mentioned, but is indirectly considered in actions to support Landcare and catchment management groups (now part of Local Land Services). The NSW Government also undertook to complete fine scale climate change projections for NSW.
24	Make it easier for people to be involved in their communities (Goal 25 relates to seniors participating in their communities).
26	Fostering opportunity and partnership with Aboriginal people.
27	Enhance cultural, creative, sporting, and recreation opportunities.
28	Ensure NSW is ready to deal with major emergencies and natural disasters. Guard against coastal erosion by ensuring that all identified coastal erosion hot spots have plans in place by 2015 (note LMCC has no coastal erosion hotspots)

At the regional scale, State-wide goals and targets are given effect through an interim 10 yr Hunter Central Rivers Catchment Action Plan (CAP), 2013-2023, and annual investment plans prepared and implemented by the HLLS – formerly the Hunter - Central Rivers Catchment Management Authority.

The HLLS has a number of broad resource condition targets which set the scene for managing biodiversity resilience on the Lake Macquarie coastline. These targets provide the framework for land use planning at the local government level. For instance, in relation to biodiversity, the interim CAP has targets for protection and enhancement of wetlands, dunes and marine shorelines.

The HLLS is currently developing the implementation plan for the interim CAP, and updating the priority of actions for the coastal zone. Key themes in the interim CAP include improved alignment of objectives, plans and actions at all levels of government; and enhancing the resilience of natural systems and the human communities who depend on them. LMCC will continue to work with the HLLS so that investment in coastal systems is efficient and effective.

1.5 Coastal science and social studies – information for decision making

Part A of the CZMP draws on a combination of scientific knowledge and information about the ways in which the community uses and values the coastal landscape. The new LMCZMP[A] takes into account feedback about the implementation of the 1999 Lake Macquarie Coastline Management Plan (**Section 3**).

The Plan is intended to be adaptive. It is not the last word on managing the coast. It contains an ongoing program of studies to enhance knowledge, to monitor coastal condition, to transfer coastal land parcels into reserve status for the purposes of corridor health where appropriate, to review how well actions have achieved their intended outcomes and to seek feedback from coastal users.

Key knowledge underpinning the risks, options, evaluation and priorities in this LMCZMP[A] includes:

- Evaluation of previous management actions (see **Section 3.1** and **Section 3.2**);
- Water quality monitoring (Beachwatch) (see **Section 3.2.3.2**);
- Cultural heritage studies (See **Section 4**);
- Results of project specific coast user surveys and broader council services surveys (see **Section 4**);
- Biodiversity studies, monitoring and ecological resilience – rock platforms, headlands, beaches and dunes (see **Section 5**);
- Updated coastal hazard studies (see **Section 6**);
- Coastal risk assessment (see **Section 6.2**);
- Information about the value (financial and social) of coastal assets and infrastructure and the costs of relocating or retrofitting assets and infrastructure to adapt to changing coastal hazard profiles (see **Section 9**); and
- Decision support systems that consider diverse environmental, social and financial risks and values (see **Section 7** and **8**).

1.5.1 A framework for on-going coastal zone management

An adaptive management cycle has four steps (**Figure 1.4**). Managers track progress against expectations and evaluate the effectiveness of responses in meeting community and environmental objectives.

Council will continue to monitor the condition of the coast and shoreline responses to major storm or extreme water level events, so that Council and local communities have the best available knowledge to evaluate, review and adapt management actions. Council will also continue to work with NSW and Australian government to facilitate a coordinated approach to difficult coastal change issues.

Details about establishing monitoring programs to track changes to the condition of the coast are in **Section 15**.

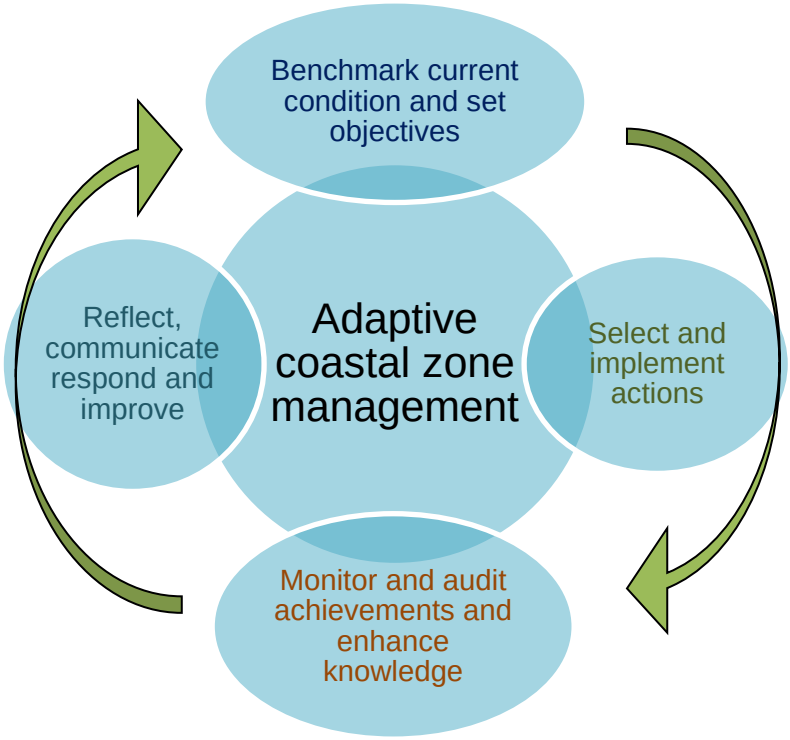


Figure 1.4 – Adaptive strategy for continuous improvement of coastal zone management

2.0 Vision for the Future Coastline

In this section
Our vision for the coast

What future is Council working towards for its coastline?

The context for the vision of Part A of the CZMP is the relevant focus areas from Council's Community Strategic Plan (CSP) (2013-2023), and the overarching mission and vision identified in the CSP. These are:

Quality Lifestyle
Caring for the Environment
Caring for our Community

Key concepts to be included in the vision for the coast, and potential wording were discussed with Council's Estuary and Coastal Management Committee. Draft ideas are noted below, for further discussion.

2.1 Vision for the Coast

The technical concept that describes the future coast that Council wants to work towards is embodied in the phrase:

'Resilient coastal landscapes and communities'

Resilience is an important concept used in natural resource and community plans at all scales. It is a key element of a healthy natural environment and implies a skill set and community attitudes that support the capacity to recover from adversity (including natural disasters) to maintain high levels of community wellbeing.

Feedback from the Estuary and Coastal Management Committee is that they favour the concept of resilience as the essence of what Part A of the CZMP should deliver for the coast and community who enjoy it. There was a preference to use words that express attachment to and passion for a healthy and accessible coast (social values), rather than technical words. This could mean something aligned with 'Living Lake Macquarie'.

'Living Coast' for the coastal areas (**Part A** of the CZMP), and

'Living Lake' for the lake and estuary (**Part B** of the CZMP)

Council's communications team are well placed to assist with how best to express these ideas.

3.0 Status of the Coast and the 1999 Coastline Management Plan

In this section
What has been achieved so far?

Council has been implementing coastal management actions with limited resources over the last 13 years. These actions were identified in the Coastline Management Plan (CMP, Umwelt 1999). This section reviews the work undertaken in that time, and considers:

- Whether or not coastal ecosystems are healthier, more resilient, and better protected than before implementation commenced;
- The progress in supporting community access to and enjoyment of the coastal environment;
- If the community has been well informed about coastal processes and about the impact of community use in the resilience and vulnerability of the coastal environment to new or more intense pressures;
- If there is a strong alliance between council, agencies and local communities to protect the values of the coastline; and
- Any shared objectives for the future of the coastline that can be taken forward into a revised and updated plan.

3.1 Previous Priorities (CMP 1999) and Achievements

The 1999 Coastline Management Plan identified ten priorities to be the focus of implementation. Council staff, coastal stakeholder organisations and community members provided feedback about the implementation and achievements of the 1999 Coastline Management Plan, through interviews and responses to a survey (see **Appendix 2**).

An important theme in this feedback is that the 1999 Plan was very useful; it detailed baseline information about some coastal values; but limited resources and implementation mechanisms have constrained its value. For example, the 1999 plan provided a detailed technical reference about land parcels along the coast, that could be used by Council staff in Plans of Management (PoMs) and review of development applications, including Council submissions on major development proposals south of Caves Beach and at Catherine Hill Bay.

Table A1 in **Appendix 1** shows many of the previous actions that were presented in the 1999 CMP as well as various local PoMs.

Table 3.1 highlights the ten highest priorities from the 1999 Plan and key achievements.

Table 3.1 - Priorities and achievements from the 1999 Coastline Management Plan

Priorities	Achievements
Identify the coastal impact zone and coastline corridor or protection zone to distinguish areas with high natural and visual conservation values and to facilitate ongoing public access to the coast.	Council officers have had a valuable, detailed reference about the baseline condition and management options for the whole coast. Information from the CMP has informed Council's response to both strategic and development assessment planning. A coastal corridor is in place, but needs reviewing for headland and beach contexts as the 40m set back recommended on headlands has been found to be not sufficient for some scenic and biodiversity outcomes.
Identify coastal zones in the Local Environment Plan (LEP) and Development Control Plan (DCP) to minimise the risks of intensified development in areas projected to be affected by coastal hazards within reasonable planning horizons.	A risk based coastal land use scheme (LEP, DCP and s149 certificates) is in place, to be updated to meet current state template requirements.
A coastal walk extending the full length of the coastline, as a unifying feature which would also provide new recreation and tourism opportunities.	Parts of the coastal walk are in place and are popular for community recreation, but use and impact need monitoring. This concept needs review in light of the Fernleigh Track.
Rationalise land tenure and governance, with transfers of land tenure from private to public ownership and from Council to state agencies as necessary to reduce fragmentation and unnecessary duplication of management processes.	Parcels of Coastal Crown land have been appropriately dedicated, but it has been a long and resource intensive process in many cases requiring rehabilitation of parcels of land as with the case at Dudley prior to transfer into Awabakal Nature Reserve. Transfer of this land has now been achieved. The new Belmont Wetlands State Park with a Plan of Management in place.
Risk assessment and controls for safe recreational access, particularly on headlands	Limited progress on this priority was identified in early workshops for the update of Part A of the CZMP and a project has recently commenced.
Stronger management of vehicle and pedestrian access	Council has formed a coastal managers working group to look jointly at issues of access, off-road vehicle use, recreational activities and illegal dumping issues along the coast.
Further records of heritage values	Council completed an Aboriginal cultural heritage strategy for the City since the 1999 Coastline Management Plan was prepared.
Protect and enhance ecological diversity, including invasive species programs and dune stabilisation	Landcare has achieved and maintained dune stabilisation at some locations, such as Blacksmiths Beach. Council is currently managing an annual Bitou bush spraying and coastal maintenance program

Priorities	Achievements
Education and awareness of coastal users and managers, including volunteers	Enhanced skills and knowledge in coastal ecology, rehabilitation, condition monitoring and connectivity – within Council and in local communities involved in volunteer work. Local scale guidance on best practice has been prepared for Landcare volunteers.
Develop a suitable funding strategy	Additional funding options are considered in the updated LMCZMP[A]

3.1.1 Constraints or issues remaining

Adaptive improvement of the 1999 CMP is a key objective of Part A of the CZMP using new knowledge such as the information in **Sections 4** to **8.** Part of the current knowledge is the understanding of why some previous actions have not been implemented, or have not produced the anticipated outcomes for the coast. During discussions about the implementation of the 1999 CMP, stakeholders identified the following constraints to the implementation, which have limited what the CMP has achieved:

- The Plan was not directly linked to Council's budget processes or forward works register.
- Limited funding constrained implementation. Council's environmental health focus has been on the lake and catchment.
- No 'coastal champion' or dedicated coastal management program was identified in Council's structure, compared with the specific resourcing of lake management works, which were for a decade managed through the Office of the Lake Macquarie Catchment Coordinator set up by the Premier's Taskforce. There has also been no clear community advocate for the coast as a whole.
- A sense that the coast is 'taken for granted', couple with a perception of polarisation of community values – conservation or recreation?
- Formal partnership arrangements suggested in the plan are not fully resolved, but a willingness to cooperate is apparent.
- Limited coastal management resources have been fragmented between a range of conservation and access initiatives, including the State Park, a separate Wetland Park proposal and other programs to transfer ownership of lands suitable for conservation.
- Surf clubs have continued to expand, increasing asset risks in the coastal hazard zone. The social and economic function of these buildings has also increased, as clubs are now used for activities, such as filming and weddings, in addition to routine Surf Life Saving Club activities and carnivals.
- Off road vehicle use for recreation has increased, with increasing population, increasing wealth and continuing disregard to formalised access. Access through private land and Crown Land has not yet been controlled. The Belmont Wetlands State Park Trust formalised access for 4WD which has led to a noticeable increase in vehicle numbers entering Nine Mile Beach. Efforts have been made to limit illegal access on Council managed land.

- Limited progress on protection of heritage assets and Aboriginal land tenure issues. A large number of Land Rights claims in the coastal zone are not yet resolved.

- A safety audit of paths on headlands is currently being funded. A risk assessment of Spoon Rocks has not been prioritised for funding.

- Asset management on the coast is not a specific priority in Council's asset plans.

- The 1999 Plan includes sea level rise issues, but the risks were not fully taken forward into detailed plans of management for Crown land (e.g. State Park) or private land.

- The detailed Plans of Management (PoM) prepared out of the Coastline Plan have now been superseded by a generic PoM for the City.

3.1.2 Trends in the condition of the coast

Trends in the geomorphic condition of the coast are discussed in **Section 6**, as part of coastal process and hazard assessment. The available information shows how the morphology of the frontal dunes has varied through erosion and accretion over the last 50 years. The information on trends in condition is not linked to specific management practices. There are examples of general relationships, such as between the remediation of mobile dunes at Caves Beach and reduced dune migration into recreational reserve space. Similarly, Landcare dune management works at Blacksmiths have helped increase dune height and volume.

Trends in the ecological and recreational condition of the coast are not currently available, because monitoring programs have only recently been established. The scopes of Council's ecosystem monitoring program and the beach water quality program (for recreational water quality) are noted in the following sections.

There is currently no long term monitoring program tracking the condition and suitability of recreational assets in the coastal zone.

Information about proposed future coastal condition monitoring, complementing the existing programs, is in **Section 15**.

3.1.2.1 Community Monitoring Strategy

Council initiated a program in 2010 to monitor the condition of ecological communities across the City. Ecological community and habitat mapping is available, and Council's Community Ecosystem Monitoring Program provides some longitudinal data on the condition of specific sites. Limited site specific condition data is available for Landcare project sites, to meet Caring for our Country and CMA grant requirements. To date there has been no city wide or coast wide tracking of changes in ecological condition (providing area rather than point or transect data).

Council's Community Ecosystem Monitoring Program includes six sites in coastal ecological communities (see **Figure 3.1**), including:

- Saltmarsh: two sites in wetlands at Black Neds Bay (Swansea Channel)
- Littoral rainforest: one site at Swansea Heads
- Coastal headland heath: one site at Caves Beach
- Maritime grasslands (i.e. grassland communities on coastal dunes): two sites on the dunes north of Second Creek

The monitoring program has been designed around the use of basic observation skills and standard sampling techniques that can be applied within various types of ecosystem. The quality of data being collected will be validated through a planned quality control program.

3.1.2.2 Beach watch

Council participates in the Beach Watch beach water quality program, in partnership with Office of Environment and Heritage (OEH). The Beach Watch program has operated in the Hunter region since 1996 and focuses on recreational water quality for swimming (biological water quality). Water quality is monitored regularly, according to standard protocols, at Glenrock Beach Dudley Beach, Redhead Beach, Blacksmiths Beach and Caves Beach and Little Beach adjacent to the southern breakwater of Swansea Channel.

The most recent results that are available are for the 2010-2011 summer. The risk of poor beach water quality events is increased by extended wet periods. Reduced water quality can occur with overflows from wastewater treatment infrastructure and with stormwater runoff from urban and rural catchments, during heavy rainfall events.

However, for the 2010-2011 summer, which was a wet summer, most Lake Macquarie beaches had consistently excellent water quality and a low risk of microbial contamination from pollution sources in their catchments.

At Glenrock Lagoon and Swansea Heads (Little) beaches, a health risk assessment commissioned by Hunter Water Corporation in 2009 indicated that there was a small risk that the effluent plume from Burwood Beach Sewage Treatment Plant (STP) could be driven back to the coast under certain combinations of wind and current (OEH website). This risk was considered as part the sanitary inspections for these beaches. However, water quality at these two beaches for summer 2010-2011 was good. Daily updates on beach water quality in Lake Macquarie City Council are available on the OEH website.

The 2015 rating of 'annual beach suitability grade' for Dudley, Redhead, Blacksmiths and Caves Beaches is 'very good'. For Glenrock and Swansea Heads, the 2015 annual beach suitability grade is 'good'. A 'very good' rating means the water is suitable for swimming almost all of the time, with very few sources of faecal contamination. A 'good' rating means the beach is suitable for swimming most of the time, but there are more sources of potential faecal contamination.

These findings are consistent with community feedback about the cleanliness of the water at Lake Macquarie ocean swimming beaches.

Recreational water quality is not an issue for the Lake Macquarie coastline.

Site_Number	Ecosystem_Type	Date	Keith_Class
1	Heath	27/10/2011	Maritime Grasslands
2	Heath	27/10/2011	Maritime Grasslands
39	Heath	14/10/2011	Coastal Dune Dry Sclerophyll Forest/Wallum Sand Heath
13	WETLAND	17/09/2010	Saltmarshes
14	WETLAND	17/09/2010	Saltmarshes
15	HEATH	28/09/2010	Coastal Headland Heaths

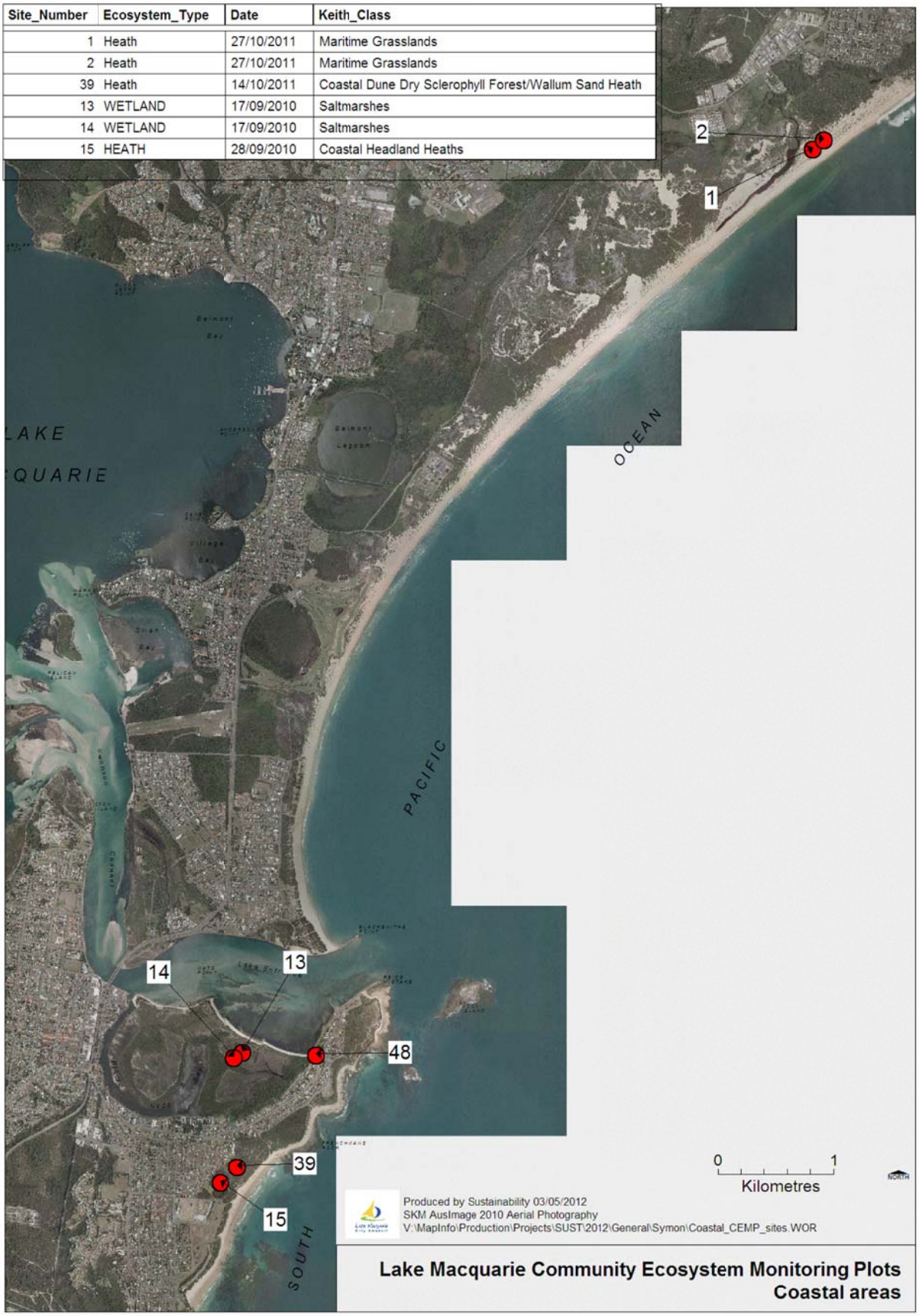


FIGURE 3.1

Lake Macquarie Community Ecosystem Monitoring Plots Coastal Areas

Image Source: Sustainability (2012)

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4.0 Community and Stakeholder Issues – New and Ongoing

***In this section**:*

How people had a say

Community values and resilience – what's important to people who use the coastal landscape?

Stakeholders issues – what's important and challenges organisations that manage the coastal landscape

The issues noted in this section are derived from:

- Matters raised by Council officers based on their experience of managing diverse coastal issues.
- Matters raised by stakeholders who manage parts of the coast – Hunter Water Corporation, NPWS, DPI Catchments & Lands (including the Belmont Wetlands State Park Trust), Belmont Golf Club, Awabakal Traditional Owners Aboriginal Corporation, Awabakal Descendants Traditional Owners Aboriginal Corporation and Bahtabah Local Aboriginal Land Council.
- Matters raised by residents and beach users in the community through a coastal uses survey and via community information days at two beaches.

4.1 How People had a Say

During the preparation of the plan, people were invited to provide input about stakeholder and community issues and concerns, community use, community values and community satisfaction about coastal facilities in four different ways. These included:

- Written invitations were sent to stakeholder organisations, asking them to provide input about their perspective on coastal management issues. Follow up meetings were held with Trade and Investment - Crown Lands, Trustees of Belmont Wetlands State Park, Hunter Water Corporation, Belmont Golf Course, OEH (Parks Service), NPWS and Traditional Aboriginal Owners groups.
- Council established a project page on its web site, offering information, contact details and feedback links
- Two community information days were held, one at Redhead Surf Club and one at Swansea Blacksmiths Surf Club, on summer weekend afternoons. Information flyers, coastal user surveys and other display material were available at these events.
- Approximately 160 people responded to a community user survey, which was available electronically and in hard copy. Details of the survey are in **Appendix 2**. A summary of values and issues is in **Sections 4.2.1** and **4.2.2**.

The Draft Lake Macquarie Coastal Zone Management Plan (CZMP) was placed on public exhibition from 28 October 2014 through to 31 January 2015. The objective of the public exhibition period was to give all Lake Macquarie City residents a chance to understand and provide feedback on the actions proposed in the draft CZMP or to suggest new actions.

Community workshops, online engagement and 'pop-up' information booths were used to give the public information about the contents of the draft CZMP and to get community input to the proposed actions and ensure that the challenges and opportunities from the perspective of the community were identified.

A specific workshop for **Part A – The Coastline** was held at Blacksmiths Surf Club, Blacksmiths on 19 November - 5.30-8.30pm. Input was received from the 21 participants attending this session.

Council's Have Your Say website also hosted a project page (www.haveyoursaylakemac.com.au/coastal-zone-management-plan) where participants could rank the actions for the area of the Coastline. A total of 28 responses were submitted on the actions for the Coastline.

Overview

Of the 28 responses that related to the Coastline, 14 responses were submitted directly through the website and 14 responses were submitted via the information pop-up booths. The themes of most interest to these respondents (highlighted yellow in **Table 4.1**) were:

1. Theme 3 - Actions for sustainable community access, use and value *(11 responses)*

2. Theme 2 - Actions for a healthy coastal zone, protecting the natural environment (including biodiversity and ecological resilience) *(10 responses)*

3. Theme 1 - Actions to manage coastal process hazards and risk (such as erosion and inundation) *(4 responses)*

Table 4.1: Online consultation for Part A Coastline

Theme	Online Consultation		
	Website	**Pop-up**	**Total**
1. Actions to manage coastal process hazards and risks (such as erosion and inundation)	**3**	**1**	**4**
2. Actions for a healthy coastal zone, protecting the natural environment (including biodiversity and ecological resilience)	**4**	**6**	**10**
3. Actions for sustainable community access, use and value	**6**	**5**	**11**
4. Improve Council's focus and capacity to manage coastal values	**0**	**0**	**0**
5. Strong governance and supportive partnerships	**0**	**0**	**0**
6. Actions for communication and collaboration	**1**	**1**	**2**
7. Knowledge and adaptation, managing uncertainty	**0**	**1**	**1**
TOTAL RESPONSES	**14**	**14**	**28**

Table 4.2 identifies what online participants considered to be the top 10 management actions for the Coastline.

Table 4.2: Ranked Management Options from online consultation

Ranked management actions	Theme
1. Prepare a strategy to provide controlled and managed off road vehicle access to Nine Mile Beach. Identify locations for formalisation of access ways and rehabilitate degraded areas.	3
2. Regulate the prohibition of off-road vehicle driving on Lake Macquarie beaches and coastal headlands currently managed by Council	3
3. Work to involve off-road vehicle users in Clean Up Australia events in the Belmont Wetlands State Park (BWSP) and along Nine Mile Beach.	3
4. Protect threatened shorebirds by seasonally excluding off-road vehicles and dogs from shorebird habitat.	2
5. Review essential uses for frontal dunes to establish trigger points for commencing detailed planning for protecting or relocating surf club buildings.	3
6. Encourage further ecological research on coastal dunes under sea level rise scenarios. Incorporate the results into future coastal risk and ecological resilience management	2
7. Use environment protection zoning (E2 or E3) for all public land along the Lake Macquarie coastline, as far landward as the extent of coastal recession by 2100.	2
8. Focus on eliminating Bitou Bush on dunes, headlands and around wetlands, as a priority.	2
9. Update Plan of Management for Swansea Heads Reserve to better manage the Aboriginal values of the reserve and tell the story of the Awabakal people	3
10. Support the use of remote sensing tools to identify areas of high biodiversity.	2

Conclusion

Online and workshop consultation undertaken for Part A – The Coastline has assisted Council to prioritise the themes and management actions from the draft CZMP. **Table 4.3** below shows combined results of the top ranked theme and management actions for the Coastline.

Table 4.3 – Top ranked theme and management actions, Part A

1. 1. Theme 3 - Actions for sustainable community access, use and value
Prepare a strategy to provide controlled and managed off road vehicle access to Nine Mile Beach. Identify locations for formalisation of access ways and rehabilitate degraded areas.
Regulate the prohibition of off-road vehicle driving on Lake Macquarie beaches and coastal headlands currently managed by Council.
Work to involve off-road vehicle users in Clean Up Australia events in the BWSP and along Nine Mile Beach.
2. Theme 2 - Actions for a healthy coastal zone, protecting the natural environment (including biodiversity and ecological resilience)
Protect threatened shorebirds by seasonally excluding off-road vehicles and dogs from shorebird habitat.
Focus on eliminating Bitou Bush on dunes, headlands and around wetlands, as a priority.
Support the use of remote sensing tools to identify areas of high biodiversity.

3. 3. Theme 1 - Actions to manage coastal process hazards and risk (such as erosion and inundation)
Conduct on-ground beach management works to support dune recovery after storms.
Re-instate citywide beach maintenance program and continue dune rehabilitation works, fencing, access controls, weed control and native dune plantings.
Incorporate preparation for coastal recession into local community adaptation plans.
Use clauses in planning controls (eg, DCP) to require new developments in coastal risk areas to incorporate design features to accommodate coastal risks.
Use DCP clauses to establish trigger-based consents for new development in coastal risk planning areas.
Establish a beach monitoring program and monitor monthly to quarterly.

4.2 Links between Community Values and Resilience

In this context, the resilience of people and communities who live near or use the coast is in part influenced by the extent to which the functioning of coastal systems is maintained. Lake Macquarie coastal residents express a high valuation of and attachment to the coastal landscape, as a key factor in their lifestyle and wellbeing. This value encompasses the natural systems, the capacity of people to be engaged in shaping the future of the landscape that they value and the capacity of both natural systems and communities to adapt to pressures and recover from shocks. **Table 4.4** summarises characteristics of natural system and community resilience on the Lake Macquarie coast.

Table 4.4 – Resilient Landscape and Community

Our resilient coastal landscape has:	Our resilient human communities have:
• Natural systems – where ecology/biodiversity and geomorphology adjust to pressures, whilst continuing to function and provide environmental services • The condition of natural systems – like ecological communities, is maintained over time • The capacity to recover from major 'shocks', such as wildfire, very large floods or storms • Connectivity of ecological systems • The capacity to sustain productive land uses aligned with community values and for those land uses to recover or adapt to major changes in context – including new land uses, climate change and changing social expectations.	• Knowledge and awareness of environmental processes, change and risk • Good communication • Capacity to accept and thrive on community diversity such as age and interests • Respected community leaders and strong community structures • A strong sense of place • Opportunity and power to affect outcomes at a relevant scale • Capacity to apply new thinking, skills and processes and to monitor the outcomes produced • Capacity and opportunity to look forward (future thinking/imagine a valued future different to now) as well as backward

4.2.1 Community Survey Results

During the preparation of the CZMP Part A, a community survey was undertaken to gauge people's opinions and their familiarity with coastal issues. It also enquired about people's values and perceptions of the coast, as well as coastal management. Important values included maintaining the beauty and naturalness of the environment, limiting development and looking after open spaces. People also supported ongoing efforts to provide for safe and continuing enjoyment of recreational uses such as surfing, fishing and walking. **Appendix 2** presents the results of the survey with graphs of actual responses.

Table 4.5 summarises the responses, and the key concerns voiced by the community. Responses were varied and covered a number of key topics. The table notes some of the specific responses, grouped by the broad topics of recreational use, access, amenity, and other.

Table 4.5 – Community Concerns and Issues

Theme	Issue	Comments
Recreational use	Dogs on beaches	Concern over the allowance of dogs on certain beaches and dog waste.
	Walkways and pathways	Maximising connectivity between pathways and walking tracks along the foreshore, especially at Redhead and Blacksmiths (where there is no path). Construct a beach boardwalk. Possibility of a path connecting lake to beach.
	Grannies Pool	Re-establishment to its former state.
	Community events	Would like more music and events for kids
	Exercise facilities along established tracks	Add some exercise bars, etc. to the tracks and pathways most used for recreation.
Access	Disabled or mobility impaired	Some beach areas do not have accesses for less able and aged community members.
	Unusable access ways	Some accesses are over grown and not passable.
	Repairs to access ways and maintenance	Some access tracks also require more frequent routine maintenance.
	Unrestricted 4WD and quad bike access, threatening environmental integrity and public safety	Restrict and formalise access points (4WDs, quad bikes). Restrict access to some areas and formalise remaining access points.
Amenity	Lack of facilities	- Picnic/ BBQ facilities with shade - Bike racks - Footpaths - Toilets/showers
	Beach Erosion	Lack of dry beach width for recreation with increased erosion.
	Rubbish and marine debris	Lack of bins and cleanup crews. Bins should be emptied daily or twice daily during summer. Better policing of illegal dumping.
	Condition of current facilities	The maintenance and upkeep of facilities is seen to be lacking e.g. toilet blocks, showers, and surf clubs.
Other	Landcare, dunecare	Better and more consistent management of these activities,

Theme	Issue	Comments
	and conservation activities	more planting, habitat maintenance etc.
	Education	Relating to all aspects of coastal management, climate change, sea level rise, dune vegetation etc.
	Water quality	Ensure quality is monitored for recreational health.
	Invasive species and weed management	Removal of unfavourable species and weeds, and replaced with natives.
	Population pressures and infrastructure	Focus on primary infrastructure, roads, storm water etc. and amenity infrastructure such as car parks.
	Better communication	More information for residents when Council makes decisions that affect them.
	Social behaviour	Better policing for vandalism, graffiti, littering etc.
	Swansea Channel Dredging	Conflicting opinions, some want more dredging, some want it to stop. Currently proposed strategic Channel dredging will provide intermittent sand supply for nourishment of Blacksmiths/Nine Mile Beach.
	Limit development	Limit the amount and type of development in the coastal zone.

4.2.2 Threats to the resilience of community values – what the community is concerned about

The community survey results highlight issues seen by residents and beach users as threats to their coastal values. Examples of issues raised in multiple submissions are summarised in **Table 4.6**. Some of these issues have also previously been raised in consultation about other aspects of coastal zone management, such as the Master Plan for Swansea Blacksmiths area (Worley Parsons, 2008).

Table 4.6 – Threats to community resilience

Physical and ecological process impacts on landscape value and access	Uses incompatible with sensitive coastal environment
• Invasive species – spreading in dune and headland bush, despite control efforts to date • Erosion of frontal dunes – triggered by disturbance, storm bite – impacts on access • Recession of frontal dunes, plus transgression of dunes – triggered by sea level rise, disturbance – impacts on access and uses behind the current dunes	• Overuse or destructive use of dunes – waste dumping, burnt out cars, antisocial behaviour, illegal access, safety issues – off road vehicles in the wrong place and not properly controlled • Littering of beaches • Overuse of headlands – fire, erosion of tracks, safety issues for cliff top pathways and lookouts • Intensification of use – affects space for potentially conflicting uses, sense of openness/crowding at patrolled beaches.

Facilities and services not adequate for demand or potential	Empowerment constraints
• Facilities and maintenance are not suitable for user needs – beaches (clean water, free of litter, safe, food available, toilets and showers, etc.), reserves, access ways and pathways/lookouts. • 'Shabbiness' of gateway areas like Swansea and Blacksmiths	• Lack of accessible information about how the coast changes and why • Perceived lack of input to management priorities • Perceptions on inequitable management arrangements – favouring one stakeholder group over others, or not recognising particular values in a transparent way; includes perception that Council has invested in lakeside recreation areas to detriment of the open coast • Changes that reduce the autonomy of local communities to manage coastal values

4.3 Stakeholder and land manager issues

The issues highlighted in the following sections incorporate the input of Council officers and other statutory land owners and managers along the Lake Macquarie coast. These stakeholders have direct responsibility for managing the values of coastal land. In this context, the issues raised focus on management needs and gaps, including information, communication, coordination, budget requirements and progress tracking.

The views of these stakeholders are in part, informed by information about projected coastal recession and inundation hazards for 2050 and 2100 planning horizons (see **Section 6**). Importantly, the issues identified reflect the popularity of the Lake Macquarie coastline for diverse community uses. There are significant challenges for land managers working in a dynamic and unpredictable landscape to provide safe and appropriate access for the community and to ensure people who use the coastal landscape are aware of and respect its natural values and hazards.

Stakeholders reported four main types of issues (see **Table 4.7**):

- Risk management and communication
- Governance, partnerships and funding
- Communication about shared objectives for the coast, across the whole community. Several stakeholders referred to the lack of communication between the various tenures and management organisations
- Access management and facilitating appropriate land use (see **Section 4.3.1**).

Table 4.7 – Challenges for stakeholders and land managers

Issue	Stakeholders involved
Risk management and risk communication – coastal process issues	
A need to continue to develop clear 'story' for community stakeholders about risk management in the coastal zone	LMCC (Sustainability & Communications) OEH Trade and Investment – Crown Lands Division
Continuing work is needed to refine and align risk assessment processes, likelihood and consequence descriptors, and concept of acceptable risks, in open coast, estuary and flood contexts.	LMCC (Sustainability)
Trigger distances for future scenarios need to be defined together with a process for reviewing and updating the triggers. Clarify how triggers are linked to Council's asset management plan. Triggers must allow time to plan and implement responses (not an emergency measure). Consistent asset replacement or relocation thresholds need to be agreed between stakeholders.	LMCC (Sustainability and Asset Management) HWC
Scenario planning by probability (e.g. 50% and 10%) is seen as emerging best practice for dealing with uncertainty associated with climate change impacts in the coastal zone. Also needs to be clearly explained to the community.	LMCC (Sustainability)
Sediment budget management for open coast and Swansea Channel needs consistent objectives – use and placement of dredged material?	LMCC (Sustainability) Trade and Investment – Crown Lands Division OEH
Knowledge to support future risk management – groundwater interactions from open coast to coastal wetlands along Nine Mile, also entrance and channel evolution as sea level rises.	LMCC (Sustainability) Trade and Investment – Crown Lands Division HWC Belmont Golf Course
Accuracy and adequacy of Council GIS systems to manage land data and support adaptive risk management	LMCC (Asset Management) Trade and Investment – Crown Lands Division
Management systems – governance, partnerships and funding	
Lack of clarity in internal Council structure to manage coastal issues with appropriate priority. A dedicated coastal maintenance program needs to be reinstated.	LMCC (Sustainability)
Coast and Estuary Committee membership is lake focused; the committee is less aware of open coast issues and less focussed on their priority	LMCC (Sustainability)
Need to enhance strategic positioning of coastal management in Council's forward planning	LMCC (Sustainability)
Partnerships with OEH, Lands	State agencies, LMCC (Sustainability)
Shared values and objectives	
A need to continue to develop clear 'story' for community stakeholders about risk management in the coastal zone	OEH Trade and Investment – Crown Lands Division LMCC (Sustainability)

4.3.1 Access management and facilitating appropriate land use – social issues

Table 4.8 notes issues that have been raised by stakeholders about the management challenges they face in meeting community demands for access and recreation facilities on the coast.

These issues highlight the level of attachment that many people in the community have to the coastal landscape, but also that some of the uses enjoyed by members of the community are not compatible with enjoyment by others, or are not appropriate in areas where protection or enhancement of natural values is important. The existing regulator and planning framework has not been able to deal with these challenges effectively.

Many of the issues raised by stakeholders have also been noted by the community in their survey responses and other feedback (see **Section 4.2**). **Table 4.8** indicates issues raised by both stakeholders (land owners and managers) and community users.

Table 4.8 – Access management and suitable community uses

Issues	Relevant sections of Council plus external partners who share some responsibility for this issue	Noted by community as an issue of concern?
Belmont Golf Club needs support to improve dune stabilisation, integrate coastal biodiversity management with golf course design.	LMCC (Sustainability, Asset Management) Belmont Golf Club	No
Is there an opportunity to streamline the development consent processes for works that will also contribute to ecological connectivity or invasive species control?	LMCC (Integrated Planning) Belmont Golf Club	No
Off road vehicle use is escalating (Nine Mile Beach), without codes of behaviour or regulation of vehicles in sensitive coastal landscapes; trespass on private land and Crown Land. High vehicle usage on the beach changes the beach experience for all other users – loss of naturalness, remoteness and opportunities for quiet contemplation, passive recreation like bird watching.	LMCC (Community Planning and Waste, Environment, Rangers) Belmont Wetlands State Park HWC OEH (Parks Service)	Yes
Some competition between commercial users and recreational users for space on popular beaches (e.g. surf schools, possibly commercial fishing?).	LMCC (Community Planning) DPI Fisheries	Yes
Uncontrolled camping around Third Creek and along Nine Mile Beach dunes needs to be managed.	LMCC (Community Planning and Waste, Environment, Rangers) Belmont Wetlands State Park	Yes
Vandalism and illegal dumping, with potential contaminated site issues, including asbestos, are all issues in the State Park and on other Crown land.	Trade and Investment – Crown Lands Division. Reserve Trust for Belmont Wetlands State Park, LMCC (Waste, Environment, Rangers)	Yes

Issues	Relevant sections of Council plus external partners who share some responsibility for this issue	Noted by community as an issue of concern?
Multiple access tracks across the dunes disrupt vegetation and reduce the ecological resilience and the storm bite buffering capacity of frontal dunes. Linked to off road vehicle access.	LMCC (Sustainability and Community Planning, Asset Management) Belmont Wetlands State Park	Yes
Insufficient rubbish bins (or not properly contained) on main recreational beaches – litter is overflowing and spread by dogs, birds etc. – ends up as marine debris with risks for wildlife.	LMCC (Community Planning, Waste, Environment, Rangers)	Yes
Need further community awareness of bag limits that apply for fisheries and on rock platforms, combined with insufficient protection of the marine areas off existing national parks and Swansea Heads.	LMCC (Sustainability) DPI Fisheries NPWS	Yes
Potential need for alternative surf club sites and patrolled beaches – in context of coastal recession, but also to meet purposes of State Park dedication.	LMCC (Community Planning) State Park Reserve Trust Surf Life Saving Australia Trade and Investment – Crown Lands Division	Yes
Cycleway and walking path routes need revisiting (especially north of Swansea Channel). Consider the use of public roads, integrate with Fernleigh Track proposals.	LMCC (Community Planning, Asset Management)	Yes
The need for stronger recognition of the contribution of volunteers in managing natural areas along the coast, to minimise the risk of losing community support.	LMCC (Sustainability, Community Planning, Asset Management)	Yes
Safety issues for off road vehicles on Nine Mile Beach relate to the vehicles and for other users	LMCC (Waste, Environment, Rangers) Trade and Investment – Crown Lands Division	Yes
Need for strategic enforcement of illegal access, noting that Council rangers can be authorised to regulate illegal vehicle access issues on NPWS land (and vice versa), but there needs to be signage	LMCC (Waste, Environment, Rangers) OEH Trade and Investment – Crown Lands Division/Reserve Trust	No
Public safety issues on rock platforms during storms and high tides need to be addressed. This includes identification of risks, emergency exit routes and provision of extra life rings on dangerous rock platforms. Key sites include rock platforms such as Flat Rock in Munmorah SCA and the rock platform between Dudley and Redhead.	LMCC (Community Planning) OEH (NPWS) DPI Fisheries Trade and Investment – Crown Lands Division	No
Need full safety audit of headland tracks as many have unfenced, precipitous drops. The safety risks are not fully understood.	LMCC (Community Planning, Asset Management) OEH (NPWS)	No

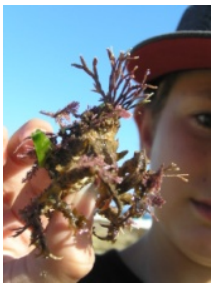
Issues	Relevant sections of Council plus external partners who share some responsibility for this issue	Noted by community as an issue of concern?
If a coastal walk is to become a reality, it needs to be a funding priority for Council and other stakeholders.	LMCC (Community Planning, Sustainability, Cultural Services) OEH (Parks Service) Trade and Investment – Crown Lands Division	Yes
Change in the outer channel has made Grannies Pool unusable.	LMCC (Community Planning, Sustainability, Asset Management) Trade and Investment – Crown Lands Division	Yes
Coast reserve picnic areas (like Blacksmiths) are not adequately maintained for high profile/usage – compare with investment in lake foreshore parks.	LMCC (Community Planning) Surf Life Saving Australia	Yes
Approvals for major new residential developments in close proximity to the coast are out of Council's control, but bring significant new recreational pressures on beaches, beach access.	LMCC (Integrated Planning, Community Planning, Sustainability, Asset Management)	Yes
Significant access impacts and urban edge effects on coastal headlands. These include risk of clearing for views, more people on exposed bluffs and rock platforms, greater risk of garden escapees invading coastal bushland, more motor bikes and other off road vehicles as affordability increases.	LMCC (Integrated Planning Community Planning, Sustainability, Asset Management)	Yes
Heritage values of the Lake Macquarie coast (e.g. coast as a cultural landscape) are not being promoted sufficiently. Cultural landscapes could be a basis for story telling about community resilience on the coast.	LMCC (Communications, Community Planning) Local Aboriginal community stakeholders	Yes
Aboriginal heritage values at Swansea Heads are not sufficiently protected; nor is the story of Lake Macquarie's coastal Aboriginal people adequately in the public domain.	LMCC(Integrated Planning, Community Planning, Communications) Local Aboriginal community stakeholders	Yes
The concept of continuing attachment to the coastal landscape – from traditional owners through to modern social and cultural values, needs to be articulated effectively as an underlying theme for understanding coastal issues.	LMCC (Sustainability, Communications) Trade and Investment – Crown Lands Division. Aboriginal community stakeholders	Yes
Community use of headland reserves, combined with Council management regimes (such as regular mowing of Themeda grassland communities) threatens the survival of patches of EEC.	LMCC (Sustainability, Community Planning, CiviLake, Asset Management)	No

All of these issues and concerns have been considered in determining the priority issues for Council's attention along the coast. The process for sorting out the most important issues is

described in **Section 7**. The process for identifying appropriate, effective and beneficial responses is noted in **Section 8**, and proposed responses to a range of social, cultural, recreational and communication issues are in **Sections 9** to **15**.

5.0 Ecosystem resilience studies and issues

In this section



Several mapping and condition assessments for coastal ecological communities have been undertaken in the Lake Macquarie coastal environment (see Umwelt, 2010 for a full list of references). These studies document important ecological values of shore platform, headland, beach, dune and estuary entrance channel habitats. Values associated with significant habitats are summarised in **Table 5.1**.

Table 5.1 – Significant habitats on the Lake Macquarie coastline

Rock platforms	Headlands
• The Swansea Heads rock platform has a high diversity of invertebrate species and more rare species than other rock platforms in the region. • Rock platforms at Swansea Heads and elsewhere along the Lake Macquarie coastline (such as Dudley) provide foraging and roosting habitat for shore birds and waders. Examples are oyster catchers, reef egrets, several species of cormorant, heron, tern and lapwing.	• The Littoral rainforest that occurs on the sheltered northern slopes and foreshore of Swansea Heads is an Endangered Ecological Community (EEC) • Small areas of Themeda grassland complex (also an EEC) on headlands occur on headlands south of Swansea Heads • Coastal heath – occurs on both dunes and headlands, with an excellent heath complex in Awabakal Nature Reserve • Spotted gum woodland is also an important habitat and visual feature between Redhead and Dudley. • Native coastal birds
Beach and coastal dunes	**Salts Bay and the outer section of Swansea Channel**
• Freshwater and marine influences add habitat diversity • Sequences linked to exposure to marine processes; highly mobile beach and nearshore sediments provide habitat for meiofauna • Dune and barrier wetlands – reed swamps, swamp oak wetlands, melaleuca forests • Coastal shorebirds roosting and nesting on beach and dunes • Bar and rip patterns in the nearshore provide diverse fishery habitat	• Salt marsh • Seagrass (Black Neds Bay) – fishery habitat • Mangrove forest • Sandy beach – estuary shoreline (Salts Bay) • Coastal shorebirds and waders

5.1 Ecosystem services

Ecosystem services that are relevant to coastal wetlands, dune and headland ecological communities along the coast (DECCW, 2009b; Eamus *et. al.,* 2005) are summarised in **Table 5.2**.

An important ecosystem service of any individual ecological community or habitat is how it contributes to the healthy functioning of adjacent and associated ecological communities. In addition, healthy coastal ecosystems help to maintain a healthy lifestyle for the people who live along the coast. Both of these are important ecosystem service values of Lake Macquarie coastal ecological communities.

Native vegetation is critical in stabilising dunes. For example, the plant communities of incipient dunes and foredunes provide buffering and protection to diverse and complex communities landward. The presence of colonising species on frontal dune systems helps reduce salt impacts on other communities and also protects them from sand incursion or marine processes. Vegetated coastal dunes provide recreational and visual values for people using the coast as well as providing habitat for crabs and birds who feed off spinifex seeds.

Intertidal ecosystems provide fish species in adjacent marine waters with food and shelter and also support recreational uses of the coast. Beach meiofauna living in the sandy beach provide food for adjacent marine species as well as active water filtering services for the near-shore zone. These ecological services can be interrupted intermittently during very large storm events, when the sand habitat is scoured and reworked in the near-shore zone. This means that biodiversity measurements in these habitats are strongly influenced by the time elapsed since a major storm event.

Table 5.2 - Ecosystem services

Services provided by coastal ecosystems	
Filtering water – protecting against pollution, such as interstitial meiofauna and bacteria cleaning water as it moves though the tide cycles	Slow down runoff and reduce flood peaks; coastal groundwater recharge
Habitat for recreational and commercial fish species, supporting fishery productivity	Carbon accumulation and storage
Genetic resources	Ecological buffer to resist weeds and feral animals
Protection from erosion	Scenic beauty
Recreational uses that depend on coastal processes and landscapes	Landform stability
Spiritual and cultural values	Food and shelter for coastal birds and other wildlife

5.2 Ecological and environmental resilience issues – coastal ecosystem condition

An assessment of the coastal ecosystems along the LMCC coast (Umwelt 2010) indicates that the condition and resilience of the coastal ecological communities are currently subject to diverse threats, including urban development (land clearing, edge effects, rubbish dumping), recreation pressure, changing fire frequency and intensity, hydrological controls, nutrient loading and invasive species. Projected climate change and sea level rise will exacerbate these threats and introduce new threat dimensions.

Key findings about condition and impacts on condition include the following:

Endangered Ecological Communities (EECs)

- Themeda grassland on headlands (EEC) is threatened by inappropriate mowing regimes, fire regimes, sediment runoff from eroding tracks and trails and trail bike tyres. On erodible steep headland slopes, Bitou bush may be favoured for establishment in Themeda grassland, but less so on stable well vegetated headland crests.

- The Littoral Rainforest EEC occurs at Swansea Heads and Dudley and is impacted by urban edge effects, including invasive species. The long term trend is likely to be greater vulnerability to invasive species.

Migratory shorebirds

- Large numbers of people (on foot or in boats) on rock platforms, inlets and on sand islands at low tide disturb protected migratory and endangered shorebirds such as the Sooty Oystercatcher and Little Tern

- Off road vehicle activity on Nine Mile Beach is a threat to nesting and roosting of shorebirds (including endangered and migratory species, such as the Sooty Oystercatcher and Little Tern)

Beach fauna

- People collecting shellfish and other invertebrates for bait and food for can threaten biodiversity on rock platforms.

- Whilst beach meiofauna (the tiny organisms between the sand grains) are adapted to rapid changes in sand volume, there is some evidence that intense activity by off road vehicles can affect populations and diversity (Schlacher, *et al* 2006). Beach cleaning and beach scraping operations can also affect populations, if not carefully scheduled. These small species, as well as bacteria amongst the sand particles play a role in recycling nutrients and organic matter and are responsible for the clear waters of our nearshore environment.

Beach Macroalgae

- Previous studies have outlined the importance of leaving macroalgae (seaweed) on the beach, rather than removal during beach cleaning practices. This is to ensure nutrients are retained.

- The smell of macroalgae is often offensive to beach users; however burying it with sand is an acceptable way to mitigate this effectively rather than removal.

Dune vegetation

- Bitou Bush, a Weed of National Significance, continues to expand in both dune and headland habitats. Bitou bush on the dunes leaves the frontal dune susceptible to `blowouts' and destabilises the system

- Off road vehicle traffic on frontal dunes disrupts fragile vegetation and local topography, encouraging wind erosion.

- Episodic storm bite affects frontal dune vegetation and in major storms; overtopping into the back dune area can also occur. Recession of frontal dunes as sea level rises will also be episodic. The actual patterns of morphological change and related ecological change are not well defined.

- Bitou bush is an invasive species that is common on frontal dune systems. Council and Landcare volunteers have worked hard to control and reduce Bitou bush at sites along the Lake Macquarie coastline. In the medium term, as the coastline and frontal dunes adjust to sea level rise, there is the potential for an enhanced threat from Bitou bush invasion. The dynamic nature of dune systems means that reproductive capacity, dispersal and establishment are key life cycle events for dune plant species, linked to periods of dune mobility and stability. Most early coloniser species on dunes reproduce, disperse and establish at high levels. However, Bitou bush can out-compete many native species in the establishment phase (French *et al* 2008). Enhanced frontal dune mobility under projected sea level rise scenarios could therefore potentially favour Bitou bush on dune systems.

Strategies to build on previous achievements and improve management of these issues are outlined in **Section 10**.

5.2.1 Current ecosystem management

Local councils, state agencies and community organisations such as Landcare have been working to protect and restore coastal ecological communities for a long time. In broad terms, some observations can be made about trends in management activities and ecological outcomes:

- Management in Wallarah National Park is gradually addressing urgent coastal stability, access and vegetation condition issues.

- LMCC in partnership with OEH have invested in the dune ecosystem enhancement program. The program includes reshaping dunes, excluding vehicles and planting native vegetation on Council land (Bilham, Walpole & Howe, paper at the NSW Coastal Conference 2013).

- Management of the coastal ecological communities in Belmont Wetlands State Park is only just commencing within the context of a Plan of Management. The Plan of Management has objectives that go beyond the resilience of coastal ecological communities, with a strong focus on community access and enjoyment for recreation and tourism.

- Lake Macquarie has a large and active Landcare network. Coastal Landcare groups have invested their time heavily in on ground works to control weeds and to revegetate coastal dunes and bluffs. At the local scale and in the short term, progress has been made in reducing threats from invasive species. Landcare is also a valuable asset for raising broader community awareness of the importance and vulnerability of coastal ecological communities.

- Even with the high level of Landcare commitment and local achievements, the condition of most of the coastal dune landscape (outside of Council care and control) is continuing to decline, and has only low to moderate ecological resilience.

- It is apparent that even highly successful projects on coastal dunes (frontal dunes) have a limited life expectancy as the coastline adjusts to rising sea level. Coastal dune enhancement projects may increase the longevity of the buffering capacity of coastal dunes to coastal recession, extending the time before trigger points for recession and retreat are passed. However, the extent to which this is the case is not currently clear and in part depends on the episodic occurrence of major coastal storm sequences.

Measures to improve the effectiveness of current coastal biodiversity management are included in **Section 10**.

6.0 Coastal processes, hazards and risk studies

In this section

Analysis and knowledge of coastal hazards and their interactions with the built and natural environment is critical to effective management of beaches, dunes and headlands along the coast. Council commissioned a coastal zone hazard and risk assessment (BMT WBM, 2015) to update understanding of how coastal processes could affect assets and values in coming decades. The results of this study:

- Build understanding of the current coastal processes
- Identify locations that are within the 'action zone' for current coastal processes – i.e. are affected by coastal hazards now
- Consider future coastal process and hazard scenarios, including climate change and sea level rise in accordance with the NSW Sea Level Rise Policy Statement (2009).
- Apply risk assessment methods consistent with the national standard (ISO 31000 (2009)) to assess the risks associated with coastal process and hazard impacts on built assets and infrastructure, now and with projected future coastal conditions. The analysis includes consideration of the likelihood of each type of hazard, and the consequence of that hazard occurring.
- This section describes the process and hazards operating along the Lake Macquarie coastline. In **Section 7**, this information is used with other issues raised by community and stakeholders, to determine the most important issues for Council's attention. Responses for important coastal hazard issues are discussed in **Section 9**.

6.1 Coastal processes and hazards

Coastal processes interact with each other and with coastal landforms (including the sea bed and the beach, dunes and headlands). Coastal processes also interact with the ways the community uses the coast and the facilities to support activities on the coast. Process and hazards operating on the Lake Macquarie coastline are shown in **Table 6.1**.

Table 6.1 - Coastal Processes and Hazards

Coastal Processes	Coastal Hazards
• Underlying regional geology and geomorphology • Waves and currents • Water levels – from tides and during storms • Storm patterns - frequency, intensity and direction, changing over decades (for instance, as influenced by La Niña and El Niño cycles) • Past and future changes to sea level associated with long term climate change • Coastal entrances – of creeks, lakes and estuaries • Sediment transport by waves and currents • Sediment transport by wind • Stormwater runoff • Weathering and slope processes on cliffs, bluffs and shore platforms	• Beach erosion during storms (storm bite) or very high tides • Shoreline recession due to sediment deficit or accretion when there is more sand migrating on to the beach. • Shoreline recession due to medium term changes to storm patterns • Shoreline recession due to long term sea level rise (or potentially accretion due to sea level fall) • Coastal inundation, when waves overtop the coastal dunes and flood low lying land (or wetland) behind the dunes • Coastal entrance instability as creek and lake entrances open, close and change position • Erosion at stormwater outlets. There may also be water quality issues from stormwater runoff. • Sand drift, where mobile dune sand moves landward over areas of native vegetation, or open space for recreational uses, or onto roads etc. • Slope instability on cliffs and bluffs, including rock fall, landslip and slumping

The coastal environment is dynamic. Coastal processes operate at different time scales, varying from hourly/daily to decades or more. Some processes vary in predictable ways; whilst for others the extent and rate of change is much more uncertain (see **Table 6.2**). There is significant uncertainty associated with exactly how and when coastal change will occur in response to the variability of coastal processes.

The resilience of natural systems to change is also uncertain. Certainty about coastal process and hazard interactions increases when processes have been measured over a long time period, and future drivers of change are known or predictable. This means that the interactions between processes operating at different time scales can be sorted out. Importantly, ongoing measuring and monitoring of coastal change is the key to building certainty around projected changes to the coast from processes and hazards.

Table 6.2 - The dynamic coast - Time frames and uncertainty

Uncertainty	Time Frame: Shorter time frame (now or within 20 years)	Time Frame: Longer time frame (20 to 100 years and beyond)
Predictable Processes and Hazards	• Tides • Runoff – with given rainfall	• Underlying geology and weathering • Tides
Uncertain Processes and Hazards	• Storms/storm patterns – when a storm (such as east coast lows) of a particular magnitude or direction will occur • How much beach erosion will occur with a particular storm • Process cycles such as La Niña and El Niño – when switches will occur • Wave height • Coastal entrance behaviour • Wind-blown sand movement • When slope instability processes like rock fall will occur • Ecological responses to storms, and other pressures	• Sea level – certain that change will occur, rate of change is uncertain • Long term storm patterns and process cycles • Rates of dune movement • Sediment movement in estuary entrances • Rates of recession (beach retreat and dune roll back) due to sediment deficit or changes to water levels • When slope processes like rock fall will occur • Ecological responses to changes in process intensity or frequency

6.1.1 Time frames for projecting and managing coastal hazards

The Lake Macquarie City Council Sea Level Rise Policy (as confirmed 2012), sets sea level planning benchmarks for 2050 and 2100. Consequently, coastal hazard studies were conducted for the immediate, 2050 and 2100 timeframes.

- **Immediate** means the hazard has occurred within local living memory and could occur at any time. Many people remember the erosion that occurred during big coastal storms in 1974 and 1978 and this is the type of erosion that is included in the immediate timeframe.

- **2050**. By 2050 (about 35 years from now) many family homes will need significant upgrade or repair, or will be occupied by a new generation of owners. Trees planted now would be mature by then.

- **2100**. Most built assets along the coast, including house and infrastructure, will have had major upgrades or have been replaced by 2100 (about 85 years from now). Some major commercial and community buildings are expected to last for about 90 years. A new generation of woodland trees could be expected to have grown by 2100.

6.1.2 Sea level rise projections for long term hazard analysis

The Lake Macquarie Sea Level Rise Policy (as confirmed 2012) sets sea level rise planning benchmarks for the 2050 and 2100 time frames. These are shown in **Table 6.3**, (based on BMT WBM, 2015) together with current estimates of future changes to storm height and wave direction.

Table 6.3 - Climate change parameters for assessing coastal hazards

Parameter	2050	2100	Reference
Sea level rise	+0.34m This is based on the NSW Government Sea level rise benchmark, less an allowance for change that has already occurred since 1990	+0.84m This is based on the NSW Government Sea level rise benchmark, less an allowance for change that has already occurred since 1990	Lake Macquarie Sea Level Rise Policy sets benchmarks of 40cm above 1990 levels by 2050 and 90cm above 1990 levels by 2100. The numbers used left subtract the 0.06m sea level rise from 1990 to 2010 from the SLR benchmarks.
Change in storm waves	+5%	+10%	Based on HCCREMS (2009) and McInnes *et. al.,* 2007
Change in mean wave direction	-2.5 degrees	-5 degrees	Based on projections (from McInnes *et. al.,* 2007) of max 3.5.

Figure 6.1 and **Figure 6.2,** from the CSIRO State of the Climate Report (2014 and 2012), show measured historic global sea level rise and the specific measured rates at different locations along the NSW coast.

CSIRO 2014 provides a series of key findings about the current indicators of climate change in the oceans. These include:

- The earth is gaining heat, most of which is going into the oceans
- Global mean sea level increased throughout the 20th century and in 2012 was 225mm higher than in 1880.
- Rates of sea level rise vary around the Australian region, with higher sea level rise observed in the north and rates similar to the global average in the south and east.
- Ocean acidity levels have increased since the 1800s due to increase CO2 absorption from the atmosphere.

CSIRO 2012 concludes that sea level rose at a global-averaged rate of about 3 mm per year between 1993 and 2011, and 1.7 mm per year during the 20th century as a whole. Measured rates of sea level rise on the NSW central coast are close to the global rate, but sea level is rising more quickly across the northern shores of Australia.

Medium to long term climate change also affects rainfall intensity and seasonality, ocean warming and the frequency and types of major storm events. For instance, on the central coast, DECCW (2009) regional modelling predicts 20% to 50% more summer rainfall by 2050, and a decrease in winter rainfall.

Changes to the frequency of different types of storms are also predicted but details are poorly understood. On the Lake Macquarie coast, changes to patterns of East Coast Lows and the southern extent of tropical cyclones are both possible. East Coast Lows in particular drive major step changes in coastal morphology. OEH and a team of coastal scientists and engineers are currently researching mechanisms driving East Coast Lows to enable more accurate and reliable predictions of future storm patterns.

The landforms we see now along the Lake Macquarie coast are the result of relatively stable sea level and climatic conditions over the last 6000 years. Over this period, sea level fluctuations on the east coast have been restricted to one to two metres. This is the same order of magnitude as sea level changes that are currently projected for the next century. Coastal erosion and accretion occurred in response to these sea level changes in the past, affecting dune stability, estuary ecology and rock platform ecological communities.

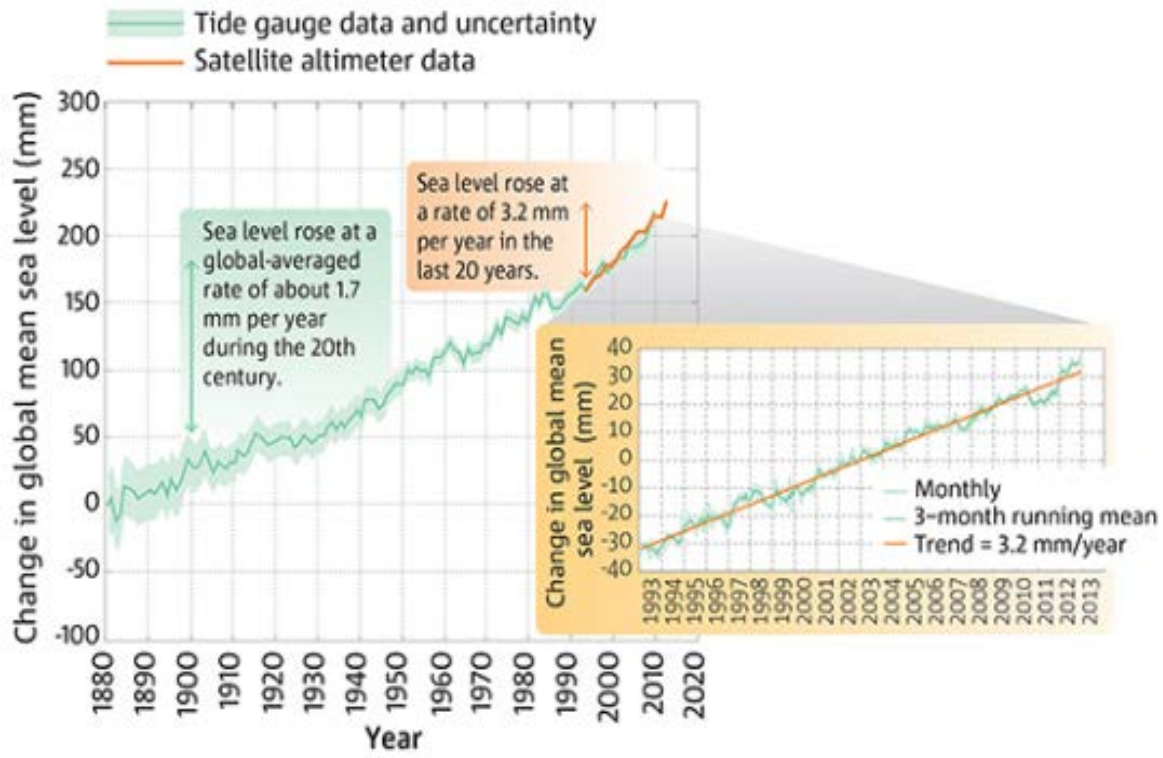


Figure 6.1 - Global average mean sea level (CSIRO, 2014).

The graph shows measured average sea level rise over the last century. Whilst year on year rates of sea level change are very variable, the long term trend is indisputable.

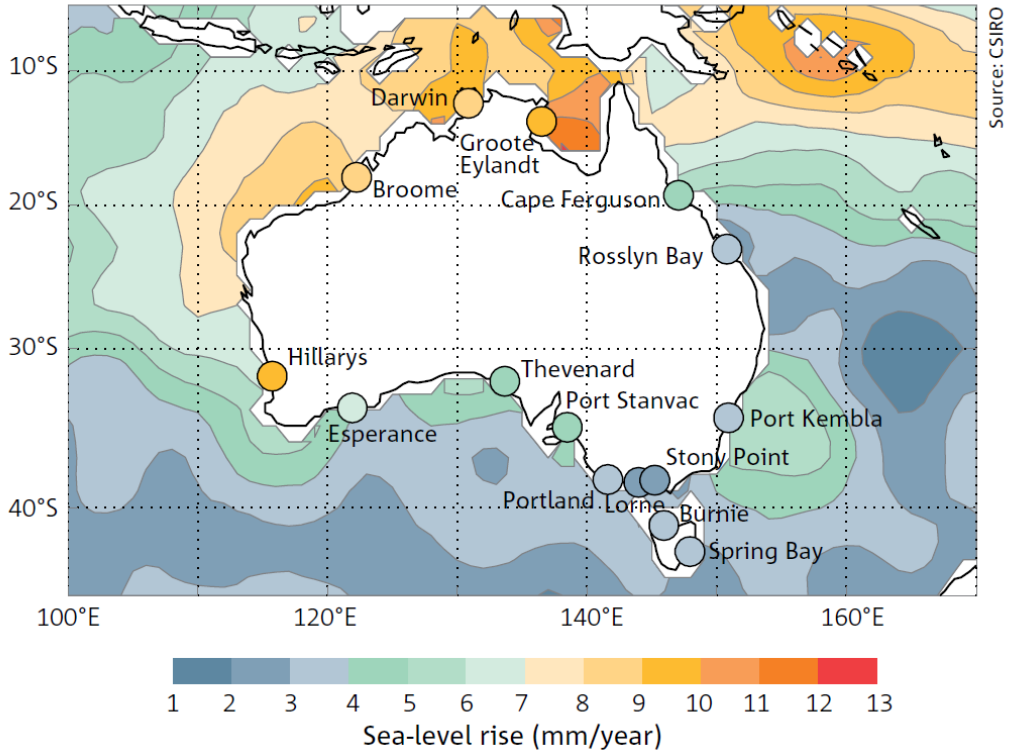


Figure 6.2 - The rate of global sea-level rise around Australia measured by coastal tide gauges (circles) and satellite observations (contours) from January 1993 to December 2011 (CSIRO, 2012).

6.1.3 Measured and projected coastal change for Lake Macquarie

BMT WBM (2015) used wave data, storm data, analysis of historical aerial photographs and beach survey (i.e. measured change), information about projected changes to coastal process parameters and models to assess coastal hazards along the Lake Macquarie coast.

6.1.3.1 Historical change

- For the period over which aerial photographs are available (generally since about 1950), Lake Macquarie **open coast** beaches were found to be stable on average over time. The volume of sand on any beach fluctuates periodically – due to seasonal and decadal variations in waves, water levels and storm patterns, but there is no apparent long term trend over the last 60 years towards accretion or erosion.

- Long sandy beaches such as Nine Mile (from Blacksmiths to Redhead), 'rotate' slightly due to decadal (approximately) cycles in the angle of wave approach. However, the northern breakwater of Swansea Channel is believed to have stabilised the shoreline at Blacksmiths Beach, separating it from entrance dynamics, and allowing the foredune to grow. Work by Landcare has aided this process.

6.1.3.2 Projected change

Without sea level rise, modelling results suggest that the Lake Macquarie coastline would continue to fluctuate periodically, but no long term trends towards accretion or recession would occur. When sea level rise is considered in the models, sandy beaches are projected to recede. The amount of recession is greater at the southern ends of beaches. This is because headlands interrupt the transport of sand along the coast and even less sand can pass around headlands as the water offshore deepens. Increased southern end recession is projected to be most apparent at Nine Mile Beach (i.e. Blacksmiths Beach will recede further than Redhead Beach), but is also apparent at Dudley and Caves Beach. Catherine Hill Bay Beach has a more easterly orientation and is contained by bedrock headlands, so this differential recession is not expected to occur.

- Small pocket beaches and other sections of beach that are underlain by rock at shallow depths or which are backed by bedrock slopes may disappear as the sand is redistributed off shore. This is projected to occur at south Catherine Hill Bay, at the southern end of Caves Beach and at small beaches such as Pinny Beach. BMT WBM (2015) note that the beach condition that occurred at Caves Beach in the 1970s (a period of several major storms), with extensive areas of rock rather than sand, is likely to become the normal condition.

- The likelihood of erosion and recession hazards has been classified as ‘almost certain’, ‘likely’, ‘unlikely’ or ‘rare’. These descriptions take into account the variations in beach condition that occur with storms and quiet periods, plus an allowance for recession due to sea level rise (0.4m above 1990 level by 2050 and 0.9m above 1990 levels by 2100 as set by the NSW Government Policy statement) and/or changes to the angle of wave approach and/or structural impacts.

For the **immediate** time frame, the likelihood of erosion recession hazards is described as:

- **Almost Certain**: **Average beach erosion**, as measured over the last four decades.

- **Unlikely**: **Maximum beach erosion** (as measured over the last four decades, and approximately equivalent to a 1 in 100 year event).

- **Rare**: **Extreme beach erosion** calculated as maximum beach erosion plus average beach erosion, with sea walls removed.

- For the future planning horizons **2050 and 2100**, the likelihood of different beach erosion states is described as:

- **Almost certain**: Immediate average beach erosion for both periods, plus structural impacts (such as Swansea breakwaters) for 2100.

- **Likely**: Immediate average beach erosion, plus recession due to sea level rise (0.4m above 1990 by 2050 and 0.9m above 1990 by 2100, as set by the NSW Government Policy Statement), plus structural impacts.

- **Unlikely**: Immediate maximum beach erosion, plus recession due to sea level rise (0.4m above 1990 by 2050 and 0.9m above 1990 by 2100, as set by the NSW Government Policy Statement) and allowing for structural controls such as breakwaters and headlands.

- **Rare**: Immediate maximum beach erosion, plus an allowance for higher than projected recession due to sea level rise, (using 0.7m above 1990 level by 2050 and 1.4m above 1990 levels by 2100) **or** Immediate extreme beach erosion plus recession associated with sea level rise (0.4m above 1990 levels by 2050 and 0.9m above 1990 levels by 2100), or Immediate maximum beach erosion, plus changes to the angle of wave approach and/or structural impacts.

6.1.4 Coastal inundation

Coastal inundation describes flooding that occurs due to high ocean water levels, which can occur due to high tide, low barometric pressure, storm wave set up and wave run-up onto cliffs, beaches and breakwaters. Coastal inundation includes:

- Storm wave overtopping of coastal dunes and structures such as breakwaters
- Inundation of estuary foreshores and low lying back beach areas that are hydraulically connected to the ocean. LMCC has conducted a separate hazard study to analyse how oceanic processes interact with catchment driven flooding in Lake Macquarie.

Details about the wave and water level parameters that have been used to assess inundation hazards for the Lake Macquarie open coast are documented in BMT WBM (2015).

6.1.4.1 Wave overtopping hazards

Wave overtopping hazards have been assessed for thirteen sites along the coast, including beach access ways, surf clubs and associated car parks and the training walls at the Swansea Channel entrance.

Analysis of dune/structure heights, and inundation rates and volumes indicates that the southern break wall of Swansea Channel is strongly affected by wave overtopping hazards, which will increase as sea level rises. The break wall is projected to be completely submerged after 2050.

Redhead and Caves Beach surf clubs may be damaged by wave overtopping in very large events in the immediate timeframe and the hazard is projected to increase with sea level rise. Note that Redhead surf club is already affected by wave run-up in storm wave conditions.

The potential for pedestrians to be injured by wave overtopping events is limited by the link to a major storm, when people would generally not be on the beach.

6.1.4.2 Inundation hazards

When assessing inundation due to wave overtopping, BMT WBM (2015) considered a range of scenarios from ‘almost certain’ to ‘rare’. The probability of inundation is linked to the return interval of the storm surge event.

For instance, a 1 in 20 year storm surge and wave set up is considered to be almost certain. A 1 in 100 year storm surge and wave set up is considered to be unlikely and a 1 in 100 year storm surge and wave set up, occurring in combination with an extreme climatic event (such as a tropical cyclone or extreme east coast low) is considered to be rare. For 2050 and 2100 time periods, sea level rise of 0.4m or 0.9m is added to the hazard calculation.

Table 6.4 shows the adopted inundation levels for potentially affected locations, for immediate, 2050 and 2100 time frames. Inundation figures are available in the Coastal Hazard Study report (BMT WBM, 2015).

Table 6.4 - Adopted inundation levels (from BMT WBM, 2015)

Adopted inundation level	Immediate (m AHD)	2050 (m AHD)	2100 (m AHD)
Almost certain	2.5	2.5	2.5
Likely	n/a	2.9	3.4
Unlikely	2.7	3.1	3.6
Rare	2.9	3.4	4.1
Unlikely wave runup			
Catherine Hill Bay	5.5	5.8	6.3
Caves	5.6	5.9	6.4
Blacksmiths	5.5	5.8	6.3
Redhead	5.8	6.1	6.6
Dudley	5.6	5.9	6.4

6.1.5 Mapping coastal planning area

Figures showing immediate and future hazard lines for Lake Macquarie beaches are included in the *Lake Macquarie Coastal Hazard and Risk Assessment* (BMT WBM, 2015).

To provide clarity for planning purposes, Council has mapped a set of Coastal Risk Planning Lines. The Coastal Risk Planning Lines indicate areas where Council will apply specific planning provisions to reduce coastal risks. These provisions are broadly consistent with Council's requirements for flood risk hazards in the coastal zone. The Coastal Risk Planning Lines are shown in **Figures 6.3** to **6.11** for the relevant beaches on the following pages.

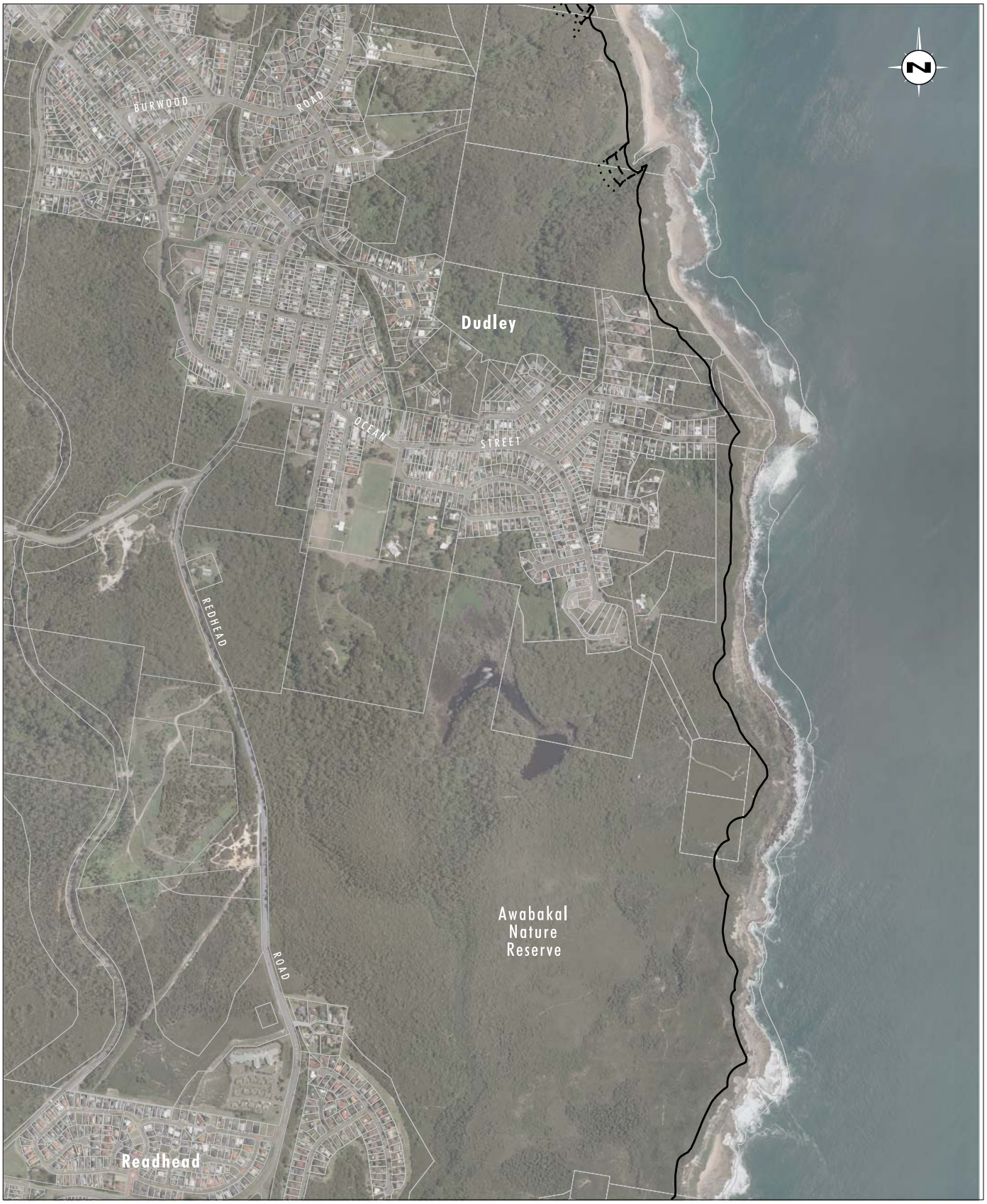


Image Source: LMCC (2010)
Data Source: LMCC (2010), BMT WBM (2012)

0 250 500 750m
1:15 000

Legend

Planning Lines:
—— Immediate
– – – 2050
—·— 2100
----- 2100_S - Critical Utilities, Essential Community and Aged Care Facilities

FIGURE 6.3b

Planning Lines
Dudley

Image Source: LMCC (2010)
Data Source: LMCC (2010), BMT WBM (2012)

0 250 500 750m
1:15 000

Legend

Planning Lines:

—— Immediate
– – – 2050
—·— 2100
----- 2100_S - Critical Utilities, Essential Community and Aged Care Facilities

FIGURE 6.4

Planning Lines
Redhead

Image Source: LMCC (2010)
Data Source: LMCC (2010), BMT WBM (2012)

0 250 500 750m
1:15 000

Legend

Planning Lines:
—— Immediate
– – – 2050
—·— 2100
----- 2100_S - Critical Utilities, Essential Community and Aged Care Facilities

FIGURE 6.5

Planning Lines
Jewells

Image Source: LMCC (2010)
Data Source: LMCC (2010), BMT WBM (2012)

0 250 500 750m
1:15 000

Legend

Planning Lines:

—— Immediate
– – – 2050
—·— 2100
----- 2100_S - Critical Utilities, Essential Community and Aged Care Facilities

FIGURE 6.6

Planning Lines
Belmont

Image Source: LMCC (2010)
Data Source: LMCC (2010), BMT WBM (2012)

0 250 500 750m
1:15 000

Legend

Planning Lines:
—— Immediate
– – – 2050
—·— 2100
----- 2100_S - Critical Utilities, Essential Community and Aged Care Facilities

FIGURE 6.7

Planning Lines
Blacksmiths

Image Source: LMCC (2010)
Data Source: LMCC (2010), BMT WBM (2012)

0 250 500 750m
1:15 000

Legend

Planning Lines:

—— Immediate
– – – 2050
—·— 2100
----- 2100_S - Critical Utilities, Essential Community and Aged Care Facilities

FIGURE 6.8

Planning Lines
Caves Beach

Image Source: LMCC (2010)
Data Source: LMCC (2010), BMT WBM (2012)

0 250 500 750m
1:15 000

Legend

Planning Lines:

—— Immediate
– – – 2050
—·— 2100
----- 2100_S - Critical Utilities, Essential Community and Aged Care Facilities

FIGURE 6.9

Planning Lines
Pinny Beach

Image Source: LMCC (2010)
Data Source: LMCC (2010), BMT WBM (2012)

0 250 500 750m
1:15 000

Legend

Planning Lines:

—— Immediate
– – – 2050
—·— 2100
----- 2100_S - Critical Utilities, Essential Community and Aged Care Facilities

FIGURE 6.10

Planning Lines
Catherine Hill Bay

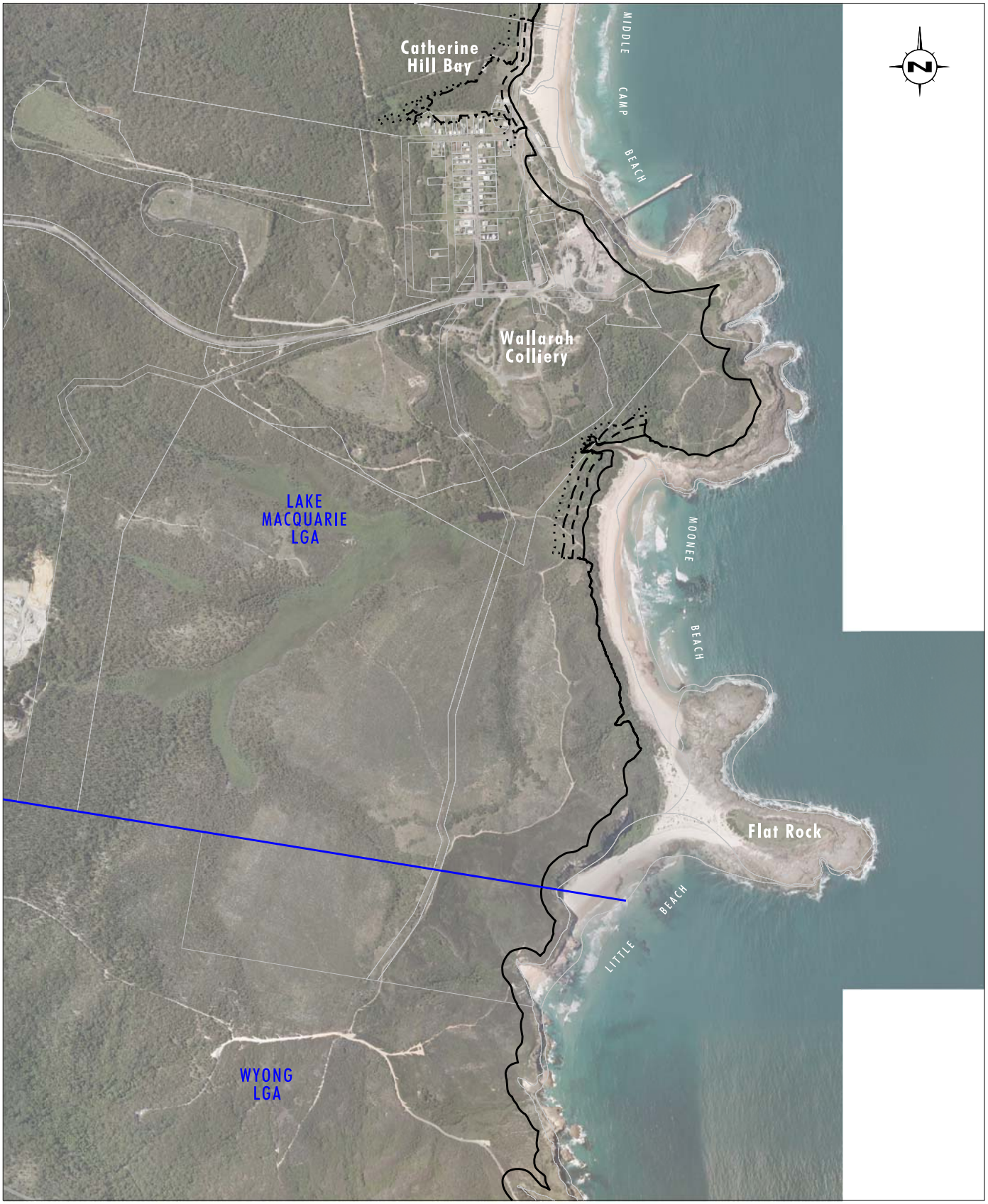


Image Source: LMCC (2010)
Data Source: LMCC (2010), BMT WBM (2012)

0 250 500 750m
1:15 000

Legend

- LGA Boundary

Planning Lines:

- Immediate
- 2050
- 2100
- 2100_S - Critical Utilities, Essential Community and Aged Care Facilities

FIGURE 6.11

Planning Lines
Moonee Beach

For coastal erosion and recession, the Coastal Risk Planning Lines are based on the 'Unlikely' coastal erosion and recession impact (as described in **Sections 6.1.3** and **6.1.4**).

- For 2015 (immediate), the Coastal Risk Planning Line is aligned with the maximum historic extent of coastal erosion, as recorded over the last four to five decades.

- For 2050, the Coastal Risk Planning Line adds recession associated with 0.4m of sea level rise (above 1990 levels) to the historic maximum extent of storm bite erosion for each beach.

For 2100 the Coastal Risk Planning Line adds recession associated with 0.9m of sea level rise (above 1990 levels) and changes to wave climate to the historic maximum extent of storm bite erosion for each beach. The 2100 Coastal Risk Planning Line also includes a buffer distance of up to 30 metres from the cliff hazard areas and other rocky coastlines and headlands identified in Appendix C of the *Lake Macquarie Coastline Hazard and Risk Assessment* (BMT WBM 2015).

- Council has also mapped a coastal erosion and recession line equivalent to Probable Maximum Flood (PMF). This uses the 2015 'Rare' erosion extent, plus an allowance for recession due to sea level rise in 2100, and is applied to consideration of critical infrastructure.

Consistent with Council's existing mapping of inundation hazards in the coastal zone, a Marine Inundation Risk Planning area in 2100 that is equivalent to the 1 in 100 year event (waves and coastal water levels), with an allowance for sea level rise of 0.9m by 2100, as per the NSW Sea Level Rise Policy Benchmarks and Council's sea level rise policy is also described on the maps. These maps also show the flood planning hazard in 2100 identified in the *Lake Waterway Flood Study* (WMA Water 2012) and the *Jewells Wetland Flood Study* (BMT WBM 2013).

In addition to the Coastal Risk Planning Lines, which map areas in which specific development control described in DCP 2014 apply, a Coastal Risk Planning Area has been created for inclusion in LEP 2014. This Coastal Risk Planning Area is defined by the 2100 Coastal Risk Planning Line. The Coastal Risk Planning Area should be adjusted as better information becomes available on the local extent of the hazard and the long-term effects of sea level rise on beaches and rocky coasts.

6.1.6 Other coastal hazards

Three other hazards affect the sandy coastline, but the impacts are more spatially confined than beach and dune erosion and recession due to storms and climate change factors.

- **Coastal entrance instability**. Natural creek and lagoon entrances along the Lake Macquarie coast include Glenrock Lagoon, Jewells Creek, Second Creek and Third Creek on Nine Mile Beach, and small creeks at Caves Beach, Pinny Beach, Catherine Hill Bay and Moonee Beach. All of these, except for the coastal creek adjacent to the caravan park at Redhead, are located in undeveloped areas of foreshore reserve or Nature Reserve/National Park.

  All of these creeks and small lagoons have small catchments and typically have closed entrances. The entrance can open during periods of heavy rainfall and the channel may track along the dune face before crossing the beach berm. The impact on built assets is considered to be minor. Open creek entrances can affect beach amenity, in terms of lowered water quality or safety issues for people wading across the entrance.

- **Stormwater erosion**. There are no significant stormwater outlets (separate to the small coastal creeks which receive urban stormwater) on Lake Macquarie beaches. Some stormwater from urban areas does discharge into the lake entrance channel and may affect local water quality for short periods.

- **Sand drift**. Sand drift landward of the frontal dune system has occurred at Caves Beach/Hams Beach, at Blacksmiths and at Nine Mile Beach during the mid-twentieth century. Dune stabilisation works at Caves/Hams Beach and at Blacksmiths have increased foredune height and volume and increased vegetation cover.

  Mobile dune sand continues to move inland in the northern part of Nine Mile Beach, within the Belmont Wetlands State Park and towards Redhead. Dune instability is exacerbated by difficulties in managing off road vehicle access in the park and onto the beach (see **Section 4**). Dune vegetation in this area is in poor condition and includes abundant invasive species (see also **Section 4.2**).

  Sand drift is an issue for the Belmont Golf Course, which has fairways and greens immediately landward of the active frontal dune. During major storms, sand blows across the golf course, affecting the quality of the course and amenity for golfers (see also **Section 4**).

6.1.7 Slope instability hazards

Council commissioned a review of slope instability hazards to identify locations where rock fall, landslip or other slope processes could impact on the use of cliff top reserves and the beach and rock platform areas below. The assessment, prepared by RCA Australia, was carried out through:

- a desk top review of available information (LiDAR digital elevation model (DEM), aerial photography, the previous Coastline Management Plan);

- site inspections of the accessible cliffs and slopes;

- preliminary assessment of landslide risks and risk to life (in accordance with *Australian Geomechanics Society Landslide Risk Management, 2007*); and

- presentation of a set or preliminary coastal landslide risk zoning maps.

The assessment provides information about the underlying geology of the Lake Macquarie coastline, including rock type, structure and weathering condition that affect the potential for slope instability hazards to occur.

From the qualitative technical assessment and risk assessment, landslide risks comprised rock falls from cliff faces, localised instability of cliff edges, faces and slopes (where slope is equal to or greater than 34°) and potential instability of slopes of 18° to 34°.

Generally, the risk to existing residential property is very low; however some specific locations are more susceptible to landslide than others i.e. a small number of properties at Bombala, Goulburn and Ocean Streets in Dudley, and Henery Lane and Ocean Street on Redhead Bluff are considered to be in the low to moderate risk category.

Public amenities (such as toilets, car parks and paths) are generally at very low risk. Some public structures are considered to be at low to moderate risk. These are the Coast Guard HQ at Swansea Heads (within 30m of cliff edge) and the SLSC at Caves Beach. Also, the road from the SLSC at Catherine Hill Bay to the decommissioned coal loader is at risk as it runs along a steep slope. The actual coal loader is also at risk from rock fall from the adjacent cliffs.

Specific localities and issues are summarised in **Table 6.5**.

Table 6.5 – Locations affected by geotechnical hazards

Locality	Issues
Dudley south rock platform, below cliff	Potential for block fall from the cliff above. Steep and unstable slope, with limited opportunity for safe exit from the rock platform if people are trapped by high tide
Awabakal Nature Reserve – cliff top between Dudley and Redhead	Near vertical cliffs, with massive blocky sandstone interbedded with claystones. Potential for block fall. Existing pathways very close to cliff top, unfenced (or very poorly maintained fences)
Redhead cliff top and beach	Upper slope of bluff is unconsolidated/heavily weathered material. Easy pedestrian access increases potential for slips and falls. Potential for block fall onto people on the northern part of Redhead Beach
Swansea Heads rock platform, below cliff	Potential for block fall onto people using the rock platform. Steep to near vertical bluff with easy pedestrian access on the top. Potential for people to slip and fall off the bluff onto the rock platform
Caves Beach – from Caves south (at base of cliff)	High , near vertical cliffs, with eroded crests (loose and unconsolidated materials) and clear evidence of large block fall at the cliff base
Headland/cliff top between Caves Beach and Spoon Rocks and south to Pinny Beach	High, near vertical cliff, with extensive disturbance of the weathered material near the edge. Easy pedestrian access and frequently used pathway. Rock platforms used by fisherman, with limited ability for safe exit during high wave conditions
Headlands and beach at Catherine Hill Bay south	Steep to near vertical cliffs and bluffs, in massive but strongly jointed sandstone. Clear evidence of block failure. Potential for further bock failure to affect people walking along the base of the cliff – a busy recreational area.

RCA Australia concluded that the risk to life is assessed as acceptable/tolerable based on the results of the slope inspections and the temporal and spatial probability of people being impacted, which they consider to be very low risk. The highest risk to life is thought to be persons slipping/ tripping and falling from the high cliffs and bluffs. In fact, there have been several incidents over the last 20 years of people slipping or falling from headlands along the Lake Macquarie coast. In addition, the risk of people being injured by rock falls is greater in the summer, when more people are on the beach (e.g. below Redhead bluff).

Council has recently commissioned more detailed studies of geotechnical hazards on cliff lines, particularly in relation to public safety.

6.1.7.1 Slope instability hazards and Sea Level Rise

RCA Australia undertook a preliminary assessment of slope stability risk due to sea level rise considering the Lake Macquarie City Council Sea Level Rise Policy (as confirmed 2012) benchmarks of 0.4m by 2050 and 0.9m by 2100.

After inspection of the area and correlation with the LiDAR DEM, it was concluded that the reduced levels (RL) at the toe of the various cliffs ranged from 1.5m to 4m AHD. Based on this is appears that the base of the cliffs at Dudley, Redhead (south) and Catherine Hill Bay could be vulnerable to increased wave impact with sea level rise, as these locations are already within the upper tidal zone.

6.2 How coastal change affects risk

Coastal risk is the focus of the NSW Guideline for Preparing Coastal Zone Management Plans (OEH, 2013). Risk assessment requires consideration of the 1) likelihood and 2) consequence of specific hazards.

1. How likely is it that a threat or hazard will occur? The likelihood of coastal erosion, recession and inundation hazards is summarised in **Sections 6.1.4** and **6.1.5**.

2. What would be lost or damaged (consequences in terms of economic, financial, social or environmental value) if the hazard did occur?

Consequences of coastal hazards can relate to a range of natural and built values, including:

- Long term changes to the morphology of the coast;
- Storm wave erosion or wave overtopping damage to buildings (e.g. houses, surf clubs), infrastructure (e.g. roads and sewerage systems) and breakwaters;
- Damage to protection structures (sea walls);
- Loss of coastal vegetation or habitat (or reduced recovery capacity after storms or droughts) – in both cases contributing to reduced biodiversity or reduced resilience of coastal systems;
- Loss of access and amenity for recreation; reduced tourism revenue for the city and local businesses;
- Reduced safety of people enjoying the coastal landscape – on the beach and dunes, in the water, on rock platforms, breakwaters and on coastal cliffs and bluffs;
- Loss of social value (the coast as a meeting place) or cultural value, if Aboriginal places or sites are disturbed;
- Reduced value and reduced flexibility of land use on private and public property;
- Increased insurance costs (or loss of access to insurance) for land holders; and
- Increased maintenance costs for beach access, or to maintain functional infrastructure.

ISO 31000 (2009) and the Australian Government Climate Change Impact and Risk Management Guide (2006) provide a standard matrix and likelihood and consequence descriptors for assessing risk and applying risk principles in environmental and climate change contexts. There are currently no specific guidelines for applying the Standard protocols and methods to risks in the coastal context.

Council and BMT WBM conducted a risk assessment workshop in 2011, to evaluate the risk profile of the Lake Macquarie coastal zone. The workshop considered erosion, recession and inundation consequences, with a focus on built assets and infrastructure.

Details of the risk assessment matrix, descriptors and consequence classifications used in the risk assessment for the Lake Macquarie coast are in BMT WBM (2015).

Key consequence classifications for erosion, recession and inundation are:

- A '**catastrophic**' consequence is one which involves more than $20 million damage to property or the local economy, or it has a widespread and irreversible environmental impact, or it has a widespread and permanent impact on community services (affecting more than 50% of the community) or wellbeing. Major damage to the Lake entrance training walls or Belmont Wastewater Treatment Plant are considered to be catastrophic consequences of coastal erosion.

- A '**major**' consequence causes more than $5 million damage to property or the local economy, or widespread environmental impacts from which recovery may take many years, or widespread community impact (affecting 25% to 50% of the community). In this assessment, major consequences applied to significant infrastructures (roads, sewerage, water supply and stormwater), plus beaches; and

- A '**moderate**' consequence is considered to cause severe damage to a surf club building and associated reserves.

These consequence classifications were used in the risk assessment, and the results have been mapped to show the spatial extent of low, medium high and extreme risks on the coast. Risk maps are with the coastal hazard maps for the Lake Macquarie in BMT WBM (2015).

Table 6.6 shows how likelihood and consequence combine to give a risk ranking. It is clear that where there is a 'catastrophic' consequence, the risk is assessed as 'Extreme', unless the likelihood is rare. 'Major' consequences lead to 'High' or 'Extreme' risks unless the likelihood is rare. Conversely, for insignificant consequences, the risk is 'Low' for all likelihoods. This means that for erosion and recession hazards, the risk has been assessed as 'High' or 'Extreme' for beaches, the Belmont Wastewater treatment plant, the Lake entrance training walls and other major road, sewer and water infrastructure.

Table 6.6 – Risk matrix (from BMT WBM (2012), based on ISO 31000, 2009)

		Consequence				
		Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Likelihood	Almost certain	Low	Medium	High	Extreme	Extreme
	Likely	Low	Medium	High	High	Extreme
	Possible	*Low*	*Medium*	*Medium*	*High*	*Extreme*
	Unlikely	Low	Low	Medium	High	Extreme
	Rare	Low	Low	Low	Medium	High

6.2.1 Risks requiring urgent response

In accordance with ISO 31000, Council has applied a risk tolerance policy. As shown in **Table 6.7**, extreme risks and high risks are regarded as 'intolerable'. Urgent action, with high level approval, is required to reduce these risks.

Table 6.7 - Risk tolerance and response

Extreme Risk	Intolerable	• Coastal hazard risks present major and/or unacceptable impacts to assets, infrastructure, safety and amenity that cannot be reduced by business as usual. • Management efforts would require approval at the executive level.
High Risk	Intolerable	• Risks can be managed with detailed planning and response measures, high level management responsibility and reporting. • Additional information and analysis is required now and in the future to ensure effective management of coastal hazard risks to coastal assets, infrastructure, safety and amenity.
Medium Risk	Tolerable	• Coastal hazard risks may be managed by additional analysis, controls and monitoring during the planning, design and operation with specific management responsibility. • Additional information and analysis is required now and in the future to ensure effective management of climate change risks to coastal assets, infrastructure safety and amenity.
Low Risk	Acceptable	• Risks can be managed by existing controls, but would be maintained under review. • Additional information and analysis is required now and in the future to ensure effective management of coastal hazard risks to coastal assets, infrastructure safety and amenity.

Actions to mitigate extreme risks driven by coastal processes and hazards affecting the Lake Macquarie coast are discussed in **Section 9**.

7.0 Identifying Priority Issues

In this section
Deciding the important and urgent issues and responses

Sections 4, **5** and **6** identified diverse issues affecting the resilience of natural systems and the ways in which people who use the coast value the coastal landscape. These issues come from the perspectives of science, land manager and community user. To manage the coast effectively, Council must make decisions about which issues are the most important or require an urgent response. It must then make decisions about which potential responses will be appropriate and cost effective for those issues.

To help differentiate the priority issues for attention, Council has evaluated issues within a simple 'urgent and important' matrix. This matrix, originally designed to help people manage their time effectively by identifying priority tasks, has been adapted to identify the most important issues for managing the Lake Macquarie coastline. The definitions of 'urgent' and 'important' criteria used in this application are in **Table 7.1**.

The matrix (see **Figure 7.1**) identifies issues that are both urgent and important, separately from issues which may be urgent, but are of low consequence to the resilience of the coast; issues which are important in the longer term but do not require urgent action and issues which are neither urgent nor important.

The assessment used information provided by land managers and community users, supplemented by further discussion with Council staff and the Estuary and Coastline Management Committee.

Table 7.1 – Criteria for defining priority issues

Important	This issue affects many stakeholders and community users The issue affects major community infrastructure and council or other stakeholder investment The issue has a major impact on other issues The issue is relevant at all timescales
Urgent	If action is not taken immediately, the issue will deteriorate rapidly If not addressed, this issue will undermine progress on other issues

A similar style of matrix has been used in **Section 8**, to help identify the appropriate time frame for implementing actions.

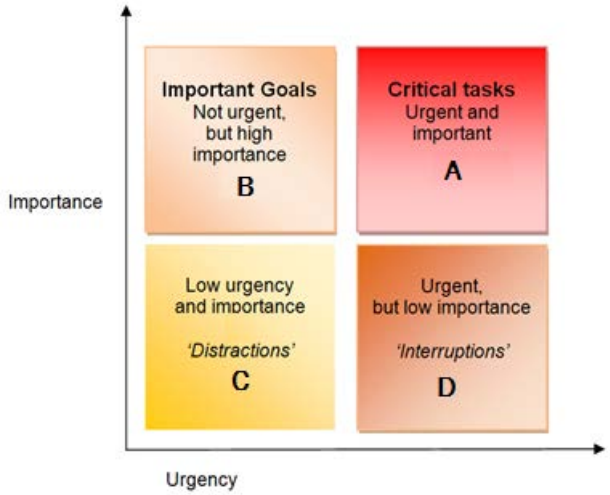


Figure 7.1 - Urgent and important matrix for identifying priority issues

Based on this assessment, twelve Urgent and Important issues are identified as the priorities that need attention in managing the Lake Macquarie coast (**Table 7.2).**

Other issues that are not considered to be both urgent and important are also included in the LMCZMP[A]. These actions may be:

- Important for one local area, rather than the whole coastline;
- Subject to new planning or management activity by stakeholders; and/or
- Addressed in longer term timeframes.

Table 7.2 also shows the key issues for each local area along the coast. Local areas are defined by coastal compartments and the social attachment of local communities, including areas defined under Council's sustainable communities' initiative. For the purposes of the LMCZMP[A], the following local areas are recognised:

- Munmorah State Conservation Area and Wallarah National Park
- Catherine Hill Bay
- Caves Beach
- Swansea Heads
- Blacksmiths
- Nine Mile Beach (includes land managed in Belmont Wetlands state Park, Belmont Golf Course and Hunter Water Corporation)
- Redhead
- Awabakal Nature Reserve and Glenrock State Conservation Area
- Dudley

Table 7.2 - Priority issues

Priority issues	Areas to which this priority issue applies
Communication about the coast	
1. Capturing whole of community aspirations for the coast. The importance of a clear vision, widely agreed objectives and communication about the Plan and its implementation	Whole of coast
2. Defining and promoting coastal resilience concepts with all land managers and community users. In essence the CZMP is about strengthening the resilience of natural coastal systems (landforms, processes and biodiversity) and of human communities. A priority issue is the translation of the concept into clear guidance for managing ecosystems, services, land use planning, recreation planning and Council's management of coastal reserve lands	Whole of coast
Taking precautionary action to mitigate Extreme and High coastal hazard risks	
3. Managing coastal risks – communicating with residents about future risk scenarios and options. As an example – what Council will do when coastal process impacts reach a point where maintenance of local (urban) infrastructure is not feasible or cost effective. Note that for most coastal risks, the actual impact (e.g. on infrastructure) is likely to be up to two decades away, so the actual relocation of assets is an important issue, but less urgent. The key action now is to set triggers for when detailed planning for asset or infrastructure must commence, together with contingency plans if hazards increase more rapidly than anticipated.	Extreme and high risks include: • Erosion, recession and loss of amenity at Redhead Beach, Caves Beach, Blacksmiths Beach, Dudley Beach, Stinky Beach, Catherine Hill Bay (Moonee and Middle Camp) Beach and Pinny Beach (from immediate timeframes onwards). • Rock platforms habitats at Dudley, Catherine Hill Bay and Caves Beach, Swansea Heads, and caves at Caves Beach (from immediate time frame onwards) • Recession and inundation impacts on surf club facilities at Caves Beach, Blacksmiths and Redhead (including services to these buildings). These risks apply for Immediate or 2050 timeframes. • Recession and inundation impacts on the HWC Belmont sewage treatment plant and the Belmont ocean discharge point. These risks apply for immediate timeframes onwards. • Inundation and storm damage to the lake entrance training walls. Immediate timeframe onwards • Recession and inundation impacts on roads, sewerage and water infrastructure and residences at Blacksmiths (2100 time frame). • Recession impacts on residential land at Flowers Drive Catherine Hill Bay (2100)

	Biodiversity	
4.	Invasive species on coastal dunes and headlands affect biodiversity values. On coastal dunes, invasive species also affect the stability of the landforms and recovery capacity after storms.	All coastal dunes and headlands. Headlands with themed a grassland EEC are high priority. On coastal dunes, Bitou infestation is threatening coastal resilience and biodiversity values
5.	Planned population growth will lead to increased recreational demand which will significantly increase threats to natural systems (management response to prepare for recreation demand and to mitigate impacts on coastal biodiversity is a priority)	General regional population growth, particularly at Catherine Hill Bay; increasing affluence can also increase off road vehicle ownership and increase pressure from off road vehicles accessing sandy beaches such as Nine Mile. This increases risks to nesting migratory shorebirds and also harvesting of rock platform fauna and general trampling of sensitive vegetation.
	Recreational access planning and regulation	
6.	Unregulated vehicle access to dunes and beaches facilitates irresponsible behaviour, illegal dumping, arson and vandalism, as well as damaging frontal dune systems. This is an issue for all land tenures along the coast.	Nine Mile Beach is the main concern. Measures are already in place for beaches in National park in the south of the City.
7.	Access to the coast – implications of unmanaged access for safety (e.g. track locations, signage, fencing, alternative exits; separating incompatible uses) and for illegal activities by a minority of people – this includes dumping of waste and arson.	Belmont Wetlands State Park; Cliff tops Dudley to Redhead; headland pathways at Swansea Heads, Caves Beach and south to Pinny Beach; headland paths at Catherine Hill Bay; beach access ways at Nine Mile (through State Park, and at Awabakal Street) and at Hams Beach. Lookout areas above Redhead Beach
	Resources and investment	
8.	An appropriate balance in Council's investment in ecosystem management, recreational and tourism facilities in the open coast landscape, as opposed to lake shore, urban or bushland landscapes	All coastal reserves; Plan of Management for Blacksmiths and southern shore of channel already recommends creating a park of similar value to lake shore 'icon 'parks.
9.	Major coastal landowners/managers have limited resources to deliver on coastal zone management. Partnerships are needed to get priority actions or facilities in place. Formal agreements about joint funding, resource sharing, consistent approaches across land tenure boundaries.	Most conspicuous for Belmont Wetlands State Park, but also applies to Belmont Golf Course. LMCC has multiple competing priorities.
	Knowledge and adaptation	
10.	Managing the open coast and entrance channel interface. This includes improving process knowledge and managing sediment budget issues, but also includes the interaction of lake flooding issues and marine inundation and recession issues for land around the channel.	Lake Macquarie entrance training walls, Salts Bay, Black Neds Bay, Grannies Pool area and northern foreshore reserve –seaward of Swansea Bridge. Note: Further information about Swansea Channel issues and management is in Part C of the CZMP
11.	Coastal data and record keeping – making sure that high quality information about the coast is available to support adaptive decision making (establishing systems to collect, manage and report information is a priority). Long term data on actual coastal change, linked to triggers for action is the key to adaptive management.	Whole of coastline

8.0 Strategies for a resilient coastline

In this section

8.1 Linking Councils coastal vision to action

Figure 8.1 shows the logical connections between the vision for the coast and the actions needed to make that vision a reality, as well as where in the document these process steps are detailed.

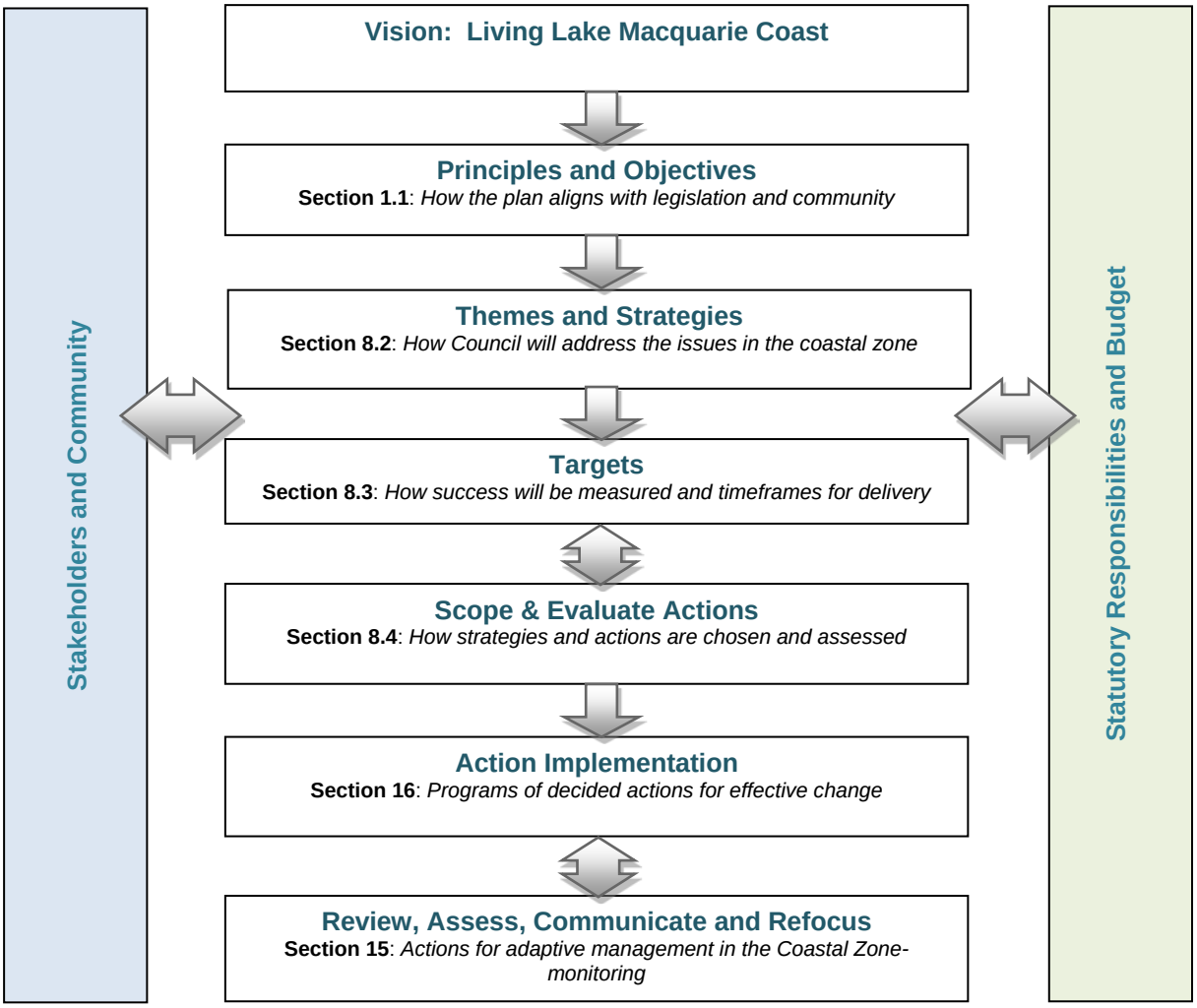


Figure 8.1 – Linking vision to action

8.2 Themes and Strategies

Themes allow Council to focus actions to manage related risks in the coastal zone. They are also used to organise strategies that set Council and its local communities on a pathway to sustainability in the coastal landscape.

Figure 8.2 shows the management themes for the coast and the local areas where actions will be implemented.

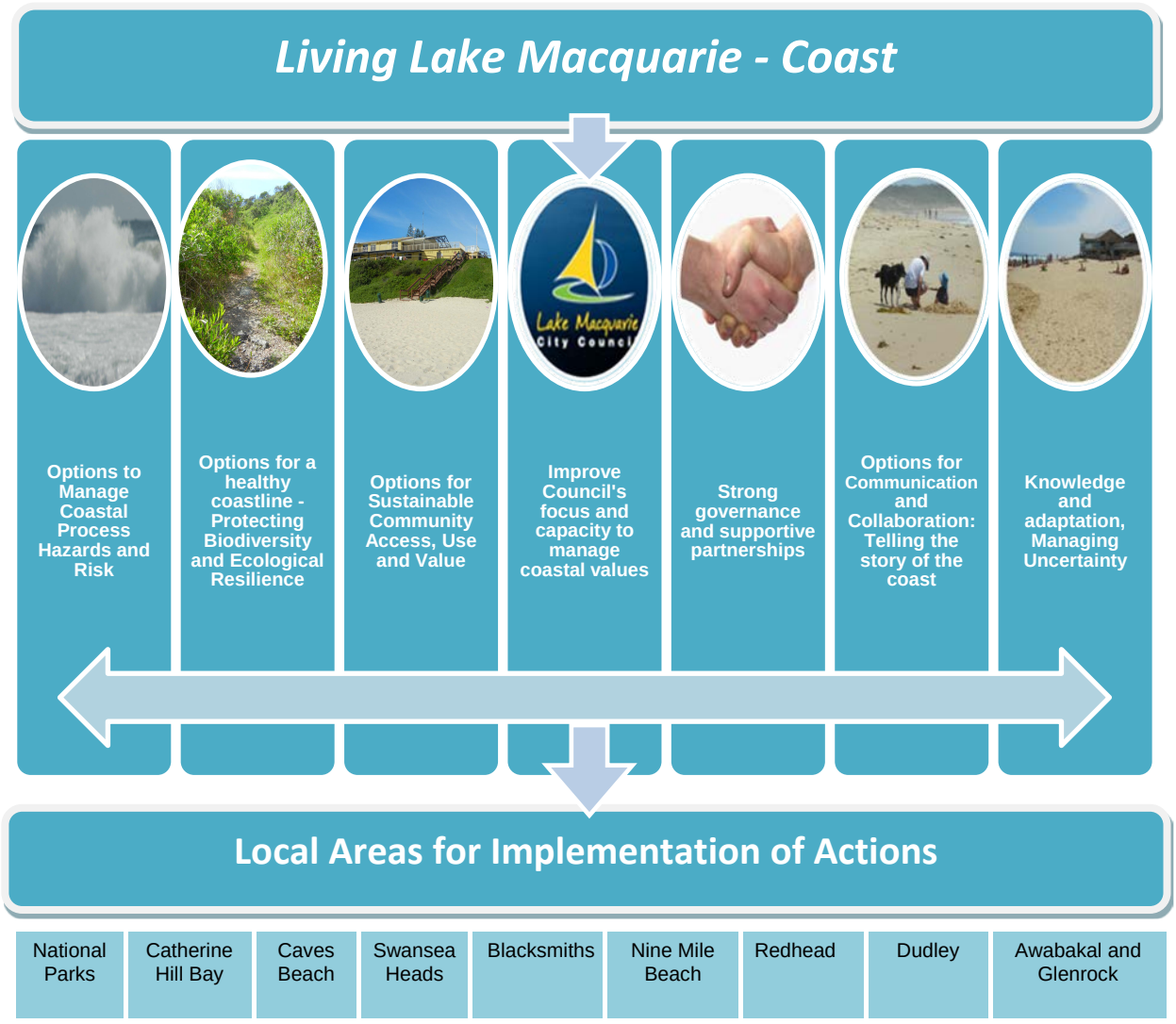


Figure 8.2 – Key themes and local implementation areas

From the seven overarching themes, a number of specific strategies can be identified. The strategies are intended to aid in the appraisal process by further categorising the numerous actions (**Figure 8.3**).

1. **Theme: Adaptively mitigate coastal risks**
   1: Monitor beach and dune condition.
   2: Conduct awareness raising activities within local communities
   3: Protect Beaches and Dunes
   4: Protect high value built assets
   5: Planning controls and design options to accommodate immediate and climate change hazards
   6: Managed retreat or existing development, or new development
   7: Emergency response planning and implementation
2. **Theme: Protect and enhance ecological resilience and coastal biodiversity**
   8: Land use planning and land management plans for ecological resilience
   9: Partnerships for sharing ecological knowledge and activities
   10: Select priority locations for action
   11: Ecological monitoring and new information for improved management
3. **Theme: Maintain and improve important social and economic values**
   12: Manage off road vehicle activity on the Lake Macquarie coastline
   13: Develop safe attractive and sustainable coastal pathways
   14: Planning and education to manage coastal reserves sustainably
   15: Consult with surf club members to match risk mitigation and community value opportunities
4. **Theme: Improve Council's focus and capacity to manage coastal values**
   16: Review Council resources and investment priorities for the coast
5. **Theme: Foster strong governance and supportive partnerships**
   17: Partnerships with state agencies
   18: Partnerships with adjoining local government areas
   19: Support community involvement in looking after the coast
   20: Partnership with private land holders
6. **Theme: Communications – telling the story of the coast**
   21: Raise the profile of the coast as a place of social, cultural and economic value
7. **Theme: Knowledge and adaptation**
   22: Establish and maintain adaptive systems

Figure 8.3 - Strategies grouped by theme

Sections 9 to **15** outline a wide variety of strategies and actions, all of which have the potential to contribute to a resilient coastal landscape, enjoyed by and supporting the wellbeing of local communities. Council and its partners cannot implement all of these potentially valuable actions at once.

8.3 Targets for coastline management

To assist Council and the community to evaluate the extent to which the objectives of Part A of the CZMP have been met, a range of Targets has been set. These targets allow Council to determine the effectiveness of the Plan. **Table 8.1** summarises the performance that Council is aiming for in managing its coastal landscape. These targets may change as Council undertakes the actions within the CZMP. These targets are organised in themes that reflect the major issues for Council's attention (see **Section 8.2**).

Table 8.1 - Targets for coastline management performance

Values	Targets
Options to Manage Coastal Process Hazards and Risk	• By 2020, the coastline risk profile of Lake Macquarie City does not increase, as indicated by the area assessed as high or extreme risk • By 2016, LMCC has clear knowledge of safety risks on coastal headlands and shore platforms and action has been taken to reduce intolerable risks. • By 2016, LMCC's DCP includes planning horizons and management triggers for coastal hazards and risks and Council is able to report on impacts on land use and land value
Options for a healthy coastline - Protecting Biodiversity and Ecological Resilience	• By 2020, the extent of coastal dune vegetation where Bitou bush is effectively managed and other weeds of national significance are increased by 20% by 2020. • By 2020, the condition of coastal ecological communities at identified monitoring sites is maintained or improved, as measured by habitat values; presence of invasive species; species diversity at monitored sites • By 2020, 5km of unnecessary or poorly sited pathways on headlands and dunes are closed and rehabilitated • By 2016, the impact of sea level rise on the water quality and health of coastal wetlands is better defined through modelling, linked to a monitoring program.
Options for Sustainable Community Access, Use and Value	• By 2020, the number of people visiting the Lake Macquarie coastline at least once a month has increased by 10% • By 2020 the volume/weight of waste collected from the main patrolled beaches in LMCC has decreased by 20% • By 2020, 20km of coastal walking track is formalised and signposted. • By 2016, MCC and SLSCs have an agreed retreat contingency plan for surf club buildings along the LMCC coast. • By 2020, two new patrolled swimming areas are available in LMCC • By 2020, three major recreation areas (i.e. regional scale picnic facilities, playgrounds, lookouts etc.) are established along the LMCC coast, in accordance with reserve Masterplans. • By 2020, all off road vehicles using Nine Mile Beach are driven by people who have completed a beach driving knowledge test and hold a beach driving permit. • By 2020 the number of reported antisocial behaviour incidents involving off road vehicles on beaches and dunes is negligible.

Value	Targets
Improve Council's focus and capacity to manage coastal values	• By 2016, LMCC has completed reviews, updates and integration of plans for open coast, Lake Macquarie estuary and Lake Macquarie flood risk and is managing the coastal zone as an integrated landscape. • By 2016, LMCC's budget strategy includes coastal specific programs that reflect the values the open coast provides for the City. This is likely to require an increase of coastal specific funding of 10%. • By 2020, the number of community volunteers involved in coastal protection and management projects increases by 15%. • By 2020, the value of coastal tourism in the City increases by 10%. • By 2020, all land on the beach and dune system, as far landward as the 2050 coastal risk planning line is in public ownership or management.
Strong governance and supportive partnerships	• By 2020, LMCC, WSC and NCC have agreed consistent approaches to coastal risk management and biodiversity resilience. • By 2020, LMCC has a Memorandum of Understanding with OEH and Trade and Investment – Crown Lands Division in relation to aligned beach/dune management objectives and consistent regulatory approaches, including authorised officers. • By 2016, LMCC has an established protocol with Trade and Investment – Crown Lands Division and OEH about the beneficial use for beach nourishment of sand resources dredged from Swansea Channel.
Options for Communication and Collaboration: Telling the story of the coast	• By 2016, Council's web site is upgraded to provide up to date on line information about the condition of the coast and the success of coastal management programs • By 2020, Lake Macquarie residents (as measured by a surveyed sample) have demonstrated knowledge of coastal change and why and how Council is managing coastal risks • By 2020, all Council work teams have knowledge about coastal processes and risks and Council's policies to address coastal issues. • By 2016, all relevant sections of Council are aware of the programs being implemented through the CZMP and how those programs affect their activities. Strategies are in place to share coastal zone information across Council. • By 2016, the Lake Macquarie Estuary and Coastal Management Committee (by then the Coastal Zone Management Committee) has membership representative of both lake and open coast issues. • By 2016, Council has established a compendium of coastal stories that illustrate coastal values, including heritage values and is using that information systematically in interpretative and engagement materials.
Knowledge and adaptation, Managing Uncertainty	• By 2016, Council has conducted a first audit of CZMP implementation and outcomes. • By 2016, Council has established clear systems for monitoring and evaluating the health and function of coastal systems. • By 2016, Council has established systems to report coastal condition information in its State of the Environment and Annual Reporting processes. • By 2020, LMCC has collected monitoring data to show actual trends in coastal condition and storm driven erosion events. • By 2020, Council has reviewed then available sea level rise information – rise to date and trends and consequently reviewed the likelihood of coastal hazard scenarios on the coast.

8.4 Selecting the most appropriate actions

Nine criteria have been used to evaluate the importance of potential management responses, and the benefits and constraints associated with their implementation. The criteria have been used to address two evaluation questions:

- Which options are important?
- Which options are feasible?

The answers to these questions determine the most appropriate actions and the priority for their delivery. The aim of the evaluation process is to identify clusters of actions which are both important responses to coastal issues and relatively easy for Council to implement.

These evaluation processes were used to determine whether actions should be implemented in a short (0-4 years), medium (4-8 years), or longer (8-12 years and/or beyond) timeframe. As the review period for the Plan will be ten years, actions in the longer time frame may be undertaken as part of future planning strategies.

8.4.1 Criteria for selecting the best actions

To determine which actions are appropriate priorities for the Lake Macquarie coastline, Council considered how each action would meet the nine criteria listed in **Figure 8.4.**

In this context, the **importance** of responses is based on the extent to which they:

- Address a high or extreme risk (Criteria 1)
- Have a significant environmental benefit or multiple benefits (Criteria 2 and 9)
- Are critical to establishing adaptive management processes for the coast (Criteria 7)

Options which can be described against these criteria in the terms in green in **Figure 8.4** for each of these criteria are considered highly important. Options which are generally rated orange or red on these criteria are considered 'Not Important'.

The **constraint** or difficulty of responses is based on the extent to which they:

- Are affordable with existing resources (Criteria 3)
- Represent good value for money (Criteria 4)
- Are within the capabilities of the responsible organisation (Criteria 5)
- Are supported by the community (Criteria 6)
- Fit within existing statutory and policy frameworks (Criteria 8)

Actions which meet the conditions listed in **green** are the best actions (the most important) for Council. Actions that rank as **amber** are of moderate value and actions ranked as **red** are of low value to Council. These rankings are shown in the action tables in **Sections 9** to **15**.

Actions which are best described in the terms in green for these criteria in **Figure 8.4** are considered very easy to implement. There are few constraints to action. The more descriptions for these criteria from the orange and red categories, the more constraints there are to early application of the option. Options which best fit all orange or red descriptions are difficult.

Actions will fall into the 'too hard for now' category if implementation would require significant changes to organisational capacity, partnerships, funding sources or legislation. Such changes could take some time to achieve and the likely environmental, social and economic benefits, within foreseeable timeframes, do not currently appear to justify investment to make these changes happen.

Figure 8.4 - Qualitative criteria and descriptors for evaluating the importance of options for managing the Lake Macquarie coast

8.5 Using the criteria to identify appropriate time frames for action

A simple matrix for determining the priority of actions is shown in **Table 8.2** (adapted from CZM Pty Ltd 2010 for WESROC in Western Australia, in the context of coastal councils adapting to coastal and climate change risks). This matrix follows the same concept as the issue prioritisation matrix used in **Section 7**.

Table 8.2 – Importance and Constraints of Actions

		Constraints	
		Less Constraints	More Constraints
Importance	Higher Importance	**Category A** **Important and Easy** Take action NOW These actions treat high priority risks, and can be done with available funds, current legislation/policy and governance arrangements	**Category B** **Important but tricky** Take action NOW to reduce barriers and enhance opportunities. These are 'preparation' actions, so that actions can move into the Important and Easy category when needed.
	Lower Importance	**Category C** **Not so important, but easy** Take action when opportunities present – these actions are 'bonuses' – schedule for implementation, but not urgently.	**Category D** **Too hard for now** Take action to remove barriers and enhance opportunities when opportunities present (focus initially on 'important but tricky')

Potential strategies and actions considered for the Lake Macquarie coastline have been allocated to these four categories, using information from the nine criteria in **Figure 8.4**. The combined evaluation process has informed the allocation of management responses to timeframes in the implementation schedules in **Section 16**.

8.5.1.1 Allocating actions to time frames

Following this process, four timeframes are being considered in the implementation schedules in Part A of the CZMP (**Section 16**), relating to Councils four year budget cycles. More information about priorities and time frames is in **Section 16**.

- **Immediate to Short term** – Include in the current annual budget cycle if possible (Category 1 actions). Otherwise, include in budget cycle to schedule commencement within the next 4 years (All **Category A** actions, some **Category B** actions. Possibly some **Category C actions** (when opportunity arises).

- **Medium term** – include in budget cycle to facilitate commencement within 8 years. Likely to be mostly **Category B** and some **Category C** actions, with ongoing actions from **Category A** (after review).

- **Long term** – to commence before the full review of the Part A of the CZMP, in 8 to 12 years (or possibly beyond). Likely to be mostly **Category B** and **Category C** actions, with ongoing actions from **Category A** (after review), and potentially introducing **Category D** actions.

- **Strategic adaptation** - actions that are foreshadowed in Part A of the CZMP, but which may not be commenced until sometime in the future, when trigger conditions are met. Likely to be a mix of **Category B** and **Category C** and introducing **Category D** actions.

8.6 Implementation risks for managing coastal hazards

An implementation risk is the risk that a management response to mitigate risk cannot be properly implemented or has unintended side effects. When mitigating an extreme risk requires significant changes for Council and the community and/or involves significant costs, it is reasonable to ask what can go wrong if this action is taken, what could prevent it from achieving its intended outcome and what would happen if we did nothing.

Is the risk of acting greater or less than the risk of doing nothing? For coastal risks where there is still a lot of uncertainty about when hazards will occur, these are important questions for communities.

To better understand potential implementation risks, Council has considered the following when evaluating appropriate responses to extreme and high coastal hazard risks:

Investment required

- Does the cost of the proposed action require a change in investment priorities, or additional sources of funds?

- Is this a stand-alone cost, or can it be integrated with existing asset management processes? For instance, if some facilities should be relocated landward to avoid intolerable risks (environmental and service continuity), is it possible to align the work with the asset life of the infrastructure or with upgrades that would be required for other reasons?

What could go wrong?

- Are technical solutions requiring further development (and uncertain cost) involved? Is action dependent on uncertain grant funds? Is action dependent on cooperation between stakeholders with divergent objectives and priorities?

- Have potential indirect impacts of management actions been scoped and understood? For instance, construction of properly designed sea walls can provide robust protection of built assets that are located landward of the structure. However, there is a significant indirect risk with a seawall that community access to the beach and dunes will not be possible (or greatly reduced) and that coastal biodiversity will be degraded. These different risks are difficult to compare – and methods are generally poorly developed, but the questions of private and public value or different/conflicting public values must be considered.

Uncertain future conditions

Particularly for management of risks associated with future coastal recession linked to uncertain rates of sea level rise:

- If, over time, the hazard (and therefore the risk) is less than assessed now, but action has been taken to mitigate an assessed extreme risk, what losses would occur and to whom? For instance, if sea level does not rise as fast as currently projected, but Council has introduced precautionary planning controls, what are the risks? Development opportunities for some landholders will have been delayed, and the value of some coastal land may have decreased, but value could recover when more knowledge is available.

- Conversely, if Council does not take precautionary actions (such as planning controls) and sea level rises as fast (or faster) than projected, what are the risks? Who would lose and what sorts of losses would be incurred? In this case, losses to individuals are delayed to the future, when coastal recession or inundation impacts on property owners not adequately prepared for the change. If land use intensification has occurred in hazard areas, the potential future risks are significant. The issues that concern existing coastal landholders whose assets are now in immediate hazard zones, would be greatly magnified.

9.0 Theme 1: Options to manage coastline processes, hazards and risks

In this section

Protect, Accommodate, Retreat, Share and Accept – strategies for managing coastal risk
Focus on Immediate extreme and high risks; planning and preparation of extreme and high risks at 2050 and 2100
Planning controls for Coastal Risk Planning Areas
Change Action Triggers

9.1 Strategies for managing coastal risk – existing and future development

Council's priority is to manage **immediate, extreme** and **high risks** from coastal processes and hazards along the Lake Macquarie coast. As determined by BMT WBM (2015), these are:

- All beaches and rock platforms and the caves at Caves Beach
- Redhead and Swansea Belmont SLSC and associated services
- Belmont Wastewater Treatment Plant, outfall and associated mains
- Northern and Southern training walls of Lake Macquarie entrance
- Important habitat at Pinny Beach
- Catherine Hill Bay disused railway (heritage listed)
- These risks are the highest priority for management in the short term. LMCC will introduce risk preparation measures for other risks in 2050 and 2100 time frames.

At 2050, in addition to those above, the following extreme and high risks become active:

- Gravity main in dunes south of the car park at Redhead;
- Open space/beach reserve areas at Blacksmiths;
- Caves Beach SLSC;
- Important habitat at Catherine Hill Bay (estuarine creeks/wetlands) and potentially at other beaches (e.g. Nine Mile creeks and wetlands);
- Residential land in Flowers Drive at Catherine Hill Bay.
- **At 2100**, in addition to the immediate and 2050 extreme and high risks, the following risks become active:
- Open space in reserves along Blacksmiths Beach – along Ungala Rd, between Binda and Tirriki Streets;
- Rising mains along Ungala Road;

- Three residential properties along Ungala Road. However, note that at this time, other properties in Blacksmiths may be extreme risk in terms of inundation from Lake Macquarie.

- Further residential land in Flowers Drive at Catherine Hill Bay.

- The risk assessment process also identified multiple low to moderate risks for built assets along the Lake Macquarie coast. The risk management actions in this section focus on the highest risks, but many of the proposed actions will also mitigate lower risks in the same locality.

- Although other coastal hazard risks are moderate to low and are therefore currently acceptable, this Part A of the CZMP considers how these risks can be managed to ensure they do not escalate over time. The CZMP proposes regular review of hazards and risks as new information becomes available, so that any change in the risk profile of areas where the risk is currently considered acceptable, can be identified and appropriate risk mitigation strategies introduced.

9.1.1 Risk management options

There are a number of options available to manage immediate and longer term coastal risk. (BMT WBM, 2015b) shows; active options such as ‘protect’, ‘accommodate’ and ‘retreat’ for existing development; and ‘avoid’, ‘accommodate’ and ‘accept’ for future development (in-fill and Greenfields) shown in **Figure 9.1**. Examples of these are provided in **Table 9.1.**

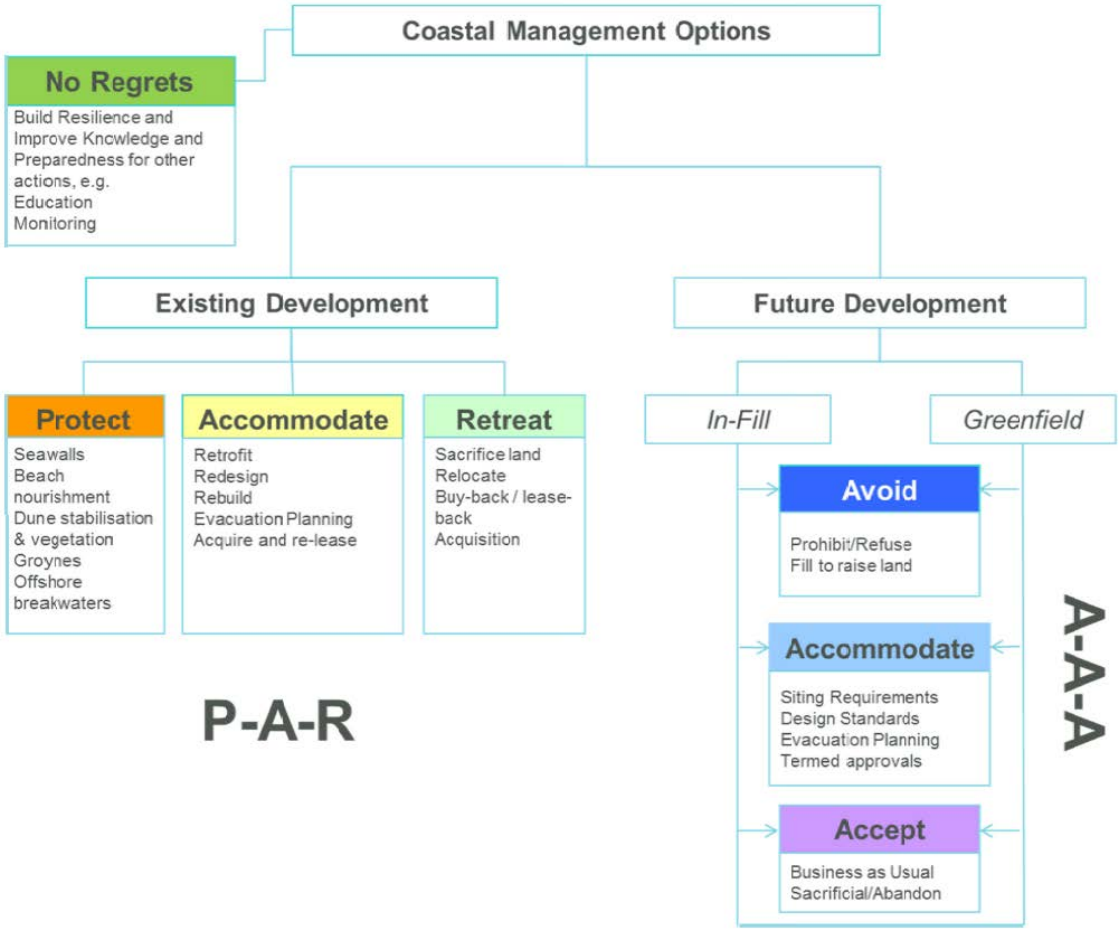


Figure 9.1 - Risk management options for existing and future development (from BMT WBM, 2015b)

9.2 Policy review – options for existing development affected by coastal risks

Blake Dawson (for DCCEE, 2011) reviews the status of Australian approaches to management of coastal process and climate change risks in the coastal zone. The review considers current strategies for future development and existing coastal settlements. The report does not address property law issues. Within the scope of its investigations, the report finds that the extent of policy preparedness in Australia for managing coastal risks associated with recession (specifically recession associated with sea level rise) is poor. There are three broad approaches in Australia to managing climate change risks for existing coastal settlements:

1. Reduce or contain the intensity of existing settlement (e.g. rezone land to a lower intensity use) (Accommodate or Retreat).

- This approach is recommended in the NSW Coastal Planning Guideline (DoP, 2003). Its successful application is constrained by existing use rights applying to existing development, which mean that existing lawful landuse can continue, even if the zoning changes and they would subsequently be prohibited. Existing use rights do not allow intensification, but will slow down retreat from high risk coastal locations, without additional measures.

- Blake Dawson (2011) suggests that compulsory acquisition might be needed in high risk locations, where a rapid adjustment to land use is needed to reduce risk and other options (such as structural protection with sea walls) are not feasible.

- Compulsory acquisition and/or compensation for what they term 'injurious affectation' processes are not currently available in NSW. The NSW Government has a clear policy that it will not compensate or acquire private land in coastal risk areas. There are limited provisions in some other states for a landholder to be compensated if additional restrictions to use are applied to their land.

- Internationally, Blake Dawson (2011) refer to the use of:

    - A short moratorium on rebuilding after disaster events that allows zoning standards to be adjusted, so that subsequent reconstruction must comply with new standards
    - Full market value buy back plans (very expensive)
    - Buy back of high risk property, but the previous owner retains a life time lease or a right to occupy up until an agreed trigger point

2. Install coastal protection works (Protect or Defend)

- The NSW requirements in relation to coastal protection works are set out in the Coastal Protection Act, and related codes and guidelines. The NSW policies include a requirement for private landholders to contribute to the cost of construction and maintenance of the works from which they benefit, and to maintenance of the public values of beaches (such as access and amenity)

3. Plan for emergency response (Accept risk)

- The NSW Coastal Protection Act (as amended) now requires emergency action sub plans to be included in the coastal zone management plan for each local government area. Certified CZMPs must be taken into account when determining development applications for coastal land (See Appendix 3)

9.2.1 LMCC/Hunter Councils research on community attitudes to coastal risks

Council is currently investigating the factors that influence how vulnerable coastal communities respond to the risks associated with sea level rise in estuaries. The project is considering social, economic and ecological factors that influence community perceptions and attitudes. One of the important issues for this project is how communities understand and act in an uncertain physical environment – but one where significant change is projected to occur.

The results of the project, which will also be relevant to some open coast issues, will help Council and the community better understand and manage the full scope of risks in land use planning and other decision making.

9.3 Tools and processes for adaptive management of coastal risks

Council's challenge in managing risks on the open coast is to determine when to move from minimal intervention to more directive/prescriptive responses.

Table 9.1 elaborates on the broad strategies outlined in **Section 9.2**. Further detail about complex management options is in **Sections 9.3.1** to **9.3.8**.

Table 9.1 - Strategic options for managing coastal risk

Type of risk response	Types of actions included
Minimal intervention (no regrets, or preparation measures). Also valuable for lower risks, where action is not urgent, and for identifying the approach of trigger points.	• Monitor actual coastal change (erosion, recession and inundation events) in relation to monitored climate parameters • Raise community awareness prepare the community for future change, through involving people in local area planning, coastal activities and providing clear and robust information about coastal change. Provide information about how individuals can contribute to adaptation and how they can prepare their assets when necessary. Provide information about how and when a change to a more active intervention would occur.
Protect beaches and dunes, infrastructure and/or private assets	• Dune rehabilitation (for the purpose of trapping sand to maintain dune height and volume) • Beach management (including beach scraping and beach nourishment). For the Lake Macquarie coast, the placement of sand dredged from Swansea Channel onto Blacksmiths beach is regarded as beach management, as the sand is from within the same coastal sediment compartment. BMT WBM (2015) recommends that a Memorandum of Understanding between the State Government (DPI Catchments & Lands) and Council should be established as a priority, ensuring that any sand dredged from Swansea Channel is placed on Blacksmiths Beach. Further discussion about this work is in **Section 9.3.1**. Governance arrangements for placing dredged sand on the open coast are in **Section 9.3.1**. • Construction of sea walls (see **Section 9.3.3** for more specific local information) • Construction of breakwaters or groynes • Beach nourishment using sand from offshore sources.
Adapt structures and assets to better withstand coastal processes	• Use coastal hazard layers attached to the LEP and specific design controls in the DCP to direct the type of development and the design of development (floor levels, piered foundations, lightweight or modular construction). These controls would be associated with timed consents – linked to coastal condition triggers. • Establish coastal land acquisition programs with specific criteria. Retaining land for public open space and beach access on a receding coastline could be one criterion.
Avoid or retreat from coastal risks	• The LEP and DCP would specify types of development prohibited in coastal risk areas and the triggers to be used for removal or relocation of development.

Type of risk response	Types of actions included
Accept coastal risks, and/or share risks through insurance	• Emergency response and evacuation plans and preparations • Note that in general, insurance is not available for impacts from coastal processes. However, research and development is continuing within the insurance industry to identify products which could cost effectively meet the needs of land owners affected by coastal risks in medium to longer term (See Appendix 3)

Table 9.4 (at the end of **Section 9**) notes potential actions and locations for the application of these measures, together with general information about the benefits and disadvantages of each option. Criteria scores relate to the evaluation criteria set out in **Section 8**. The criteria scores have been allocated based on currently available information, as outlined in **Sections 1** to **6** of the LMCZMP[A].

9.3.1 Trigger mechanisms for changing management on the coast

The hazard analysis by BMT WBM (2015) shows that over the last 50 to 60 years, no recession trend is evident on Lake Macquarie beaches. If no further sea level rise occurred, they conclude that the coast would be stable over the 2050 and 2100 planning time frames. If sea level rises as projected, coastal recession will occur, most likely as step changes with intermittent storms.

The current stability of the Lake Macquarie coastline and projected impacts on some assets only after 2050 means that for many landholders, coastal management may appear to be 'business as usual'. This is not actually the case. Whilst many activities may continue unimpeded for some time, adaptive coastal management in conditions of uncertainty means that immediate actions to build resilience, supported by a combination of monitoring and triggers for changing management is essential.

Council proposes to introduce a series of 'Change Action Triggers' for new development and existing infrastructure that is seaward of the 2100 Coastal Risk Planning Line (coastal recession and marine inundation). These Triggers provide guidance on when planning should commence for adapting an asset to coastal change. Change Action Triggers are different for infrastructure, major community assets, private dwellings and local scale access infrastructure.

Table 9.2 presents potential triggers for:

- Commencing detailed planning for a change to management – most likely retrofitting or relocating. Note that for Council assets, this preparation phase may involve multiple divisions of Council, so communication of the triggers and requirements is essential.

- Commencing on ground works

These Change Action Triggers are not related to the NSW Government trigger distance for emergency works in Authorised Locations. There are no Authorised Locations for coastal erosion protection works in LMCC.

All Change Action Triggers rely on effective monitoring of actual coastal change and evaluation against predicted change.

The concept of Change Action Triggers follows the work of Fisk and Kay (2010). The concept is illustrated in **Figure 9.2**.

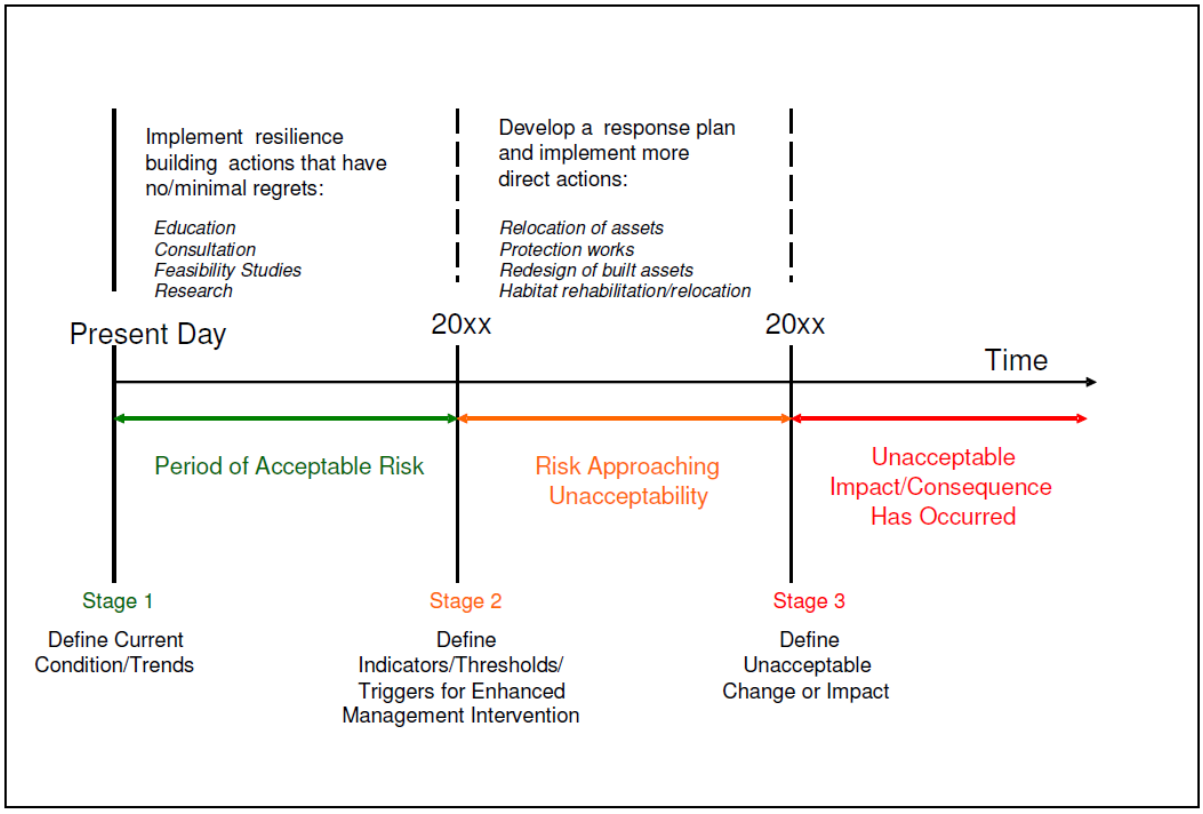


Figure 9.2 - Adaptive change management processes (Fisk and Kay, 2010)

Table 9.2 - Proposed Change Action Triggers for the Lake Macquarie coastline

Type of development	Triggers for enhanced management intervention		Explanation
	Commence planning for management change (Risk is increasing)	Commence on ground works (Risk of continuing current management is unacceptable)	
Major infrastructure	Immediately, with reviews at five year intervals until the 'commence on ground works' trigger condition is met.	When actual coastal recession reaches the 2050 Coastal Risk planning Line (2050 'Unlikely' hazard line) as currently mapped.	Long term planning is required because of complexity of issues and significance to community wellbeing; extremely high investment required (e.g. for WWTP or Swansea Channel training walls – see also Part C) so long term budget planning also required.

Type of development	Triggers for enhanced management intervention		Explanation
	Commence planning for management change (Risk is increasing)	Commence on ground works (Risk of continuing current management is unacceptable)	
Surf Club buildings	Immediately, with reviews at two year intervals until the commence action trigger is met. Removal of assets from ground floor subject to inundation should commence immediately. Decision about medium term protection or retreat options should be made in next two years, to allow for planning.	Upgrade 'accommodate coastal hazards' management now. If protection is agreed option, protection works to be initiated within 2 years for Redhead (review and strengthen) Swansea Belmont and Caves Beach surf clubs.	Community social asset, with high levels of attachment to current buildings and locations. However, cost of maintaining facilities in these locations (including cost of maintaining a protection structure that also addresses inundation) will exceed relocation costs before 2050.
Local roads, water supply and sewerage reticulation	When actual erosion or recession reaches 2050 Coastal Risk Planning Line (2050 'unlikely' hazard line) as currently mapped.	When actual erosion and recession reaches the 2050 'Rare' hazard line, or is no more than 15m from the infrastructure alignment; or the infrastructure is inundated by marine processes during events estimated to have a 1 in 20 year recurrence interval; or infrastructure reaches its asset life.	These assets service existing development. The triggers are intended to recognise the costs of maintaining functioning infrastructure in situ, as opposed to relocating/redesigning at asset life.
Existing dwellings	When actual erosion or recession reaches the 2050 Coastal Risk Planning Line (2050 'unlikely' hazard line), as currently mapped; or the property is inundated by marine processes having a 1 in 20 year recurrence interval	When actual erosion or recession escarpment is no more than 20m from the dwelling; or the dwelling is inundated by marine processes at intervals of less than 2 years.	New dwellings can have consent conditions linked to the triggers. For existing development, the consent provisions cannot be used. However, a similar trigger for retreat would apply because the dwelling would cease to be occupiable.
Other existing buildings (commercial and industrial)	When actual erosion/recession reaches the 2050 Coastal Risk Planning Line; or the property is inundated by marine processes having a 1 in 20 year recurrence interval.	When actual erosion or recession is no more than 20m from the building.	As above

Type of development	Triggers for enhanced management intervention		Explanation
	Commence planning for management change (Risk is increasing)	Commence on ground works (Risk of continuing current management is unacceptable)	
Recreation infrastructure such as pathways, lookouts	Review of designs should commence immediately, to allow the seaward toe of access ways to adjust. Emergency closures should commence immediately, when required for safety.	Review situation at intervals of ten years or at asset life/major review. Relocate landward as necessary and feasible, when the erosion or recession reaches to no more than 5m (along the beach) pathways and lookouts.	The triggers are linked to expected asset life of this infrastructure.
Recreation infrastructure – facilities in coastal reserves	Review of landscape plans should commence immediately, to incorporate dune enhancement works and appropriate access ways. Locate picnic facilities, new amenities etc. landward of the immediate Coastal Risk Planning Line.	Review landscaping plans and designs of facilities with asset life of these facilities – likely to be at ten year intervals.	Trigger is linked to asset life of facilities in public reserves and to review periods for Plans of management for reserves.
Private recreation – Belmont Golf Club	Planning for fairway and green design and planting that accommodates coastal processes should commence now and be gradually introduced.	Seaward parts of the course would be abandoned when the cost of maintaining fairways and greens exceeds the value obtained from use. Likely to be linked to sand and/or wave inundation of the seaward part of the golf course at intervals of not more than 2 years. Indicatively, this could occur by 2050.	Trigger to be confirmed by Golf Club Board and members.

9.3.1.1 Local community adaptation plans

Council is already working with local communities that are expected to be affected by flood risks associated with climate change and sea level rise. Council will also work with local communities to incorporate long term recession and marine inundation risks in the local area adaptation plans that are in preparation for areas such as Blacksmiths and Catherine Hill Bay.

9.3.2 Redhead – Existing seawall fronting the SLSC

The SLSC building was constructed in its current location in 1972. The building is in the immediate erosion hazard zone and considered to be at high risk. Following the May 1974 storm a rock wall was constructed to protect the building and the area between the wall and the building was subsequently sealed.

The beach in front of the building and the seawall is also at immediate risk from inundation and is considered to be at extreme risk, because of its amenity value as one of Lake Macquarie's main safe beach areas.

Options to mitigate the immediate and longer term risks affecting the surf club building involve enhanced rock protection or planned retreat/relocation of the major built asset to a lower risk position. Because of the high community value of the surf club and the importance of club and community engagement in any decision about relocation, this aspect of risk mitigation is addressed in detail in **Section 11** (Theme 3 – Maintain and improve important social and economic values).

In this section, the background to the current sea wall and measures to enhance protection are considered.

In 1994 a study was undertaken on behalf of Council by the Many Hydraulics Laboratory (MHL, 1994) to design a new seawall to better protect the surf club and to determine the potential inundation risk based on the new design of the wall. It was found that the new wall would need to be 1m higher than the previous structure to reduce the overtopping risk. This was not thought to be practical considering the use and amenity of the building, and an alternative approach was taken. Additional rock armouring was placed over the existing units at a similar elevation and it was proposed to retrofit the actual building to better withstand inundation. Works on the rock wall were completed at the end of 1994.

At present the wall is usually covered by sand and a thorough condition assessment is not possible. However, it is exposed in storm wave conditions and waves overtop the wall and transport sand around the building. A review of the condition and protection capacity of the sea wall at Redhead surf club is strongly recommended.

Plates 9.1a and **9.1b** show the damage caused at Redhead Beach in the recent June 2012 storms. The ground level of the Surf Club was partially inundated due to overtopping. This also displaced sand from the beach onto the landward side of the building. Rubbish bins on the beach were also damaged from direct wave impact. In this context, further investment in access infrastructure or viewing platforms over the rock wall is not recommended, unless Council is prepared to regularly replace these structures after high wave events – this could be as often as every year.

Plate 9.1a - Sand on the landward side of the Surf Club, due to waves overtopping the seawall.

Plate 9.1b - Wave runup at Redhead causing damage to bins on the beach.

9.3.3 Protecting critical infrastructure

Belmont wastewater treatment plant is the main piece of 'critical' infrastructure on the Lake Macquarie coast. The plant is on land owned by Hunter Water Corporation and is managed by HWC.

Because the WWTP is located on Nine Mile Beach, with land managed by the Trade and Investment – Crown Lands Division, Council and Belmont Golf Club in close proximity, measures to protect the WWTP will be developed in consultation with these land owners and managers. In the medium to long term (beyond 2050), the WWTP site could be protected by a properly designed sea wall. Interim options for the WWTP site involve working with Council, Trade and Investment – Crown Lands Division (State Park) and Belmont Golf Course to stabilise the frontal dune system, remove invasive species and replace with locally indigenous dune vegetation and control off road vehicle access.

Other important infrastructure located seaward of the 2100 Coastal Risk Planning Line includes roads, sewerage and water reticulation systems. Where the asset life of this infrastructure is less than the relevant coastal risk planning period, decisions about redesign and/or relocation can be made at the time of asset replacement or major upgrade.

For situations where coastal erosion and recession risks proceed faster than anticipated in the risk assessment process, Council has identified trigger points for planning for redesign or relocation of infrastructure to commence. These trigger points (outlined in **Section 9.3.7**) are intended to ensure that there is adequate time for a proper design and risk review to be completed and for funds for necessary works to be included in Council's budget planning, including applications for grant funds.

Section 9.3.7 also notes trigger points when works to protect or relocate important infrastructure must commence.

9.3.4 Swansea entrance training walls

Swansea Channel is the focus of Part C of the Coastal Zone Management Plan. However, some management issues and actions for the channel also have implications for the sustainable management of the open coast. For this reason, some background on channel dynamics and issues, particularly for the outer channel, is included here.

Structures at the entrance to Lake Macquarie were first built in the 1880s to assist navigation. This section considers the interaction between sedimentary processes on the open coast and those in the outer part of the channel. More detail about channel hydrodynamics, management issues and potential responses is in Part C of the LMCZMP.

Structures in the channel entrance area now include (BMT WBM, 2015):

- Entrance training walls and the breakwaters
- Foreshore works including Lucys Groyne
- Two groynes on the Salts Bay foreshore
- A groyne at Mats Point
- A groyne at the western side of Black Neds Bay

- Training walls along the entire northern shoreline, from the entrance breakwater to Swansea Bridge, and including a small break at Grannies Pool.

  Originally, Grannies Pool was roughly circular in shape and approximately 1m deep at high tide. It was a much used local community swimming place. Works in the late 1970s through the 1990s changed the position of the entrance to the pool, resulting in the pool filling with sand. It is currently in poor condition and the pedestrian access way from the car park down to the pool is also in poor condition.

The training walls and groynes are all high capital value structures. Their continuing functional condition is necessary for constraining channel change in the outer entrance channel and maintaining navigation. Audits of the condition of all these structures are required regularly, with follow up maintenance works as necessary.

Trade and Investment – Crown Lands Division is responsible for maintenance of the entrance training walls and for dredging the entrance bar if necessary for navigation. The main constraint to safe navigation is not sediment deposited at the entrance (although the coal shelf across part of the entrance is a hazard for deep draft vessels), but dynamic shoaling upstream of Swansea Bridge. These processes are exacerbated by the training walls which have increased flood tide current velocities and caused continual adjustment of the channel (BMT WBM, 2015), including shoreline recession at Salts Bay and scouring elsewhere in the channel.

Channel scouring is expected to continue into the future, with or without sea level rise (Worley Parsons, 2010; BMT WBM, 2015). Worley Parsons (2010) and BMT WBM (2015) state, based on original modelling by PWD (1976), that there is very limited sand transport into the channel from the open coast, but some sand moves seaward in the scour ebb tide channel along the northern training wall, in the outer estuary.

9.3.5 Placing dredged sand on beaches

Dredging of Swansea Channel to manage hydrodynamic issues and to maintain navigability, is addressed in Part C of the Coastal Zone Management Plan. A preferred option for the beneficial reuse of sand which may be dredged from the channel from time to time is to place the sand on Blacksmiths Beach and frontal dunes. The rationale for this approach is discussed here.

Prior to the construction of the entrance training walls at Swansea Channel (initial works in the 1880s), Blacksmiths Beach was part of the dynamic entrance morphology of the channel. The beach would accrete along an entrance spit/berm in calm conditions, but beach volume would be greatly reduced by entrance scouring during flood conditions. A combination of construction of the northern entrance training wall and dune management works has stabilised the volume of Blacksmiths Beach.

However, training wall construction at the entrance to Lake Macquarie has initiated and enhanced erosion of the depositional landforms inside the channel, as the outer channel adjusts to the changed hydrodynamic conditions. The natural channel form was shallow and braided, not a single deep channel. The training walls have cut off sand supply into the channel from the north, but also increased tidal current velocities and hydraulic efficiency, and increased exposure of the southern shoreline at Salts Bay to current and wave erosion. The sand that has been eroded from Salts Bay over the last sixty years was deposited and therefore isolated from the active coastal sediment compartment long before European settlement of the area.

BMT WBM (2004) concluded that most of the infilling of the channel upstream of Swansea Bridge has occurred because of erosion at Salts Bay (seaward of Swansea Bridge), rather than increased transport into the estuary from the open coast. Although the channel has been infilling and widening and the drop over prograding into the lake for many decades, there is no apparent recession trend at Blacksmiths Beach, which adds weight to the argument that the training walls are not directing sand from the open coast to the north or south into the estuary. Sand deposited at the drop over is also now isolated from the active coastal sediment compartment and will not be eroded and transported back to the outer channel or the open coast.

Although Blacksmiths Beach has been stable or slightly accreting over the last 50 years or so, it has also been identified as the most at risk of Lake Macquarie beaches to long term recession with sea level rise, because of its position at the southern end of a long open embayment. In the medium term, this means that a buffer of dune sand would be very valuable to help maintain beach alignment and amenity. In the medium term, additional sand would also help build dune volume and increase the buffering capacity of the frontal dune system north of Belmont Golf Course.

Appropriate options for disposing of sand dredged from Swansea Channel would therefore include placing the sand on Blacksmiths Beach, (and potentially at other locations if sufficient sand is available and can be transported cost effectively). Together with ongoing dune stabilisation works, this would reinforce a buffer of dune sand behind the beaches. Provided sand can be retained by the groynes (and can be transported cost effectively), dredged sand could also be placed on the beach at Salts Bay.

Retaining sand dredged from an estuary entrance channel **within the same coastal sediment compartment** is an informal OEH policy. If the sand in the channel is from the same coastal sediment compartment as the open coast beaches, then material dredged from Swansea Channel should be placed on the adjacent beaches. The recent coastal engineering studies suggest that this assumption is not valid for Swansea Channel, at least in the short to medium term. It may have been valid in the past (pre training walls), but not at present. As outlined in **Section 9.3.4**, the coastal engineering studies suggest that the sand currently moving in Swansea Channel is sourced from relic deposits at Salts Bay and from deepening of the channel as far upstream as Pelican.

Some sand from previous dredging campaigns in Swansea Channel was placed on Blacksmiths Beach. Some sand has also been sold as fill and for local use in the concrete industry.

If dredged sand is placed in the open coast area, it could be placed on the active beach (i.e. seaward of the frontal dune scarp) or it could be placed behind the frontal dunes, increasing dune volume, but isolating it from active coastal processes in the short term. Sand placed seaward of the frontal dunes is likely to be reworked north along Nine Mile Beach by prevailing south east waves. This same northerly accretion trend is also the reason that intervention to enhance beach and dune sand volume is less important further north along the beach.

High erosion and recession risks on Blacksmiths Beach or further along Nine Mile Beach are not immediate concerns, but will be important management issues by 2050, with projected sea level rise. It is likely that placing sand on the beach and dune system will be a beneficial activity before 2050. Careful monitoring of both channel condition and beach condition will be necessary to understand the best timing for adding channel sand to the beach.

In the interim period, if sand is available from dredging in Swansea Channel, some could be placed in constructed dune forms behind the frontal dune system at Blacksmiths or Nine Mile, or at Salts Bay. Any constructed dune forms would require dune stabilisation works to prevent sand being blown across recreational and residential areas, or in the case of Salts Bay, eroded back into the channel.

Final decisions about placement of sand in beach and dune contexts will depend on the costs and environmental impacts of sand transport (e.g. pumping or trucking), and on alternative opportunities that may arise in terms of the overall management of recreational opportunity in and along Swansea channel.

It should be noted that the sand dredged from the channel over the 2014-2015 summer was pumped to the dunes at Blacksmiths Beach, increasing dune volume and height, in accordance with the logic noted above.

9.3.6 Accommodating coastal change in the design of buildings and access structures along the Lake Macquarie coast

Actions to accommodate (adjust by design) coastal change can be used for private development and for public assets such as surf clubs and beach access ways. Where existing development or land zoned for intensive development is affected, risk accommodation strategies are beneficial in situations with significant uncertainty. For the coast, this is the case because:

- Storm events are episodic, and individual storms of apparently similar magnitude can have quite different impacts (in part dependent on antecedent conditions). There is not currently adequate data to quantify return intervals for changes to beach condition.

- Although there is broad agreement that sea level is changing, actual rates of future rise are projections only. Sea level may rise faster or more slowly than projected. Sea level rise benchmarks may be adjusted in the future.

Very little private land along the Lake Macquarie coast is affected by immediate coastal process and hazard risks. A small number of properties at Blacksmiths and Catherine Hill Bay are impacted by inundation and recession in the 2050 and 2100 planning horizons. Continuing zoning of frontal dunes for environment protection is the most important action to continue to minimise risks.

Coastal change can be accommodated in both existing and future development in coastal risk areas. Aspects of this strategy include design requirements that make development more resilient to coastal risks through:

- Design specifications for new development and requirements for retrofitting and redesigning existing development, as part of an application for extensions (e.g. piered foundations or raised floor levels). See also **Section 9.3.7** for controls of the scale and location of extensions to existing development.

- Siting/setback requirements and termed approvals (with trigger points for a change to retreat or other strategies), which are implemented through the planning system, as clauses in the LEP and DCP and design guidelines.

- Other options that can be considered, but are less relevant to the Lake Macquarie coast in the immediate and 2050 time frames include:

- Land acquisition and lease back arrangements for less intensive or more flexible/relocatable uses.

- Rezoning to support less intensive or alternative uses of land projected to be affected by coastal risks in short to medium timeframes

Council will finalise the details of wording of LEP and DCP clauses/tables after further consultation.

9.3.7 Linking development controls to Coastal Risk Planning Lines

Council proposes controls on certain types of development in areas seaward of the 2050 and 2100 Coastal Risk Planning Lines. These planning controls are consistent with the NSW government guidelines for land use planning in coastal risk areas. The aim of these controls is to limit the risks to land holders and also to limit emergency response requirements during severe coastal storms that drive rapid erosion and cause inundation from wave overtopping of frontal dunes.

The proposed planning controls are based on the asset life of different types of development, whether infrastructure provides a critical service for community wellbeing, and the sensitivity of the land users. **Table 9.3** shows the Coastal Risk Planning Line relevant to different types of development. All new development seaward of the 2100 Coastal Risk planning Lines would also be subject to triggers for accommodation or retreat from coastal hazards (see **Section 9.3.1**)

Following further consultation, these development controls will be included in the Lake Macquarie LEP and DCP.

Table 9.2 - Coastal Risk Planning Lines and periods for development controls

Land use	Estimated asset life	Relevant Planning Line	Rationale
Critical utilities:	100 years .	2100 (rare)	These are major infrastructure developments and once in place, the assets are difficult to retrofit or relocate without major disruption. Community risk from disruption of services due to erosion impacts is very high – many people affected.
Essential Community Facilities (eg., Hospitals, hospices)	100 years	2100 (rare)	These facilities have a long asset life and provide services for the frail, ill or elderly. Very high emergency management requirements if the facilities are impacted by an erosion or inundation event.
Aged Care Facilities (eg., Nursing Homes, hostels)	100 years	2100 (rare)	These facilities have a long asset life and provide services for the frail, ill or elderly. Very high emergency management requirements if the facilities are impacted by an erosion or inundation event.
Subdivision	100 years	2100 (unlikely)	New subdivisions provide the planning context and direction for subsequent development.

Land use	Estimated asset life	Relevant Planning Line	Rationale
Medium Density Housing	100 years	2100 (unlikely)	These are more complex developments and have a higher density than single unit dwellings, so risks are higher
Seniors Housing	100 years	2100 (unlikely)	These are more complex developments and have a higher density than single unit dwellings, so risks are higher
Mixed Use Development	100 years	2100 (unlikely)	These are more complex developments and have a higher density than single unit dwellings, so risks are higher
Dual Occupancies	50 years	2050 (unlikely)	Dwelling footprint of new dual occupancy dwellings (i.e. dwellings that are replacing an existing dwelling or are infill development in an existing subdivision)
Residential (single dwellings)	50 years	2050 (unlikely)	Dwelling footprint of new dwellings (i.e. dwellings that are replacing an existing dwelling or are infill development in an existing subdivision)
Commercial / Retail / Industrial	50 years	2050 (unlikely)	In general such development will require large area slab foundations, so it is difficult to adapt to climate change impacts over time.
Tourism Development	50 years	2050 (unlikely)	E.g., Hotels, resorts or other tourism based development
Private Recreational Buildings and Facilities	50 years	2050 (unlikely)	E.g., RSLs, bowling club buildings, golf course club houses, golf courses, tennis courts, bowling greens
Public Recreational Buildings	50 years	2050 (unlikely)	E.g., Surf clubs, beach kiosks / pavilions, amenities blocks / buildings
Public Recreational Facilities	40 years	Immediate (unlikely) (Note: Structures that provide an essential access for safety purposes, can be located seaward of the Immediate Planning Line.)	E.g., Parks, public open space / recreation, cycleway / shared pathways, lifeguard towers

9.3.8 Insurance and emergency response

Informed acceptance of risk is an option for areas that are within immediate coastal risk areas. This means that no protective measures are installed, but an emergency action plan is in place for the occasions when significant storm bite erosion occurs. This option leaves open the possibility that existing development will be damaged or destroyed by coastal storm erosion.

Property and asset owners who choose to accept risks may mitigate the risk by sharing potential costs through insurance. It should be noted that:

- Many insurance companies do not offer insurance for erosion damage caused by coastal storm

- The cost of insurance for a variety of natural hazard impacts such as flooding is changing rapidly, as insurance companies analyse new risk profiles and try to develop new insurance packages to address emerging risks. Sharing coastal risk through insurance is unlikely to be a sustainable long term option for private landholders and asset owners in coastal risk areas.

9.3.8.1 Emergency response

A draft Emergency Response Action Plan was prepared with the coastal hazard and risk studies (BMT WBM, 2015).

Council's responsibilities in relation to coastal emergencies are limited to the safety of public access ways onto beaches during and after the coastal emergency.

BMT WBM (2015) note that there are no properties in the City at which temporary coastal protection works are permitted (i.e. there are no Authorised Locations). Property owners may apply for consent to install permanent coastal protection works only if the works are an action in a certified CZMP for the area. This Part A of the CZMP does not propose coastal protection works at these locations. For works to be undertaken by the landowner, they would have to apply for a standard Development Application, which would not likely be granted.

Table 9.3 - Theme 1 – Options to manage coastline processes, hazards and risks

Objectives **To reduce high and extreme risks to acceptable levels** **To prevent risk escalation** To align adaptive management with actual coastal change			Targets See Table 8.1		
Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 1: Monitor beach and dune condition					
1.1 Establish a beach monitoring program, with cross section sites at each of the main recreational beaches. These sections would be monitored monthly to quarterly.	Locate cross sections at Catherine Hill Bay, Caves Beach, Blacksmiths and Redhead surf clubs. Sites could also be considered at Nine Mile (within the State Park) and at Dudley. See **Section 14** for details about locations and monitoring methods.	Regular monitoring provides reliable information about rates of change on the beaches and the links to storm events or other factors. By locating monitoring points at surf clubs, community involvement can be enhanced (monitoring could be done by lifeguards or local community). Also consider use of cameras and/or COPE stations.	Labour intensive; if monitoring services are paid for, moderate costs are involved.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
1.2 Conduct a detailed cliff–line/headland stability study to confirm hazard and planning lines for headland areas.	Coastal Headlands including Dudley, Redhead, Swansea and Caves beach to Catherine Hill Bay	This detail will inform future planning decisions regarding development near cliff lines and headlands and design for access and walkway infrastructure along coastal headlands and cliffs.	Cost of study.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**

Objectives **To reduce high and extreme risks to acceptable levels** **To prevent risk escalation** To align adaptive management with actual coastal change			Targets See Table 8.1		
Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
1.3 Participate in a regional scale coastal zone monitoring program, using LiDAR and other high resolution spatial data.	Applies to entire coastline of LMCC. LiDAR data collection runs likely to be at regional scale – covering Wyong and Newcastle coast as well. Aerial photos are already flown regularly for LPI/OEH.	High resolution LiDAR data can be analysed to provide excellent detail of actual changes to beach and dune volume. Cost effective whole of coast change assessment.	Data is expensive to collect if a one off flight. Costs are much reduced if flights are for several areas such as across local government areas, or for multiple purposes.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **A**
Strategy 2: Conduct awareness raising activities with local communities					
2.1 Conduct summer and winter coast information and action days with local communities, to include beach monitoring, ecological monitoring and presentations on adaptive management of coastal risks.	Focus on main surfing beaches and associated local communities. Information would also be available on Council's web site. Other actions about community awareness and engagement (not directly related to coastal risks) are in **Section 11**.	Events at surf clubs or in association with other local community events bring coastal management into the daily lives of people who use the coastline and help build community understanding of change. Builds on work that Council is already doing with coastal communities through its sustainable communities initiative.	Opportunity cost for Council staff. Generally an excellent 'no regrets' option to prepare community for change.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
2.2 Develop signage to inform the community about coastal processes and coastal change.	All surf clubs and main beach access ways e.g. at Awabakal St, main access way through the State Park. Could be linked to the coastal pathways project (see **Section 11**). See also other general community involvement activities in **Section 12**.	Takes coastal information to beach users, at low cost.	Risk of vandalism and maintenance costs.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **A**

Objectives
To reduce high and extreme risks to acceptable levels
To prevent risk escalation
To align adaptive management with actual coastal change

Targets
See Table 8.1

Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 3: Protect beaches and dunes					
3.1 Re-instate city wide beach maintenance program and continue dune rehabilitation works. This includes dune fencing, access controls and replanting native colonising species. Closely linked to invasive species control.	-Redhead Beach (at the surf club and to the south towards Third Creek) -Belmont Golf Course dunes -Caves Beach (entire length) -Catherine Hill Bay -Other locations along Nine Mile Beach (State Park)	Low cost option, with significant opportunities for forging partnerships and supporting community involvement. Coupled with beach scraping, access management and invasive species management, it can maintain and enhance dune form and biodiversity in the short to medium term, and provide time for adjustment of landward ecological communities. Coupled with land tenure management to allow rollback, it can be part of a longer term strategy to maintain scenic and biodiversity values.	Dune rehabilitation is a good short to medium term management option. It helps build resilience to storm bite erosion, and helps to maintain scenic values and ecological connectivity in the short to medium term, but will not prevent long term recession as sea level rises.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
3.2 Conduct beach management works such as beach scraping to reshape dunes and increase dune volume/recovery after storms. This involves using earthmoving equipment to move sand from the swash zone (between Mean Low water and Mean High Water) to the frontal dune. There may be potential to place sand extracted from Swansea channel at these locations, subject to agreement with DPI and contractual arrangements for managing Swansea Channel. **See also LMCZMP Part C**	Should be used in conjunction with management of dune vegetation. -Blacksmiths Beach; extend treatment as far north as Belmont Golf Course and Belmont WWTP. -Redhead Beach (north from Third Creek) The dune area between the golf course and WWTP is the barrier between open coast marine processes and the lake (weakness via Cold Tea Creek). Investigate opportunities to place sand here to strengthen the dune here as a priority. -Caves Beach	Beach scraping is generally a low cost and flexible option that can be used after storms to enhance the recovery of dunes affected by storm bite. In these circumstances, ecological impacts are likely to be minimal. It uses existing Council equipment.	Beach scraping and dune building will enhance the buffering capacity of the coastal system to storm bit erosion, but will not change its resilience to long term recession (due to sea level rise), as the total sand volume remains the same. Good short to medium term option.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **A**

Objectives **To reduce high and extreme risks to acceptable levels** **To prevent risk escalation** To align adaptive management with actual coastal change		Targets See Table 8.1			
Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
3.3 Maintain groynes at Salts Bay. **See also LMCZMP Part C** In addition, some sand from the dredging of Swansea Channel (upstream of Swansea Bridge) could be placed on the Salts Bay shoreline or along the channel shore from Mats Point to Black Neds Bay to build up the beach between the groynes. Any sand placement areas should be planted with Spinifex runners to help stabilise the sand.	Groynes are not likely to be suitable for any part of the open coast of Lake Macquarie. However, groynes already in use along southern shore of Swansea Channel to mitigate shoreline erosion need to be maintained in the short to medium term, as the channel continues to adjust to the effects of the entrance training walls.	The groynes in Swansea Channel are designed to control erosion of the sandy shore line at Salts Bay (which has been eroded by approximately 400m over the last 60 years). Salts Bay is a primary source of the sand currently shoaling in the channel from Pelican to the drop over, which interferes with navigation in the channel. By controlling erosion, the groynes also protect Aboriginal sites.	Groynes are expensive to construct and have down drift impacts. The groynes at Salts Bay in Swansea Channel are causing erosion down drift. Erosion has moved to Pelican and Coon Island areas.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **A**
3.4 Establish a protocol with Trade and Investment – Crown Lands Division about how and when sand dredged from the Swansea Channel could be placed on Blacksmiths Beach, seaward of the frontal dunes. BMT WBM (2015) recommends that sand dredged from Swansea Channel should be placed on Blacksmiths Beach, but other options are also feasible (see **Section 9.3.5** for further discussion).	Ongoing dredging program is required to maintain safe navigation in Swansea channel, upstream of Swansea bridge to the dropover. Sand could be pumped approximately 1.6km to Blacksmiths Beach	Where sand from dredging is placed on the beach, this is generally regarded as 'win-win' in that navigation or water circulation is enhanced at the same time as beach volume is maintained.	Benefits depend on source of sand filling the channel – from the open coast compartment, or from relic deposits in the channel. Material must be of appropriate grain size for higher energy open coast. Significant costs in transport of sand. There is no evidence that placement of dredged sand on Blacksmiths Beach is an urgent priority.	1 2 3 4 5 6 7 8 9	Important Yes; Easy No **B**

Objectives
To reduce high and extreme risks to acceptable levels
To prevent risk escalation
To align adaptive management with actual coastal change

Targets
See Table 8.1

Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
3.5 Establish a protocol with Trade and Investment – Crown Lands Division about how and when sand dredged from navigation channels in Swansea Channel could be stored for future use for beach protection works at Blacksmiths Beach or elsewhere as required. Sand could be stored in dunes constructed landward of the existing frontal dune system.	Swansea channel is continuing to adjust to the construction of the training walls and bridge abutments. Blacksmiths Beach has not receded since construction of the training walls, and has stabilised and accreted slightly, as sand is no longer lost into the channel from the beach. However, Blacksmiths Beach is very vulnerable to long term recession linked to sea level rise.	Sand supplies for future beach protection will be very difficult to obtain. Significant losses of beach amenity are expected if beach volume cannot be maintained. Sand could be 'stored' behind the current dunes at Blacksmiths, near the training wall or further north along the beach (such as north of the Golf Course, to increase dune height and reduce risk of washover to Cold Tea Creek), or on other Crown land.	Cost and statutory approval process for double handling sand, use of Crown land; possible temporary alienation of recreational space.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
3.6 Prepare a detailed channel management strategy for the entrance to Lake Macquarie	The lake entrance is a highly dynamic sedimentary environment, with very high recreational values. The channel management strategy could take the form of a master Plan, to build on work already done for the northern shoreline of the outer channel and on the framework for maintaining navigation (in preparation for DPI Catchments and Lands)	Provide for proper alignment of channel processes and channel usage. Maximise benefits of the high value environment and recreational assets of the channel (including along the shoreline) and connectivity from lake to ocean.	Cost of management. Ongoing changes to channel with climate change.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**

Objectives
To reduce high and extreme risks to acceptable levels
To prevent risk escalation
To align adaptive management with actual coastal change

Targets
See Table 8.1

Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
3.7 Nourish beach volume with sand imported from outside the immediate coastal system. For instance, there have been proposals to access sand which is offshore on the continental shelf to provide additional sand volume for some very high value beaches (such as Manly, Collaroy).	Not recommended for any beaches in the short to medium term, but may be relevant to the Blacksmiths end of Nine Mile Beach in the longer term - beyond 2050, (by itself, or in combination with sea wall protection)	Beach nourishment is used to maintain the scenic value of beaches which would otherwise retreat or disappear altogether. It also maintains recreational access and amenity, which has social and economic value (amount depending on the recreational and tourism value of the beach). There are provisions for benefitting landholders to contribute to the cost.	Current NSW government policy prohibits sourcing sand from offshore (on the continental shelf), so currently sand for beach nourishment must be sourced from local terrestrial deposits. These are rare and highly valued for other purposes (including conservation and construction sand). There are no known local terrestrial sources for Lake Macquarie beaches. Beach nourishment using either terrestrial sources or offshore sources is very expensive, with estimates generally up to $2 million for the first episode and then approximately $1 million for essential repeats (likely to be required at intervals of 5 to 10 years).	1 2 3 4 5 6 7 8 9	Important No; Easy No **D**
Strategy 4: Protect high value built assets					
4.1 Conduct an audit of the condition of the sea wall at Redhead surf club - when possible	The revetment at Redhead Surf Club was but in the 1990s and is the main protection mechanism for the surf club. In addition, up to date information about the design and condition of the sea wall would inform decisions about additions and refurbishment around the surf club, such as construction of a	Clarifies the capacity of the existing sea wall to withstand wave impact erosion associated with large storms now and as sea level rises.	Rock wall is only occasionally exposed, so testing condition could be difficult. Time inspection after storm conditions.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**

Objectives **To reduce high and extreme risks to acceptable levels** **To prevent risk escalation** To align adaptive management with actual coastal change		Targets See Table 8.1			
Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
	board walk over the sea wall.				
4.2 Conduct an audit of the foundations of all surf clubs along the Lake Macquarie coast	Catherine Hill Bay, Caves Beach, Swansea Blacksmiths and Redhead. The aim is to understand the capacity of these assets (now each more than $2 million) to storm bite erosion under immediate conditions or increased sea level.	Clarifies the structural capacity of existing surf club buildings to withstand storm bite erosion and reduced load bearing capacity of underlying sand mass. Raises awareness about the potential threat of coastal processes to surf club infrastructure and opens further opportunities for dialogue about longer term solutions.	Information may not be available.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
4.3 Conduct a detailed risk assessment of the training walls at the entrance to Lake Macquarie Maintain the entrance training walls, taking into account potential redesign and strengthening in the context of sea level rise and climate change. Actions relating to community access on the training walls are in **Section 11.** This is an action for the NSW Government	The entrance to Lake Macquarie is controlled by two breakwaters, under the management of Trade and Investment – Crown Lands Division Southern breakwater would be frequently overtopped by waves by 2050, with current sea level rise predictions. High risk locations are also likely to be less safe for community access. See **Section 11** for information about possible access controls and tourism implications. When maintaining this training structure, Trade and Investment – Crown Lands Division should also review design options to mitigate channel erosion (ongoing increases in cross	Maintenance of the entrance breakwaters is critical to ongoing navigability of the entrance to Lake Macquarie. Also has high recreational value, but safety issues if structure is not stable	Extremely high cost of maintenance	1 2 3 4 5 (CLD) 6 7 8 9	Important Yes; Easy moderate **A**

Objectives **To reduce high and extreme risks to acceptable levels** **To prevent risk escalation** To align adaptive management with actual coastal change		Targets See Table 8.1			
Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
	sectional area)				
4.5 Construct sea walls to protect surf clubs (see also **Section 11**)	Possibly suited for maintaining surf clubs in their current location, particularly Redhead (where a structure already exists), Blacksmiths and Catherine Hill Bay.	A properly engineered sea wall would prevent undermining of the surf club buildings by storm waves as sea level rises. Additional design criteria may protect from wave overtopping and inundation.	These beaches are major recreational assets and a sea wall would degrade recreational amenity, unless beach nourishment can also be achieved. Recession due to sea level rise will also affect amenity at these beaches, reducing the value of a surf club – particularly for Blacksmiths, Caves Beach and Redhead. Sea walls are a high cost option – at approximately $10,000 per linear metre.	1 2 3 4 5 6 7 8 9	Important Moderate; Easy No D
4.6 Conduct a review of all pedestrian and vehicle beach access ways against best practice guidelines for resilience to storm bite erosion and stable dune forms. Reference the NSW Dune Management Manual and NPWS Guidelines for track construction. Upgrade design of key access ways.	Beach access ways across dunes at Catherine Hill Bay, Caves Beach, Blacksmiths Beach, Nine Mile Beach, Redhead Beach. Consider design and materials used in steps, ramps and lookouts.	Reduce risks to safe public access and to dune stability by improved design – for flexibility rather than collapse during storm bite events and to provide good protection for the dune surface and vegetation at other times.	May result in community resistance to changes to access ways – but support is likely	1 2 3 4 5 6 7 8 9	Important Moderate; Easy Yes C

Objectives **To reduce high and extreme risks to acceptable levels** **To prevent risk escalation** To align adaptive management with actual coastal change			Targets See Table 8.1		
Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 5: Planning controls and design options to accommodate immediate hazards and climate change hazards					
5.1 Use clauses in the DCP to require new development in relevant coastal risk planning areas to incorporate design features to accommodate coastal risks. These include piered foundations (to a stable foundation depth), floor levels to prevent marine inundation, and light weight or modular structures for relocation	All sections of the coast	Provides clear guidance to land owners about the style of development that is acceptable in coastal risk areas. Should increase certainty.	Community concern about limitations to land use, if not clearly presented.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
5.2 Incorporate preparation for coastal recession into local community adaptation plans developed with the community at Blacksmiths Beach, Redhead Beach and Catherine Hill Bay Beach.	All coastal suburbs, but highest priority is Blacksmiths, Redhead and parts of Caves Beach.	Presents integrated information about full spectrum of risks. Involves community in developing locally appropriate solutions.	Staff time – could be labour intensive process.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**

Objectives **To reduce high and extreme risks to acceptable levels** **To prevent risk escalation** To align adaptive management with actual coastal change		Targets See Table 8.1			
Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
5.3 Develop advice for property owners in coastal risk planning areas about design options which can be retrofitted to existing residential structures, to extend potential occupation period. This includes raising floor levels and deep piering, where feasible. These works would require development consent. Requirements would be included in the DCP.	All areas where current residential development is in coastal risk planning zones.	Provides clear guidance to land owners about the style of development that is acceptable in coastal risk areas. Should increase certainty.	Some retrofitting options are not practical for existing development and retreat is the only practical long term option, based on current information.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**
Strategy 6: Managed retreat or existing development, or new development					
6.1 Conduct further analysis of the interactions of lake sourced inundation, coastal recession and marine inundation from overtopping, to clarify likely constraints to land use and potential for retreat.	Blacksmiths to Pelican and Belmont – low lying land behind low coastal dunes	The Blacksmiths area is affected by severe inundation risk and coastal recession by 2100 with current sea level projections. Clarity about options for managing existing and future land use in the suburb – and the uncertainties attached will assist local residents with planning.	May cause alarm when risks are in the long term and uncertain	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
6.2 Use clauses in the LEP to link new development types to coastal risk planning zones, based on lifespan and sensitivity of the development. See **Section 9.3.6** for details.	The principal intent is to ensure that sensitive new development and major infrastructure are not located in coastal risk planning zones for planning periods up to 2100. New development such as hospitals, nursing homes, wastewater infrastructure and major arterial roads should not be permitted within the 2100 coastal risk planning zone. The Swansea-Blacksmiths area is the main locality likely to be	Minimises the risk catastrophic consequences from failure or significant damage to major infrastructure and community services, associated with coastal hazards.	May restrict the areas suitable for provision of new major community services.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**

Objectives **To reduce high and extreme risks to acceptable levels** **To prevent risk escalation** To align adaptive management with actual coastal change			Targets See Table 8.1		
Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
	affected.				
6.3 Use DCP clauses to establish period consents, linked to specified trigger points, for new development in coastal risk planning areas. Further information about trigger points is in **Section 9.3.7**.	Applies to all land within coastal risk planning lines to 2100	Introduces adaptive provisions for new development so that the consent conditions require review of land use and land management as coastal hazards change	May cause community alarm where people believe that a development consent is permanent	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**

Objectives **To reduce high and extreme risks to acceptable levels** **To prevent risk escalation** To align adaptive management with actual coastal change			Targets See Table 8.1		
Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
6.4 Use the DCP to place controls on the floor area of extensions to existing development and the design requirements for extensions to existing development that is within immediate coastal risk planning zones.	A small number of properties in immediate coastal risk planning areas.	Limits increase of risk in immediate hazard areas	May create difficulties for a small number of landholders (currently three properties in the city)	1 2 3 4 5 6 7 8 9	Important Moderate; Easy Yes C
6.6 Investigate the potential for acquisition of private property along Ungala Road at Blacksmiths, as a long term option to maintain land for public access to a retreating Blacksmiths Beach. As above, this would come into effect only if coastal recession reaches the 2050 'unlikely' coastal recession hazard line, as shown in BMT WBM 2015. If land is acquired, then investigate the potential for rezoning appropriate to public recreational uses	Ungala Road at Blacksmiths	The aim would be to provide for continuing public access to a retreating Blacksmiths Beach. Future action – as above, it depends on the extent of lake inundation as well as coastal recession.	Current state policy does not support acquisition of coastal land affected by erosion or recession hazards. However, rationale here is for public access, not to compensate land owners.	1 2 3 4 5 6 7 8 9	Important Low; Easy No D
Actions 15.3 to 15.8 in **Section 11.3** address options for planned retreat of surf club assets , particularly at Redhead, Swansea Belmont and Caves Beach	See Actions 15.3 to 15.8 in **Section 11.3**	See Actions 15.3 to 15.8	See Actions 15.3 to 15.8	See Actions 15.3 to 15.8	See Actions 15.3 to 15.8

Objectives **To reduce high and extreme risks to acceptable levels** **To prevent risk escalation** To align adaptive management with actual coastal change			Targets See Table 8.1		
Management Option	Potential applications/locations	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 7: Emergency response planning and implementation					
7.1 Train council staff in coastal emergency response requirements, in accordance with the emergency response action subplan for the City	Relevant Council staff – such as rangers. Principally actions relate to closure and repair of access ways that are damaged by coastal processes.	Relevant staff are well prepared for coastal emergencies	Time for training.	1 2 3 4 5 6 7 8 **9**	Important Yes; Easy Yes **A**
7.2 Incorporate coastal emergency actions into Council's management systems	Systems will make provision for communication with SES, monitoring of beaches potentially at threat, closure of access ways, beach closures, signage for closed access ways, repair of access ways, reducing the height of eroded escarpments after storms	Clear accountability within Council for management of coastal emergencies, and necessary equipment, approvals etc. are known and in place.	No specific disadvantages	1 2 3 4 5 6 7 8 **9**	Important Yes; Easy Yes **A**
7.3 Provide information at community meetings and in hard copy/web form about how to prepare and respond to coastal emergencies, for local communities where coastal emergencies are possible in the immediate term. This is a more general version of local adaptation planning.	Blacksmiths, Redhead, Caves Beach (see BMT WBM 2015). For Blacksmiths in particular, emergency response information for the community should also address lake inundation hazards. Includes safe exit routes, emergency contacts, and safe access to beaches, headlands and dunes.	Direct information for affected local communities about what they should do in the event of a coastal emergency. Level of detail and effort depends on the extent of the risk. Currently, risks for coastal residents at lake Macquarie are relatively low, so focus on general awareness.	Cost and staff time to attend meetings.	1 2 3 4 5 6 7 8 **9**	Important Moderate Easy Yes; **C**

10.0 Theme 2: Options for a healthy coastline - Protecting Biodiversity and Ecological Resilience

In this section
Adaptive actions to build the resilience of coastal biodiversity:
Monitoring
Planning controls
Land use plans
Priority ecological communities

10.1 Scope of coastal biodiversity options

This section describes options to maintain and improve the values of coastal ecological communities, in the context of a changing coastal landscape. Ecological resilience is strengthened by:

- Reducing threats such as invasive species and rubbish dumping
- Managing urban to natural area interfaces – fire management, garden escapees into natural areas
- Restoring connectivity though areas disrupted by past (or current) land uses, including activities such as clearing and uncontrolled access, both of which destabilise the ground surface.
- Ensure planting provides a suitable mix of native species selected from the coastal planting guide and that are relevant to site conditions. Optimise natural assets by selecting plants that provide higher biodiversity value above those low maintenance plants such as *Lomandra* and *casuarina* species.
- Targeted habitat protection at critical times – such as nesting and fledging of protected bird species
- Understanding the extent to which recreation management activities affect fauna habitat on beaches, headlands and shore platform, so that appropriate controls can be put in place
- Understanding the changes that are likely to accompany sea level rise – particularly for shore platform, beaches and frontal dunes, and providing wherever possible, room for coastal ecosystems to migrate with the shoreline.

The options outlined in this section focus on:

- Ongoing monitoring or the condition of coastal ecological communities
- Partnerships for sharing knowledge and activities about coastal biodiversity values and their management
- Information needs for improved management of biodiversity values and resilience

- Land use planning and land management plans to provide the right context for protecting and enhancing coastal biodiversity

- Priority locations and restoration activities

Actions that are primarily about access management, but also have significant positive effects on coastal biodiversity are discussed in **Section 11**. This includes track management and regulation of off road vehicles.

Table 10.1 summarises proposed actions to reduce threats to biodiversity resilience. Criteria scores relate to the evaluation criteria set out in **Section 8**. The criteria scores have been allocated based on currently available information, as outlined in **Sections 1** to **6**.

10.1.1 Coastal dune priorities

All of the beach and dune systems along the Lake Macquarie coastline are expected to undergo geomorphic and ecological transformation over the next century. These beach and dune systems have previously been targeted for dune restoration and rehabilitation works by local groups, with some local scale improvements in condition. With predicted coastal recession, there is limited opportunity for robust long term outcomes (holding the line) for these communities.

Notwithstanding the constraints to long-term stability of Lake Macquarie vegetated frontal dune systems for long term protection of beach and dune morphology, there are some good reasons for investment in dune ecology at multiple locations, for instance:

- to protect breeding habitat for migratory shore birds

- to encourage community involvement and responsibility for the condition of popular beach and dune recreation areas

- to strengthen resources available to tackle wicked problems such as Bitou bush

- to protect specific patches of very high ecological value vegetation

- to trial methods for preparing ecological communities for change

- to maintain a buffer between the marine influences and back barrier or hind dune communities for as long as possible – allowing time for adaptive strategies to be developed

- to maintain or enhance connectivity in the short to medium term.

10.1.2 Priorities for review and resourcing of plans of management on coastal headlands

Plans of Management for multiple areas of Crown Land and/or Council owned and managed land along the Lake Macquarie coastline were prepared as part of the 1999 Coastline Management Plan, and formalised shortly thereafter. These plans provide detail about the condition of the reserve areas, and their value in terms of the criteria set out in Crown Land and Local Government Acts. The plans include:

- Swansea Heads

- Caves Beach (including the frontal dune system and headland)

- Redhead Beach and Bluff

These are all areas with high conservation value vegetation, easy access and relatively high usage. They are a priority for more intensive management. In addition to the information in the early Plans of Management and the information in Council's current integrated Plan of Management, site specific designs are required to manage the natural and social values of the headlands. To make site specific planning worthwhile, investment is also needed in initial on ground works such as fencing *Themeda* grassland, construction of paved pathways, closure of assorted other tracks, and well maintained car parking area.

Table 10.1 - Theme 2 – Options for a healthy coastline - Protecting Biodiversity and Ecological Resilience

Objectives **To maintain or enhance the condition of coastal ecological communities** To maintain or enhance the connectivity of coastal habitats				Targets See Table 8.1	
Option	Potential applications	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 8: Land use planning and land management plans for ecological resilience					
8.1 Use a 'coastal landuse zone' should it become available in the LEP standard template for all public land along the Lake Macquarie coastline, as far landward as the extent of coastal recession by 2100, plus a buffer. Wherever possible on coastal dunes, maintain a buffer zoned environment protection (beyond 2100), to allow for ecological transition as dunes roll landward.	All public land along the Lake Macquarie coastline. -Dune buffers at: -Middle Camp Beach -Caves Beach (and Hams Beach) -Blacksmiths Beach -Nine Mile Beach -Redhead Beach -Dudley Beach	Intended to allow coastal processes to function and to facilitate adaptive response by coastal vegetation. Minimises development in the coastal risk areas, but would still permit recreation facilities in reserves.	Buffer areas may interact with land currently zoned for development. Rezoning of these areas is not likely to be feasible in the short term	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
8.2 Update Plans of Management and/or prepare Masterplans for headland reserves (consistent with Council's general natural areas Plan of Management) to ensure management of vegetation and access recognises the presence of EECs and targets invasive species, fire regime management (where feasible), and access management.	These headlands are the core of ecological resilience for the Lake Macquarie coastline. -Headlands in Awabakal Nature Reserve (OEH responsibility). -Swansea Heads -Headlands from Caves beach south to Pinny Beach -Headlands south of Catherine Hill Bay See **Section 10.1** for further details.	Headlands have very high cultural heritage values and are also the location for Themeda grassland EECs. Local scale management actions can make a big difference to the resilience of the EECs and can also build understanding of the cultural heritage value of the coast for Awabakal people.	Resource requirements for plan making and implementation. Potential local conflicts about access across EECs which need more protection.	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**

Objectives **To maintain or enhance the condition of coastal ecological communities** To maintain or enhance the connectivity of coastal habitats			Targets See Table 8.1		
Option	Potential applications	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
8.3 Update Plans of Management for coastal reserves on dunes under Council's management (consistent with Council's general Plan of management for natural areas), to ensure a consistent planning approach and to manage ecological transition with climate change.	Dunes at Blacksmiths, Redhead, Caves and Hams Beach, Catherine Hill Bay.	Incorporate actions to facilitate roll back of coastal landforms and ecological communities and to maintain vegetation cover (not invasive species) as coastal change occurs. Link to actions in Strategy 1 for protection of beaches and dunes by dune management techniques.	Costs of detailed local area actions and monitoring of outcomes.	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**
8.4 Use planning controls and design guidelines to minimise the use of foreshore structures that restrict ecological transition (in estuarine and open coast situations). Remove existing barriers to wetland migration wherever possible.	Swansea Channel, including Black Neds Bay, to the extent possible with existing development. Training walls along the northern side of the channel limit habitat migration there. More likely to be useful within the main body of Lake Macquarie.	Provides clear guidance to waterfront land owners and managers about how to design and install waterfront structures to minimise ecological impact. OEH Guidelines on sea walls for estuarine shorelines are the basis of DCP requirements.	Expect some community resistance to increased costs or reduced access.	1 2 +ve 3 4 5 6 7 8 9	Important Moderate; Easy Moderate **C**
Strategy 9: Partnerships for sharing ecological knowledge and activities					
9.1 Support Belmont Golf Club in efforts to design and implement a course which restores the ecological values of the Golf Club site. The site includes frontal dunes, hind dune and wetland areas.	Focus on technical advice for restoring vegetation on the frontal dune system and on introducing native grass species for fairways. See also **Section 11**. Council support could include advice on grant applications to fund some of the works. Golf Club will be involved in preparation of a dune management plan for Nine Mile Beach	A stable and well vegetated dune system will benefit the golf club but also enhances connectivity of ecological communities along the dune system.	Golf Club will need to obtain resources to conduct works.	1 2 +ve 3 4 5 6 7 8 9	Important Moderate; Easy Moderate **C**

Objectives **To maintain or enhance the condition of coastal ecological communities** To maintain or enhance the connectivity of coastal habitats			Targets See Table 8.1		
Option	Potential applications	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
9.2 Prepare a combined dune management plan for frontal dunes on Nine Mile Beach land owned or managed by Council, Belmont Golf Club, Belmont Wetlands State Park, Hunter Water Corporation – to deliver consistent objectives and strategies, share funding arrangements and technical skills	Focus on dunes north of Awabakal Street, through to Third Creek	Will set the agenda for consistent management of the whole frontal dune system and identify the priority areas for dune reshaping and revegetation to improve connectivity and the buffering capacity of the dune system.	May be difficulties gaining all stakeholder agreement, particularly on resourcing.	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**
9.3 Provide technical advice to Landcare groups about the time limitations of benefits of works on the frontal dune system	Middle Camp Beach Continuing on Blacksmiths Beach north of the existing works. At Belmont Golf Club Across the frontage of the State Park North of the State Park to Redhead Beach	Helps Landcare groups to understand drivers of priorities for dune management that go beyond short term.	May require review of Dunecare group priorities – driver is not local	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
9.4 Raise awareness of the impact of litter (from fishing and general food consumption on beaches and shore platforms) on marine species, including shorebirds. See also **Section 11**.	Focus on all patrolled beaches and at main off road vehicle access points	Litter on beaches is detrimental to user amenity, but also impacts on the health of bird and animal species. Aim is to encourage more responsible disposal of waste.	Beach users are not the main source of waste on beaches?	1 2 +ve 3 4 5 6 7 8 9	Important Moderate; Easy Moderate **C**

Objectives **To maintain or enhance the condition of coastal ecological communities** To maintain or enhance the connectivity of coastal habitats			Targets See Table 8.1		
Option	Potential applications	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 10: Select priority locations for action					
10.1 Encourage Landcare projects that build the resilience of moderate to high significance communities, such as Middle Camp Beach and Dudley Beach. Encourage projects that prepare the hind dune and back barrier communities for future change	Middle Camp Beach Dudley Beach Wetland areas around Golf Club Dune management at Golf Club, Hunter Water and State Park on Nine Mile Beach.	Supports adaptive responses to coastal change and makes Landcare work effective.	Priorities may not be the same as those of local groups	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
10.2 Ensure planting provides a suitable mix of native species selected from the coastal planting guide and that are relevant to site conditions. Optimise natural assets by selecting plants that provide higher biodiversity value above low maintenance plants such as *lomandra* and *casuarina* species.	Whole of coast	Will set the agenda for consistent management of whole of coast plantings for biodiversity.	No disadvantages perceived	1 2 +ve 3 4 5 6 7 8 9	Important Yes Easy Yes **A**
10.3 Focus on control of Bitou bush by eliminating new colonisation on dunes, headlands and around wetlands, as a priority. This may require revisiting 'cleaned up' sites to remove new seedlings	Swansea Heads Caves Beach headland and dunes at Cams Beach Redhead dunes Nine Mile Beach dunes	To maximise establishment of indigenous species on dunes and control reshooting of Bitou. Work most likely done by volunteers, not Council staff	Time consuming. Could hover be part of ongoing project performance monitoring for Landcare or HLLS funded projects.	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**

Objectives **To maintain or enhance the condition of coastal ecological communities** To maintain or enhance the connectivity of coastal habitats			Targets See Table 8.1		
Option	Potential applications	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
10.4 Protect little tern breeding areas on beaches and dunes by seasonal exclusion of off-road vehicles and dogs.	Relevant sections of Nine Mile Beach. Involve OEH (NPWS), BWSPT and other landholders as necessary.	Little Terns area species listed under State and Commonwealth legislation. Nesting sites on beaches are very vulnerable to vehicle tracks and other disturbance.	Nesting sites may be destroyed by high seas as well as disturbance by human use.	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
10.5 Conduct awareness raising activities for bag limits for the collection of rock platform species and enforce bag limits. This is principally an action for NSW government	Relevant to Swansea heads shore platforms and Redhead to Dudley shore platforms in particular	Some stakeholder concern that the collection limits are not clear to the local community and pressure on rock platform habitats is increasing	May be higher priority sites for agency attention elsewhere – funding not available	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Yes **A** (if done by DPI Fisheries)
10.6 Prepare more detailed inundation and ecological transition studies and plans for wetlands in coastal creeks and on the Nine Mile Beach Barrier system (including pilot projects).	Coastal creeks along Nine Mile Beach and at Pinny Beach Belmont Lagoon Jewells wetlands	All of these wetlands will be more exposed to saline intrusion and/or more permanent inundation as sea level rises. Better information about the potential transition processes will assist management actions to maintain function and protect wetland values	Council may have limited capacity to protect the wetlands due to tenure and other land use issues. Needs collaboration with Lands and OEH.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**

Objectives **To maintain or enhance the condition of coastal ecological communities** To maintain or enhance the connectivity of coastal habitats			Targets See Table 8.1		
Option	Potential applications	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 11: Ecological monitoring and new information for improved management					
11.1 Further develop remote sensing techniques (using LiDAR derived terrestrial and marine digital terrain models and SPOT 5 satellite imagery), as tools to aid high resolution monitoring of ecological community extent and condition and ground surface change.	All dune and headland areas where vegetation management projects are in place. Would be done in parallel with analysis of LiDAR for high resolution terrain change.	Once initiated can provide a cost effective method to monitoring both terrain and vegetation change, including invasive species.	Cost for collecting data if not done in partnership with others. Requires community awareness raising of how the remote data helps understand coastal change	1 2 3 4 5 6 7 8 9	Important Moderate; Easy Low D
11.2 Support the use of remote sensing tools with targeted field survey of biodiversity and condition: *Themeda* grasslands on headlands; coastal wetlands; and a selection of barrier beach and pocket beach locations. See also Section 15 re monitoring and links to Council's citizen science monitoring program.	Add to existing site on coastal headland where Themeda grassland occurs; selected sites on beaches and dunes – to augment existing sites	Part of the data collection to understand coastal change as projected climate change occurs over the next two –four decades. Also to boost community awareness and involvement in coastal change issues.	Significant ongoing cost if ground surveys done at all monitoring periods. Some cost could be accommodated by expanding the community monitoring network slightly.	1 2 3 4 5 6 7 8 9	Important Moderate; Easy Yes C
11.3 Continue regular monitoring of beach macro and meiobenthos at selected high recreation and low recreation usage locations, for the purpose of checking impacts of beach cleaning operations and other activities.	Blacksmiths Beach and Redhead Beach	Micro fauna are often overlooked in terms of biodiversity but contribute to ecosystem services provided by beaches. Will help to track how these fauna respond to climate change (increased storm bite) as well as beach management.	Expensive monitoring program, requires specialist skills.	1 2 3 4 5 6 7 8 9	Important Moderate; Easy Moderate C

Objectives **To maintain or enhance the condition of coastal ecological communities** To maintain or enhance the connectivity of coastal habitats			Targets See Table 8.1		
Option	Potential applications	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
11.4 Establish monitoring sites on shore platforms, to track ecological changes associated with rising sea level. Benchmark condition is established, use follow up surveys at intervals of not more than 5 years.	Focus on shore platform at Swansea Heads and Redhead to Dudley. Could be included in an expanded community monitoring network.	Shore platforms habitats are vulnerable to sea level rise, but also vulnerable to over collection. Intent is to provide ongoing information on the condition of these habitats	Cost of work if done by specialist. May be difficult to disentangle drivers of change.	1 2 3 4 5 6 7 8 9	Important Moderate; Easy Moderate C
11.5 Encourage further research on the behaviour of coastal dunes in pocket and long barrier coastal sediment compartments, as climate changes and sea level rises. Incorporate the results of these studies into future revisions of coastal risk and ecological resilience management.	Link to LiDAR monitoring of dune form and monitoring program for ecosystem health – use sites at Pinny Beach, Caves/Hams Beach and Nine Mile Beach	How dunes will roll back or by eliminated is a key aspect of coastal resilience as sea level rises. Will provide additional information about how to best maintain ecological values during transition of vegetation communities and habitats. Work could be done through the Research Grants program	Will require multiple monitoring events to distinguish change meaningfully – coordination and consistency issues	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate C

11.0 Theme 3: Options for Sustainable Community Access, Use and Value

In this section

11.1 Scope of responses

These management responses focus on four aspects of community use of the coast, which have been identified in the twelve urgent and important issues (in **Section 7.0**):

- Access controls for appropriate use
- Access facilities for community enjoyment
- Raise the profile of the Lake Macquarie coast as a place of cultural, social and economic value
- Support community involvement in looking after the coastal environment

Options for well managed and appropriate access during periods of high erosion or events that result in significant storm bites will include a range of appropriate responses guided by the Emergency Response Action Sub-Plan. This may include beach or access closures.

11.2 Managing off road vehicle access

Vehicle access and use of Nine Mile Beach is the most often raised coastal access issue in Lake Macquarie from local residents and visitors. However, off road vehicle management is also an issue in other areas – both on dunes and headlands, and on both public and private land.

Options which could contribute to well managed and appropriate access to the coast by off road vehicles are summarised in **Table 11.2**. Criteria scores relate to the evaluation criteria set out in **Section 8**. The criteria scores have been allocated based on currently available information, as outlined in **Sections 1** to **6**.

11.2.1 Users and issues at Nine Mile Beach

There are multiple different purposes for off road vehicle use on Nine Mile Beach, including the following:

- Commercial fishing – beach haul fishery – regulated by NSW Fisheries FMS and EIS. Whilst the fishery could be closed, the main issue here is that the presence of commercial fishers' vehicles on the beach sets a precedent for other off road users.
- Emergency services – to access people injured or taken ill on the beach

- Recreational fishers – for access to popular mid beach locations and for safety if fishing at night. These users drive along the beach – not in the dunes
- People wanting to sit on the beach – but away from other users and next to their vehicle.
- Quad bike commercial operators with groups of people on quad bike tours or adventures
- Other tour operators – for visitors
- Independent quad bike riders– develop alternative and confined location – in already disturbed land? Keep out of wetlands and of vegetated frontal dunes
- Bush campers – mostly restricted to State Park area. Camping should be restricted to designated areas, with facilities, in the Park.
- General weekend 'hoons' thrill seekers
- Locals who think it's their backyard and they'll do what they like

There is general agreement amongst stakeholders that uncontrolled off road vehicle access to the coastal landscape at Nine Mile Beach is an issue requiring urgent and coordinated attention, because of the risks to the safety of vehicle drivers and passengers, risks to other beach users and risks to ecological and cultural values.

Stakeholders have suggested a wide range of options to improve the regulation of off road vehicles, so that there is fair, safe and environmentally sustainable access for people who want to visit and experience the more remote parts of Nine Mile Beach.

- Some stakeholders have suggested that off road vehicles should be banned from Nine Mile Beach, on the grounds that it is a valuable natural area very near major urban development so that naturalness and quiet are highly valued.
- More stakeholders have suggested that access should continue but in a controlled framework, with restrictions on areas open to off road vehicles and how those areas would be used.
- Council proposes that limited off road vehicle access would be allowed onto Nine Mile Beach, with access regulated via a formal agreement and strategy between all relevant landholders. Many of the stakeholder suggestions have been about how regulated access could be achieved through a multi stakeholder strategy. Details about the partners to and content of a multi user strategy are in **Section 11.1.3**.

11.2.2 Managing off road vehicles south of Caves Beach and Catherine Hill Bay

Off road vehicle access, including trail bikes and four wheel drive vehicles is also an issue in National Park managed land in the southern part of the coastline. Issues of concern include:

- The safety of riders on remote tracks including on headlands and rock platforms;
- People riding or driving through Aboriginal sites and European heritage sites;
- Spread of invasive species on vehicle wheels;
- Damage to gates and padlocks;

- People riding or driving through *Themeda* grassland EECs and other protected vegetation; and

- Increased fire risk.

NPWS is part of a wider Task Force charged with addressing off road vehicle activity (including motorbikes) in diverse areas of public land. OEH Parks Service officers have a demonstrated interest in working with local government and other stakeholders to reduce the impacts of off road vehicle use, which is seen as a major threat to the values of all coastal parks.

In the Lake Macquarie region, NPWS has initiated a multi action plan to improve control over off road vehicles in park lands. The program includes:

- Occasional police motor bike patrols through the Park. NPWS has previously had its own motor bike patrols, but these have been discontinued for several reasons including safety of officers.

- Authorisation of Wyong Shire Council rangers to enforce NPWS vehicle access regulations on NPWS land. Note similar cross jurisdiction enforcement has also been introduced between NPWS and Councils on the mid north coast. Regulations that can be enforced include unlicensed vehicles, unlicensed drivers, using unauthorised trails; also unlicensed firearms and dogs on NPWS land.

- Improving the design of gates on fire trails

- An education and awareness program on responsible bike riding in and around parks

- Installing robust Armco railing along main roads to limit access.

- Rangers use their capacity to respond effectively in the southern part of the park, where there is close access to urban areas.

Extensions of these programs to the Nine Mile Beach area is reflected in the suite of actions proposed for consideration in the multi user strategy for Nine Mile Beach (**Section 11.1.3**).

11.2.3 A multi stakeholder approach to off road vehicles

Input from diverse land managers has indicated clearly that off road vehicle access issues affect all land tenures along the LMCC coast. A multi stakeholder approach is essential to achieve results, through the formation of a working group. This is the essence of Action 12.2 in **Table 11.2**.

Members of a multi stakeholder working group could include:

- OEH – Central Coast or Newcastle Districts

- Trade and Investment – Crown Lands Division

- Belmont Wetlands State Park Trust

- Hunter Water Corporation

- Belmont Golf Course

- Council – Sustainability and Ranger teams
- Surf clubs (potential member)
- User groups – (4WD clubs)

The main task for this panel would be to prepare and resource a coordinated strategy to:

- Establish a collaborative framework for vehicle management
- Close priority access points
- Construct and maintain safe access points at specific locations
- Share enforcement activities, with consistent capabilities and messages from all affected land holders
- Develop and implement awareness raising programs for off road vehicle users
- Develop opportunities for off road vehicle users to contribute to looking after the coast.

11.2.4 Aspects of a multi user framework to manage off road vehicle activity on the Lake Macquarie coastline

A multi user strategy for off road vehicle activity could include diverse regulatory, awareness raising, and engagement options. Examples of the types of management options that should be included at included in **Table 11.1**. Some of these options, particularly those focused on communication and codes of practice for people using vehicles in the coastal zone, could also be introduced as interim measures prior to negotiation of the multi stakeholder strategy.

Table 11.1 - Options for consideration in a multi user strategy for off road vehicle activities

Option	Comments
Negotiate a lease over the Belmont Golf Course land, seaward of the frontal dune, so that there is public tenure of the entire beach area. Lease would be held by either by Trade and Investment – Crown Lands or Council.	Beach currently under the ownership of Belmont Golf Course. Golf Club does not use the beach area, but technically people on the beach are trespassing on Golf Club land. The Golf Club is sometimes affected by off road vehicles moving over the dunes and onto its course. Would make regulation of off road vehicle activity on the beach by rangers feasible.
Introduce a permit system for off road vehicles using Nine Mile Beach, with an annual fee and a 'knowledge' test to be passed before a permit is obtained.	Permits would clearly identify authorised users. A similar system operates in Port Stephens Council. Linking to a knowledge test, as for boat licences; provides an opportunity for awareness raising. Responsible use of the beach and dunes by off road vehicles will also have benefits for the environment

Option	Comments
Restrict off road vehicle access onto Nine Mile Beach to two locations (other than for emergency services, NSW Fisheries officers and licensed commercial fishermen). Close and rehabilitate other access routes, and formalise one main track.	Awabakal Street access could continue to service the southern part of the authorised off road vehicle access area, with vehicles required to turn north at this point. Other options for a southern access point should also be considered. The second access could be through the BWSP. Enforcement of no access at other locations is expected to be difficult. Previous experience is that structures to close off access have been damaged/removed. Requires coordination with track rehabilitation and intensive communication/consultation with users. Higher maintenance costs for the two main access ways may be an issue
Implement recommendations in the Blacksmiths/Swansea Channel Masterplan to provide well constructed pedestrian paths over the dune to the open beach from car parks constructed along Ungala Road.	See Blacksmiths Masterplan for locations at the southern end of the beach. A similar park and walk system has been constructed by Landcare at Redhead. These parking and pathway arrangements make pedestrian access to areas away from the main patrolled beaches easier. May reduce need for vehicle access onto the beach and dunes for many users. Could increase interaction between pedestrians and vehicles in some areas. May attract antisocial activities around car parks at night, if not well lit or in public view.
Implement PoM recommendations in Belmont WSP, to provide formalised parking and pedestrian access to Nine Mile Beach	Additional paths would be constructed in the BWSP, in accordance with the plan of management.
Prepare a Memorandum of Understanding between LMCC, Trade and Investment – Crown Lands (State Park Board), HWC and OEH (NPWS) to provide for authorised officers from all organisations to enforce trespass, safety and illegal dumping regulations in a consistent manner.	Would cover all of the potential of road vehicle use areas on Nine Mile Beach. Increases the efficiency of resource use for providing information to and enforcing use by off road vehicles. Supports consistent application of regulations across all land tenures. Demonstrates a consolidated approach – a high priority issue for all land managers.
Train all ranger staff from Council, HWC, NPWS and BWSP (when rangers are appointed here) in consistent messages and strategies for effective enforcement of local regulations.	Would apply to all rangers working on Nine Mile Beach
'Zone' Nine Mile Beach to distinguish general access areas and areas where access is restricted (seasonally or permanently) to protect the environment and the safety of users. Seasonal closures would include shore bird nesting areas and closure of beaches in high sea. Permanent closures would include wetlands and all frontal dunes.	Consider bird nesting areas – protected shore bird species; higher usage pedestrian areas and rehabilitation areas.

Option	Comments
Place signage at relevant Lake Macquarie beaches to advise the public about off road vehicle regulations.	At all relevant beaches. Specifically, at Awabakal Street, place signage about the use of the off road vehicle access way, about the beach zoning and active closures, plus information about the reasons for closures. Similar signs would be placed at the access way through the BWSP when it is constructed. Information could also be available at local petrol stations and on the internet
Close potential access to the State Park from the Fernleigh Track and prevent off road vehicle (quad bike and motor bike) access along the Fernleigh Track	Stakeholders have advised that some vehicles access the Fernleigh track where it crosses roads and then use the track to get into the State Park bushland.
Conduct beach driving information campaigns, with Rangers present at legal beach access ways to talk to drivers about beach safety and environment protection measures. Provide ranger contact details to vehicle users to report illegal activity.	This would occur at the Awabakal Street and access way through BWSP (or others that may be chosen by the Multi Stakeholder Panel)
Conduct targeted consultation with local residents around the BWSP to identify community views on vehicle access issues and potential solutions.	Streets in immediate vicinity of BWSP. This is a task for the State Park Trust, but assistance could be provided by LMCC. Residents of these areas use the State Park but would also be affected by other people accessing the State park, both legally and illegally using off road vehicles. If these residents are supportive of State Park management initiatives, then some progress could be made in controlling illegal access.
Investigate opportunities to use surveillance cameras at high risk access locations, in consultation with land owners and NSW Police	Cameras would be installed on the main entry points that are used to gain illegal access (e.g. Ocean Park Road) and/or in areas where rubbish dumping is common.
Fence off frontal dunes with sand trap fence, as part of dune stabilisation and vegetation recovery program, but in this case for the purpose of managing access	Would be conducted as part of overarching plan for frontal dune management along Nine Mile Beach. The action would continue the benefits already seen at Blacksmiths along the rest of the frontal dune system
Invite off road vehicle users to participate in Clean Up Australia events in the BWSP and along Nine Mile Beach, similar to the Stockton Bight Clean Up Day.	All of Nine Mile Beach, but focus on areas north of Awabakal Street. Cooperation between BWSP Trust, LMCC, HWC and Trade and Investment – Crown Lands required. Directly involves off road vehicle users in helping to protect the environment of Nine Mile Beach. Acknowledges that a cooperative effort is required to look after a community asset. Consistent with other community involvement initiatives. Opportunity to reinforce the message about environmentally friendly vehicle use.

Option	Comments
Prepare feature articles/opinion pieces for local newspapers and off road vehicle magazines about the importance of safe off road vehicle driving at Nine Mile, the appropriate access routes, how to get a permit (if this is introduced), how regulations will be enforced etc.	Relevant to all access to Nine Mile Beach and non access to other areas.

Table 11.2 - Theme 3 – Options for sustainable community access, use and value: - Managing off road vehicle activity

Objectives **To develop consistent objectives, strategies and land owner commitment for managing off road vehicle access along Nine Mile Beach** **To provide safe and controlled off road vehicle access across natural areas** To minimise the impact of off road vehicles on the resilience of natural coastal systems		Targets See Table 8.1			
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 12 - Manage off road vehicle activity on the Lake Macquarie coastline					
12.1 Prohibit off road vehicle driving on all Lake Macquarie beaches and coastal headlands, other than in a specified section of Nine Mile Beach and where specifically approved by OEH.	All of Lake Macquarie coast, other than Nine Mile Beach between Awabakal Street and Third Creek, subject to the outcomes of Action 12.2	Provides clear advice on where off road vehicle use is permitted on the Lake Macquarie coast. Benefits to the environment from reducing threats such as weed transmission, rubbish dumping and dune surface disturbance.	Enforcement costs for areas currently accessed, but prohibited in the future (note most of these are illegal access now).	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
12.2 Form a multi stakeholder working group and prepare a strategy to provide controlled and managed off road vehicle access to Nine Mile Beach. Identify locations for access ways, design safe and environmentally appropriate access structures. Close and rehabilitate other access ways.	Entire length of Nine Mile Beach, with focus on area north of Awabakal St and south of Third Creek at Redhead. Include land managed in State Park, Belmont Golf Course, Hunter Water Corporation, Crown Lands and Council tenure. More information is in **Section 11.1.3**.	Documents how the stakeholders will work together to manage access, including shared enforcement, resources for closing and rehabilitating tracks, and provision of good quality tracks at approved locations.	May take time to negotiate. Some stakeholders have limited funds or other resources. Will require further user consultation – time and cost intensive.	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
12.3 Develop a code of practice on safe and environmentally responsible off road vehicle use.	Would be developed in consultation with Roads and Maritime Service and Off Road Vehicle organisations. Could be delivered in hard copy at popular petrol stations and could also be delivered via the internet.	Would support a permit system, but could also be used by Council community services team and/or Tourism Office to raise awareness of local off road vehicle requirements.	Cost. Consultation requirements to develop an agreed code.	1 2 +ve 3 4 5 6	Important Yes; Easy Moderate

	Examples are available from the management of off road vehicles on the coast in South Australia.	A code of practice could be prepared as an interim measure, to raise awareness of good driving practice in sensitive coastal environments, while the multi stakeholder strategy is resolved.		7 8 9	B
12.4 Invite off road vehicle users to participate in Clean Up Australia events in the BWSP and along Nine Mile Beach, similar to the Stockton Bight Clean Up Day .	All of Nine Mile Beach, but focus on areas north of Awabakal Street. Cooperation between BWSP Trust, LMCC, HWC and Trade and Investment – Crown Lands required. .	Directly involves off road vehicle users in helping to protect the environment of Nine Mile Beach. Acknowledges that a cooperative effort is required to look after a community asset. Consistent with other community involvement initiatives. Opportunity to reinforce the message about environmentally friendly vehicle use	Consultation requirements to achieve engagement of volunteers	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Moderate B
12.5 **Prepare feature articles/opinion pieces for local newspapers and off road vehicle magazines about the importance of safe off road vehicle driving at Nine Mile, the appropriate access routes, how to get a permit (if this is introduced), how regulations will be enforced etc**	Relevant to all access to Nine Mile Beach and non access to other areas.	Would support a permit system, but could also be used by Council community services team and/or Tourism Office to raise awareness of local off road vehicle requirements. A code of practice could be prepared as an interim measure, to raise awareness of good driving practice in sensitive coastal environments, while the multi stakeholder strategy is resolved	Cost. Consultation requirements to develop an agreed code.	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Moderate B

11.3 Pathways, tracks and reserves

As outlined in **Section 4**, access and facilities that support community enjoyment of the coast are important to many stakeholders and residents. Several of the priority issues identified in **Section 7** relate to how community users access the coast, and the capacity of existing facilities to withstand both increasing demand and a changing coastal hazard profile. Safety is a major issue on headlands and rock platforms.

Table 11.3 presents options for managing these high profile access issues, within an overarching strategy:

'Develop safe, attractive and sustainable beach reserves and pathways'

Criteria scores relate to the evaluation criteria set out in **Section 8.4.1**. The criteria scores have been allocated based on currently available information, as outlined in **Sections 1** to **6** of the LMCZMP[A].

11.3.1 Facilities in coastal reserves

Community responses to the coast use survey indicate that while the coastal reserve areas are most heavily used in summer – especially reserves at the main surf club sites and the entrance training wall area, people also use the coast for a range of purposes that do not require hot weather or good waves. These uses include:

- Land based physical exercise, including running, exercise routines. These activities are very popular on the coastal pathways in Newcastle LGA, but are not provided for in Lake Macquarie.
- Picnics – all year round
- Coastal walks on headlands, along beaches and to places of interest/good lookouts for whales etc.
- Dog walking
- Children's playgrounds
- Landcare activities
- A place to take visitors
- Fishing
- Games requiring some open space – on the beach or in the reserve
- Bird watching
- Photography, art work

This mix of year round activities indicates both the limitations of the existing beach front reserve areas and the potential for the areas to be used by more people, if they were well designed and had quality facilities. Well designed reserve sites should, for preference, be stopping points on the coastal walks and cycling system. Conceptually, each of the major reserves would have facilities of a regional quality – like the main lake side parks. These reserves would have local walking paths – short loops or tracks to lookout points, as well as the in reserve facilities. The reserves would be linked by longer walking or cycle ways.

High priority should be given to establishing and/or improving the quality of pathways/cycleways:

- At Blacksmiths and along the northern side of Swansea Channel
- Extending the Fernleigh Track through Belmont Wetlands State Park, through Belmont Golf Course and on to join up with the Blacksmiths local pathway.
- From Swansea Heads to Caves Beach, via Hams and Crabbs Beaches – this route has excellent locations for lookouts (see the 1997 Coastline Plan and the Plan of Management for Caves Beach) and would then connect to the track south to Pinny Beach.

The Lake Macquarie coast does not have historic rock pools equivalent to Newcastle Ocean Baths or Merewether Baths. The Lake Macquarie coast was relatively inaccessible at the time that these facilities were originally built. There was originally a network of salt water pools around Lake Macquarie, but most have now been replaced with an un-netted area adjacent to a local jetty. Grannies Pool, set behind the entrance training wall is the closest facility to an ocean baths in the lake Macquarie LGA, and is currently in poor condition. It is shoaled with sand and access is difficult.

Grannies Pool has high local value, but also wider value on the Lake Macquarie coast because a safe swimming area in full marine waters is not available. The pool should be made useable and accessible, including for the less physically able.

New and updated plans of management and Master Plans should not seek to make Lake Macquarie another concreted coastline, like Newcastle, but should provide quality outdoor recreation experiences in a natural setting.

11.3.2 Blacksmiths- Swansea Channel Master Plan

The Master Plan sets the agenda for the Swansea – Blacksmiths area and was developed with wide ranging community consultation. Its priority recommendations should be implemented. Although much of the area coved by the Master Plan is at high risk from long term climate change and sea level rise, the community could expect at least 20 years of enjoyment out of upgraded facilities before a review of asset location and risks is required.

11.3.3 Protecting cultural heritage values of the coast

Local Aboriginal groups are very concerned about the long term management of coastal country. The most important ways to protect cultural heritage values of the coastal landscape are:

- Involve local Aboriginal community groups in decisions about and practical work on the coast. This includes the preparation of detailed plans of management, guidance for Landcare volunteers, development of awareness raising materials.

- Support local Aboriginal community organisations to manage land they own or manage in accordance with coastal resilience principles.

- Work with Aboriginal community stakeholders to prepare and site appropriate cultural heritage interpretation information on walking trails and at beach and headlands reserves. This information would tell the story of the coast from an indigenous perspective.

- Train Council outdoor staff in the fundamentals of cultural heritage statutory provisions in NSW and the value of cultural heritage places, so that Council officers demonstrate best practice in their management of Council managed reserve lands.

- Be aware that there are Aboriginal Land Claims and Native Title Claims (under the NSW Aboriginal Land Rights Act and Commonwealth Native Title Act) over large areas of the coast and shoreline of Swansea channel.

- Implement provisions which provide for consultation with local Aboriginal stakeholders about significant development in the coastal zone.

These approaches are incorporated in strategies for reserve management (**Table 11.3**) and communication about the coast (**Section 14**).

Table 11.3 - Theme 3 –Options for sustainable community access, use and value: - Coastal reserves and pathways

Objectives **To provide a safe, functional and attractive network of coastal pathways** To build the resilience of the coastal landscape by managing reserve lands sustainably		Targets See Table 8.1			
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 13: Develop safe, attractive and sustainable coastal pathways					
13.1 Prepare Masterplans which identify the most appropriate track locations for walking from residential areas onto cliff tops, bluffs and local beaches. When these track routes have been identified, they should be formalised and other routes closed and rehabilitated.	Caves Beach (southern headlands) Redhead – old Bicentenary walking tracks are now in poor condition and need redesigning. See also Action 2.2, which suggests the same mechanism to improve protection of EECs in these reserves.	Provide an overarching rationale and design theme for coastal pathways on headlands and across back beach reserve areas. Clear priorities for Landcare community volunteers	Must involve consultation with Landcare and local residents who use the existing pathways. Time to gain agreement; potential to lose some volunteers	1 2 +ve 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**
13.2 Establish well designed and maintained coastal access paths – on headlands, along Blacksmiths Beach, along Swansea Channel and across dunes onto the beach, to manage access risks and enhance amenity. This would be combined with more formal parking arrangements at selected locations. Link various pathways in a coast walk where possible, maintain coastal vistas by removing weeds and incorporate interpretative signage and a series of loops or shorter sections suitable for different walking abilities.	Blacksmiths and Swansea Channel routes and designs are in the existing Master Plan. Grannies Pool access is damaged and in need of repair. Other priority areas are Hams Beach, Caves Beach headlands, Redhead.	Part of a broader action which would link various pathways in a coast walk, incorporating a series of loops or shorter sections suitable for different walking abilities. Local scale small steps towards a full coastal walk – as was described in the 1997 plan.	Requires a review of existing pathway design and maintenance. Link to local access pathway Masterplan.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**

Objectives **To provide a safe, functional and attractive network of coastal pathways** To build the resilience of the coastal landscape by managing reserve lands sustainably			Targets See Table 8.1		
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 13: Develop safe, attractive and sustainable coastal pathways					
13.3 Conduct safety audits of headland walking tracks and lookouts to determine the appropriate level of risk management. Based on the outcomes of the audits and community consultation, close extreme risk tracks and lookouts which cannot be made safe through targeted management.	Tracks from Redhead to Dudley, tracks at Swansea Heads, tracks south of Caves Beach, tracks south of Catherine Hill Bay	Some headland tracks invite community access to areas with significant potential for people to fall. Tis action was also in the 1997 Plan but has not been implemented, although additional tracks have been installed.	May require significant changes to some existing community projects. May require a community awareness program about the risks involved and why some tracks should be relocated or fenced.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
13.4 Conduct a safety audit of Redhead, above the surf club and beach, to clarify the risk of rock fall risks to beach users.	The unstable bluff above Redhead Beach has easy public access from residential streets. Beach users sit immediately below the cliff. The top of the bluff is used as a lookout by surfers and others.	Council should be aware of the public safety risk at this location, so appropriate risk mitigation actions can be taken. Most likely that a controlled lookout access point is required, with other access closed. Proper risk assessment will allow informed discussion of the issue with the local community	No significant problems with conducting this audit	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**

Objectives **To provide a safe, functional and attractive network of coastal pathways** To build the resilience of the coastal landscape by managing reserve lands sustainably			Targets See Table 8.1		
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 13: Develop safe, attractive and sustainable coastal pathways					
13.5 Formalise cliff top lookouts, install safety fencing more formal stairs and rails on access tracks down the cliff or bluff to rock platform fishing sites, and also to provide emergency exit points for people on rock platforms in popular locations (such as Dudley and Catherine Hill Bay).	Tracks from Redhead to Dudley, at Swansea heads, south of Caves Beach, and south of Catherine Hill Bay. The rock platform route from Redhead to Dudley is very exposed to high wave and high tide conditions, with the potential that people can be trapped.	Provides clear guidance on safe places to view the coast and can be part of a promoted coastal walking system. Some tracks down bluffs are eroded and slippery – limits access to the physically able and increases risks in wet weather.	Some coast users may regard these structures/controls as overly cautious and restrictive. Consultation essential. Significant capital cost for construction. Adds to maintenance costs for Council	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**
13.6 Depending on the results of safety audits, consider placing additional 'Angel Rings' (and signage) for emergency rescues of people washed off the rock platform. Council would support the introduction of the requirement for rock fishers to wear personal floatation devices (PFDs).	Consider use at Swansea Heads (including on the breakwall), and between Redhead and Dudley as well as all rock platform areas south of Catherine Hill Bay, such as at Flat Rock.	Rings have saved lives of people washed off rock platforms on Central Coast, however the safety of rock fishers is an ongoing issue, and several people have drowned off Lake Macquarie rock platforms in recent months.	Maintenance, responsibility and training issues	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**

Objectives **To provide a safe, functional and attractive network of coastal pathways** To build the resilience of the coastal landscape by managing reserve lands sustainably			Targets See Table 8.1		
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 13: Develop safe, attractive and sustainable coastal pathways					
13.7 Reinstate Council's Beach Maintenance program to drive strategic track placement and ensure quality track construction and routine maintenance. These should be in accordance with the NSW Track Standards guidelines and Coastal Dune Manual. See also Strategy 12 in relation to the Beach Maintenance Program and vegetation management.	Relevant to all coastal areas, particularly Hams, Frenchmans and Blacksmiths Beaches. This is something Council's outdoor/leisure staff (e.g. lifeguards) could contribute to, out of season.	Provides a stronger 'bench' of professional staff to support and guide Landcare volunteers. Increases total resources available for maintaining beach access and simultaneously protecting and enhancing important coastal ecological communities.	Additional costs for Council, to employ seasonal staff all year round. Beach maintenance team to be trained to work in partnership with Landcare	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**
Strategy 14: Planning and education to manage coastal reserves sustainably					
14.1 Prepare Master Plans and redesign and upgrade facilities in reserves at the main recreational beaches (patrolled beaches), to provide attractive coastal park landscapes suitable for local and tourist use. See Section 11.2.1 for more details. Includes upgraded amenities blocks, playground equipment, landscaping, paths, picnic facilities, shade.	Redhead Beach Reserve, Hams Beach to Caves Beach reserve, Caves Beach headland. Also applies to Swansea Heads reserve (inside the channel) and on the headland. A Master Plan has already been prepared for Blacksmiths and the northern side of Swansea Channel.	These are high profile coastal recreation assets, are generally in poor condition, and perceived by the community to be of a low standard, compared to lake side reserves. All these reserves have potential for increased year round use by residents and visitors. Potential economic return for the City.	Significant cost of upgrade.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**

Objectives **To provide a safe, functional and attractive network of coastal pathways** To build the resilience of the coastal landscape by managing reserve lands sustainably			Targets See Table 8.1		
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 13: Develop safe, attractive and sustainable coastal pathways					
14.2 Prepare and implement a disabled access strategy for beaches and headlands (could be included in Masterplans for relevant locations).	Provide disabled beach access facilities at Caves Beach and Blacksmiths Beach, to allow access across the sand to the water. Develop wheel chair accessible lookouts (and potentially wheelchair accessible short pathways) on coastal headlands and dunes (dune sites to be linked to parking areas by suitable grade ramps	Gives effect to Council policies about disabled access to beaches. Currently access is only available to some surf clubs and to some lookout locations – not onto the beach itself.	Demand not confirmed. Cost of construction and maintenance.	1 2 3 4 5 6 7 8 9	Important Moderate; Easy Moderate C
14.3 Conduct a beach litter education program and install recycling bins to minimise litter on beaches – for aesthetic reasons and to prevent impacts on marine species Could involve surf lifesaving clubs in this activity.	All patrolled beaches and beaches used by beach fishermen. Include the breakwall areas and along the channel	Litter on beaches detracts from amenity and social value. Identified as an issue in community survey. Could reduce the need for beach cleaning if waste collected more effectively. Marine species and birds are known to be affected by litter – continued awareness raising for out- of-sight impacts is beneficial.	Cost of installing appropriate waste collection facilities and maintaining services. Overflowing bins in high use areas could outweigh the benefits of the program, so maintenance is essential.	1 2 3 4 5 6 7 8 9	Important Moderate; Easy Yes C

Objectives **To provide a safe, functional and attractive network of coastal pathways** To build the resilience of the coastal landscape by managing reserve lands sustainably			Targets See Table 8.1		
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 13: Develop safe, attractive and sustainable coastal pathways					
14.4 Update Plans of Management and prepare master plans for design and implementation of on ground works in headland reserves, to protect biodiversity values and provide for community activities.	Swansea Heads and Caves Beach headland – managing open space for weddings etc.; protecting Themeda grasslands; determine appropriate pathways and consider options for disabled accessible pathways and lookouts.	Improves the asset value of community open space by making it more useable by diverse people in the community. Protects biodiversity values	Cost of on ground works; risk of vandalism and maintenance costs if on ground works carried out	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**
14.5 Update Plan of Management for Swansea Heads Reserve to better manage the Aboriginal values of the reserve and tell the story of the Awabakal people.	Swansea Heads Reserve, including reburial site. Link to 4.10 – potential for interpretation or art work installations within the Master Plan	One of the most valuable elements of the Awabakal cultural landscape, and has great potential for interpretation of Awabakal story and cultural values. Potential to involve Awabakal people and Local Aboriginal Land Councils in planning, construction and maintenance.	Cost of works and installation	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
14.6 Consult local Aboriginal community stakeholders about Plans of Management and about the potential impacts of proposed major works in coastal reserves. Ensure all plans of management contain up to date cultural heritage information, including sites and land claims.	Consistent with Council's Aboriginal Cultural heritage Strategy and the requirements of the National Parks and Wildlife Act.	In addition to compliance issues, Awabakal people have strong cultural and historical knowledge of how Awabakal people have lived on the cast over time.	Difficulties in alignment of objectives.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**

11.4 Managing surf club assets and services

11.4.1 The social value of surf clubs

The four surf clubs along the Lake Macquarie coast are important social and cultural assets. The local surf clubs have provided a social and sporting focus for beach side communities for more than 80 years.

Council's objective is to support the continuation of these social benefits through a period of projected significant coastal change. As sea level rises, beach condition will be more frequently like it was in the 1970s, with rock exposed in the near shore at Caves and Redhead, and storm bite in the frontal dunes encroaching on the buildings. Caves Beach Surf Club will be susceptible to marine inundation as waves are able to overtop the frontal dune.

Blacksmiths, Caves and Redhead Surf Clubs are all in the impact area for historic storm bite (mapped as 'unlikely' immediate hazard by BMT WBM 2015).

Table 11.4 shows when the clubs were established, their current membership and the facilities they offer local communities.

Table 11.4 - Surf clubs as community assets

Club	When established	Membership	Facilities
Catherine Hill Bay	Wallarah Surf Club 1923-24	Not available, likely at least 300	Club house with function rooms, monthly members meetings and newsletters, blue light disco, training in surf lifesaving and competitions. Function rooms and kiosk on site Local community sponsors. Public toilets and showers are in the club building
Caves Beach	1929	500 members (aged 5 to 80 years), contributing 3500 hours of beach patrols each season.	Original club house was on the top of the bluff. Current club building is the fourth on site and was completed in 1978. It provides function rooms, kiosk. Has been used for major band concerts. Public toilets and showers separate to the club building
Swansea Belmont	1927	Total 700 people, including 150 active adults and 350 nippers	Auditorium, Board Room, decks and several bars are available for hire, with capacity of up to 180 people seated. Training facilities for surf lifesaving. Site for major carnivals. Conducts the Cross Lake swim annually. Public toilets and showers separate to the club building

Club	When established	Membership	Facilities
Redhead	1908 (one of the oldest in NSW)	Total numbers not available, but anticipate more than 600	Large function rooms used for weddings etc., with catering and lifts on site, decks with views, etc. Kiosk on site. Major expansion of club and facilities in the 1970s and facility enhancements have continued. Rock wall built seaward of the club in the 1970s (at a time when very little sand was on the beach). Public toilets and showers separate to (at rear of) the club building.

11.4.2 Surf clubs and coastal erosion and recession

Surf clubs are, by their historical function, located on frontal dunes and are consequently in immediate to short term coastal risk areas. Surf clubs provide major social benefits and are also significant built assets – most have value exceeding $2 million and have club rooms, reception rooms of commercial value.

Council's intention is to work closely with surf clubs to provide information that will assist club members and management with decisions about major club and community assets. Actions that will help clarify the risks at surf club sites are discussed in more detail in **Section 9** (**Strategy 4**). Council will assist with information such as:

- Current mapping of coastal hazards and risks
- Reporting on actual coastal change, using data from beach survey and regional LiDAR
- Advice on risk assessment and interpretation
- Advice on triggers for changing management strategies – such as from do nothing to planning for relocation, or from planning to actual change.
- Audits of existing protection structures and foundation capacity
- Master Planning of reserves in which Clubs are located, so that decisions about relocation of assets are made in the context of all aspects of reserve management

This section explores the options that are available for the management of surf club buildings, in the context of both high risk (expensive buildings in exposed locations right on the frontal dune) and high community value.

Based on current information, options for surf clubs include:

- Do nothing. Rely on existing dune buffers or existing protection structures to protect the built assets in major storms. With no new measures, the ground floor of Redhead and Caves Beach will be subject to regular inundation. In the medium term, Swansea Belmont Club would be affected by coastal recession.

- Strengthen existing protection, by raising the height of rock walls, increasing rock size and increasing the buffer of dune sand with sand from elsewhere in the system. Any existing protection works (such as at Redhead) should be audited, to confirm their design, condition and engineering capacity. Increased sand buffer is only feasible at Swansea Belmont, and only if sand from dredging of Swansea channel can be used to build dune volume.

- Redesign internal uses, so that no high value assets, electrical items or are stored on the ground floor. This will reduce potential damage to assets due to marine inundation. This is already an option at Redhead.

- Structural retrofit (such as deep piling) to increase resilience to storm bite erosion. This is likely to be very high cost and impractical for traditional slab on sand buildings.

- Rebuild on the same site, but using a modular design that could be relocated landward in emergency conditions, or as the dune escarpment reaches a trigger point (note, at Redhead, any possible triggers have already been met)

- Construct new coastal protection works in front of the surf club buildings, to prevent storm bite erosion under the buildings. Note that any sea wall will have a detrimental impact on beach volume and profile. Coastal protection works (e.g. large geotextile bag structures) could be used as an interim measure, while alternatives are resolved.

- Relocate landward, in the same reserve. This would include construction of a new main club building (maintain views and beach side amenity), with other facilities (such as lookouts for beach patrol) located on the frontal dune. Most surf clubs already have small mobile life saver facilities that are taken onto the beach daily; there is no need for a major structure to provide these services.

- Establish new surf club locations (new or additional sites), to meet expected growing demand for patrolled beach facilities and beach side recreation facilities. These new facilities would be located outside the immediate 'unlikely' hazard area and would be designed to facilitate landward retreat if necessary. Patrolled beach facilities, which can be mobile equipment, are much more cost effective than major surf club buildings. Options for new patrolled beaches and simple beach related facilities could be linked to major tourism development at Hams Beach or in Belmont Wetlands State Park. An additional facility could also be considered at Catherine Hill Bay, where a large growth in local resident population expected.

- The options for increased protection and/or relocation of part or all functions and assets would only occur when agreed trigger points, based on the costs and benefits of managing risk, are met. Actual asset moves are more likely to occur when existing assets are already deteriorating from impacts of coastal processes, or essential services cannot be safely maintained.

Actions for the future management of surf clubs are summarised in **Table 11.5**.

Table 11.5 - Theme 3 – Options for sustainable community access, use and value:- Provide sustainable surf club assets

Objectives To provide for ongoing safe recreational use of Lake Macquarie beaches To maintain the community benefits of surf club assets along the coast, particularly surf club buildings			Targets See Section 8.1		
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 15 – Consult with surf club members to match risk mitigation and community value opportunities					
15.1 Plan for another surf club and/or patrolled swimming area.	Options are on Nine Mile Beach, linked to access to beach through the State Park **-** At access point identified in the Plan of Management for the State Park Or At Moonee Beach	A medium term option, when access through the State Park is upgraded ad hind dune recreation/tourism facilities are in place. An alternative to Blacksmiths and Redhead as beach usage increases. In medium term, Redhead Beach will become more rocky and less safe, as sea level rises.	Needs to be integrated with the off road vehicle access plan and back beach access for two wheel drive vehicles and/or pedestrians.	1 2 3 4 5 6 7 8 9	Important No; Easy No D
15.2 In consultation with Surf Clubs and local communities prepare community use studies to scope potential broader community access to club facilities.	All surf clubs	The surf club buildings are major community social assets. Investigate options to increase public events and access –as well as private functions. Council has supported construction of these buildings, and other community halls/venues not of similar quality.	Options could conflict with lease arrangements for SLSC and with current business plans of SLSC.	1 2 3 4 5 6 7 8 9	Important Moderate; Easy moderate C
15.3 In consultation with Surf Clubs review essential uses for frontal dune locations and uses which could be accommodated further landward, to inform Master Planning for surf club sites, car park areas and other reserve lands and to inform decisions about protection or relocation of assets in response to coastal recession.	All surf clubs	All surf clubs are in coastal erosion and recession areas. Potential cost savings from retaining only essential rescue services in the higher risk locations and relocating over time, other major built assets away from the immediate risk area.	May be community resistance to contemplating moving community assets away from the beach area. First step in a longer process of consultation and decision making	1 2 3 4 5 6 7 8 9	Important yes; Easy Yes A
15.4 (See Action 4.1) Conduct	Redhead surf club	Provides important information about the	Cost; access to inspect	As per (See	

Objectives To provide for ongoing safe recreational use of Lake Macquarie beaches To maintain the community benefits of surf club assets along the coast, particularly surf club buildings		Targets See Section 8.1			
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
an audit of the design and condition of the sea wall that protects Redhead surf club from storm bite erosion and of the foundation capacity of the surf club.		structural integrity of existing structures. Rock wall constructed in mid 1990s. Information to guide decisions about additional investment over the wall, or in the main surf club building	the rock wall is difficult except in storm conditions	Action 4.1)	A
15.5 (See Action 4.2) Conduct an audit of the foundation capacity of Swansea-Blacksmiths Surf Club, Caves Beach Surf Club and Catherine Hill Bay surf club and any existing structures designed to protect the buildings from storm bite erosion.	As per Acton 1.12	Clarifies the structural capacity of existing surf club buildings to withstand storm bite erosion and reduced load bearing capacity of underlying sand mass. Raises awareness about the potential threat of coastal processes to surf club infrastructure and opens further opportunities for dialogue about longer term solutions.	Information may not be available.	As per (See Action 4.2)	A
15.6 In consultation with Surf Clubs (and SLSA) determine agreed trigger points for commencing detailed planning for protecting or relocating surf club buildings.	Relevant to all surf clubs. Timing varies with asset life of the existing structure and the location of the buildings re risk areas.	Makes Council's position clear and informs the Club about the timing for potential relocation	Cost of planning process – clubs may not be in a position to contribute. May be resistance to relocation concept.	1 2 3 4 5 6 7 8 9	Important yes; Easy Yes A
15.7 In consultation with surf clubs and local communities, identify alternative surf club sites (i.e. for the main club buildings) which could be developed if coastal erosion/recession triggers are met.	Note that Caves and Swansea Belmont Surf Clubs have both previously been located elsewhere.	Part of planning process in response to triggers for planning for change and taking action for change Will involve club members in discussion, so awareness raising value. Could be linked to telling the story of the coast.	May be resistance from some members to moving the building. Must be clear that moving would only occur if risks cannot be managed in situ – this is the role of the trigger points.	1 2 3 4 5 6 7 8 9	Important yes; Easy Moderate B

Objectives To provide for ongoing safe recreational use of Lake Macquarie beaches To maintain the community benefits of surf club assets along the coast, particularly surf club buildings		Targets See Section 8.1			
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
15.8 Prepare project plans for relocation of individual surf clubs, including master plans for sites, approvals required, land tenure arrangements and funding opportunities for implementation.	See preliminary research on surf club vulnerability and management options done by SLSA. Applies to all surf clubs along the coast, but most importantly for Redhead, Caves and Swansea Belmont.	Provides a clear pathway of what needs to be done, when and, how and likely costs, for maintaining the services that surf club assets provide. Supports planning for change and allows for grant processes which may cover some costs.	Plan may need to be revised on a regular basis – consultation processes with members.	*Score relates to plans only* 1 2 3 4 5 6 7 8 9	Important yes; Easy Moderate **B**
15.9 Undertake capital works – construct new surf club buildings or upgrade protection structures.	As required – at Redhead, Swansea Belmont or Caves Beach.	In the long term, constructing a new building outside the immediate risk area may be the only sustainable option. New buildings low probability of being required within the life of this Plan.	Very high cost – expect more than $2 million for each club building (not including any land costs)	1 2 3 4 5 6 7 8 9	Important yes; Easy Low **D**

12.0 Theme 4 – Options to Enhance Council's Coastline Management Capacity and Focus

Internal Focus and Resources

In this section
Set goals for Council to enhance their internal capacity to action coastal management
Determine an internal framework under which Council staff are able to implement actions effectively

12.1 Scope of responses

This section deals with Council's internal organisation and resource allocation to the management of the open coast landscape. Council has for more than a decade invested in improving the health of estuarine environments in Lake Macquarie and enhancing recreational amenity around the lake shore. These works have been very well received in the community and lake shore recreation is enjoyed by many in the community, as well as attracting visitors.

Over this period, investment in open coast management, in terms of reserve management, proactive access management and development of passive recreation and tourism opportunities, has been much less focused. Potential responses included in this theme are intended to reset priorities so that Council's internal systems support the implementation of actions to address significant issues, which will restore and enhance the resilience of coastal ecosystems.

More focused and effective management of the open coast would also raise the profile of the City's coastline as a place of great natural beauty, for swimming, surfing, coastal walks and cycling.

12.2 Internal resources

Council resources for managing the coast are spread over a wide range of divisions. Council manages multiple environmental contexts and currently does not have a separate unit with place management responsibilities for the open coast environment. Previous models of management have included a dedicated team managing a lake restoration/health program as a special project (Office of lake Macquarie and Catchment Coordinator). The current model has teams organised by function, rather than place.

The divisions across Council that have roles in aspects of coastal management are noted in **Table 12.1**. The Sustainability Department has the primary role, but Community Planning and Asset Management are also key internal stakeholders.

Table 12.1 - Council divisions and departments with coastline management responsibilities

Divisions	Work areas	Examples of roles
City Strategy	Integrated Planning	Strategic land use planning, LEP and DCP, City Strategy
	Development Assessment and Compliance	Processing applications for development requiring consent, including coastal protection works
	Sustainability	Coastal ecology Coastal hazard assessment. Coastal monitoring and reporting. Climate change risk assessment and management. ESAP Support Estuary and Coastal Management Committee
Community Development	Community Planning	Strategic planning for community facilities, including plans of management and master plans for coastal reserves. Cultural heritage Developing local events with a coastal focus
	Leisure Services	Lifeguards
	Asset Management	Audit of City assets, including natural area assets Management of the condition of Council's coastal facilities
Operations	Waste, Environment & Rangers	Emergency response Compliance with waste and vehicle regulations, e.g. vehicles on beaches
	CiviLake	Stormwater maintenance, road and pathway maintenance

Effective coastal management requires:

- Strong leadership – a champion within Council, who can promote the ecological and socioeconomic values of the coast with decision makers and explain the significance of current and emerging threats;
- Stakeholder communication - to build partnerships and to foster community engagement and involvement
- A strategic and adaptive approach, implemented by a core team of coastal specialists
- Integrated management of coastal issues across the multiple Council divisions that have responsibilities for parts of the coastal management process

To enhance the effectiveness of Council's coastal management, building on what has been achieved to date, five initiatives are proposed.

Within the Sustainability Department, identify a 'coastal champion', whose role description includes strategic leadership on coastal issues and primary responsibility for implementing the adopted CZMP. This would include liaising with other divisions of Council to ensure resources for coastal projects (internal planning and coordination projects, stakeholder liaison and on ground works).

1. Form an internal coastal working group. This group would include representatives from the relevant divisions and would meet on a regular basis (perhaps quarterly) to facilitate and streamline coastal projects.

2. Review the membership of the Estuary and Coastal Management Committee and reform the group as a Coastal Zone Management Committee. The stakeholder membership of the current Committee reflects Council's focus on lake management over the last decade. The membership should in future include open coast stakeholders such as the Surf Life Saving Association, Dunecare and major coastal landholders (e.g. Belmont Golf Course and BWSP Trust). Further efforts should be made to engage the local Aboriginal community in the Committee process, as they are significant land holders (claimants at this stage) on the open coast, along Swansea Channel and around the lake shore. If a suitable representative of the off road vehicle community is feasible, then they could also be included. This diversification of membership is consistent with Council's intention to integrate coast and estuary management in a single coastal zone management plan. This approach will need strong community champions as well as the internal champion for the coast.

   The secretariat for the Coastal Zone Management Committee would remain with the Sustainability Department.

3. Enhance budget planning and alignment for coastal projects. Council should ensure that high priority coastal zone actions are included in Council's budget management systems and tracked in annual, four yearly and longer term budget planning and reporting. Effective implementation of coastal zone management priorities will require a shift in budget priorities – in terms of allocation of financial resources for further studies, plans and on ground works; and in terms of the allocation of staff resources (within relevant teams).

4. Effective budget management should also include a review of Council's funding allocations to provide a dedicated funding stream for important coastal works. Several of the most urgent activities on the coast are about community safety – conducting full risk assessments, reviewing access ways and structures, community awareness and providing for emergencies. Investment in community safety on the coast should be a very high priority for Council, working with other agency and community partners.

   In part this is also about developing external funding partnerships, and scoping all relevant grant schemes.

5. Enhance internal systems for tracking coastal zone management outcomes. This can be achieved in part by directly linking the CZMP priorities to ESAP, so that budgets, targets, monitoring and review processes are clearly set out in the environmental and social management systems. Direct links between the CZMP actions and Council's annual reporting and State of the environment reporting should also be confirmed and maintained.

Initiatives to refocus Council activity and investment are described and evaluated in **Table 12.2**.

Table 12.2 - Theme 4 – Options to enhance Council's coastline management capacity and focus

Objectives To align Council internal structure, resources and investment with the current and future challenges and opportunities that are offered by open coast issues		Targets To be determined by Council			
Option	Potential applications	Benefits	Disadvantages	Criteria scores	Category Score
Strategy 16: Review Council resources and investment priorities for the coast					
16.1 Review staff responsibilities and identify a 'coastal zone champion' to promote open coast values and highlight coastal zone threats and risks. This role would coordinate the implementation of the CZMP, including cross council facilitation and budget planning; outcome tracking etc.	Internal Council position, intended to raise the profile of the open coast in coastal zone management and ensure that high risk open coast issues receive appropriate attention. Highlight the opportunities for City social and economic development from sensitive management of coastal assets.	Will bring coastal issues forward and raise understanding across Council of the different challenges facing open coast managers to those that Council has been successfully addressing in the lake and catchment.	Council has multiple priorities – need to make a strong case for such a coastal focus which would potentially involve moving some investment away from the lake and lake foreshore.	1 2 3 4 5 6 7 8 9	Important Yes Easy Yes **A**
16.2 Revisit the balance of investment in lake shore reserves and open coast reserves, with an increase in investment in coastal areas, to address high priority actions in a timely manner. For instance, community safety audits and actions to reduce safety risks.	Whole of Council LGA. See also **Section 16.2** regarding funding options	Would reflect the potential benefits to the City of quality facilities and actively managed habitats on the coast – currently much lower standard than the lake shore or coastal facilities in adjoining LGAs.	Council has limited funds and high community demand for facilities in lake shore reserves.	1 2 3 4 5 6 7 8 9	Important Yes Easy Yes **A**
16.3 Form a small working group with representatives across relevant Council divisions to facilitate delivery of the plan and schedule and oversee implementation. Also Council representatives to be part of an external working group for Nine Mile Beach with stakeholders.	Internal Council	A group focused on the implementation of the Plan will ensure actions are resourced and implemented to a predefined schedule.	Organising funding and time commitments across departments may be difficult.	1 2 3 4 5 6 7 8 9	Important Yes Easy Yes **A**
16.4 Review the allocation of the Council's funding programs), to provide a direct income stream for coastal zone management works.	Internal Council. See also **Section 16.2** regarding funding options		Community concern about ongoing additional charges.	1 2 3 4 5	Important Yes Easy Yes **A**

Objectives To align Council internal structure, resources and investment with the current and future challenges and opportunities that are offered by open coast issues		Targets To be determined by Council			
Option	Potential applications	Benefits	Disadvantages	Criteria scores	Category Score
				6 7 8 9	
16.5 Investigate and utilise all relevant and cost effective external funding avenues, to facilitate implementation. An example is potential packaging of coastal zone management activities to meet Commonwealth priorities.	Internal Council. See also **Section 16.2** refunding options	Additional funds to aid in further internal planning processes, and Plan implementation. Further opportunities to promote the values of the Lake Macquarie coast.	Long and time consuming process to fill in grant and funding paperwork. Criteria can be difficult to meet and drive a project focus away from what is needed locally. Time spent initially planning out and targeting certain grants will mitigate this.	1 2 3 4 5 6 7 8 9	Important Yes Easy Yes **A**
16.6 Review the membership of the Estuary and Coastline Management committee and reform as a Coastal Zone Management Committee, with membership more representative of open coastal stakeholders as well as the lake.	Internal Council activity, plus liaison with coastal landholders and community groups to achieve the best membership for future roles in implementing the integrated Coastal Zone Management Plan	Clear link to the full scope of coastal zone management. Brings some previously excluded stakeholders into a regular discussion forum.	Determine appropriate size for this group and balance between community representatives and technical experts.	1 2 3 4 5 6 7 8 9	Important Yes Easy Yes **A**
16.7 Council to review the management partnerships with Landcare Australia Ltd**,**	Internal Council + Landcare Involve LLS in terms of project funding criteria	Provide a strategic focus for Landcare projects and better align them with the coastal ecosystem priorities	This will require time and effort from relevant Council staff to implement and oversee.	1 2 3 4 5 6 7 8 9	Important Moderate; Easy Moderate **C**
See also 13.7 Reinstate a Council	This action would support Option	See Option 13.7	See Option 13.7	See Option 13.7	Important Yes;

Objectives To align Council internal structure, resources and investment with the current and future challenges and opportunities that are offered by open coast issues		Targets To be determined by Council			
Option	Potential applications	Benefits	Disadvantages	Criteria scores	Category Score
coastal maintenance team.	16.5, by allocating more Council on ground resources to coastal projects. Also ensure that on ground works by Council and community groups have consistent objectives and are using the same knowledge about the value and condition and threats affecting coastal natural and cultural assets				Easy Moderate B
16.8 Establish monitoring programs to track the condition of the coast and the outcomes of management actions.	A draft scope of the monitoring program is in **Section 15**.	This monitoring program is fundamental to adaptive management of the coast and will also enable council to report regularly to all stakeholders on the outcomes of investment in coastal zone management programs.	Significant cost in multi-dimensional monitoring programs across geomorphology, ecology/biodiversity, community use, coastal value and management outcomes.	1 2 3 4 5 6 7 8 9	Important yes; Easy Yes A

13.0 Theme 5 – Strong Governance and Supportive Partnerships

In this section
Partnerships with agencies, adjoining councils and community

13.1 Scope of responses

Proposed partnership strategies create opportunities for more effective and efficient management of the coastal landscape, by shared objectives and joint programs and projects.

Options for consideration are noted in **Tables 13.1 and 13.2**.

Table 13.1 is arranged to show separately strategies involving:

- State agencies - particularly DPI Catchments & Lands and Reserve Trusts, Hunter Water Corporation and NPWS
- Adjoining local government areas

Table 13.2 focuses on community involvement and capacity building:

- Private land owners and managers, such as the Belmont Golf Club
- Community recreational organisations
- Community environment organisations
- Local business

13.2 Agency and council partnerships

Not only is the open coast a very dynamic natural environment, but projected climate change introduces new uncertainty into how coastal processes will interact in the future. Council shares statutory responsibilities for managing these complex process interactions and land management responses with multiple state agencies. As an urban council, LMCC has neighbouring councils only a short distance away, managing the same coastal bioregion and in some cases the same coastal sediment compartment.

In NSW, the framework for coastal management has changed significantly over the last five years and is expected to be refined further as regulations and policy are adapted to new knowledge and/or changing community and political contexts.

LMCC therefore, will work closely with state agency partners and with adjoining Councils to:

- Contribute to the identification and refinement of best practice coastal hazard and risk assessment, coastal management strategies and share knowledge.
- Provide for consistent approaches within the region to matters such as biodiversity resilience, coastal risk assessment and community assets.

- Promote the value of healthy and functioning coastal systems to support social and economic resilience in the community.

Agencies and councils with which Council will collaborate include:

- Wyong Shire Council and Newcastle City Council, plus other coastal councils on a less frequent basis;
- Hunter Councils for a regional perspective on climate change, biodiversity and adaptation;
- OEH – Coastal Unit and National Parks Service (District offices);
- Trade and Investment – Crown Lands, and DPI Fisheries (as necessary);
- LLS – in relation to regional objectives and targets and the application of resilience concepts in the coastal landscape;
- Hunter Water Corporation;
- Newcastle University.

13.3 Supporting community involvement and capacity building

As shown in **Section 4**, the open coast is a highly valued natural and social asset in local coastal villages, the Lake Macquarie community and more broadly in the region. The community is already closely involved on coastal zone management through a number of organisations, such as:

- Trustees of the Belmont Wetlands State Park are all community representatives;
- Membership of the four surf lifesaving clubs along the coast;
- Members of coastal Landcare groups;
- Membership of Council's Estuary and Coastal Management Committee;
- Members of Sustainable Communities groups;
- Other informal, conservation or recreational groups such as Birds Australia, walking groups etc.;
- Members of Belmont Golf Club – also a major landholder on the coast;
- Participation in summer programs on the coast.

Ongoing and growing community involvement in the management of the coast is a key theme of the NSW Coastal Policy and ongoing recreational access to the coast is a requirement of the Coastal Protection Act. Council's approach to the open coast is consistent with these requirements and with its approach to environmental sustainability across the City. Council supports enhanced community involvement in all aspects of coastal zone management, but particularly in informed decision making, on ground ecological protection works and monitoring of coastal condition.

13.3.1 Major community landholders

As noted in **Section 4**, parts of the Lake Macquarie coast are owned by private organisations to mean high water. In the southern part of the City, some land remains with Coal and Allied, whilst in the northern part of the City, Belmont Golf Club owns a section of Nine Mile Beach.

Transfer of some Coal and Allied land to public ownership is being managed through the strategic planning process for new residential areas. This land includes significant historic heritage values and assets.

Belmont Golf Club is located in a critical section of Nine Mile Beach. Apart from meeting the interests of its members for a well designed and financially viable course, it is affected by coastal processes such as sand drift, coastal recession, dune destabilisation by off road vehicles, invasive species, illegal access, potential alignments of coastal walk or cycleway and other high profile issues.

More direct engagement with the golf club about coastal management is proposed, including potential membership of the Coastal Zone Panel, participation in the multi stakeholder Strategy for off road vehicle activities and participation in dune management activities.

Table 13.1 - Table 13.1 – Theme 5 – Strong governance and supportive partnerships: - Agencies and Councils

Objectives **To enhance alignment of objectives and management strategies across land tenures** **To improve the efficiency or resource use** To share information and encourage collaboration for a healthy and accessible coast		Targets See Table 8.1			
Option	Potential applications	Benefits	Disadvantages	Criteria scores From Section 8.4.1	Category Score From Table 8.3
Strategy 17: Partnerships with State agencies					
17.1 Review and improve alignment of objectives of Plans of Management and other Plans (such as LEP and Master Plans) prepared by Council Trade and Investment – Crown Lands and NPWS. Note that Trade and Investment – Crown Lands Plans of Management can no longer override the LEP Action involves State agencies.	Belmont Wetlands State Park National Parks, Conservation Areas and Nature Reserves along the Lake Macquarie coast. Council Plans of management for coastal community land	As for other actions for Nine Mile Beach area, the objective of this action is to improve efficiency and effectiveness of land management by resolving conflicting objectives and agreeing on shared priorities	Limited resources available in each organisation to apply to review of Plans. Some plans may not have any review period identified.	1 2 3 4 5 6 7 8 9	Important Yes Easy Yes **A**
17.2 Consolidate Crown land and other land parcels around Belmont Lagoon to achieve consistent management of conservation values Action involves State agencies.	The Belmont Lagoon area is with Crown land, Council land, Hunter Water and Belmont Golf Course land. Transfers of title would occur as opportunities arise.	A single management entity could provide a more consistent approach to managing high conservation value lands that are otherwise subject to diverse objectives.	Land tenure rationalisation is a long term process. Consistent management could also be achieved by MoU re shared objectives and coordinated management actions. Cost implications for Council or lands Department if acquisition required. NB. Land claims are in process around the Belmont Lagoon area, consultation with relevant LALCs would be required.	1 2 +ve 3 4 5 6 7 8 9	Important yes; Easy Moderate **B**

Objectives **To enhance alignment of objectives and management strategies across land tenures** **To improve the efficiency or resource use** To share information and encourage collaboration for a healthy and accessible coast		Targets See Table 8.1			
Option	Potential applications	Benefits	Disadvantages	Criteria scores From Section 8.4.1	Category Score From Table 8.3
17.3 Review Plans of Management for Crown Land Reserves and National Park/Nature Reserves to align approach to sea level rise threats Action for State agencies.	Belmont Wetlands State Park National Parks, Conservation Areas and Nature Reserves along the Lake Macquarie coast.	Sea level rise is projected to impact on the type of beach, the alignment of frontal dunes and on water levels and salinity in coastal creeks and wetlands. These features of the coast have high biodiversity value and community enjoyment value (e.g. in terms of investment in access infrastructure), so acknowledging risks in reserve planning is important	Current risk assessment ranks risks to biodiversity and access below risks to infrastructure assets, other than for the beaches themselves.	1 2 3 (Crown responsibility) 4 5 6 7 8 9	Important Yes; Easy Moderate B
17.4 Review Plans of Management for Crown Land Reserves and National Park /Nature Reserves to provide for joint authorisation of rangers (or similar positions) to enforce off road vehicle regulations across different land tenures. Also liaise with WSC and NCC to provide consistent authorisation and enforcement procedures for off road vehicles using coastal lands across local government boundaries. Action involves State agencies.	Belmont Wetlands State Park National Parks, Conservation Areas and Nature Reserves along the Lake Macquarie coast. Also northern part of Wyong Shire Council. Will depend on the outcomes of the Multi Stakeholder working group	As for Strategy 3.9, this option will provide for consistent regulation of off road vehicle use and also increases the efficiency of ranger presence on beaches and dunes by increasing collaboration.	May take time to negotiate the agreement, although similar agreements are already in place between Wyong Shire Council and OEH and for areas on the mid north coast. Training requirements for authorised officers.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate B
Strategy 18: Partnerships with adjoining local government areas					
18.1 Liaise with Wyong Shire Council (WSC) and Newcastle City Council (NCC) to provide consistent methods of assessing coastal risks.	Future updates of coastal risks across all local council coasts in the region.	Local communities are aware of different risk assessment processes and risk appetites across Council boundaries.	Risk profiles of Councils may be different for very good reasons. However, even in this case, consistent	1 2 3 4	Important Yes Easy Yes

Objectives **To enhance alignment of objectives and management strategies across land tenures** **To improve the efficiency or resource use** To share information and encourage collaboration for a healthy and accessible coast		Targets See Table 8.1			
Option	Potential applications	Benefits	Disadvantages	Criteria scores From Section 8.4.1	Category Score From Table 8.3
	Will also involve OEH	Consistent approaches that enable Council staff to present consistent risk management messages would help to reduce conflict.	messages about risk and risk management strategies would be beneficial	5 6 7 8 9	**A**
18.2 Liaise with WSC and NCC to adopt consistent triggers for changes to land use controls and other risk mitigation measures in coastal risk areas.	Future updates to coastal risk management for all local Councils in the region. Will also involve OEH and Trade and Investment – Crown Lands	Different approaches across local council boundaries create confusion, and provide support for landholders arguing unfair or unnecessary controls on land use. High levels of misunderstanding and resistance reduce the effectiveness of planning in individual Councils.	Would need to accommodate any specific needs of each Council. Needs State government support. Limited time and resources available in Councils to push amendments through.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Moderate **B**
18.3 Liaise with WSC and NCC to provide consistent biodiversity resilience strategies where coastal ecological communities cross Council boundaries. Link to Catchment Action Plan and Regional Biodiversity Strategy	Across the southern boundary of NCC and northern boundary of WSC. Efforts consistent with the aims of this action are already underway	Aligns management responses with the scale of the issue – biodiversity values at regional scale or larger, so responses should address regional priorities.	Regional priorities may not allow resources for pressing local needs.	1 2 +ve 3 4 5 6 7 8 9	Important Yes Easy Yes **A**

Table 13.2 - Theme 5 – Strong Governance and Supportive Partnerships

Objectives To raise community awareness of coastal zone management issues and the rationale for adaptive responses To build community skills and capacity in managing the coastal zone To provide a clear management framework for community projects		Targets See Table 8.1			
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores From Section 8.4.1	Category Score from Table 8.3
Strategy 19: Support community involvement in looking after the coast					
19.1 Discuss proposed changes to coastal management with local communities – through precinct committees, sustainable communities program etc., to maintain ownership of landscape values.	All local community representative organisations along the Lake Macquarie coast	Provide opportunities for questions and comments, build awareness of adaptive approaches and capacity to address risks	Intensive Council staff resources as new concepts are introduced. However, Council is already working in this response, through its Sustainable Neighbourhoods initiative	1 2 3 4 5 6 7 8 9	Important Yes Easy Yes **A**
19.2 Prepare a communication package about migratory shore birds on Nine Mile Beach and shore platforms.	Nine Mile Beach, Swansea heads, Redhead to Dudley shore platform	Raises community awareness of the presence and habitat needs of high conservation value bird species in the City. Should be linked to the broader story of migratory birds that visit the region. Input from community organisations	Few disadvantages other than potential costs and time costs, however is affordable.	1 2 3 4 5 6 7 8 9	Important Moderate Easy Moderate **C**
19.3 Train community volunteers in – citizen science level ecological monitoring techniques. This involves community members participating in scientific monitoring programs to collect data, and become more engaged on ecological issues.	All localities	Encourages community involvement and education. Will allow for a more thorough monitoring record and database to be established as long as a consistent standard can be achieved and maintained.	Potential for inconsistencies in the monitoring may reduce accuracy of records. Some time required for training and overseeing monitoring or groups and data sets.	1 2 3 4 5 6 7 8 9	Important Yes Easy Yes **A**
19.4 Investigate opportunities for members of Belmont Golf Club to	Nine Mile Beach – dunes at seaward margin of developed	This would ensure a more consistent approach to dune and	Will involve some Council leadership, and willingness	1 2	Important Yes

Objectives To raise community awareness of coastal zone management issues and the rationale for adaptive responses To build community skills and capacity in managing the coastal zone To provide a clear management framework for community projects		Targets See Table 8.1			
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores From Section 8.4.1	Category Score from Table 8.3
form a Landcare group.	golf course, as part of a broader strategy for managing dune form and vegetation	Landcare activities whilst promoting partnership values between tenures. Links golf club land management directly into coastal care networks.	of participation from the Belmont Golf Club (BGC) members.	3 4 5 6 7 8 9	Easy Yes **A**
19.5 Investigate/liaise about the potential for Surf Life Saving Clubs to be involved more in Landcare type activities in off season.	All four surf club areas.	Would provide additional resources for dune management programs in areas that have high usage in the summer months.	May involve additional training for surf club members. Surf club members may not be interested in these types of activities .	1 2 3 4 5 6 7 8 9	Important Yes Easy Yes **A**
19.6 Develop opportunities for local businesses to sponsor community projects on the coast.	All localities	Would foster community involvement and promote local business in a positive light.	Willingness may be low if no direct financial incentives.	1 2 3 4 5 6 7 8 9	Important Yes Easy Yes **A**

Objectives To raise community awareness of coastal zone management issues and the rationale for adaptive responses To build community skills and capacity in managing the coastal zone To provide a clear management framework for community projects		Targets See Table 8.1			
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores From Section 8.4.1	Category Score from Table 8.3
Strategy 20: Partnership with private land holders					
20.1 Adopt a policy to encourage transfer of private land along the coast from MHW to the landward edge of the 2100 coastal hazard zone, plus a buffer) to public tenure, as opportunity arises.	This could apply to the process for new residential development proposals in the south of the City, and could be part of negotiation with Belmont Golf Course about course enhancement opportunities.	In accordance with Coastal Policy objective of ongoing public access to the open coast, as the shoreline changes. Note suggestion in **Action 12.2** for short to medium term lease of Golf Course owned beach to Crown or Council, to provide for legal off road vehicle access. Transfer as opportunity arises should limit costs.	Transfer of important parcels of land may be delayed, thus delaying rationalisation of management approaches.	1 2 3 4 5 6 7 8 9	Important Yes; Easy No **Policy A** **Implement – D**
20.2 Prepare a dune management strategy for the full length of Nine Mile Beach, involving shared objectives and collaborative management by private and public and holders, including Belmont Golf Club (working group).	See also **Section 10** and Option 9.2 in relation to biodiversity benefits	See Option 9.2	See Option 9.2	As per Option 9.2,	Important Yes; Easy Moderate **B**
20.3 Prepare a course development plan/design for Belmont Golf Course which makes best use of its coastal position but also restores and builds biodiversity values. Action for Belmont Golf Club	For Council to support this type of development of the Golf Course, - support could be via master planning process or technical advice.	See Option 9.1	See Option 9.1	As per Option 9.1, Benefit Moderate	Importance moderate; Easy moderate **C**
20.4 As part of the biodiversity enhancement plan for Belmont Golf Course, research native grass species and coastal ground covers that could be used on fairways.	Council could provide strategic assistance, using its knowledge and experience from Landcare projects and from Council's own work on coastal dunes and	This information would greatly benefit BGC's efforts to integrate the golf course recreational use with dune stabilisation and biodiversity enhancement	No particular constraints other than research costs.	1 2 +ve 3 4 5	Importance moderate; Easy moderate

Objectives To raise community awareness of coastal zone management issues and the rationale for adaptive responses To build community skills and capacity in managing the coastal zone To provide a clear management framework for community projects		Targets See Table 8.1			
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores From Section 8.4.1	Category Score from Table 8.3
Action for Belmont Golf Club	headlands.	objectives.		(assistance only) 6 7 8 9	C
20.5 Revise route through Belmont Golf Course, for a Fernleigh Track cycleway extension from Ocean Park Road to join new route from Awabakal Street to Swansea, not involving cyclists using the Pacific Highway	An informal track exists south from Docker Street through the Nature Reserve. A safe route is needed across part of the golf course and associated wetland area. Walkers can use the beach to traverse this area, but a more formal cycling path would be required.	Would connect cycleway from Fernleigh Track through to Swansea, significant recreational and tourism asset.	Options are limited by safety issues on the Golf Course, wetland terrain (could a boardwalk type construction be used?). Costs likely to be high.	1 2 3 4 5 6 7 8 9	Importance Moderate; Easy Moderate Construction would be Importance moderate; Easy Low (high cost) B
20.6 Investigate opportunities to streamline approval processes for biodiversity enhancing projects on private land, which comply with the CZMP, and whole of system dune management plans.	Could apply to golf course redesign projects if directly linked to dune habitat enhancement, aligned with the CZMP and Dune Management Plan.	Could encourage investment in redevelopment projects that are directly linked to biodiversity resilience	DCP modification would benefit only one or two landholders. Biodiversity outcomes could be obtained without creating a different DA process.	1 2 3 4 5 6 7 8 9	Importance Low; Easy Moderate D

14.0 Theme 6 – Options for Communication and Collaboration – Behaviours to Make a Healthy Coastline Business as Usual

In this section
Some great stories that will aid in raising the profile of the coast and coastal issues

14.1 If the coast could talk……

In the landforms of our coast and in the memories and records of generations of people who have loved our coast are wonderful stories about change, about different lives and about different types of resilience.

Some of these stories are recorded in specific local histories; others are held in documents at Council and university libraries; others are barely recorded at all.

The preparation of the coastal zone plan creates an opportunity for Council and other partners along the coast to draw together the story of our coast and to present it in ways that are of interest to the local community, help attract visitors and give meaning to the choices for ongoing coastal management. Some of the stories of the Lake Macquarie coastline are well known, others long hidden, or only available in media that are not used by many in the population.

The story of the coast could be presented in several different ways, such as:

- Council's web site – this is the social and landscape history, rather than technical detail
- In place based interpretative material, for instance along a coastal pathway network or at local community reserves
- In brochures, booklets and short films prepared for the Tourism Association
- As story boards at the main beach front reserves or at Surf Clubs
- As story boards along the coastal pathway network – as done for the Bathers Way in Newcastle
- In short films screened at various film festivals or in photos at various photographic events.
- Apps for use by visitors – linked to coastal walking and lookouts.
- As displays at Council offices

Both how the story is presented and what topics are included would be decided in consultation with local communities. Some possible topics are suggested below, providing an indication of diversity, continuity and change.

- The story of the Awabakal people on the coast – the landscape they saw evolving around them; cultural significance of the lake entrance and open coast; resources used by Awabakal people. How Awabakal people connected to other coastal Aboriginal people to the north and south. How Awabakal people reacted to the arrival of Europeans.

- Captain Reid and the accidental arrival. Why he ended up in Lake Macquarie and what he found here.
- History of defence in WW2 – e.g. Blacksmiths Machine Gun Turret and submarine netting of Swansea channel.
- Surf boat building – the Boyd and Humphreys family boat builders at Swansea Flats and the boats they built.
- Surfing champions – our surf clubs have been around since the early 20th century.
- Coastal geomorphology and how dunes form and change. What's the long term story of coastal landforms- what is the age of the current features.
- Coastal biodiversity – protected species on our coast; when to see whales. Which sharks are in our coastal waters? What fauna and flora were here pre 1750?
- The mullet run and the story of beach hauling – who are these fishermen? What are their lives like as they chase mullet and other species along the coast?
- Swansea Channel and how the entrance has changed – from earliest European records, to the first break wall in the 1880s, and up to the present - the changes to Blacksmiths (stabilised, higher dunes, no more wash-overs); the changes to Salts Bay (major recession).
- Coastal geology and geological heritage – e.g. fossil forest at Swansea Heads
- From coal and rock extraction to conservation. The extractive industries of the Lake Macquarie coast – links to the Mawson Family, old coal workings, Spoon Rocks – how this land got into National Park. The mining heritage of Catherine Hill Bay
- Local people who have helped look after our coast – the story of Landcare on the Lake Macquarie coast; how local communities have looked after their patch.
- Belmont Wetlands State Park – how a coastal park is linked to the end of BHP in Newcastle.
- The Lake Macquarie coast and camping summer holidays for mining families.

Table 14.1 outlines some possible steps.

14.2 Raise the profile of the coastline

Telling the story of the coast is part of a broader strategy to raise the profile of the coast as a place of social, cultural and economic value in the City. The strategy outlined in **Table 14.1** incorporates the research, consultation and engagement that would help draw together the important parts of the story of the Lake Macquarie coast, but also includes actions that scope how aspects of the story would be woven into city marketing, interpretative material, major events, school curricula and other communication opportunities.

Criteria scores in **Table 14.1** relate to the evaluation criteria set out in **Section 8**. The criteria scores have been allocated based on currently available information, as outlined in **Sections 1** to **6**.

Table 14.1 - Theme 6 –Options for communication and collaboration – Behaviours to make a healthy coastline business as usual

Objectives Raise the profile of the coastal zone and communicate it			Targets See Table 8.1		
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Strategy 21: Raise the profile of the coast as a place of social, cultural and economic value					
21.1 Prepare a Master Plan for the coastal walk between Glenrock and Catherine Hill Bay, incorporating a review of alignment to reflect other walking and cycling initiatives (Fernleigh Track and City Cycleway Strategy).	Whole of coast. Fernleigh Track as centrepiece, but incorporate tracks to side as well.	Coastal Walk was a feature of the previous Coastline Plan and some sections are in place (but could be improved). Completion of Fernleigh Track changes access opportunities for the coast.	Potentially costly, and alignment between tenures difficult. Preparation of the Masterplan is the first step – main cost is in construction	1 2 3 4 5 6 7 8 9	Importance Moderate Easy Yes **C**
21.2 Complete selected sections of a coastal walking and cycling network, and highlight walking opportunities in local and regional tourism material	Belmont to Swansea Heads (including around the channel) Swansea Heads to Pinny Glenrock to Redhead	This would be favourable to the public and aid in promotion of the area locally and regionally.	Potentially costly for works, and alignment between tenures difficult. Likely to disrupt established habitat in areas.	1 2 3 4 5 6 7 8 9	Importance Moderate Easy Moderate **B** (D if funds are not available)
21.3 Conduct a project to research and collate information that is part of the story of the Lake Macquarie coast	Whole of coast - this could be done in partnership with local Aboriginal and community groups.	Cultural heritage values are important in the Lake Macquarie region and the documenting of local stories and knowledge will ensure they are appreciated by all and future generations. Will foster partnerships between groups.	Low cost, however potentially time consuming.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
21.4 Prepare and deliver a coastal communications strategy to best present the story of the Lake	Whole of coast	This action will be the publication and promotion of the material collated in Option **20.3**. This will be	Possibly costly and time consuming.	1 2 3	Importance Moderate Easy

Objectives Raise the profile of the coastal zone and communicate it			Targets See Table 8.1		
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
Macquarie coast. This action will follow on from **20.3.**		good for local heritage values and good PR for the coastal and should attract more visitors to the coast through an enhanced experience.		4 5 6 7 8 9	Moderate **C**
21.5 Develop interpretative signage for locations along pathways/cycleways, and at lookouts to tell the natural and heritage stories of the coast.	Whole of coast	This will promote tourism values and awareness within the local community about the local stories of the coast.	Possibly costly, and will require ongoing maintenance costs and efforts.	1 2 3 4 5 6 7 8 9	Importance Moderate Easy Moderate **C**
21.6 Update tourist information about Lake Macquarie with coastal tourism and recreation opportunities.	Whole of coast. Note this is an ongoing action. Recent tourism publications position the coast as an attractive community asset and a keystone of Lake Macquarie tourism.	This will promote tourism values, attract visitors (e.g. Lake Macquarie as a destination separate from Newcastle or Port Stephens) and generate revenue for local businesses.	More use on the coast may result in more impact to habitat and ecological communities.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
21.7 Investigate options for major community events on the coast e.g. surf fest in Newcastle (not directly surf club related) Promote the economic opportunities that the coast brings to the city, such as national surf carnivals, conferences etc. Attain additional information on the economic value of the coast.	Whole of coast	This will promote tourism values. Additional information on the economic value of the coast will also inform decisions about priorities for investment in coastal recreational spaces and land management.	More use on the coast may result in more impact to habitat and ecological communities.	1 2 3 4 5 6 7 8 9	Important Yes; Easy Yes **A**
21.8 Update and enhance Council's	Whole of coast. Intention would	Easy access opportunity to provide	Needs regular update with news	1	Important

Objectives Raise the profile of the coastal zone and communicate it			Targets See Table 8.1		
Response	Localities where this would be applied	Benefits	Disadvantages	Criteria scores from Section 8.4.1	Category Score from Table 8.3
web site with information about coastal processes and hazards, Council's management approach and achievements. Provide more information about coastal values and activities.	be to have communications of a scale similar to that used for the OLMCC project	sound technical information to the community, but also to promote the value of the coast and the rationale for Council's management.	and events, outcomes of management, opportunities to be involved.	2 3 4 5 6 7 8 9	Yes; Easy Yes **A**

15.0 Theme 7 - Knowledge and adaptation, Managing Uncertainty

In this section

15.1 Monitoring actual change

Coastal systems are complex and natural, social, cultural and economic systems interact and influence each other across multiple time scales. To facilitate manager and community understanding of the significance and sensitivity of these systems and interactions and to provide real information to underpin Council management decisions, an ongoing program of monitoring is required on the coast.

Council has already acknowledged the need for real and timely data, and has initiated or participates in a number of existing programs (such as Beachwatch, Community Ecosystem Monitoring).

The monitoring that is outlined in this section builds on these existing programs and provides additional ground surface condition data as well a systematic assessment and evaluation of management implementation. The intent of the monitoring is to provide targeted information for ongoing refinement of coastal zone management. All monitoring options (sites, frequency, indicators, resolution, who does the monitoring?) should be considered in this context.

Monitoring in relation to coastal management should be conducted for six purposes:

- Collecting data on actual changes to coastal morphology, including beach and dune profile, volumes, storm bite volumes and long term trends. The currently available evidence for coastal change along the Lake Macquarie coastline does not indicate a long term recession trend to date. With projected sea level rise, long term recession of frontal dune systems is expected to occur but the details of rates of change and the details of geomorphic adjustment are not certain.

- Council will investigate use of quad bike mounted GPS systems for beach survey (profile monitoring), to be used at monthly intervals on selected sections of beach. This would provide local detail for high risk sections of the coast, such as Blacksmiths, parts of Nine Mile Beach and Redhead. In addition, Council will work with the NSW government to obtain regular sets of LiDAR (terrestrial) and LADS (shallow submarine) generated ground surface morphology data. This high resolution spatial data can be analysed to provide detailed information about changes to beach, dune and nearshore sand volumes and morphology over time.

- Morphology monitoring should be conducted in consultation with the NSW government OEH and Trade and Investment – Crown Lands Division), so that a consistent method is used for sites across different local government areas and land tenures, allowing collation and analysis of the results at different scales.

- Local water level monitoring. Tide gauge monitoring at the lake entrance. This monitoring would be used to ascertain any long term trends in tidal circulation in the lake, reflecting changes to connectivity to the ocean and rising sea level.

- The condition of coastal ecosystems, linked to the condition of natural assets in coastal reserves (as established in Council's natural areas Plan of management). Council has already commenced a community monitoring program using key indicators across the City (mostly high profile birds and animals). This proposed program has a higher technical element, but would still be suitable for community volunteers, with some training. Landcare and Bushcare teams whose projects are funded through the LLS or other programs already require pre and post project monitoring to be undertaken to demonstrate whether their project has met its intended outcome and that the outcome is being maintained over time i.e. that the project has contributed to a more resilient ecological value).

- Guidelines are available through LLS to assist community volunteers doing ecological monitoring. Trade and Investment – Crown Lands Division is working towards implementing similar programs with its Reserve Trust Volunteers to track changes to the condition of important vegetation communities and habitats. Examples of existing relevant guidelines for community monitoring include National Parks Association 'Community Biodiversity Survey Manual' 2001 and the Hawkesbury Nepean Catchment Trust 2000 Guidelines for Monitoring a Bushcare project, as well as Council's own Community Ecosystem Monitoring Manual.

- In addition to on ground condition monitoring, remote sensing techniques, combining LiDAR and multispectral satellite imagery can be used to rapidly provide high resolution information about vegetation condition (such as presence of invasive species and canopy density). If Council is working with the NSW government to obtain LiDAR data for monitoring morphology, it should also request data of sufficient resolution to allow analysis of ecological change.

- Implementation monitoring. This monitoring is a systematic program of tracking the extent to which actions scheduled for a given time frame have commenced, are in progress or have been completed. Related information about the adequacy of the budget to do the work, governance issues and grants/Council resources required to make the actions happen, will assist with review of progress and identifying maters requiring further attention.

- Community use and community satisfaction monitoring. Council has an existing generic community attitudes and satisfaction survey, which is repeated at regular intervals and also regularly checks community satisfaction with lake management. These existing mechanisms could be supplemented with some questions that target specifically coastal management issues. Alternatively, a short survey could be conducted regularly specifically about coast issues, using Council's web site. The community monitoring program could also include questions that explore community knowledge and capacity on coastal zone issues and management approaches.

- Condition of coastal assets, such as surf clubs, toilet blocks, pathways, steps and ramps. This program is closely linked to Council's asset management strategy for recreation areas and facilities. By linking a program of monitoring asset condition to the monitoring program for coastal landform condition, climate context and community satisfaction, Council will be generating knowledge to support ongoing decisions about redevelopment and relocation of assets. The program would be based on regular asset inspections with a checklist of condition indicators appropriate to each type of asset.

- All monitoring results would be reviewed and reported annually, with broader trend analysis at five year intervals, in line with progress reviews and updates of the CZMP.

15.2 An adaptive and flexible plan

The aim of Part A of the CZMP is to help Council and the people of Lake Macquarie manage the open coast in an adaptive manner, so that important values are maintained as the coast changes.

To achieve this, the progress in implementing Part A of the CZMP and the outcomes achieved must be reviewed regularly.

Monitoring the implementation of the CZMP will be aligned with Council's existing program for implementation management for the ESAP. Both condition information and implementation information will be reported. Coastal condition information will be included as a specific item in the State of the Environment Report. Coastal management information (implementation, budget and related aspects of program delivery) will be reported annually in Council's annual reports and reviewed at intervals of not more than four years, aligned with Council's operational budget cycles.

Table 15.1 provides an overview of potential monitoring programs. Results would be assessed against implementation targets and in terms of progress towards coastal condition targets.

Table 15.1 - Monitoring data for adaptive management

Monitoring program	Indicative monitoring location, period and frequency	Reporting mechanism	Review period
Program implementation			
Budget and resources allocated (from Council resources) to coastal projects as identified in the CZMP, plus funds obtained from grants and partnerships to give total investment. Include effort invested in grant fund applications.	Annually, with major review linked to Council's budget planning cycles (4 years) and/or reviews of the Plan at intervals of not more than 5 years.	LMCC Annual Report LMCC State of the Environment Report	Review against other programs and priorities with budget planning cycles
Management responses commenced, in progress and completed	Annually	LMCC Annual Report LMCC State of the Environment Report	Brief annual review to establish program for following year, with broader review, linked to performance targets, at five yearly intervals.

Monitoring program	Indicative monitoring location, period and frequency	Reporting mechanism	Review period
New knowledge acquired and required	Annually	Internal records – linked to research programs to improve understanding and reduce uncertainty about costal process changes and risks	Report to Coastal Zone Management Committee annually.
Hazard and risk			
Ground surface change – dune and beach volume, position of dune escarpment	After major storms/big wave events and at annual (ground profiles) and five yearly (LiDAR data, if available) intervals. Local scale ground monitoring data for beaches with surf clubs – could involve surf clubs in the process.	State of the Environment Report. Annual program report	Review local changes at key sites annually; full review of beach and dune volume changes, with wave and rainfall data, at 5 yearly intervals. Review models – new inputs, at not more than 10 yearly intervals.
Water levels in the Lake entrance and in coastal creeks subject to marine inundation	After major storm events and at High Spring Tide	State of the Environment Report	Review trends at five yearly intervals
Value of development and assets in coastal risk planning areas	Every two years	In relevant Council Annual Reports	At five yearly intervals
Biodiversity resilience			
Condition of coastal ecological communities (including ground surface condition when communities are fragmented by tracks). Include beach meiofauna and protected species.	In accordance with Council's Community Ecosystem Monitoring Manual (for ground data), ensuring that sites on shore platforms and headlands are included as well as dunes and creek lines/wetlands. Remote sensing tools for ecological condition could be used at five yearly reviews.	State of the Environment Report	Review trends at five yearly intervals, taking into account rainfall, flood and fire events, and major rehabilitation programs. Note this requires that records of weather conditions and major natural events must also be maintained.
Coastal water quality (Beachwatch program)	In accordance with Beachwatch protocols	Annually on Council's web site, plus in State of the Environment Report	Review annually and at five yearly intervals, if results are less than very good.

Monitoring program	Indicative monitoring location, period and frequency	Reporting mechanism	Review period
Communication			
Survey community coastal knowledge and attitudes, as part of wider community survey by Council, or through targeted user surveys at beaches during the summer. This survey would also address community use and enjoyment issues (satisfaction with facilities)	Align survey methods with Council's other community awareness and satisfaction surveys, to facilitate consistent messages. Repeat surveys at intervals of 2-3 years.	LMCC relevant Annual report/reports against Community Strategic plan, and in State of the Environment Report.	Report at intervals of up to 3 years.
Number and type of hits on coastal information on Council's web site	Not more than annually – would also align with particular coast marketing programs	Report annually to coastal Zone Management Committee/Panel, plus in State of the Environment report	Review success of individual campaigns, but overall trends in community use of the web site as a source of information about the coast.
Membership and attendance at the Coastal Zone Management Committee/Panel	Annually. Intent is to maintain an engaged and highly representative group, with good long term understanding of coastal management issues and programs.	Report annually in Council's Annual report	Review structure at intervals of 2 to 5 years, linked to other Council processes for community panels.
Attendance/participation at Council facilitated community events in the coastal zone (e.g. summer programs)	Each event	Annually to Coastal Zone management Committee and in council's Annual Report	Review program annually.
Community Use and Enjoyment			
Number of off road vehicles using the beach and dunes, with and without permits (if permits are introduced)	Sample 'census' days on the beach and dunes, conducted by ranger staff. Council/Lands records of permits issued.	Council's Annual Report. Annual report of Belmont Wetlands State Park.	Review management strategy at intervals of not more than 4 years – linked to Council budget cycles.
Membership and activity levels of surf clubs	Annual – club registrations plus beach rosters.	Club Annual Reports.	Council would work in conjunction with surf clubs to maintain membership levels and activity.
Membership and activity levels of Landcare	Annual	Landcare Annual Reports. Council Annual reports State of the Environment Reports.	Review participation rates and achievements and needs at intervals of 3-5 years, to align with funding timetables.

Monitoring program	Indicative monitoring location, period and frequency	Reporting mechanism	Review period
Community Use and Enjoyment			
Number of people using beaches in peak periods and in off peak periods. Include also data on the number of safety incidents on beaches – number of people requiring assistance.	Annual – records from survey by surf clubs, plus occasional broader beach user surveys	Report beach user statistics annually	Review trends at intervals of 4 to 5 years.
Number of people using redeveloped coastal parks (reserves) and distribution of use through the year	Annual, from user surveys	In Council's Annual Report	Review trends, compared to lake side and bush reserve use, at intervals of approximately 5 years.
Waste collected from patrolled beaches – in bins and in beach cleaning operations	Annual, include type of waste – could potentially be done by surf club members, with Council's waste team	In Council's Annual Report Council State of the Environment Report	Review trends at intervals of approximately 5 years, or after specific waste management campaigns
Number of people using coastal walking/cycling paths – and distances/destinations	Occasional sample/audit of pathway use (include seasonal samples)	In Council's Annual Report	Align with existing reviews of cycleway and walking paths use and quality of facilities
Value of coastal tourism to the City (separate from the lake, if possible)	Annual Through Lake Macquarie Tourism Association	In Council Annual Reports	Review trends at intervals of approximately five years

15.3 Reviewing Part A of the CZMP

Part A of the CZMP is intended to be implemented over a ten year period. Actions are proposed for urgent/short term implementation (less than 4 years, providing funds are available), for medium term implementation (Year 4 to Year 8) and longer term implementation to be commenced after Year 8, but before 10 years. Part A of the CZMP also identifies some actions that are part of Council's long term adaptation strategy. These actions are unlikely to be implemented within the life of this Plan (i.e. before a ten year review), but are included because they provide information about how Council will respond if certain trigger conditions are met.

A review of implementation progress will occur after four to five years (linked to Council's State of the Environment Reporting and strategic budget cycles). A full review of the effectiveness of the plan will occur after ten years. Strategic priorities and triggers for adaptive change to land use would be reviewed and updated at that time.

Coastal hazard and risk studies will be reviewed when new projections are issued by the Intergovernmental Panel on Climate Change (IPCC) and/or the Lake Macquarie City Council Sea Level Rise Policy is reviewed, or at the direction of the NSW government.

The full review would consider:

- The extent to which proposed actions have been implemented, the cost of management and the reasons for variations from the proposed schedule (Resource Targets)
- The extent to which the actions in the Plan can be seen to have supported improvements to the condition of coastal ecosystems, or provided for ongoing safe community enjoyment of the coast (Recreational access and Communication targets)
- The extent to which Council has delivered the plan itself and/or in partnership with other organisations (Resource and Partnership targets)
- The extent to which implementation of the Plan has delivered the objectives of the Plan (as set out in **Section 1**, plus Risk targets, Communication targets, Resourcing targets and Knowledge targets).

When reviewing the overall implementation of the LMCZMP[A], Council will involve the Coastal Zone Management Committee and provide opportunities for the broader community and stakeholder partners to contribute.

Figure 15.1 provides an overview of how the monitoring requirements of the plan contribute to ongoing review and improvement.

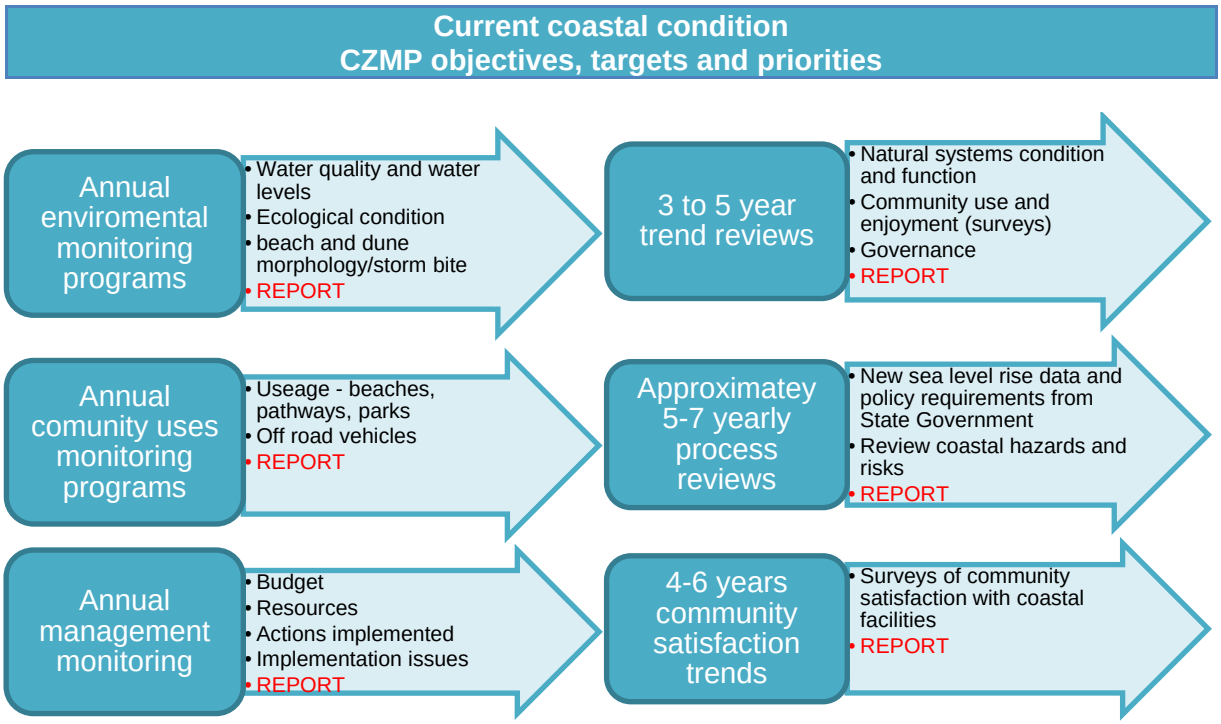
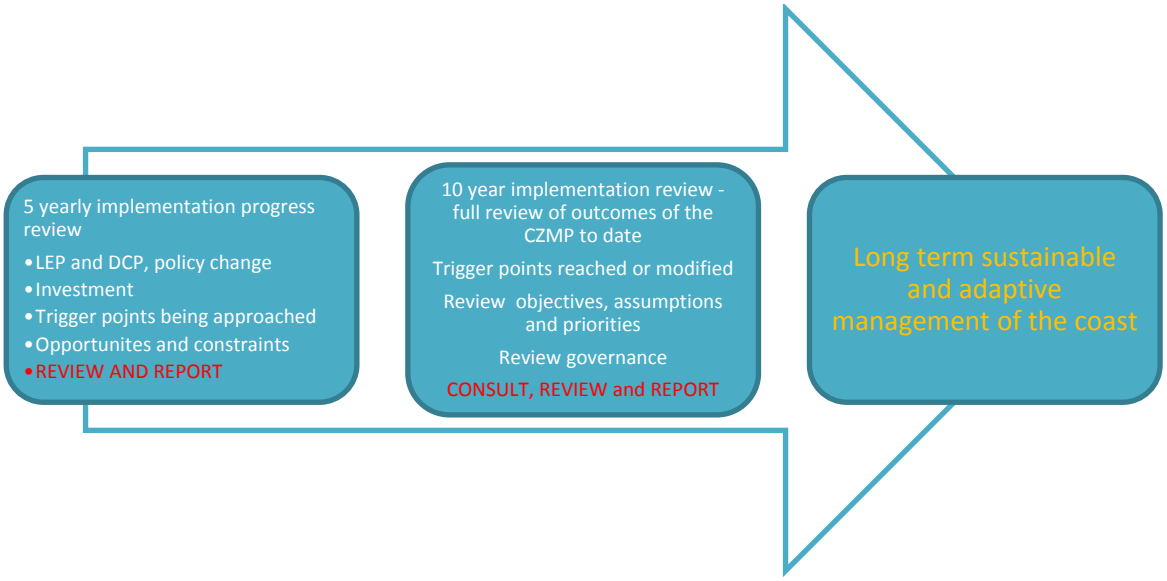


Figure 15.1 - **Annual monitoring, trend analysis and CZMP review**



15.3.1 Summary of adaptive management set up

Table 15.2 summarises the three main elements of the adaptive management system.

Table 15.2 - Theme 7 – Knowledge and adaptation, Managing Uncertainty

Objectives Establish a flexible adaptive management framework		Strategy 22: Establish and maintain adaptive systems	Targets See Table 8.1		
Response	**Localities where this would be applied**	**Benefits**	**Disadvantages**	**Criteria scores**	**Category Score**
22.1 Confirm coastal management targets for the next ten years and establish appropriate systems to track progress towards targets	Whole of City coast	Provides quantitative framework for coastal zone management	Align coastal targets with other performance targets for the City	1 2 3 4 5 6 7 8 9	**A** Essential for adaptive management
22.2 Confirm coastal zone monitoring program relevant to targets, establish systems and train staff and community monitoring personnel	Whole of City coast	Essential information for evaluating progress. Good opportunity to enhance community involvement	Potential cost of monitoring program. Maintaining trained volunteer personnel for community monitoring	1 2 3 4 5 6 7 8 9	**A** Essential for adaptive management
22.3 Confirm period and process for review of the CZMP and reporting lessons learnt	Whole of City coast	Provides clear timeframes for assessing trends in condition and for targeting funding programs.	Costs of review process, data analysis.	1 2 3 4 5 6 7 8 9	**A** Essential for adaptive management

16.0 Implementation programs for resilient coastal systems and communities

16.1 Priority actions to set future direction

Council is moving from implementing separate coast and estuary plans that were prepared some 15 years ago, to a new integrated framework based on current coastal science and engineering as well as a re-evaluation of priorities. The actions in the following tables are intended for the open coast areas.

The tables in **Sections 9** to **15** outlined a wide range of actions that Council could implement with its partners to build the resilience of natural systems and human community values along the Lake Macquarie coastline, together with information about the importance of different types of response and the challenges faced in implementing the responses.

In the short term, as noted in **Section 1**, Council's aim is to create the right framework for ongoing adaptation to coastal change. This is the first step towards resilient coastal ecosystems and resilient communities who benefit from healthy coastal systems. Also included in the first steps are actions to mitigate current extreme or very high risks. Once the framework is established and Council, agency partners and community share a good understanding of coastal processes and are working together for the benefit of coastal systems and community wellbeing, other responses will be implemented as the need arises.

To identify the most important responses for setting the scene and creating the right framework for managing the coast, an additional criterion was applied to the potential responses:

Is this response necessary to create the right framework for ongoing adaption?

So what is needed for the right framework?

Alignment

- Agreement between stakeholders about the objectives of coastal zone management in the short through to long term

Shared knowledge

- Broad understanding of how the open coast and estuarine systems (estuary health and estuary flood risk) interact in terms of coastal zone risk. Critical information gaps are identified and addressed as a priority
- Baseline condition information and systems for monitoring change to physical form, biodiversity and community values
- Systems to share information and foster partnerships

Mitigate risk and maintain appropriate access

- Initial actions to reduce extreme and very high risks
- Initial actions to support appropriate community use
- Actions to limit and direct off-road vehicle use on Lake Macquarie beaches.

Adaptive management systems

- A funding strategy that can adapt to coastal change
- Clear criteria for how decisions about management approaches will be made, reviewed and changed
- Evaluation processes that give priority to management approaches that build biodiversity resilience and foster appropriate ongoing use and enjoyment of the coastal landscape.

Figure 16.1 shows a summary of how the option evaluation and prioritisation criteria combine to identify the actions for implementation, drawing on the information in **Sections 9** to **15**.

In general actions that were allocated an 'A' score in the tables in **Sections 9** to **15** are in the programs of work to be implemented in the first period of the Plan (**Table 16.2 - immediate actions – 0-4 years**). Actions to be included in the short term programs of work are considered 'Important' and 'Easy' to accomplish. They are also necessary for establishing the adaptive framework. These short term work programs include actions that address key risks or threats AND can be done within existing statutory and policy frameworks, require limited external collaboration (or partnerships that have already been established), can be funded internally (or with limited grants) and the work is within Council's technical and resourcing capacity. The themes and categories are included in the table to link actions in each program back to the issues identified during consultation and technical analysis.

Most of the actions that were placed in the 'B' category in **Sections 9** to **15** are also in these work programs for either the first stage (**Table 16.2 - immediate actions – 0 to 4 years)** or second stage (**Table 16.3 medium term actions – 4 to 8 years)** of plan implementation. These actions are included as a high priority when they describe work that is needed to address barriers to the implementation of other important actions. As above, the themes and categories are included in the tables to link actions in each program back to the issues identified during consultation and technical analysis.

Actions in Categories C and D are lower priority and less urgent, therefore are distributed between the medium (**Table 16.3 medium term actions – 4 to 8 years)** and long term tables (**Table 16.4 longer term actions – beyond 8 years)**.

The 11 programs of work that are introduced in **Figure 16.1**, and are further outlined in the immediate, medium and long term implementation tables (**Tables 16.2, 16.3 and 16.4**) show how action to address the important issues along the lake Macquarie coastline will involve coordination and cooperation across multiple sections of Council and other agency and community partners. Successful management of nearly all coastal zone management issues requires a multidisciplinary and multi stakeholder approach, rather than stand-alone responses by any one stakeholder.

The programs of work take into account the management themes introduced in **Section 8**, but also take into account the importance of integration – so multiple themes could be addressed in each work program (see **Table 16.1**). The programs go across themes and combine actions that are appropriate to be implemented together during a given timeframe.

Council proposes to commence these programs of work as soon as funds are available. For some actions, funds can be made available in the current annual budget; for others Council would plan for funds to be available within the next budget planning cycles (within 4 or 8 year budget cycles, and beyond). The implementation tables also show the organisation or division of Council responsible for the activities and other organisations or agencies that

would be involved. An indicative budget for each of these responses is included for actions that require some element of external input (e.g. consultants, surveyors, construction works).

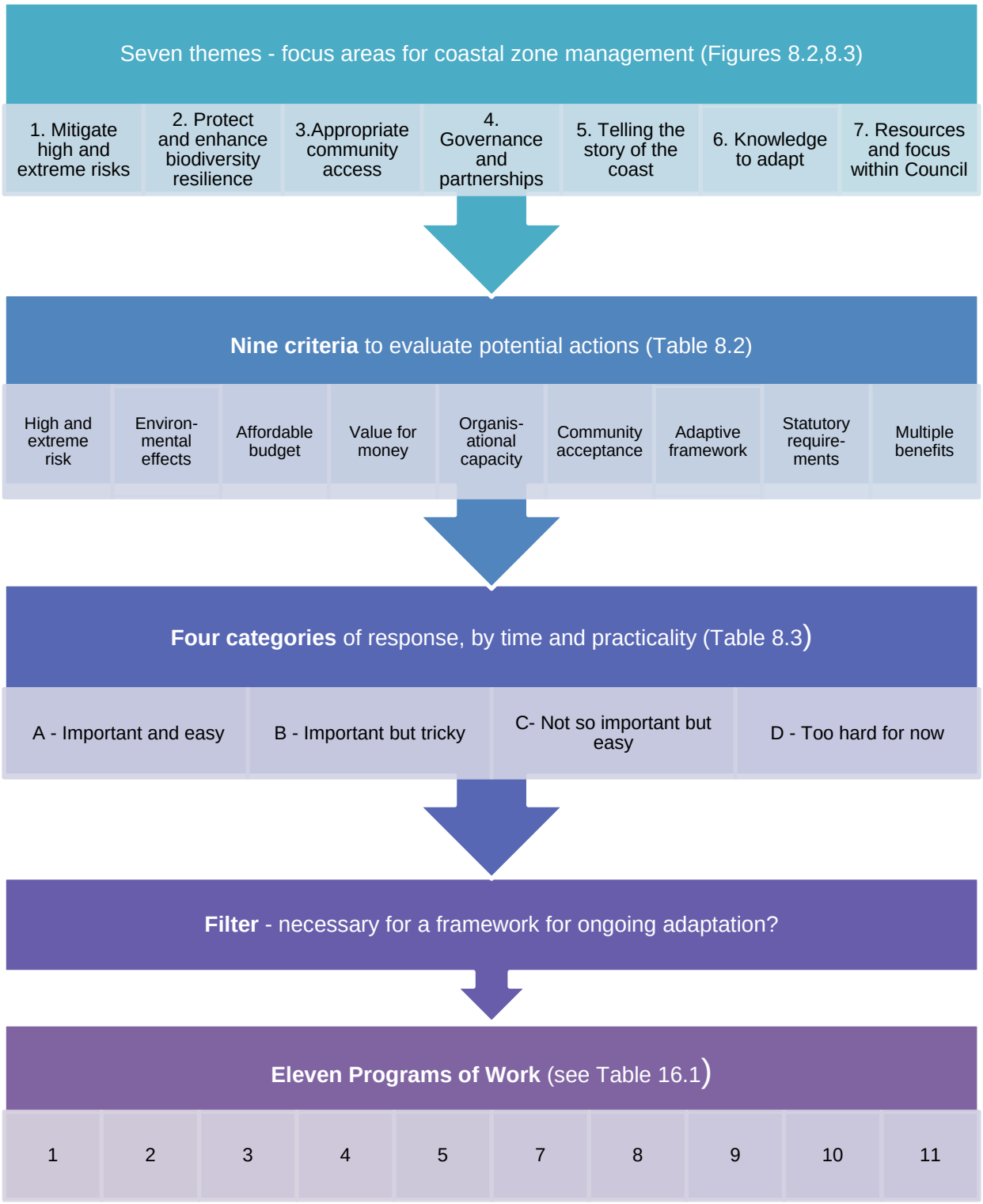


Figure 16.1 - Filtering potential responses to identify priority programs of work

Table 16.1 - Programs of work for implementation

Programs of Work	
1	Improve understanding of risk
2	Reduce extreme and high risks
3	Processes for changing management
4	Build and enhance resilience in coastal biodiversity
5	Work towards integrated management of the coastal zone
6	Review internal resourcing and systems for managing open coast values
7	Multi stakeholder alignment and coordination
8	Communication, partnerships, education and consultation about the coastal environment and coastal change
9	Supporting appropriate access and community use of the coast
10	Establish monitoring systems to track actual change
11	Adaptive funding strategies

16.2 Funding

LMCC has the primary role in land use planning (through clauses in its LEP and DCP) and in carrying out on ground works to reduce serious coastal risks to community assets and infrastructure. Council owns and/or manages coastal land on behalf of the Crown and local communities. Council works in partnership with community organisations to manage coastal vegetation, protect sensitive coastal ecosystems and provide safe and attractive beach access facilities for residents and visitors. Council has an important role in presenting the coastal landscape to local people and to visitors, through communication and marketing materials. Thus, Council has the responsibility of developing funding strategies for coastal zone management.

Council has prepared budget estimates for the proposed actions. The estimates are linked to Council's internal budget planning cycles. Some actions are beyond Council's responsibility or capacity, or require new or strengthened partnerships. For these actions, implementation of Part A of the CZMP will draw on funds available from other sources.

16.2.1 Funding Options

There are several strategies open to Council to provide human and financial resources for implementation of the Plan. Council is already addressing many issues through existing staff responsibilities. Council is considering additional options, including:

- Review and reallocate priorities in Council's overall Business Plan so that greater resources are allocated to coastal zone management on the open coast, rather than to lake shore management or catchment management.

- Modify job descriptions for Council officers in line with new priorities, to clarify where officer time is to be invested.

- Focus on a sound, risk-averse planning framework (LEP and DCP) so that new development is directed out of coastal risk areas and investment required to address coastal risks decreases over time.

- Council will foster its partnerships with land holders and community based organisations along the coast and with key NSW agencies such as OEH, HLLS, Trade and Investment – Crown Lands Division, Hunter Water Corporation, SLSA and Belmont Golf Course to foster research and on ground works programs relevant to Lake Macquarie coastal issues and priorities. Community involvement is critical to dune vegetation rehabilitation, and to monitoring the condition of coastal natural resources. Partnerships or sponsorships with private sector businesses are also possible for some coastal management works, both in terms of ecological resilience and asset management.

  Council is also considering the following future options to generate funds for implementing coastal risk management actions. Options involving new levies will require detailed community consultation.

- Require that all private landholders who are directly impacted by coastal process hazards pay for any coastal protection works (on private land) from which they benefit, including maintenance of protection works. In Lake Macquarie, few landholders are directly impacted by coastal processes, so this option would have limited impact on resources. The exception is investment to provide for long term sewerage system services. Adaptive protection and/or relocation works would be the responsibility of Hunter Water Corporation.

- Implement a special levy on affected coastal landholders, to cover the costs of maintaining beach amenity, where public access and recreational amenity are indirectly impacted by approved private coastal protection works. This charge is authorised by recent amendments to the *Coastal Protection Act 1979*. In Lake Macquarie, few landholders are directly impacted by coastal processes, so such a targeted levy would not necessarily raise significant funds for investment in coastal protection or management works. It could also apply to the Belmont Golf Course, if Council were to construct protection works to protect the seaward greens and fairways from coastal processes.

- Apply for funding through special coastal grant schemes (such as Coastal Program, Crown Lands programs, OEH programs and Commonwealth emergency response programs). These grant funding programs generally require a dollar for dollar contribution from Council, so Council must have budget allocated to a project to be eligible for a grant. To ensure timely and coordinated delivery of the priority actions in the Plan, Council has identified grant programs which would support implementation of some actions and is actively submitting project applications to these programs.

Internal resources and potential grant fund opportunities are identified in the implementation tables of the Part A of the CZMP and the four year action plan

16.3 Implementation Schedules

Tables 16.2 to **16.5** allocate all proposed management responses to a time frame for action.

As noted in **Section 8**, these time frames are:

- **Immediate/Short term** – Include in the current annual budget cycle, if possible. Otherwise, include in budget cycle to schedule commencement within the next 4 years
- **Medium term** – include in budget cycle to facilitate commencement within 8 years.
- **Long term** – to commence before the full review of the Plan, at ten years, or beyond.

Table 16.2 - Short term actions for the Lake Macquarie coastline – commence in 1 to 4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
Program 1: Improve understanding of risk							
1 A	**4.1** (See also 15.4)	Conduct an audit of the condition of the sea wall at Redhead surf club - when possible	Redhead Surf Club	LMCC (Sustainability)	Allow $40,000 for coastal engineering and geotechnical review	Internal funds plus OEH coastal program	1 year and 4 years
1 A	**4.2** (See also 15.5)	Conduct an audit of the foundations of all surf clubs along the Lake Macquarie coast	Catherine Hill Bay, Caves Beach, Blacksmiths and Redhead	LMCC (Sustainability, Asset Management)	Allow $50,000 for engineering advice	Internal funds plus OEH coastal program	1 year and 4 years
1 A	**4.3**	Conduct a detailed risk assessment of the training walls at the entrance to Lake Macquarie Maintain the entrance training walls, taking into account potential redesign and strengthening in the context of sea level rise and climate change.	Lake entrance	Trade and Investment – Crown Lands Division	Allow $100,000 for coastal engineering advice	DPI funds	4 years
1 A	**6.1**	Conduct further analysis of the interactions of lake sourced inundation, coastal recession and marine inundation from overtopping, to clarify likely constraints to land use and potential for retreat.	Whole of coast, but priority for Swansea/Blacksmiths and Pelican area	LMCC (Sustainability, Asset Management)	Allow $150,000 for coastal engineering advice and modelling	Internal funds and OEH coastal program grants	4 years
1 A	**1.2**	Conduct detailed cliff line stability study to confirm hazard and planning lines for headland areas.	Coastal Headlands including Dudley, Redhead, Swansea and Caves beach to Catherine Hill Bay	LMCC (Sustainability)	Allow $30,000	Internal funds and OEH coastal program grants	4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
2 A	**11.5**	Encourage further research on the behaviour of coastal dunes in pocket and long barrier coastal sediment compartments, as climate changes and sea level rises. Incorporate the results of these studies into future revisions of coastal risk and ecological resilience management	Whole of coast	LMCC (Sustainability) OEH Could involve University of Newcastle	Allow $50,000	Work could be done through research grant scheme, with other supervision and support from academic staff	4 years
3 A	**13.3**	Implement recommendations of safety audits (conducted in 2014) of headland walking tracks, lookouts and beaches below cliff lines to determine the appropriate level of risk management. Based on the outcomes of the audits and community consultation, close extreme risk tracks and lookouts which cannot be made safe through targeted management.	Redhead to Dudley (including Redhead Bluff), Swansea Heads, south of Caves Beach and south of Catherine Hill Bay	LMCC (Community Planning, Asset Management, Sustainability)	Within existing Council budgets	Internal Council funds	1 to 4 years
Program 2: Reduce extreme and high risks							
1 A	**3.2**	Conduct beach management works such as beach scraping to reshape dunes and increase dune volume/recovery after storms if necessary. This involves using earthmoving equipment to move sand from the swash zone (between Mean Low water and Mean High Water) to the frontal dune. There may be potential to place sand extracted from Swansea channel at these	Blacksmiths Beach, Redhead Beach, Caves Beach, Near Belmont WWTP & Golf Course	LMCC (Sustainability, CiviLake) OEH Trade and Investment – Crown Lands Division	Advice from OEH (in kind), and allow $30,000 for coastal engineering advice regarding beach scraping or renourishment. Cost of works should be scoped during advisory studies as will depend on extent of works and	Internal cost – possible funding from Coastal Program Council may have to contribute to cost of external agency works if sand is acquired for beach nourishment.	4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
		locations, subject to agreement with Trade and Investment – Crown Lands Division and contractual arrangements for managing Swansea Channel. **See CZMP Part C for further detail.**			volumes of sediment.		
1 A	**7.1**	Train council staff in coastal emergency response requirements, in accordance with the emergency response action sub-plan for the City.	N/A	LMCC (Sustainability, Asset Management, Civil Lake)	Existing Council staff	Internal resources	Ongoing
1 A	**7.2**	Incorporate coastal emergency actions into Council's management systems	N/A	LMCC (Integrated Planning, Sustainability)	Existing Council staff	Internal resources	Ongoing
3 A	**13.6**	Depending on the results of safety audits, consider placing additional 'Angel Rings' (and signage) for emergency rescues of people washed off the rock platform. Council would support the introduction of the requirement for rock fishers to wear personal floatation devices (PFDs).	Swansea Heads, between redhead and Dudley, also south of Catherine Hill Bay	LMCC (Community Planning, Asset Management, Sustainability) SLS SES	Will depend on number of most at risk locations - allow $20,000 for signage and rings at each location.	Internal Council funds + NSW Govt agency support	1 year and 4 years
3 B	**13.5**	Formalise cliff top lookouts, install safety fencing more formal stairs and rails on access tracks down the cliff or bluff to rock platform fishing sites, and also to provide emergency exit points for people on rock platforms in popular locations	Dudley and Catherine Hill Bay	LMCC (Community Planning, Asset Management, Sustainability)	Internal Council resources. Investigate costs with LMCC operations depending on extent of works.	Internal cost	Establish year 1 - maintain yearly, review every 4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
Program 3: Processes for changing management							
1 A	**5.1**	Use clauses in the DCP to require new development in relevant coastal risk planning areas to incorporate design features to accommodate coastal risks. These include piered foundations (to a stable foundation depth), floor levels to prevent marine inundation, and light weight or modular structures for relocation	All areas within 2100 coastal risk planning areas	LMCC (Integrated Planning)	Existing Council staff	Internal resources	1 year and 4 years
1 A	**5.2**	Incorporate preparation for coastal recession into local community adaptation plans developed with the community at Blacksmiths Beach, Redhead Beach and Catherine Hill Bay Beach.	All suburbs linked to beaches and likely to be affected by coastal process/risks	LMCC (Sustainability)	Existing Council staff	Internal resources	1 year and 4 years
1 A	**6.2**	Use clauses in the LEP and other planning instruments to link new development types to coastal risk planning zones, based on lifespan and sensitivity of the development.	All coastal risk planning areas	LMCC (Integrated Planning, Sustainability)	Existing Council staff	Internal resources	1 year and 4 years
1 A	**6.3**	Investigate use of DCP clauses to establish period consents, linked to specified trigger points, for new development in coastal risk planning areas.	All coastal risk planning areas	LMCC (Integrated Planning, Sustainability)	Existing Council staff	Internal resources	1 year and 4 years
2 A	**8.1**	Use coastal land use zone' should it become available in the LEP standard template for all public land along the Lake Macquarie coastline, as far landward as the extent of coastal Planning Line by 2100, plus a buffer. Wherever	Whole of coast – all public land	LMCC (Integrated Planning , Sustainability)	Existing Council staff	Internal resources	1 year and 4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
		possible on coastal dunes, maintain a buffer, zoned environment protection (beyond 2100), to allow for ecological transition as dunes roll landward.					
3 A	**15.3**	In consultation with Surf Clubs review essential uses for frontal dune locations and uses which could be accommodated further landward, to inform Master Planning for surf club sites, car park areas and other reserve lands and to inform decisions about protection or relocation of assets in response to coastal recession.	All four surf clubs	LMCC (Integrated Planning, Sustainability) SLS	Existing staff resources; would then flow to a Master planning exercise – allow $100,000	Internal Council funds	4 years
3 A	**15.6**	In consultation with Surf Clubs (and SLSA) determine agreed trigger points for commencing detailed planning for protecting or relocating surf club buildings.	All four surf clubs	LMCC (Community Planning, Asset Management, Sustainability)	Existing staff	Internal Council funds	4 years
5 A	**20.1**	Adopt a policy to encourage transfer of private land along the coast from MHW to the landward edge of the 2100 coastal hazard zone, plus a buffer) to public tenure, as opportunity arises. Investigate land swap options as necessary	All private land within coastal risk planning area	LMCC (Community Planning, Sustainability, Corporate Legal)	Existing staff	Internal Council funds. Investigate land swaps to maintain cost neutral position.	4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
3 B	**15.7**	In consultation with surf clubs and local communities, identify alternative surf club sites (i.e. for the main club buildings) which could be developed if coastal erosion/recession triggers are met.	N/A	LMCC (Community Planning, Asset Management, Sustainability)	Internal Council resources.	Internal cost	Establish triggers year 1 and start identifying locations, review progress after 4 years
Program 4: Build and enhance resilience in coastal biodiversity							
2 A	**10.1**	Encourage Landcare projects that build the resilience of moderate to high significance communities, such as Middle Camp Beach and Dudley Beach. Encourage projects that prepare the hind dune and back barrier communities for future change	Relevant ecological habitats e.g. Middle Camp and Dudley beaches.	LMCC (Sustainability)	Within existing Council budgets	Internal Council funds	4 years
2 A	**10.2**	Ensure planting provides a suitable mix of native species selected from the coastal planting guide and that are relevant to site conditions. Optimise natural assets by selecting plants that provide higher biodiversity value above those low maintenance plants such as *Lomandra* and *Casuarina* species	Whole of coast	LMCC (Asset Management, Sustainability)	Within existing Council budgets	Internal Council funds or grant funds. Dependant on project	On-going
2 A	**10.3**	Focus on control of Bitou bush by eliminating new colonisation on dunes, headlands and around wetlands, as a priority. This may require revisiting 'cleaned up' sites to remove new seedlings	Whole of coast	LMCC (Sustainability, CiviLake, Waste, Environment and Rangers)	Within existing Council budgets	Internal Council funds	1 to 4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
2 A	**10.4**	Protect little tern breeding areas on beaches and dunes by seasonal exclusion of off-road vehicles and dogs.	Relevant sections of Nine Mile Beach.	LMCC (Sustainability)	Within existing Council budgets	Internal Council funds	1 to 4 years
2 A	**11.2**	Support the use of remote sensing tools with targeted field survey of biodiversity and condition: themeda grasslands on headlands; coastal wetlands; and a selection of barrier beach and pocket beach locations.	Whole of coast	LMCC (Sustainability) OEH	Within existing Council budgets + allow time for Council staff to be trained in the use techniques to support on ground condition monitoring programs	Internal Council funds	4 years
Program 5: Work towards integrated management of the coastal zone							
1 A	**3.6**	Prepare a detailed channel management strategy for the entrance to Lake Macquarie. The focus is on the outer entrance area, and will complement a current project on the inner entrance channel	Swansea Channel	LMCC (Sustainability) Trade and Investment – Crown Lands Division. RMS	Council resources	Internal resources + support from partner agencies	1 to 4 years
Program 6: Review internal resourcing and systems for managing open coast values							
1 A	**3.1**	Re-instate city wide beach maintenance program and continue dune rehabilitation works. This includes dune fencing, access controls, invasive species control and replanting native colonising species. Provides stronger in house support and direction for Landcare volunteers	Whole of coast	LMCC (Sustainability, Waste, Environment and Rangers, Civil Lake)	Internal cost	Internal cost	4 years
4 A	**16.1**	Review staff responsibilities and identify a 'coastal zone champion' to promote open coast values and highlight coastal zone threats and risks. This role would coordinate the	Whole coast and estuary	LMCC (Sustainability)	Allow $100k if new position established, or else alteration to responsibilities of a current Council	Internal cost	Ongoing

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
		implementation of the CZMP, including cross council facilitation and budget planning; outcome tracking etc.			staff member.		
4 A	**16.3**	Form a small working group with representatives across relevant Council divisions to facilitate delivery of the plan and schedule and oversee implementation. Also Council representatives to be part of an external working group for Nine Mile Beach with stakeholders.	Whole coast Note this is an internal Council working group, separate to the Estuary and Coast Management Committee	LMCC (Sustainability, Asset Management, Community Planning)	Internal cost, existing staff	Internal cost	4 years
4 A	**16.4**	Review the allocation of Council funds and particularly potential for use of more funds for coastal management projects.	Whole of coast and estuary	LMCC (Sustainability)	Internal cost, existing staff	Community levy – extension to be approved	4 years
4 A	**16.6**	Review the membership of the Estuary and Coastal Management Committee and reform as a Coastal Zone Management Committee, with membership more representative of open coastal stakeholders as well as the lake.	N/A	LMCC (Sustainability) , ECMC members	Internal Council cost	Internal cost	4 years
5 A	**19.5**	Investigate/liaise about the potential for Surf Life Saving Clubs to be involved more in Landcare type activities in off season.	Surf Club Areas	LMCC (Sustainability)	Internal Council cost	Internal cost	4 years
5 A	**21.8**	Update and enhance Council's web site with information about coastal processes and hazards, Council's management approach and	Whole of coast	LMCC (Sustainability)	Internal Council cost	Internal cost	Update when necessary i.e. yearly or when new

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
		achievements. Provide more information about coastal values and activities.					studies are undertaken
5 A	**22.1**	Adopt a suite of coastal management targets and a monitoring program related to both the delivery of the CZMP and the results achieved.	Whole of coast	LMCC (Sustainability) Consult with HLLS	Internal Council resource – existing staff	Internal Council funds	1 year and 4 years
5 A	**22.2**	Adopt a reporting and review program so that coastal managers and the community are aware of progress towards targets and of the lessons to be learnt from the implementation of the CZMP. Link the reporting program to Council's State of the Environment Report and annual reporting cycles.	Whole of coast	LMCC (Sustainability)	Internal Council resource – existing staff	Internal Council funds	4 years
5 A	**22.3**	Confirm period and process for review of the CZMP and reporting lessons learnt.	Whole of coast	LMCC (Sustainability)	Internal Council cost	Internal cost	4 years
4 C	**16.7**	Council to review the management partnerships with Landcare, and look to reinstate Landcare as a Council led activity if necessary.	N/A	LMCC (Sustainability)	Internal Council resources	Internal resources. Potential for grants from Environment Trust	Establish between year 2 -4, review every 2 years
Program 7: Multi stakeholder alignment and coordination							
1 A	**3.3**	Maintain groynes at Salts Bay. Some sand from the dredging of Swansea Channel (upstream of Swansea Bridge) could be placed on the Salts Bay shoreline or along the channel shore from Mats Point to Black Neds Bay to build up	Swansea Channel (see CZMP Part C)	LMCC (Sustainability) OEH Trade and Investment – Crown Lands Divisions	Will depend on extent of works and volumes of sediment and locations required.	Internal cost – possible funding from Coastal Program. Council may have to contribute to cost of external agency works if	4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
		the beach between the groynes. Any sand placement areas should be planted with Spinifex runners to help stabilise the sand. Alternatively, dredged sand could be placed on Blacksmiths Beach/dunes to provide an additional erosion buffer to the open coast. **See CZMP Part C for further analysis and responses**				sand is required.	
5 A	**17.1**	Review and improve alignment of objectives of Plans of Management and other Plans (such as LEP and Master Plans) prepared by Council, Trade and Investment – Crown Lands Division and NPWS. Note that Trade and Investment – Crown Lands Division. Plans of Management can no longer override the LEP.	Belmont Wetlands, National Parks, Conservation areas and Nature Reserves	LMCC (Sustainability)	Internal Council cost	Internal cost	4 years
5 A	**18.1**	Liaise with Wyong Shire Council (WSC) and Newcastle City Council (NCC) to provide consistent methods of assessing coastal risks and management responses.	Whole of coast	LMCC (Sustainability), with WSC and NCC, also OEH	Existing staff resources All three Councils may appoint consultants to assist in resolving any existing inconsistencies in risk assessment. Allow $80,000	Internal Council funds	4 years
5 A	**18.3**	Liaise with WSC and NCC to provide consistent biodiversity resilience strategies where coastal ecological communities cross Council boundaries.	Whole of coast	LMCC (Sustainability), with WSC and NCC, also OEH and HLLS	Existing staff resources All three Councils may appoint consultants to	Internal Council funds	4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
		Link to Catchment Action Plan and Regional Biodiversity Strategy			assist in resolving any existing inconsistencies in the ways ecological condition and resilience are assessed Allow $80,000		
5 A	**19.4**	Investigate opportunities for members of Belmont Golf Club to form a Landcare group	Nine Mile Beach – dunes at seaward margin of developed golf course, as part of a broader strategy for managing dune form and vegetation	LMCC (Sustainability, Community Planning) Belmont GC	Internal Council resources	Internal cost	4 years
5 A	**19.6**	Develop opportunities for local businesses to sponsor community projects on the coast	Whole of coast	LMCC (Sustainability, Community, Planning, Communications)	Internal Council resources	Internal cost	4 years
2 B	**9.2 (also 20.2)**	Prepare a combined dune management plan for frontal dunes on Nine Mile Beach land owned or managed by Council, Belmont Golf Club, Belmont Wetlands State Park, Hunter Water Corporation – to deliver consistent objectives and strategies, share funding arrangements and technical skills	Full length of Nine Mile Beach, particularly north of Awabakal Street	LMCC (Community Planning, Asset Management, Sustainability) HWC BWSPT Belmont Golf Club	Internal Council resources + stakeholders	Internal cost + contributions from stakeholders	Establish by year 4 - review by year 8-10

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
5 B	**17.2**	Consolidate Crown land and other land parcels around Belmont Lagoon to achieve consistent management of conservation values	Belmont Lagoon area	LMCC (Community Planning, Sustainability) Trade and Investment – Crown Lands Division	Internal Council resources + support from NSW Govt.	Internal Council funds + NSW Govt agency support	Establish by year 4 - review by year 8-10
5 B	**18.2**	Liaise with WSC and NCC to adopt consistent triggers for changes to land use controls and other risk mitigation measures in coastal risk areas.	N/A	LMCC (Sustainability)	Internal Council resources + support from adjoining Councils	Internal Council funds + support from adjoining Councils	Establish year 1 - monitor yearly, review every 4 years and when new hazard/risk studies are undertaken
5 B	**17.4**	Review Plans of Management for Crown Land Reserves and National Park /Nature Reserves to provide for joint authorisation of rangers (or similar positions) to enforce off road vehicle regulations across different land tenures. Also liaise with WSC and NCC to provide consistent authorisation and enforcement procedures for off road vehicles using coastal lands across local government boundaries.	Belmont Wetlands State Park, National Parks, Conservation Areas and Nature Reserves	LMCC (Community Planning, Sustainability) Trade and Investment – Crown Lands Division NCC WSC OEH (NPWS)	Internal Council resources + support from adjoining Councils	Internal Council funds + support from adjoining Councils	4 years
Program 8: Communication, partnerships, education and consultation about the coastal environment and coastal change							
1 A	**2.1**	Conduct summer and winter coast information and action days with local communities, to include beach monitoring, ecological monitoring and	Whole of coast – locations will vary with theme and local issues	LMCC (Sustainability)	Internal Council resource – existing staff; potentially allow $80,000 for	Internal staff, partnership with HCRCMA and Coastal Environment	4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
		presentations on adaptive management of coastal risks.			summer staff to assist	Network	
1 A	**2.2**	Develop signage to inform the community about coastal processes and coastal change.	Whole of coast	LMCC (Sustainability)	Existing staff for concept and wording. Allow $100,000 for initial installation	Internal resources. Potential for grants from Environment Trust	4 years
1 A	**3.5 (also 3.4)**	Establish a protocol with DPI Catchments & Lands about how and when sand dredged from navigation channels in Swansea channel could be stored for future use for beach protection works at Blacksmiths Beach or elsewhere as required. Sand could be stored in dunes constructed landward of the existing frontal dune system. NOTE: not all sand dredged from Swansea channel must be used in this way.	Swansea Channel and Blacksmiths area	LMCC (Sustainability) Trade and Investment – Crown Lands Division	Existing staff resources to develop protocol. Council contribution to the cost of relocating, storing and stabilising sand will depend on agreement with Lands. Allow up to $150,000 for development of stable storage areas/vegetation and minor works.	Internal cost – possible funding from Coastal Program, OEH	4 years
2 A	**9.3**	Provide technical advice to Landcare groups about the time limitations of benefits of works on the frontal dune system	Middle Camp Beach, Blacksmiths Beach, Gold Club, State Park north to Redhead	LMCC (Sustainability)	Council resources	Internal resources. Potential for grants from Environment Trust	1 to 4 years
2 A	**10.5**	Conduct awareness raising activities for bag limits for the collection of rock platform species and enforce bag limits.	Swansea Heads, Redhead to Dudley shore platforms	DPI (Fisheries)	Council in kind contribution of support	Internal resources	1 to 4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
3 A	**12.4**	Invite off road vehicle users to participate in Clean Up Australia events in the BWSP and along Nine Mile Beach, similar to the Stockton Bight Clean Up Day.	Applies primarily to Nine Mile Beach	LMCC (Sustainability) Belmont Wetlands State Park Trust	Existing staff resources	Internal Council funds	1 year and 4 years
3 A	**14.5**	Update Plan of Management for Swansea Heads Reserve to better manage the Aboriginal values of the reserve and tell the story of the Awabakal people	Swansea Heads Reserve	LMCC (Community Planning) Awabakal Traditional Owners Aboriginal Corporation	Existing staff resources	Internal Council funds	4 years
5 A	**19.1**	Discuss proposed changes to coastal management with local communities – through precinct committees, sustainable communities program etc, to maintain ownership of landscape values.	Whole of coast	LMCC (Sustainability)	Existing staff resources	Internal funds	1 year and 4 years
5 A	**19.3**	Train community volunteers in – citizen science level ecological monitoring techniques	Whole of coast, with focus on sites already in place and additional sites suggested in the CZMP	LMCC (Sustainability)	Internal Council resource – existing staff	Internal Council funds	4 years
5 A	**21.3**	Conduct a project to research and collate information that is part of the story of the Lake Macquarie coast	Whole of coast	LMCC (Sustainability, Cultural Services)	Internal Council resource – existing staff	Internal Council funds	4 years
5 A	**21.4**	Prepare and deliver a coastal communications strategy to best present the story of the Lake Macquarie coast.	Whole of coast	LMCC (Sustainability, Communication, Community Planning)	Existing staff resources. Council could use university students (traineeships) or consultants to	Internal funds	1 year and 4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
					assist with research		
5 A	**21.6**	Update tourist information about Lake Macquarie with coastal tourism and recreation opportunities.	Whole of coast	LMCC (Communication)	Existing staff resources.	Internal funds	1 year and 4 years
5 A	**21.7**	Promote the economic opportunities that the coast brings to the city, such as national surf carnivals, conferences etc. Additional information on the economic value of the coast will also inform decisions about priorities for investment in coastal recreational spaces and land management.	Whole of coast	LMCC (Cultural Services, Sustainability, Community Planning)	Existing staff; allow $100,000 for promotion material	Internal funds	1 year and 4 years
3 B	**14.6**	Consult local Aboriginal community stakeholders about Plans of Management and about the potential impacts of proposed major works in coastal reserves. Ensure all plans of management contain up to date cultural heritage information, including sites and land claims.	N/A	LMCC (Community Planning, Sustainability) Awabakal Traditional Owner Aboriginal Corporation, Awabakal Descendants Traditional Owners Aboriginal Corporation, Bahtabah LALC	Internal Council resources.	Internal cost	4 years
Program 9: Supporting appropriate access and community use of the coast							

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
3 A	**12.1**	Prohibit off road vehicle driving on all Lake Macquarie beaches and coastal headlands, other than in a specified section of Nine Mile Beach and where specifically approved by OEH.	All of Lake Macquarie coast, other than Nine Mile Beach between Awabakal Street and Third Creek.	LMCC (Community Planning, Asset Management, Sustainability)	Within existing Council budgets	Internal Council funds	1 to 4 years
3 A	**12.2**	Prepare a multi stakeholder strategy through the Nine Mile working group to provide controlled and managed off road vehicle access to Nine Mile Beach. Identify locations for access ways, design safe and environmentally appropriate access structures. Close and rehabilitate other access ways, and formalise the main one(s).	Nine Mile Beach	LMCC (Community Planning, Asset Management, Sustainability) Belmont GC Belmont Wetlands State Park Trust	Existing staff resources + external partner organisation resources Estimate $20-$30 per linear meter for road costs (haul road). Consult CiviLake for more accurate costing.	Internal Council funds + stakeholder contributions	1 to 4 years
3 B	**12.3**	Develop a code of practice on safe and environmentally responsible off road vehicle use.	Whole of coast	LMCC (Community Planning, Sustainability) Belmont Wetlands State Park Trust	Internal Council resources	Internal cost	Establish within 4 years - review effectiveness every 2 years
3 A	**12.5**	Prepare feature articles/opinion pieces for local newspapers and off road vehicle magazines about the importance of safe off road vehicle driving at Nine Mile, the appropriate access routes, how to get a permit, how regulations will be enforced etc.	Applies primarily to Nine Mile Beach	LMCC (Sustainability), Belmont Wetlands State Park Trust	Existing staff resources	Internal Council funds	1 year and 4 years

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
5 B	**20.5**	Negotiate a revised route through Belmont Golf Course and Blacksmiths Nature Reserve, for a Fernleigh Track cycleway extension from Ocean Park Road to join new route from Awabakal Street to Swansea, not involving cyclists using the Pacific Highway	Belmont Golf Course	LMCC (Community Planning, Asset Management, Sustainability)	Internal Council resources.	Internal cost + contributions from stakeholders	n/a
5 B	**21.2**	(After 20.5) Complete selected sections of a coastal walking and cycling network, and highlight walking opportunities in local and regional tourism material	Belmont to Swansea Heads	LMCC (Asset Management, CiviLake)	Internal Council resources. Costs to complete this are likely already known.	Internal Cost	Complete by year 4
3 B	**13.5**	Formalise cliff top lookouts, install safety fencing more formal stairs and rails on access tracks down the cliff or bluff to rock platform fishing sites, and also to provide emergency exit points for people on rock platforms in popular locations	Dudley and Catherine Hill Bay	LMCC (Community Planning, Asset Management, Sustainability)	Internal Council resources. Investigate costs with LMCC operations depending on extent of works.	Internal cost	Establish year 1 - maintain yearly, review every 4 years
3 B	**13.7**	Reinstate Council's Beach Maintenance program to drive strategic track placement and ensure quality track construction and routine maintenance. These should be in accordance with the NSW Track Standards guidelines and Coastal Dune Manual.	Whole of coast	LMCC (Community Planning, Sustainability) OEH	Internal Council resources.	Internal funds plus OEH coastal program	Establish by year 4 - review by year 8-10
Program 10: Establish monitoring systems to track actual change							

Theme Category	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
1 A	**1.1**	Establish a beach monitoring program, with cross section sites at each of the main recreational beaches. These sections would be monitored monthly to quarterly.	On ground monitoring at Catherine Hill Bay, Caves Beach, Blacksmiths Beach and Redhead beach. Link also to Community Biodiversity monitoring program	LMCC (Sustainability)	Allow $25,000 for establishment; sites installed by Council staff; some on ground monitoring could be done by volunteers	Internal Council funds. Partnership grant from LLS may be possible	1 year and 4 years
1 A	**1.3**	Participate in a regional scale coastal zone monitoring program, using LiDAR and other high resolution spatial data.	Whole of coast	LMCC (Sustainability), OEH DPI	Allow time for Council staff to be trained in use of this high resolution data	Internal Council funds	4 years
4 A	**16.8**	Establish monitoring programs to track the condition of the coast and the outcomes of management actions (see **Section 15** for details of potential parameters and monitoring framework)	Whole of coast	LMCC (Sustainability) OEH, HLLS		Internal Council resources, in partnership with other organisations	1 year, 4 years, 8 years
Program 11: Adaptive funding strategies							
4 A	**16.2**	Revisit the balance of investment in lake shore reserves and open coast reserves, with an increase in investment in coastal areas.	Whole coast and estuary, including lake foreshore management	LMCC (Sustainability, Community Planning)	Internal cost, existing staff	Internal cost	4 years
4 A	**16.5**	Investigate and utilise all relevant and cost effective external funding avenues, to facilitate implementation. An example is potential packaging of coastal zone management activities to meet Commonwealth priorities.	Whole of coast	LMCC (Sustainability)	Existing staff resources	Internal Council funds	Every year

Table 16.3 - Actions for commencement within the 4 year to 8 year timeframe

Theme	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
Program 1: Improve understanding of risk							
2 B	**10.6**	Prepare more detailed inundation and ecological transition studies and plans for wetlands in coastal creeks and on the Nine Mile Beach Barrier system.	Coastal creeks; nine mile beach & Pinny beach. Belmont lagoon and Jewells wetlands	LMCC (Sustainability)	Internal Council resources	Allow $30-40k for additional studies depending on requirements	4 years +
Program 2: Reduce extreme and high risks							
1 C	**6.4**	Use the DCP to place controls on the floor area of extensions to existing development and the design requirements for extensions to existing development that is within immediate coastal risk planning zones.	Relevant properties	LMCC (Integrated Planning, Sustainability)	Internal Council resources	Internal Council funds	Establish year 4 - review by year 8-10
1 C	**5.3**	Develop advice for property owners in coastal risk planning areas about design options which can be retrofitted to existing residential structures, to extend potential occupation period. This includes raising floor levels and deep piering, where feasible. These works would require development consent. Requirements would be included in the DCP.	Relevant properties	LMCC (Integrated Planning, Sustainability)	Internal Council resources	Internal Council funds	Establish year 4 - review by year 8-10
Program 3: Processes for changing management							
3 B	**15.8**	Prepare project plans for relocation of individual surf clubs, including master plans for sites, approvals required, land tenure arrangements and funding opportunities for implementation	N/A	LMCC (Community Planning, Asset Management, Sustainability)	Internal Council resources.	Internal cost	Establish year 4 - review by year 8-10

Theme	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
Program 4: Build and enhance resilience in coastal biodiversity							
2 B	**8.2**	Update Plans of Management and/or prepare Masterplans for headland reserves (consistent with Council's general natural areas Plan of Management) to ensure management of vegetation and access recognises the presence of EECs for protection and targets invasive species, fire regime management (where feasible), and access management. Ensure planting provides a suitable mix of native species selected from the coastal planting guide and that are relevant to site conditions. Optimise natural assets by selecting plants that provide higher biodiversity value above those low maintenance plants such as *lomandra* and *casuarina* species.	Coastal headlands	LMCC (Community Planning, Sustainability)	Internal Council resources	Internal costs. Potential for grants from Environment Trust	Establish by year 4 - review by year 8-10
2 B	**10.6**	Encourage pilot projects for re-establishing estuarine wetland communities, such as saltmarsh and sea grass, which will be affected by higher lake levels	Coastal wetlands	LMCC (Sustainability)	Internal Council resources	Internal cost	Establish by year 4 - monitor yearly
2 C	**8.4**	Use planning controls and design guidelines to minimise the use of structures that restrict ecological transition (in estuarine and open coast situations). Remove existing barriers to wetland migration wherever possible.	Coastal Wetlands	LMCC Integrated Planning, with Sustainability	Internal Council resources	Internal funds and OEH coastal program grants	4-8 years

Theme	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
2 C	**9.4**	Raise awareness of the impact of litter (from fishing and general food consumption on beaches and shore platforms) on marine species, including shorebirds	patrolled beaches and off-road vehicle access points	LMCC (Sustainability, Communication)	Internal Council resources	Internal funds and OEH coastal program grants	Ongoing
2 C	**11.3**	Continue regular monitoring of beach macro and meiobenthos at selected high recreation and low recreation usage locations, for the purpose of checking impacts of beach cleaning operations and other activities	Blacksmiths Beach, Readhead Beach	LMCC (Sustainability)	Internal Council resources	Internal resources. Potential for environmental grants	Monitoring reports yearly
2 C	**11.4**	Establish monitoring sites on shore platforms, to track ecological changes associated with rising sea level. Benchmark condition is established, use follow up surveys at intervals of not more than 5 years	Swansea Heads, Redhead to Dudley shore platforms	LMCC (Sustainability)	Internal Council resources	Internal resources. Potential for environmental grants	Monitoring reports yearly
5 C	**19.2**	Prepare a communication package about migratory shore birds on Nine Mile Beach and shore platforms	Nine Mile Beach, Swansea heads, Redhead to Dudley shore platform	LMCC (Sustainability)	Internal Council resources	Internal resources. Potential for grants from Environment Trust	Establish year 4 - 8, review year 10
5 C	**20.3**	Prepare a course development plan/design for Belmont Golf Course which makes best use of its coastal position but also restores and builds biodiversity values	Belmont Golf Course	LMCC (Sustainability)	Internal Council resources	Internal cost + contributions from stakeholder	Establish year 4 - 8, review year 10
5 C	**20.4**	As part of the biodiversity enhancement plan for Belmont Golf Course, research native grass species and coastal ground covers that could be used on fairways.	Belmont Golf Course	LMCC (Sustainability)	Internal Council resources	Internal cost + contributions from stakeholder	Establish year 4 - 8, review year 10

Theme	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
Program 5: Work towards integrated management of the coastal zone							
2 B	**8.3**	Update Plans of Management for coastal reserves on dunes under Council's management (consistent with Council's general Plan of management for natural areas), to ensure a consistent planning approach and to manage ecological transition with climate change.	Dunes at Blacksmiths, Redhead, Caves and Hams Beach, Catherine Hill Bay	LMCC (Community Planning, Sustainability)	Internal Council resources	Internal costs. Potential for grants from Environment Trust	Establish by year 4 - review by year 8-10
5 B	**17.3**	Review Plans of Management for Crown Land Reserves and National Park/Nature Reserves to align approach to sea level rise threats	Belmont Wetlands State Park, National Parks, Conservation Areas and Nature Reserves	LMCC (Sustainability) Trade and Investment – Crown Lands Division	Internal Council resources + support from NSW Govt.	Internal funds and OEH coastal program grants	4 years
Program 6: Review internal resourcing and systems for managing open coast values							
4 C	**16.7**	Council to review the management partnerships with Landcare, and look to reinstate Landcare as a Council led activity if necessary.	N/A	LMCC (Sustainability)	Internal Council resources	Internal resources. Potential for grants from Environment Trust	Establish between year 2 -4, review every 2 years
Program 7: Multi stakeholder alignment and coordination							
2 C	**9.1**	Support Belmont Golf Club in efforts to design and implement a course which restores the ecological values of the Golf Club site. The site includes frontal dunes, hind dune and wetland areas.	Golf Club	LMCC Community Planning, and Sustainability	Internal Council resources	Internal resources. Potential for community and environmental grants	Establish year 4 - 8 review year 10

Theme	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
Program 8: Communication, partnerships, education and consultation about the coastal environment and coastal change							
3 B	**13.1**	Prepare Masterplans which identify the most appropriate track locations for walking from residential areas onto cliff tops, bluffs and local beaches. When these track routes have been identified, they should be formalised and other routes closed and rehabilitated.	Caves Beach, Redhead Beach	LMCC (Community Planning, Asset Management, Sustainability)	Internal Council resources	Internal cost	4 years
3 B	**14.1**	Prepare Master Plans and redesign and upgrade facilities in reserves at the main recreational beaches (patrolled beaches), to provide attractive coastal park landscapes suitable for local and tourist use. Includes upgraded amenities blocks, playground equipment, landscaping, paths, picnic facilities, shade.	Redhead Beach, Hams/Caves Beach reserve & headland. Swansea Heads reserve.	LMCC (Community Planning, Asset Management, Sustainability)	Internal Council resources.	Internal cost	4 years
3 B	**14.4**	Update Plans of Management and prepare master plans for design and implementation of on ground works in headland reserves, to protect biodiversity values and provide for community activities	Swansea Heads and Caves Beach headland.	LMCC (Community Planning, Asset Management, Sustainability)	Internal Council resources.	Internal resources. Potential for grants from Environment Trust	4 years
1 C	**7.3**	Provide information at community meetings and in hard copy/web form about how to prepare and respond to coastal emergencies, for local communities where coastal emergencies are possible in the immediate term. This is a more general version of local adaptation planning.	Blacksmiths, Redhead, Caves Beach	LMCC (Sustainability)	Internal Council resources	Internal Council funds	n/a

Theme	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
3 C	**14.3**	Conduct a beach litter education program and install recycling bins to minimise litter on beaches – for aesthetic reasons and to prevent impacts on marine species.	Whole Coast	LMCC (Sustainability)	Internal Council resources	Internal Council funds	Ongoing
5 C	**21.5**	Develop interpretative signage for locations along pathways/cycleways, and at lookouts to tell the natural and heritage stories of the coast.	Whole of coast	LMCC (Sustainability, Community Planning)	Internal Council resources	Internal Council funds	Establish between year 2 -8, review year 10
Program 9: Supporting appropriate access and community use of the coast							
1 C	**4.6**	Conduct a review of all pedestrian and vehicle beach access ways against best practice guidelines for resilience to storm bite erosion and stable dune forms. Reference the NSW Dune Management Manual and NPWS Guidelines for track construction. Upgrade design of key access ways	Whole Coast	LMCC (Sustainability, Asset Management)	Internal Council resources	Internal Council funds	4-8 years
3 B	**13.2**	Establish well designed and maintained coastal access paths – on headlands, along Blacksmiths Beach, along Swansea Channel and across dunes onto the beach, to manage access risks and enhance amenity. This would be combined with more formal parking arrangements at selected locations.	Blacksmiths and Swansea Channel, also Hams/Caves Beach, Redhead	LMCC (Community Planning, Asset Management, Sustainability)	Internal Council resources + allow $20,000 for external planning and design advice (if required)	Internal cost + potential for community grants	4 years +

Theme	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
3 C	**14.2**	Prepare and implement a disabled access strategy for beaches and headlands (could be included in Masterplans for relevant locations)	Caves Beach, Blacksmiths Beach	LMCC (Sustainability, Asset Management, CiviLake)	Internal Council resources + allow approximately $30k for works (budget may increase dependent on type and number of accesses required)	Internal Council funds + community grants	Establish year 4 - review by year 8-10
3 C	**15.2**	In consultation with Surf Clubs and local communities prepare community use studies to scope potential broader community access to club facilities	N/A	LMCC (Community Planning, Sustainability)	Internal Council resources	Internal Council funds	Establish year 4 - 8, review year 10
5 C	**21.1**	Prepare a Master Plan for the coastal walk, incorporating a review of alignment to reflect other walking and cycling initiatives (Fernleigh Track and City Cycleway Strategy).	Whole of coast	LMCC (Sustainability, Asset Management)	Internal Council resources	Internal Council funds	Establish year 4 - 8 or after completion of track, review year 10

Table 16.4 - Actions for commencement within the 10 year timeframe before revision of the Plan

Theme	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
Program 2: Reduce extreme and high risks							
1	**3.7**	Nourish beach volume with sand imported from outside the immediate coastal system. For instance, there have been proposals to access sand which is offshore on the continental shelf to provide additional sand volume for some very high value beaches (such as Manly, Collaroy).	Blacksmiths Beach	LMCC (Sustainability), OEH Trade and Investment – Crown Lands Division	$1-2 million +	Would require govt. Contribution and numerous approvals	As required
1	**4.5**	Construct sea walls to protect surf clubs	Redhead, Blacksmiths, Catherine Hill Bay	LMCC (Leisure Services, Asset Management, Sustainability)	These will have been costed in previous studies through previous actions - but estimate $200k + per wall incl. design	Internal cost	Dependent on triggers
Program 3: Processes for changing management							
1	**6.6**	Investigate the potential for acquisition of private property along Ungala Road at Blacksmiths, as a long term option to maintain land for public access to a retreating Blacksmiths Beach. As above, this would come into effect only if coastal recession reaches the 2050 'unlikely' coastal recession hazard line, as shown in BMT WBM 2015. If land is acquired, then investigate the potential for rezoning appropriate to public recreational uses	Ungala Road	LMCC (Sustainability)	$10 million + (dependent on property market and number of homes)	Internal cost + govt and stakeholder contributions where required	Dependent on triggers
3	**15.1**	Investigate other long-term surf club options and/or patrolled swimming area	Nine Mile Beach, Mooney	LMCC (Sustainability, Leisure Services)	$3-5 million + for construction and facilities i.e. Car parking etc	Internal cost	Dependent on triggers

Theme	Action ID	Management Response	Location	Responsibility (Lead and partners)	Cost estimate	Funding options	Review period
Program 5: Work towards integrated management of the coastal zone							
5	**20.6**	Investigate opportunities to streamline approval processes for biodiversity enhancing projects on private land, which comply with the CZMP, and whole of system dune management plans.	Belmont Golf Course	LMCC (Sustainability)	Internal resources	Internal cost	Ongoing
Program 9: Supporting appropriate access and community use of the coast							
3	**15.9**	Undertake capital works – construct new surf club buildings or upgrade protection structures	Redhead, Swansea, Belmont or Caves Beach	LMCC (Leisure Services, Asset Management, Sustainability)	Dependent on works - but in the millions	Internal cost	Dependent on triggers
Program 10: Establish monitoring systems to track actual change							
2	**11.1**	Further develop remote sensing techniques (using LiDAR derived terrestrial and marine digital terrain models and SPOT 5 satellite imagery), as tools to aid high resolution monitoring of ecological community extent and condition and ground surface change	Whole of coast	LMCC (Sustainability)	In conjunction with neighbouring shires - estimate $100k + depending on LiDAR acquisition. If attained though Govt departments, estimate $20k for processing	Internal cost shared with neighbouring Councils	Ongoing

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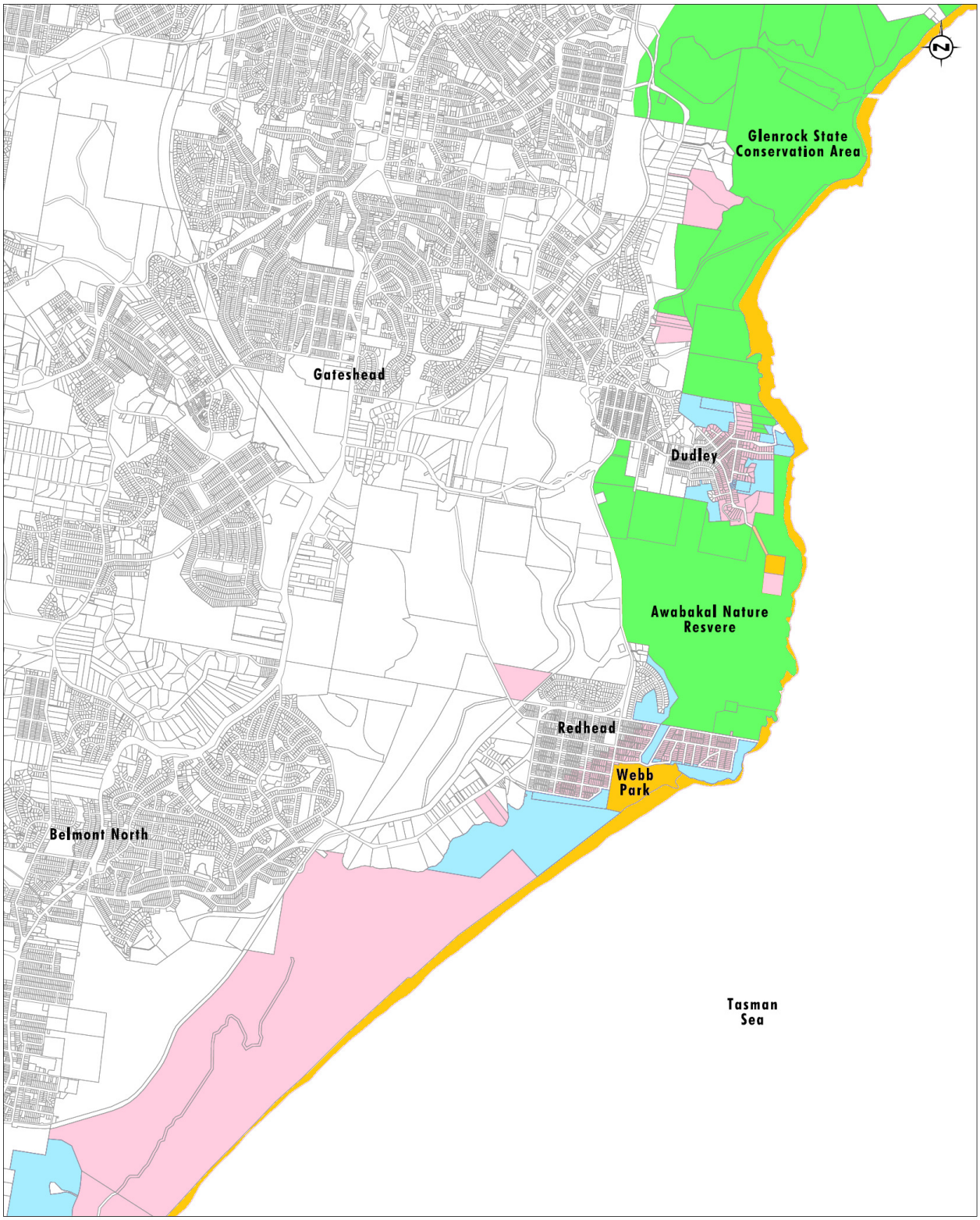
APPENDIX 1

Additional Information



Legend

- Reserves
- Crown Land (some areas administered by Council)
- Council (or Council administered) Land
- Private Land

FIGURE 1

Land Tenure

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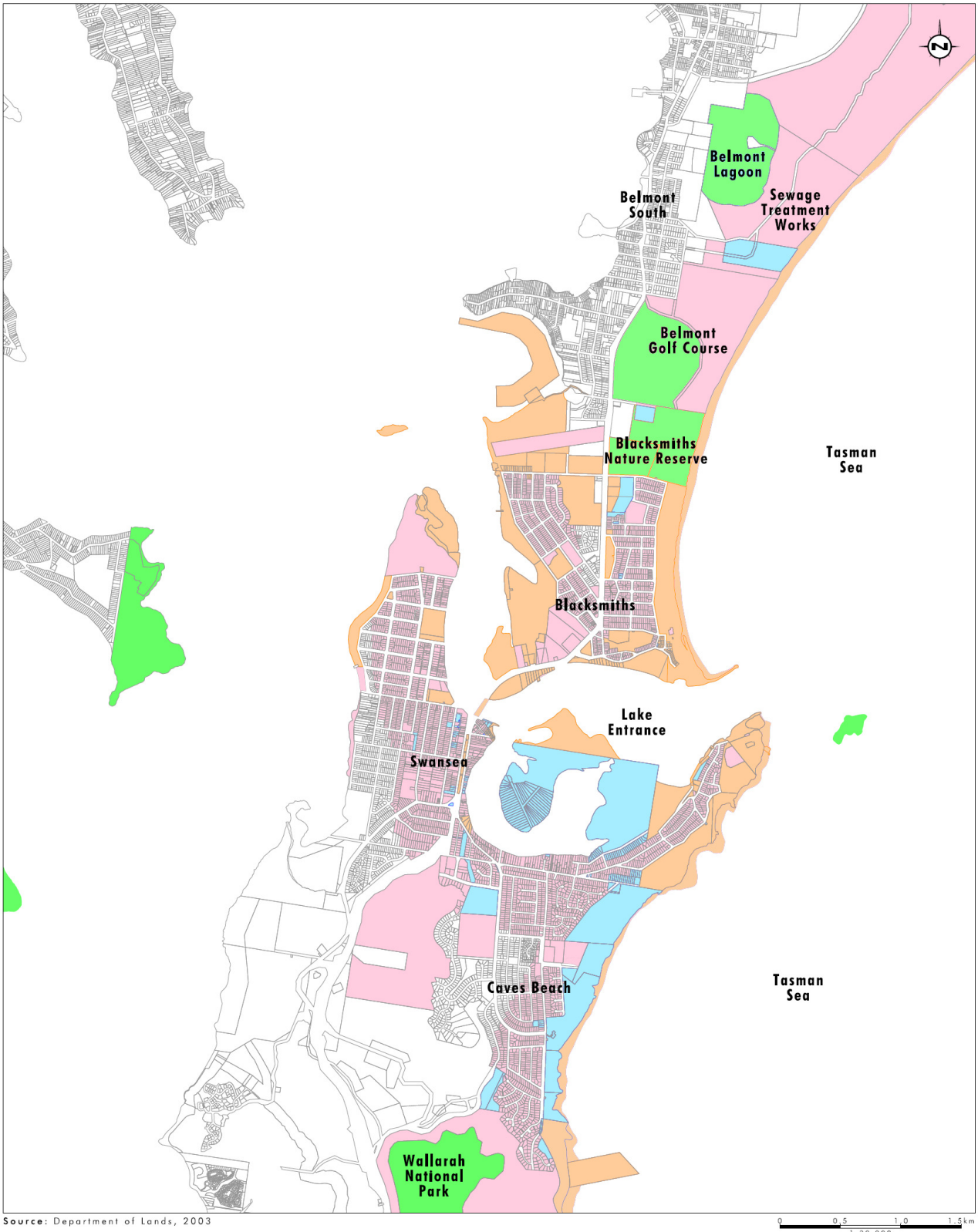


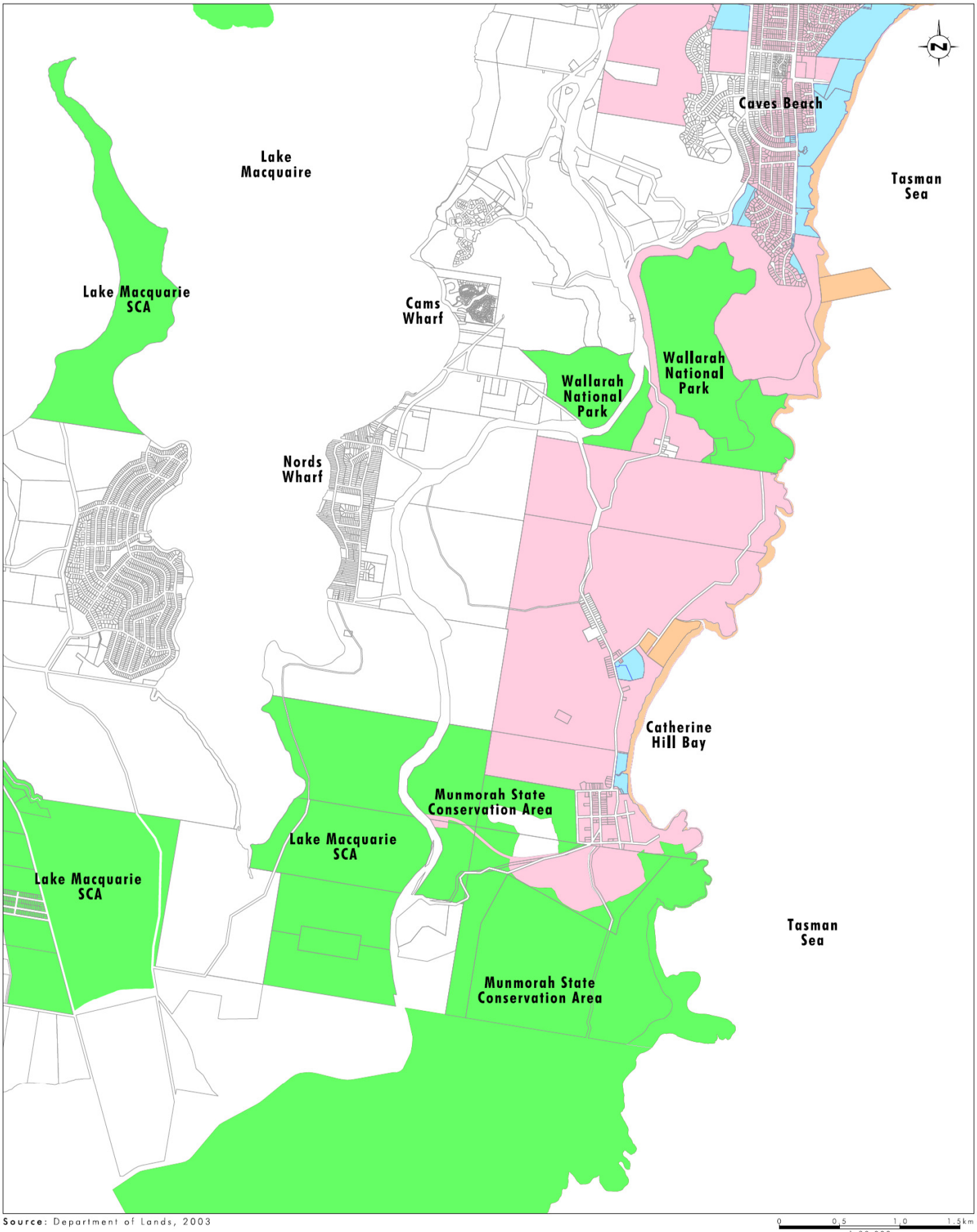
Source: Department of Lands, 2003

Legend

- Reserves
- Crown Land (some areas administered by Council)
- Council (or Council administered) Land
- Private Land

FIGURE 2

Land Tenure



Source: Department of Lands, 2003

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Legend

- Reserves
- Crown Land (some areas administered by Council)
- Council (or Council administered) Land
- Private Land

FIGURE 3

Land Tenure

Table A1: Actions from Relevant Previous Management Plans

	1999 Coastline Management Plan
1999 Coastline Management Plan - All area actions	LMCC adopt the CMP and Plans of Management
	Council to request the Minister for land and water Conservation to approve Plans of management which have been adopted by LMCC
	Amend planning instruments and make DCP relating to the coastline
	Secure entire coastline (coastal impact zone) in public ownership
	Establish a 'coastal corridor' zoned consistently as 7x 'coastal protection zone'.
	This zone includes all existing 7c Environmental Protection Zone land (Coastal Lands Acquisition) + land within the Coastal Impact Zone (plus a 30m ecological buffer and 10m coastal walk easement) + areas of high visual prominence
	Include Lake Macquarie coastal lands in the NW Coastal Policy; Council will adopt the NSW Coastal Policy as an appropriate framework for management of the coastline.
	Prepare a Memorandum of Understanding between Council and relevant government agencies for implementation of the CMP
	Negotiate with major private and public landholders to facilitate implementation of the CMP
	All Crown land to be dedicated to the care and Control of Council. For Spoon Rocks, delay dedication until after preparation of a plan of management and Risk Assessment and action plan.
	Develop a risk assessment and management program for coastline access
	Prepare a risk management plan for any infrastructure to be established within the coastal impact zone and associated access tracks
	Develop set back guidelines for development adjacent to the 'Coastline Protection Zone'
	Bitou bush eradication program
	Dune stabilisation and rehabilitation
	Provide safe access to rock platforms, cliffs and bluffs
	Controlled access for pedestrians and vehicles
	Establish an educational and safety oriented signage system
	Protect and rehabilitate headlands
	Establish a coastal walk along the entire Lake Macquarie coastline (+ multiple details on design and priority sections). Adopt guidelines for design and construction based on NPWS 'Walking Track Construction Guidelines'
	Establish Intertidal Protection Areas (NSW Fisheries)
	Review licences and regulation of beach hauling fishery
	Review use of recreational vehicles on the coastline. Define areas suitable for recreational vehicle use (Parcel 21 noted in the recommendation).
	Changes to vehicle access could be aligned with establishment of the coastal walk.
	Review Council policy re horses and dogs on public beaches. Dogs currently banned from all of Catherine Hill Bay Beach, Caves Beach, Hams Beach, Blacksmiths Beach, Breakwall to Awabakal Ave, Redhead Beach (Second Ck to the headland), Dudley Beach.
	Ban horses from same areas as dogs not permitted?
	Extend conservation are to take in all historic sites in the 3 villages at Catherine Hill Bay, railway route, industrial land and archaeological sites along the coastal fringe.
	Document heritage and conservation values of Swansea heads
	Prepare an audit of ecological communities and species along the coast
	Develop consistent guidelines for biodiversity management – control of plant and animal invasive species; maintain an attractive natural environment, rehabilitate dunes to improve connectivity
	Implement education and training programs for volunteers and Council staff working on the coast
	Prepare guidelines/codes to ensure works carried out in accordance with Plans of Management
	Seek Coastcare funding for these programs and to employ a Coastcare coordinator
	Establish a monitoring and review plan for all works undertaken under the CMP and PoM

	1999 Coastline Management Plan
Management Sub Areas	Consult with Rio Tinto Limited and construct walkway
	Provide safe public access to Deep Cave Bay and headland. Upon acquisition by the State Government, provide a small scale low impact car park.
	Link area with Munmorah SRA
	Development of tourism in the area by utilising natural and heritage attributes of the area
	Heritage study to be undertaken on the coal loader facility. Adoption/implementation heritage study
	Undertake detailed design, upgrading and rehabilitation work. Monitor back beach escarpment and plan for relocation of car park
	Approach DUAP to investigate the addition of Middle Camp Lagoon as SEPP 14 wetland. Establish buffers around lagoon/wetland area
	provide for the alignment of the coastal walk in an environmentally sensitive way
	coastline protection zone to be established and to include the 7c land
	Rehabilitate degraded land within the coastline protection zone with native indigenous plant species
	Investigate if Pinny Lagoon should be gazetted as a SEPP 14 wetland
	Carry out risk assessment of the spoon rocks area
	Construct fencing of the wall near the beginning of Spoon Rocks and on the cliffs. Also include signposts warning of the danger of rock falls, etc.
	Rezone area 7x - Coastline protection
	conduct study at spoon rocks and repair rock wall if necessary
	Improve and expand golfing facility with accommodation to increase tourism within the environmental constraints
	Transfer beach into public ownership and return ownership to the community
	provide for the alignment of the coastal walk and fence appropriately
	provide a link with the two SEPP 14 wetlands, Belmont Lagoon and the Crown Land to the south
	Consult with the landowner (currently BHP) and negotiate the construction of the Coastal Walk
	Plan for reuse of effluent to minimise ocean discharges
	place beach and the identified coastline protection zone within public ownership
	rehabilitation of dunal areas
	Off road vehicle access controlled
	Protection of ecologically sensitive wetlands and provision for habitat linkages and a buffer for the coastal lagoon on Second Creek
	Detailed design and construction of walk to accompany any development and/or rehabilitation of the site
	Design and implement reshaping and stabilisation works for Third Creek entrance
	Incorporation in the Awabakal Nature Reserve if NPWS will take over the land, or provide for some special facility in bush land setting within context of other council community lands in locality
	Liaise with NPWS for alignment of coastal walk, construct walk
	Identify location and management requirements for any Aboriginal sites as a part of City wide Archaeological Study
	Rehabilitate track and provide a mulched surface to reduce water flow and the further effects of erosion
	Council to declare area as a wildlife corridor and implement adopted management protocols for wildlife corridor management
	identify for possible inclusion into the Glenrock SCA

	1999 Coastline Management Plan
1999 CMP Plan of Management (PoM) 1: Catherine Hill Bay	Develop alignment of the coastal walk (multiple land parcels), including an elevated boardwalk under the coal loader. Consult with Rio Tinto and construct walkway.
	Construct walk along heritage railway embankment, including necessary repairs, in accordance with heritage assessment.
	Provide safe public access to Deep Cave Bay headland.
	Acquire land when coal loading operations cease, return to public ownership, rezone, construct small car park
	Consult with NPWS about pedestrian connection to Munmorah SRA
	Ensure tourism development is outside the Coastal Protection Zone
	Conduct detailed heritage study and prepare PoM for significant heritage places; place on city heritage register.
	Rehabilitate degraded areas , upgrade car park and provide a new viewing platform
	Protect Middle Camp Lagoon; approach DUAP re SEPP 14 status; establish buffers around lagoon shore.
	Conduct risk assessment for Spoon Rocks
	Conduct a study to determine whether wave damage of Spoon Rocks will have an adverse impact on adjoining coastline.
	Construct fencing of the wall near the beginning of Spoon Rocks and on cliff top; plus warning signs re falling rocks.
	Monitor position of back beach escarpment at surf club; establish reference points
	Investigate options for the surf club – including sea wall protection, land acquisition for access, provide commercial tourist facilities, interpretation material (heritage); feasibility study for relocation outside of Coastal Impact Area (e.g. to a site within the Sports Ground reserve)
	Prepare Master Plan to guide development/redevelopment of the surf club , including new or refurbished surf club pavilion, beach observation areas, sealed car park, landscaped picnic areas and amenities, commercial/community recreation and tourism facilities, heritage etc.
	Alter beach car park- consider protection, smaller units, relocation landward, landscaping; construct footpath to direct beach users to the old beach area south of the lagoon (include new bridge over the lagoon?); close and rehabilitate northern and eastern parts of existing car park.
	Carry out dune stabilisation works and improve habitat diversity on dunes and in lagoon.
	prevent damage to surf club pavilion and associated facilities and amenities, the railway bridge abutments by coastal processes
	If monitoring indicates recession of the back beach escarpment, construct a seawall along the present back beach to protect the site
	acquire additional land to provide for legal access, expansion of the pavilion, car parking and picnic areas
	provide for the inclusion of commercial tourist facilities in association with the surf pavilion if the club is adequately protected
	provide a heritage interpretation post for Catherine hill bay and the nearby shipwrecks
	undertake a feasibility study of the viability of relocating the surf club clear of the Coastal Impact Zone to North Beach, including consideration of a site within the Sports Ground Reserve, possibly as part of a general community and sports complex with the acquisition of beach between the Sports Ground Reserve and mean high water mark
	Plan for future of surf club
	alter beach car park in accordance with the following principles:
	Construction of coastal protection works or relocation of the car park in the long term, outside the Coastal Impact Zone
	Separate car park into smaller units each buffered with native landscaping and moved back towards Flowers Drive
	Relocation of the main part of car park at southern end of present parking area. Construct a convenient footbath to direct beach users to the old beach area south of the Lagoon outlet. This access could include a new bridge over the lagoon outlet possibly making use of the railway bridge abutments subject to a heritage report
	close and revegetate the northern and eastern parts of the existing car park
	construct the coastal walk along the heritage railway embankment including an investigation of repairs to the embankments and the construction of a footbridge, all in accordance with a heritage report
	provide for the relocation of the surf club clear of the coastal impact zone to North Beach
	Identify location and management requirements for any Aboriginal sites as a part of City wide Archaeological Study
	Implement Standard procedures for supervision by council staff of volunteer workers on community land and Crown Land

	1999 Coastline Management Plan
1999 CMP PoM 2 Catherine Hill Bay Cemetery area	Investigate redevelopment of site and produce master plan. Master Plan to provide for heritage assessment, conservation of the cemetery, protection of graves; investigate funding options.
	Relocate playing field, car park and access road outside the Coastal Impact Zone
	At Middle Camp Lagoon, carry out dune rehabilitation along Crown land section of the beach.
	Carry out flora and fauna study in Middle camp lagoon and dunes.
	Recognise need for beach observation areas for surfing events; provide parking area, picnic facilities and amenities outside Coastal impact Zone.
	Construct coastal walk through the cemetery, outside Coastal Impact Zone, subject to heritage conservation Plan; construct links to the beach; provide for coastal walk to cross Middle Camp lagoon and provide a viewing platform.
	Implement Standard procedures for supervision by council staff of volunteer workers on community land and Crown Land
	Identify location and management requirements for any Aboriginal Sites as part of City-wide Archaeological study
	Prepare a Master Plan to guide future development for the area in accordance with the following principles:
	Surf pavilion, car park, picnic areas and other facilities and amenities to b outside the Coastal Impact Zone
	Demountable or transportable surf patrol tower and viewing platform may be within the Coastal Impact Zone
	Consideration of incorporating surf pavilion and associated amenities and facilities within the community sports facility including provision for commercial tourist uses.
	Acquisition of land to provide for access to the breach and to link the playing fields area and the bowling club area with the beach
	Incorporate proposals of cemetery heritage conservation plan
	Provide for the coastal walk outside the coastal impact zone
	The Master Plan is to provide for:
	heritage assessment
	maintenance of dune rehabilitation areas
	conservation of the cemetery
	possible routes for an access road to the beach and car park
	recommendations to provide for conservation of areas of the cemetery within the Coastal Impact Zone
	Recommendations for protection of graves beside existing access road including the need for land acquisition and temporary protection measures such as shade cloth screen attached to fence.
	Recommendation for funding sources to secure the cemetery and provide for its conservation and access
	Proposals for interpretation of the cemetery, signposting, etc.
	proposed route for coastal walk
	Identify location and management requirements for any Aboriginal Sites as part of City-wide Archaeological study
	Implement Standard procedures for supervision by council staff of volunteer workers on community land and Crown Land

	1999 Coastline Management Plan
1999 CMP, POM 3 Caves Beach	Implement landscape Rehabilitation and Park Development Concept Plan from 1997. Construct grassed picnic area, construct viewing platform.
	Rehabilitate native plant areas on dunes and bluffs.
	Incorporate coastal walk as safe track along the bluff.
	Provide safe access to the caves, including sign posting re geology and safety warnings.
	Investigate long term protection options for the surf club, including maintain Spoon Rocks and relocation
	reduce the size of the car park to 20 to 30 spaces
	Provide a surf patrol tower (demountable) on the beach
	Prepare proposals for improved stormwater management re flows across the southern corner of the beach.
	Coastal walk – provide urban and bush land route options, and different surface types including suitable for cycling and walking
	Provide for relocation of car parks along the beach out of the Coastal Impact Zone, make any new structures in the Coastal Impact Zone demountable
	Maintain a belt of open parkland behind the beach, and adjoining the urban area – up to 100m wide
	Investigate options for further tourism development near/within the caravan park – accessible to the public and outside the Coastal impact Zone.
	North of Creek and caravan park, provide recreational amenities in park setting, including children's playground and skate board ramp, toilets, showers and surf viewing platform.
	At North Caves, retain as a natural area. Provide a small car park at Francis St and a small amenities block outside the Coastal Impact Zone
	At North Caves, prevent vehicle access to beach and dunes; other than emergency vehicle access from the car park to the south
	Rehabilitate dunes as a natural area with controlled pedestrian access.
	Coastal walk through this area as a natural track, generally with the urban area not visible from the track. Enhance the urban wetland.
	Identify location and management requirements for any Aboriginal Sites as part of City-wide Archaeological study
	Implement Standard procedures for supervision by council staff of volunteer workers on community land and Crown Land
	provide for the Coastal walk as a meandering, hard surfaced combined footpath/cycleway within the parkland belt
	rehabilitate the dunal area within the Coastal Impact Zone as a natural area with a nature walk as a mulched path section of the Coastal Walk from which the urban spaces will not be visible
	any new structures within the coastal impact zone are demountable
	monitor stability of rock lined wetland outlet
	prepare a detailed landscape plan for the area
	Maintain a belt of open parkland behind the beach, and adjoining the urban area – up to 100m wide
	Investigate the inclusion of further commercial tourist/recreation facilities within the open parkland belt near to or within the caravan park. Any facilities are to be accessible to the public and outside of the Coastal Impact Zone
	combine urban parkland, beach access and natural coastline roles for the unit
	provide for the following facilities outside the coastal Impact Zone where possible:
	Children's playground, facilities for youth such as skateboard rink, basketball courts and volleyball courts, toilet facilities and shower, surf viewing platform
	continue public access to beach
	Provide for a small car park within the reserve at Francis Street and a small amenities block outside the Coastal Impact Zone. Take into account any impact to residential amenity
	Prevent vehicular access to beach dunes
	provide for emergency vehicle access fringe car park in the adjoining management unit to the south
	rehabilitate the dunal area as a natural area with controlled pedestrian access to the beach in accordance with revised guidelines to maximise habitat diversity and incorporating the urban wetland at the southern end of the unit
	construct the coastal walk as a mulched or gravel track within a natural setting outside the coastal impact zone and generally ensuring the urban area is not visible from the track

	1999 Coastline Management Plan
1999 CMP, PoM 4 Swansea Heads	Prepare Master Plan. Provide for manageable buffer between natural areas and residential areas, with consideration of fire hazard, weed control, litter control, delineation of public/private space; general use of the reserve.
	Revegetate disturbed areas – restore natural character and provide bush land route for coastal walk.
	Maintain access to pilot station and any future tourist facility on HWC land.
	Construct coastal walk with viewing platforms; limit development to that needed to service the walking path; provide safe pedestrian access from walk to small beaches.
	Assess opportunities for tourist development on HWC land and community land, in character with Master Plan
	Ensure appropriate management of Aboriginal cultural values – record, consult, protect.
	Implement Standard procedures for supervision by council staff of volunteer workers on community land and Crown Land
	Master Plan for pilot station area to include heritage Conservation Plan, retain heritage significance.
	subject to a heritage conservation plan, investigate opportunities to include commercial tourist facility within the community land
	Retain native vegetation on the eastern and northern parts of the headland and revegetate all areas not required for heritage conservation, recreation or tourism purposes. Viewing platforms are to blend with native vegetation. Weed removal with care in littoral rainforest areas. Repaint coast guard (reduce visual impact in natural landscape)
	Amend Crown reserve descriptions to be consistent with proposed roles for the area.
	Protect the Aboriginal reburial site, in consultation with Bahtabah LALC
	Investigate the need to relocate any facilities outside the Coastal Impact Zone, with detailed design and costing if required.
	Investigate feasibility of a boat ramp near the Lambton Parade Car park.
	Provide for an interpretation post at the eastern end of the eastern-most car park and overlooking Little Swansea Beach. Include appropriate interpretive material in relation to the historic significance of Reids Mistake, to the training walls and the geology
	Assess the standard and condition of all amenities and landscaping; upgrade car parks
	Include the heritage value for the fossil trees in the Master plan and provide for protection of the item.
	prepare proposals for improvements to amenities blocks, picnic settings and landscaping
	provide links for coastal walk to Black Ned's Bay walk and the Pilot Station
	Investigate the suitability of Little Swansea Beach for swimming

	1999 Coastline Management Plan
1999 CMP PoM 5: Blacksmiths Beach	Prepare a Master Plan to investigate and guide the staged development of the major recreational area
	Provide area for eventual relocation of surf club outside the Coastal Impact Zone, including associated facilities and amenities and commercial, tourist and recreation facilities
	Investigate opportunities to include commercial tourist facilities within the relocated club complex
	recreate the former Granny's pool swimming facility beside the channel training wall
	Provide for a bush land and training wall walk with disabled access. The walk to extend to link with the Coastal Walk
	Implement Standard procedures for supervision by Council Staff of volunteer workers on Crown Land
	Identify location and management requirements for any Aboriginal Sites as part of a City-wide Archaeological Study
	Prepare a Master Plan for Unit B that complements the Master Plan for Unit A and seeks to:
	Continue to encourage use of the area as a major surfing beach capable of supporting major surfing events
	Construct coastal protection works for the surf club pavilion and associated amenities and facilities. This could include beach nourishment with sand from Swansea Channel, construction of an artificial reef or construction of a buried sea wall
	Further development of the surf club pavilion and associated amenities and facilities to an area outside the Coastal Impact Zone in accordance with the Master Plan
	Provide for relocation of the club or pavilion and associated amenities and facilities to an area outside the Coastal Impact Zone in accordance with a Master Plan for future development of the beach
	Any relocation to be staged in response to beach recession
	provide for the incorporation of commercial tourist, recreational facilities in any protection works or in a new site for relocation of the surf club pavilion and associated amenities and facilities
	Develop a level viewing area on the top of the dune in front of the surf club pavilion
	the dune face to be stabilised with mature vegetation with fenced pedestrian access to the beach
	the viewing area to me maintained as a grassed area (or native grasses and ground covers) for a distance of 50m north and 100m south of the pavilion
	keep dune stabilisation vegetation behind the protective fencing to allow for beach cleaning operations
	Provide for demountable shade structures to the proposed boardwalk in front of the pavilion and for additional structures or plants to provide shade in the picnic area.
	provide for a surf patrol tower on the dune at the southern end of the surf pavilion
	Extend coastal walk within the Ungala Road Reserve adjoining the Crown Land as a meandering hard surface combined footpath and cycleway
	Maintain present location for vehicle access to the beach at the northern end of the surf pavilion
	Identify location and management requirements for any Aboriginal Sites as part of a City-wide Archaeological Study
	Implement Standard procedures for supervision by Council Staff of volunteer workers on Crown Land
	Extend dune rehabilitation over any area not already stabilised
	maintain pedestrian access to the beach
	Dune rehabilitation and maintenance work is to be carried out in accordance with revised guidelines, which include provision for enhancement of dunes a natural habitat as well as satisfying stability criteria
	Maintain fencing along Ungala Street and to all beach access paths
	Maintain fencing along front of fore dune or prohibit all vehicles along the beach
	provide for relocation of car parks outside the coastal impact zone in the long term
	any additional viewing platforms or the development within the Hazard zone to be demountable or otherwise capable of removal outside the coastal impact zone
	Relocate Awabakal Avenue car park outside the coastal impact zone
	Relocate the Maneela Street car park to the Ungala Road frontage (or within the Ungala Road Reservation
	Provide for the coastal walk within the Ungala Street reserve clear of the Coastal Impact Zone
	Construct Coastal Walk as a meandering, hard surface combined pedestrian path/cycleway within the road reserve and landscaped to allow for surveillance from dwelling fronting Ungala Street
	Prepare brochure to educate residents and adjoining landowners and occupiers about the value of natural areas and ways in which they can assist with the reduction of impacts on adjoining or nearby natural areas
	Prepare a Master Plan to indicate the extent of natural/open space required and the boundary of the proposed extension of Belmont Golf Club. The plan should provide for acquisition of Golf Club beach front land through suitable land access arrangements
	Agreement over the ongoing use by Belmont Golf Club of land within the proposed 7x - coastline protection zone until such time as recession of the coastline requires use of the land to be place within the council to provide for public access.
	Determine if Parcel E is a contaminated site
	As part of the Master Plan, identify areas suitable for retention and enhancement as natural conservation area and a habitat link between the lake, the beech and the gold club lagoon
	determine an appropriate alignment at the landward edge of the 50yr coastal impact zone and develop contingency plans for the landward relocation of the coastal walk to the landward edge of the 100 year coastal impact zone to accommodate coastal recession and provide for public access
	provide for landscape buffer to the golf course and physical protection for walkers from golf balls such as screened fencing and landscaping

	1999 Coastline Management Plan
1999 CMP, PoM 6 Ocean Park Road	Investigate opportunities to expand and improve the Golf Course (including accommodation), in consultation with community, local and State government
	Transfer beach into public ownership, zone 7x coastline protection and provide adequate public access
	Provide for alignment of coastal walk, in consultation with Golf Club and DLWC
	Acknowledge SEPP 14 land in this area and rehabilitate native vegetation.
	Place the beach front of the BHP land holdings in public ownership.
	Provide a link between the two SEPP 14 wetlands, Belmont Lagoon and Crown land to the south.
	Provide for the alignment of the coastal walk through the BHP land.
	HWC land (parcel 20). Plan for reuse of effluent to minimise ocean discharges
	HWC land. Place beach and identified Coastline Protection Zone in public ownership
	Rehabilitate dunes in accordance with a plan developed by HWC
	Provide for the alignment of the coastal walk across HWC land
	HWC land. Restrict vehicle access
	BHP land (parcel 21). Protect ecologically sensitive wetlands, provide buffer for coastal lagoon on second Creek.
	Provide for alignment of coastal walk; detailed design and construction to accompany any development and/or rehabilitation of the site
	Design and implement reshaping and stabilisation works for the entrance to Third Creek.
	Identify location and management requirements for any Aboriginal Sites as part of a City-wide Archaeological Study
	Implement Standard procedures for supervision by Council Staff of volunteer workers on Crown Land
	provide formalised access to the beach

	1999 Coastline Management Plan
1999 CMP PoM 7 Redhead Beach	Reduce impacts by the public on natural areas through public education program
	prepare brief for rehabilitation plan which provides for:
	investigation of flora and fauna values
	investigation of ways and means of providing for dune stability, integration of dunes and lagoons to maximise ecological diversity
	investigation of suitability of area for education in Aboriginal culture as part of City-wide Archaeological survey
	Implement Standard procedures for supervision by council staff of volunteer workers on community land and Crown Land
	investigate implication on beach processes of a reef being constructed offshore
	determine detailed alignment of and construct coastal walk generally in accordance with this POM, with bridge over second creek and additional pedestrian access for nature recreation and education , education in Aboriginal culture, to link coastline with wetlands and heritage railway corridor
	Implement Landscape Plan No 3310-4, 3 April 1995 and construct bridge and elevated walkway in accordance with Plan 97-192
	Prepare and implement rehabilitation plan
	implement maintenance plan
	Implement council's landscape plan
	maintain present roles as an access corridor and recreational area of natural character, educational and interpretative facility with disabled access
	Reduce sewerage discharges into the wetland
	consider as a site for the interpretation of Aboriginal culture
	Maintain as a buffer between the urban area and the wetland
	ensure that all work carried out on the crown lands and community lands is in accordance with the provisions of this POM
	Ensure appropriate management of Aboriginal sites
	Provide for further development as a regional surfing beach facility incorporating commercial tourist, recreational facilities whilst protecting residential amenity and environmental values
	provide a new patrol tower and additional change rooms, toilets, outdoor showers at southern end of beach car park near First creek with wheelchair access or incorporate these facilities within a new pavilion complex
	Provide an elevated boardwalk with seating and shade structures along the frontal across with width of the Main Beach to provide a viewing area of beach activities
	Reform the dunes within the 100 year coastal impact zone to provide a hind dune area which is landscaped to provide a picnic area with picnic settings, shade and shelter similar in character to facilities provided at Blacksmiths Beach and Caves Beach. An structures should be capable of being removed from the hazard area if necessary
	Investigate the feasibility of providing an outdoor stage outside the 100 year coastal impact zone and facing on the hind dune area located a sufficient distance from the bluff o obscure viewing of events from dangerous vantage points
	Link Webb Park and Beach car parks with landscaping and picnic settings adjacent to Beach Road with a footbridge near the existing helipad
	Redevelop the old picnic area at the northern end of the northern car park to provide an area with views over Little Beach
	Provide access to beach service vehicles at Northern end of beach, from car park south of Surf Club pavilion
	from Webb Park to Helipad onto the beach south of First Creek
	Repair and preserve heritage shark tower
	Provide for continued regular maintenance of the First Creek flow line as required
	The character to be developed in the surfing beach area is to be clearly a man-made landscape but making use of native rather than exotic plants
	Investigate feasibility of designating a buffer zone along the base of the bluff defined by fencing and/or guard rail, to minimise the risk of injury to persons through rock falls and provide adequate signage to warn people of this danger
	Develop sealed cycle routes
	Investigate the feasibility of constructing a path to provide adequate wheelchair access and construct if feasible
	Implement standards procedures for supervision by council staff of volunteer workers on community land
	Identify location and management requirements for any Aboriginal Sites as part of a City-wide Archaeological Study
	Determine alignment for coastal walk and construct walk. Remove weeds and rehabilitate creek line
	Provide cycle link along Collier St to proposed Colliery Railway cycle track, including sign posting and safe crossing of steel St.
	Determine need for water treatment facilities in reserve
	Finalise plan of management after consultation with reserve committee
	undertake further studies of water quality to establish suitability or determine source of pollutants
	Design lookout to allow safe access to viewing area with interpretative signage for whale watching, geology and shipwrecks
	provide for safety by fencing off dangerous areas
	provide for car park within road reserve
	revegetation of area with indigenous species
	Provide interpretation program
	Prepare maintenance strategy to allow for balance between retention of natural vegetation and access to views for residents

	1999 Coastline Management Plan
1999 CMP PoM 8 Awabakal NR area/Dudley	Incorporate small parcel of vacant Crown land into Awabakal NR; or investigate opportunities for developing a special facility – both in consultation with NPWS
	Provide for the alignment of the coastal walk – in consultation with NPWS
	Identify location of any Aboriginal sites, plus management requirements.
	Land parcel J (Dudley). Rehabilitate track, provide mulched surface, protect from further erosion.
	Land parcel J, 26, 27, 28. Retain areas as a wildlife corridor; protect habitat
	Land parcel J, 26, 27, 28. Consult with NPWS about possible transfer of tenure to Glenrock SRA
	Implement adopted management proposals. Construct access and lookout. Investigate use of local stone

	1999 Coastline Management Plan
1999 CMP PoM 9: Dudley Bluff	Construct a viewing platform with interpretative signage and/or rehabilitate using low growing species to permit observation
	Rehabilitate using low growing species to permit observation
	Include unformed section of Goulburn St reserve in community land
	Provide for safe access to Bluff and Beach, integrate track system with Coastal Walk
	Reduce non indigenous landscaping intrusion
	Provide for lookout and integrate with Coastal Walk

	Managing the Ecological Resilience of the Lake Macquarie Coast (2009)
Managing the Ecological Resilience of the Lake Macquarie Coast	Use environment protection zoning (E2 and E3) for all public land along the Lake Macquarie coastline, as for landward as the extent of coastal recession by 2100, plus a buffer.
	Wherever possible on coastal dunes/barriers, maintain a buffer zoned environment protection, to allow for ecological transition as dunes roll landward. This also applies to estuary shorelines where saltmarsh communities are present.
	Strengthen protection of the ecological condition and functions of coastal headland ecological communities through targeted weed control, fire regime management (where feasible), and access management. These headlands are the core of ecological resilience for the Lake Macquarie coastline.
	Maintain and encourage community involvement in dune restoration projects. Ensure that community groups are aware of the time limited benefits of works on the frontal dune system. Encourage projects that build the resilience of moderate to high significance communities, such as Middle Camp Beach and Dudley Beach. Encourage projects that prepare the hind dune and back barrier communities for future change. Encourage projects that nurture the renewal of coastal dune communities.
	Protect little tern breeding areas on beaches and dunes by seasonal exclusion of off road vehicles. Control unauthorised beach access, in partnership with influential beach users.
	Encourage pilot projects for re-establishing estuarine wetland communities, such as saltmarsh and sea grass, which will be affected by higher lake levels.
	Use planning controls and design guidelines to minimise the use of foreshore structures that restrict ecological transition (in estuarine and open coast situations). Remove existing barriers to wetland migration wherever possible.
	Further develop remote sensing techniques (using LiDAR derived terrestrial and marine digital terrain models and SPOT 5 satellite imagery), as tools to aid high resolution monitoring of ecological community extent and condition and ground surface change.
	Support the remote sensing tools with targeted field survey of biodiversity and condition. This includes beach macro and meiobenthos at selected high recreation and low recreation usage locations; themeda grasslands on headlands; coastal wetlands and a selection of barrier beach and pocket beach locations.
	Complete higher resolution coastal erosion and recession hazard studies for the Lake Macquarie coastline (beaches and dunes in particular). Preliminary analysis, which may be conservative, indicates serious losses of key ecological units along the coast over the 2050 and 2100 timeframes.
	Encourage further research on the behaviour of coastal dunes in pocket and long barrier coastal sediment compartments, as climate changes and sea level rises. Incorporate the results of these studies into future revisions of coastal risk and ecological resilience management.
	Update Plans of Management for coastal reserves, to ensure a consistent planning approach and to manage ecological transition with climate change.
	Communicate and consult to share accurate, up to date information about threats, objectives, management and outcomes for coastal ecological communities

	Blacksmiths/North Swansea Channel Master Plan (WP, 2009)
	General Foreshore Area
	construct shared cycleway/ path linking existing path along Awabakal Avenue to existing path from Swansea Bridge – possible future extension across highway and around Lake/ Bahtabah land
	Aboriginal community to monitor works where there is potential for middens or other sites to be disturbed and advise (where necessary) on route of shared cycleway/ path – opportunities for involvement in site works and interpretation (signage and possibly guided tours)
	interpret the natural and cultural values of area
	provide identity for reserve(s) through consistent signage and landscape design/ public art.
	Area 1 Awabakal Avenue to Boikon Street
	provide parallel parking along Ungala Road and incorporate traffic calming features in design to address speeding traffic (e.g. narrowing of roadway, bays divided by planting, pedestrian thresholds at beach accessways)
	incorporate shared pedestrian path/ cycleway in design of carparking along Ungala Road.
	Area 2 Surf Life Saving Club and Surrounding Parkland
	any redevelopment of the clubhouse is to be in line with Council's policies on coastline hazards (including sea level rise) with designs taking these hazards into account. Ideally new development should be located landward of the 100 year coastline hazard zone and incorporate storage for professional lifeguards
	provide public facilities in any redevelopment of clubhouse e.g. amenities (toilets, showers, change rooms) to reduce 'clutter'/ increase passive surveillance
	provide deck in association with proposed SLSC kiosk which could also be used as a commentary area/ stage etc for SLSC titles
	redesign carpark access roads/ carparks to provide safer linkages within reserve and across Ungala Road to the residential area
	Area 3 Granny's Pool, Breakwater and Wetland
	once the cottage is not longer in use as a residence, consider other uses for the cottage/ cottage site or adjacent areas including commercial and educational opportunities
	formalise carpark to maximise spaces and minimise damage to surrounding vegetation
	improve tidal flushing/ remove sand from Granny's Pool
	a WWII gun turret was located to the south of the SLSC which provides opportunities for interpretation – this area is also a good vantage point for interpretation of the Aboriginal site on the southern headland
	incorporate breakwater access/ part of access in shared cycleway/ walking track (while still providing access for maintenance/ professional anglers)
	construct wetland walk to control access and protect vegetation/ habitat, opportunities for interpretation/education e.g. school field trips
	any works should maintain/ enhance habitat for saltmarsh.
	Area 4 Boatsheds and Boatharbour
	incorporate public amenities (toilets/ showers) in future regional SLSC storage (note Swansea Belmont shed has hot showers etc) – consider combined public/ SLSC facilities
	improve visual amenity of boatsheds and use shadows to shade future picnic tables etc
	formalise carparking in the vicinity of boatsheds – in association with this, consider traffic calming elements
	provide boat landing area on beach on eastern side of boat harbour.
	improve efficiency of boat ramp through provision of an adjacent pontoon boarding area - this would enable boats to be launched and quickly moved away from the ramp area to avoid restricting the flow of ramp traffic; the pontoon could be used for holding, loading and boarding and facilitate the erection of masts and rigging for trailer/ sailers and large and deep draft boats; boats could also be launched by a single operator
	incorporate integral, level platforms for fishing in upgrading of rock revetment
	improve fish cleaning facility
	connect to existing cycleway and create picnic facilities/ nodal points along the channel.
	Area 5 near Swansea Bridge and Existing Cycleway
	in the short term maintain cleared area for viewing and water access for activities such as scuba diving and snorkelling (need to consider sightlines to channel, swift channel currents, possible safety issues/ conflicts with motorised craft)
	develop 'gateway' markers and link to Council's Gateway Master Plan
	in the longer term consider commercial opportunities in the vicinity of the cleared area (need to take into account that area is inundated during high tides).
	Lake Macquarie Coastline Management Plan
	update coastline hazard information based on current LMCC and NSW State Government polices on sea level rise
	map hazard lines based on the above to guide Master Plan detailed design phase.
	Plan of Management V Blacksmiths Beach Update and revise *Plan of Management V Blacksmiths Beach* (Umwelt and Gardner Brown 2001) to:
	include additional information provided in this report (e.g. site specific values);

	Blacksmiths/North Swansea Channel Master Plan (WP, 2009)
	ensure consistency between the Plan of Management (PoM) and Master Plan; and
	enable the Master Plan to be implemented. Specific matters to be addressed are:
	inclusion of Area 5 in the PoM and consideration of whether the area to the north (Management Unit VD in *Plan of Management V Blacksmiths Beach*) should still be included in the PoM (depending on the boundary of the proposed Belmont Wetlands State Park).
	revision of management units and land categories under the *Local Government Act 1993*, for consistency with the Master Plans (e.g. redundant and relocated car parks currently mapped as general community use)
	inclusion of site specific objectives and design principles (including consideration of sea level rise etc for the siting and design of new reserve buildings and structures)
	enabling future uses/ commercial opportunities to be developed, consistent with reserve values
	review/ formalisation of lease/ licence agreements and boundaries (current and potential)
	revision of follow-on actions, priorities and indicative costs.

	Belmont Wetlands State Park, Final Plan of Management (Andrews Neil, 2010)
	Undertake comprehensive vegetation mapping of the BWSP in association with the vegetation mapping commissioned by Lake Macquarie City Council.
	Undertake fauna studies and record the occurrence of Threatened Species (under the TSC Act.)
	Identify the location of Endangered Ecological Communities and threatened flora species listed under the TSC Act (1995).
	Prepare a Vegetation Management Plan to rehabilitate degraded areas and appropriately manage weed infestations, with a long term intent and commitment to implementing a VMP over the entire BWSP site.
	Undertake discussions with the Fernleigh Track Committee (Lake Macquarie City Council/Newcastle City Council) to protect existing vegetation along the Track that is in good condition.
	Implement recovery plans as prepared under the TSC Act (1995) for communities, species and populations listed as endangered or vulnerable.
	Investigate having BWSP acknowledged within an international migratory bird route status under agreements with the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA) and the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).
	Control pest fauna species in accordance with the Australian Government's Australia Pest Animal Management Program (APAMP).
	Retain, and where possible, enhance wildlife corridors within BWSP.
	Encourage and assist LMCC and other relevant stakeholders to prepare a Storm Water Management Plan designed to minimise the impact of the surrounding urban catchment on the wetlands. Include a review of the effectiveness of existing gross pollutant traps and sediment control devices at discharge points into the BWSP along with consideration of alternative techniques (such as retention basins) and ways to control non-point pollution sources entering the park.
	Undertake a study of all physical obstructions impeding hydrologic patterns within the park to determine the implications and potential benefits of rehabilitating hydrologic systems. The study should include estimates of the time it would take systems to readjust to any proposed changes.
	Liaise with the Aboriginal community to identify any known Aboriginal heritage sites and take protective measures to secure them against future damage.
	Consult the Aboriginal community regarding the management of Aboriginal sites, places and values
	Facilitate ongoing consultation with the Aboriginal Community regarding issues of Awabakal Culture and Heritage.
	Register any known Aboriginal sites with the National Parks and Wildlife Service Aboriginal Heritage Information Management System (AHIMS).
	Develop a creative program of site interpretation which covers important aspects of BWSP's Aboriginal heritage.
	Subject to funding, prepare an Aboriginal Cultural Heritage Management Plan (ACHMP) to manage Aboriginal cultural issues that may arise during ongoing development.
	Identify and document sites of cultural significance.
	Develop a creative program of site interpretation which covers important aspects of BWSP's European cultural heritage.
	Promote the history of BWSP and protect important heritage values.
	Support institutions and individuals conducting research into the parks natural and cultural values. Approval is required before research may be conducted.
	Make contact with and encourage visitation from a range of education institutions.
	Encourage the core education values of the BSWP including:
	Environmental stewardship and rehabilitation;
	Wetland education;
	Community involvement and participation;
	Access to and interpretation of historic sites;
	Research and study opportunities – e.g. coastal processes, wetland hydrology, management of public recreation and natural resources; and
	Establishment of mutually beneficial partnerships with neighbouring landholders and education institutions.
	Install and maintain an appropriate level of infrastructure to suit the specific requirements of each Management Zone.
	Install car parking facilities to support key activity areas.
	Investigate opportunities to use recycled water for irrigation in conjunction with Hunter Water Corporation.
	Ensure all facilities and infrastructure meet high standards of energy efficiency and environmentally sustainable design (ESD) principles (e.g. encourage the use of recycled water for irrigation purposes, solar power generation).
	Ensure facilities and infrastructure are designed according to Crime Prevention through Environmental Design (CPTED) principles.
	Develop waste management strategies that encourage recycling and waste separation at source.
	Workshop ideas with the local community to identify business opportunities that will benefit local people.
	Maximise funding opportunities through grants, sponsorship and other appropriate partnerships.
	Prepare and implement a Works Program for ongoing reserve maintenance.
	Prepare a Land Capability Assessment for areas where development and/or re-vegetation are proposed to occur.
	Encourage the use of shared facilities such as car parking with other local stakeholders such as Lake Macquarie City

	Belmont Wetlands State Park, Final Plan of Management (Andrews Neil, 2010)
	Council and the Hunter Institute of TAFE, Belmont Campus.
	Develop and implement measures which address specific problems such as alcohol restriction and hours of use within the BWSP.
	Subject to funding, employ a full-time Park Ranger/Caretaker to oversee park activities, enforce regulations and coordinate maintenance works.
	Establish a program of volunteer rangers/caretakers to support the Ranger in overseeing park activities.
	Investigate the possibility of exchanging the BWSP owned land adjoining Belmont Cemetery (Lot 3, DP211142) with publicly owned land directly adjoining BWSP.
	Discuss with adjoining Government landholders the opportunity to acquire land. (Parcels which should be considered include Lot 2 DP228483 (LMCC), Lot 104, DP533297 (LMCC), Lot 1, DP537587 (LMCC), Lot 6, DP814551, Lot 10, DP548901 (LMCC), Lot 21 DP709388 (LMCC) and the western portion of Lot 1 DP433549 (HWC
	Develop a coherent system of managed access to BWSP with a main entry at Kalaroo Road and a clear hierarchy of vehicular, pedestrian and cycle movements.
	Upgrade the Merleview Fire Trail to a pedestrian/cycleway and incorporate wetland rehabilitation initiatives into the track design (i.e. small bridges may become a design feature showcasing water cleansing initiatives). Emergency vehicle access to be maintained.
	Control unauthorised access to inappropriate areas using measures such as fencing, vegetation, signage and visual markers.
	Prohibit access of trail bikes, quad bikes, motorcross bikes and minibikes in all areas of BWSP and restrict 4WD beach access to a board and chain road originating at the Beach Village.
	Provide adequate and appropriate access for people with disabilities.
	Promote BWSP as a destination for Fernleigh Track users.
	Promote links from BWSP to the Great North Walk.
	As visitation increases, support additional public transport services to and from BWSP in conjunction with key stakeholders.
	Require all vehicles to have the appropriate permits and licenses (see section 12.2.5).
	Implement the strategic actions listed in the Belmont Wetlands State Park Communications Strategy (2008).
	Provide information to the community about the site, including development projects and upcoming events in which they can become involved (e.g. through newsletters, brochures and websites).
	Provide suitable opportunities for volunteer involvement.
	Subject to funding availability, develop a dedicated website for BWSP.
	Work collaboratively with the 'Friends of the Wetlands Park' Landcare group to undertake rehabilitation works and raise the profile of the park.
	Encourage community understanding and appreciation of the park's natural and cultural values through ongoing education programs as outlined in the Belmont Wetlands State Park Communication strategy (2008).
	Actively encourage the community to participate in rubbish removal through events such as Clean Up Australia Day.
	Remove existing rubbish found within BWSP and swiftly remove any rubbish or vandalism which occurs thereafter.
	Install and maintain litter bins, with recycling compartments, at appropriate locations, (i.e. Track entries).
	Maintain a regular rubbish collection service.
	Ensure prohibited activities are adequately signposted.
	Increase public activity within the Park to improve natural surveillance and discourage antisocial behaviour.
	Exercise powers under the Crown Lands Act and other laws to issue penalty notices or prosecute offenders.
	Develop public education programs discouraging anti-social behaviour in partnership with key stakeholders.
	Implement public education programs in partnership with key stakeholders covering issues such as the appropriate control of domestic pets and minimising weed spread.
	Clearly identify the BWSP boundaries using signage and appropriate design devices along the northern, western and southern park boundaries.
	Install appropriate access control measures at strategic points.
	Plan and maintain an Operational Risk Assessment process at all levels of park management, including a Public Safety Management Plan to identify and control all reasonably foreseeable risks to public safety.
	Test radioactivity levels in areas where development is proposed.
	Maintain a vegetated buffer zone of 400m around the Hunter Water Corporation Waste Water Treatment Plant to prevent odours affecting developed areas.
	Maintain adequate bush fire mitigation measures, including APZs and fire trails throughout BWSP in conjunction with the Land and Property Management Authority and the NSW Rural Fire Service.
	Prepare a Bushfire Management Plan in accordance with NSW Rural Fire Service, Planning for Bushfire Protection 200
	Continue to maintain a record of fire burn history in conjunction with the Land and Property Management Authority and NSW Rural Fire Service.
	Implement bush fire hazard reduction and ecological burns in accordance with the Bush Fire Management Plan and

	Belmont Wetlands State Park, Final Plan of Management (Andrews Neil, 2010)
	Biodiversity Thresholds for all vegetated areas.
	Prepare and implement a Weed Control Plan to manage aquatic and other weeds impacting on wetland and water bodies following a review and upgrade of the gross pollutant traps and sediment control devices that drain into the wetlands.
	Prepare a Vegetation Management Plan to rehabilitate degraded areas and appropriately manage weed infestations, with a long term intent and commitment to implementing a VMP over the entire BWSP site.
	Subject to an analysis by a suitably qualified ecologist re- establish the vegetative links between the wetlands.
	Revegetate Third Creek margins using locally occurring riparian species.
	Create a bird island sanctuary on the Belmont Lagoon airshaft peninsula and restrict general access.
	Monitor rehabilitation works within the wetlands.
	In association with the Rural Fire Service, undertake any required ecological and hazard reduction burns within biodiversity thresholds.
	Provide access to appropriate passive recreation facilities such as walking and cycling trails and viewing decks for bird watching.
	Liaise with LMCC and the the Aboriginal Community to authorise the use of kayaks and canoes on Belmont Lagoon for tourism, recreation and/or educational purposes under the guidance of recognised environmental managers.
	Liaise with LMCC and the Department of Planning to encourage the development of the Fernleigh Track as an all weather walkway/cycleway and promote as part of the NSW Coastline Cycleway route.
	Rehabilitate and reopen the historic Burma Track as a local walking trail and provide connectivity to the Fernleigh Track.
	Construct and maintain pedestrian boardwalks in appropriate wetland areas. Restrict pedestrian access in environmentally sensitive areas.
	Prohibit motorised vehicular access in this Management Zone with the exception of authorised emergency and maintenance vehicles.
	Identify point and non-point sources of pollution to the wetlands.
	Prepare and implement a long term water quality and biological monitoring program to assist in the assessment of wetland health in conjunction with HCRCMA and other relevant agencies.
	Avoid exposure of acid sulfate soils by prohibiting development in areas where exposure of these soils is expected to occur.
	Prepare a Wetland Services Rehabilitation Plan, in association with the HWC along the George Street pipeline easement to allow the enhanced connection of Belmont Lagoon to SEPP14 wetland 867.
	Commission a comprehensive review by suitably qualified personnel to assess the advantages and disadvantages of returning the majority of Belmont Lagoon to its original fresh water status by mitigating marine water inflow.
	Prepare groundwater and catchment studies to determine if and where Jewells Swamp catchment Flood Flows may be directed into the BWSP wetland environment.
	Prepare and implement a SEPP 14 boundary definition program aimed at re-defining the SEPP 14 boundaries in consultation with relevant stakeholders to ensure accurate delineation and protection of these assets.
	It is possible that burials may still exist in undisturbed areas around wetland margins. Advise representatives of the Aboriginal Community if any human skeletal remains are located.
	Liaise with LMCC as they implement plans for the conversion of the Fernleigh Track into a pedestrian walkway/cycleway.
	Investigate the extent of remains of the old Belmont Railway Station and John Darling Colliery Railway Line for archaeological significance. Any artefacts found are to be protected and may potentially be incorporated into an interpretive heritage feature. Literal reproduction of historic sites is to be avoided.
	Liaise with Lake Macquarie City Council to promote the incorporation of Belmont Lagoon and BWSP into one overall land management parcel.
	Prepare and implement a Coastal Vegetation Management Plan aimed at gradually phasing out Bitou Bush and other weeds with replacement planting of local provenance plant stock.
	Prepare a Vegetation Management Plan to rehabilitate degraded areas and appropriately manage weed infestations, with a long term intent and commitment to implementing a VMP over the entire BWSP site.
	Maintain habitat through the control of introduced fauna and flora.
	Provide viewing platforms, pedestrian pathways and rest areas that take advantage of scenic view corridors and do not detract from those residents who have views over the park.
	Provide a formalised board and chain beach access point for 4WD vehicles.
	Develop, in consultation with LMCC, NSW Police, LPMA and Hunter Water a beach access permit system with an appropriate fee structure.
	Provide beach access at defined points for pedestrians, separate from vehicular roads.
	Provide access along the beach and foredune for future development of the Lake Macquarie Coastline Walkway.
	Provide pedestrian links to surrounding areas including Lake Macquarie, Blacksmiths Beach and Redhead.
	Develop and introduce a beach driving permit system in consultation with LMCC and review regularly. Permits will be required to drive on Nine Mile Beach in designated areas where and when beach driving is permitted.
	Drivers are required to purchase a permit prior to accessing the beach which is to be clearly displayed at all times.

	Belmont Wetlands State Park, Final Plan of Management (Andrews Neil, 2010)
	Information about beach driving is to be provided to drivers at the time of purchase.
	Prepare information and a Code of Conduct for beach driving and include with the literature provided to permit holders at the time of purchase. The permit will be revoked if drivers fail to comply with the conditions of the permit.
	Vehicle travel on Nine Mile Beach to be restricted to below high water mark. Speed limits of 30km/hr or 15km/hr within 50m of another beach user are to be imposed.
	Implement beach closures to sections where threatened species are found to nest.
	Enforce compliance via issue of penalty notices and/or permit cancellations for repeat or serious offences.
	Identify sensitive areas and exclude vehicle use by various techniques such as fencing, bollards, mounding and the like.
	Provide access to Nine Mile beach for swimming, walking, fishing, surfing and other appropriate recreational activities.
	Since the beach will be relatively remote and un-patrolled, install appropriate signage regarding hazards.
	Provide education opportunities and interpretive information about the role and value of the coastal zone within the park and across the region.
	Provide information and regulatory signage at beach access points and other key locations.
	Provide markers and signage to clearly identify areas where off-road vehicle access is permitted or prohibited.
	Prepare a Coastal Vegetation Management Plan (CVMP) for the rehabilitation of the BWSP foredune. Include within this plan an assessment of the feasibility of importing material to restore the natural dune profiles and if feasible provide workable techniques for stabilising imported and in-situ material.
	Included in the CVMP strategies to restore and stabilise existing blow out erosion sites.
	Close and rehabilitate disturbed areas and illegally formed vehicular tracks and implement a formal system of vehicle and pedestrian access across the foredune to Nine Mile Beach.
	Design and situate beach access points to minimise wind erosion and subsequent vegetation and dune damage.
	Liaise with LMCC to close beach access and repair damage as necessary following storm events.
	When heavy seas remove considerable quantities of sand and travel is not possible at high tide, the beach is to be closed to vehicles until sand returns and adequate beach width is restored.
	Liaise with LMCC to develop a Risk Assessment and Management Program for coastline access.
	Liaise with LMCC to develop a Risk Assessment and Management Plan to reduce coastal hazards for the whole coastline, in line with the Lake Macquarie Coastline Management Plan's Whole of Coastline approach.
	Progressively remove dominant weed species and rehabilitate degraded areas with local provenance plant stock.
	Non invasive exotic species are permitted around key development areas where a maintenance program is implemented.
	Undertake ecological and hazard reduction burns within biodiversity thresholds.
	Provide and maintain public recreation facilities in existing degraded areas, including:, Picnic areas with gas/electric barbeques, Public toilets and drinking fountains, Children's playground, Public entertainment areas, Viewing platforms, Pedestrian walkways, Cycleways, Bike racks and Signage
	Provide and maintain camping areas accessible for a fee.
	Encourage small to medium sized outdoor entertainment activities such as music performances, outdoor theatre/cinema etc.
	Focus on interpretation that tells the story of the park's natural and industrial heritage within this Management Zone.
	Rubbish bins to be placed in strategic locations and include a recycling component.
	Install gas/electric barbecues and discourage open fires within the park.
	Dogs are permitted on-lead within this Management Zone.
	Situate facilities such as roads and carparks in existing degraded areas and ensure they harmonise with their surroundings and are visually unobtrusive.
	Locate car parking facilities close to main access roads to limit the extent of hard surfaces within the park.
	For developments that are remote from services, investigate on-site treatment of waste water and the use of alternative energy sources such as solar power.
	Select materials that are in keeping with the coastal character of the BWSP such as sand, timber and native grasses. Exotic turf species are to be avoided. Non permeable surfaces are to be minimised.
	New infrastructure is to be contemporary in form and reflect the coastal character of the site and its environs'.
	Provide areas for commercial development that are in keeping with the park's values and character.
	Foster the development of commercial activities which would enhance the use of the park.
	Ensure that all commercial leases and licenses represent a sound financial return reflecting full land value.
	Identify and access funding available through government grant programs.
	All significant commercial developments to be subject to a competitive tendering process to ensure a competitive financial return.
	Provide facilities and infrastructure that support learning such as; A Visitor Centre, Guided tours (including cultural heritage tours in conjunction with Bahtabah Local Aboriginal Land Council, Awabakal Traditional Owners Aboriginal Corporation; and Awabakal Descendants Traditional Owners Aboriginal Corporation)

APPENDIX 2

Consultation:

Community Uses Survey

Community Values and Uses Surveys

The survey was undertaken to engage the community, and provide an opportunity for them to contribute their values and opinions to the Plan.

The survey was conducted online and paper copies were made available and distributed to at information sessions. There were 150 respondents. The survey consisted of twelve questions. The first seven questions related to the demographics of the users, how often they visited/used the coast, their preferred coastal locations and what activities they enjoyed at the coast. The next three questions were about how the community viewed change within the coastal zone, whether they thought things had changed for the better/worse in recent times, what things they'd like to change, and whether they thought things would actually change for the better/worse in future. The last question was to gauge opinions about what issues they consider to be important, and any additional comments they had.

The survey results illustrate the ways in which people who live along the coast or visit the coast for recreation value the coastal landscape as part of their lives. Survey input highlights values such as those noted below:

- Open space – the beach, the bush and foreshore reserves
- Extensive views – to the horizon, plus waves and wildlife
- Cooling water and breezes in summer
- Coast and lake connections – e.g. Swansea Channel walkways, breakwall, Grannys Pool
- Fishing – recreational and commercial (mullet run, beach haul fishery) (so
- Safe swimming and surfing
- Walking and wandering (people, dogs – lots of happy dogs and their owners), beach and rock platform, headland bush tracks
- Cycling along a network of trails
- Social gathering – weekends and a place to holiday – surf clubs, coal fields traditions and the local communities of camp grounds, golf course
- A beautiful place to take visitors
- Cultural and spiritual values – peace, traditional attachment etc
- Recreational adventure – close to urban areas – water based (e.g. kite surfing, scuba diving) and vehicles in the dunes
- Local access and control (beach-side communities at Catherine Hill Bay, Caves Beach, Blacksmiths, Redhead and Dudley) of actions to protect the environment (or access ways) e.g. local Landcare groups
- View that Council is helping to protect what they value
- Concerns voiced by the community were varied and covered a number of key themes. The community uses survey enabled us to gather a picture of the actual use of the coast, but also how people value the coast. There were opportunities within the survey to give opinions, this section notes some of the take home messages voiced separated into themes, recreational use, access, amenity and cultural heritage.

It should be noted that this survey was not intended to be a statistical sample of the residents of the Lake Macquarie area. Rather, it provided an opportunity for people with an interest in the management of the coast to provide some direct input to the project. This local experience is effective for describing and qualifying the ways in which people use and value the coast, and to scope the issues that concern residents.

The results of the survey that are reported below reflect this purpose. The type and diversity of responses are important, not the statistics.

Survey Results

Of the 150 respondents, the majority live in the Lake Macquarie LGA. The greatest number came from the 2290 postcode which includes Bennetts Green, Charlestown, Dudley, Gateshead, Hillsborough, Kahibah, Mount Hutton, Redhead, Tingira Heights and Whitebridge.

The age groups of those surveyed were quite even. Although those who responded were mostly in the more mature age groups, all ages groups were reasonably well represented. This is the same for gender; the number of males and females was quite even.

Of the beach areas visited by the respondents, Redhead is visited the most frequently. Some to the southern area beaches such as Middle Camp and Spoon Rocks are the least frequented locations. Figure x shows each area and how frequently they are visited.

The most frequently used modes of transport to arrive at the beach were driving a car and walking. Biking is also a popular option. Figure x shows how frequently each mode of transport is taken by respondents.

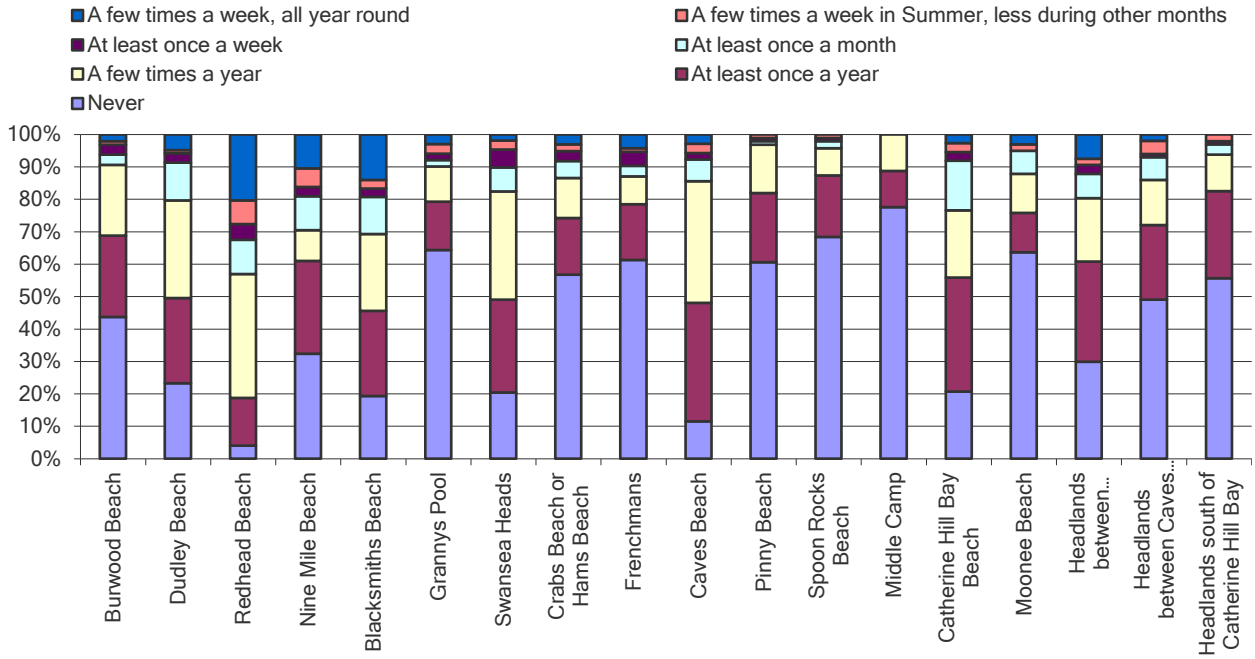

Figure 1 - How often do you visit the following locations?

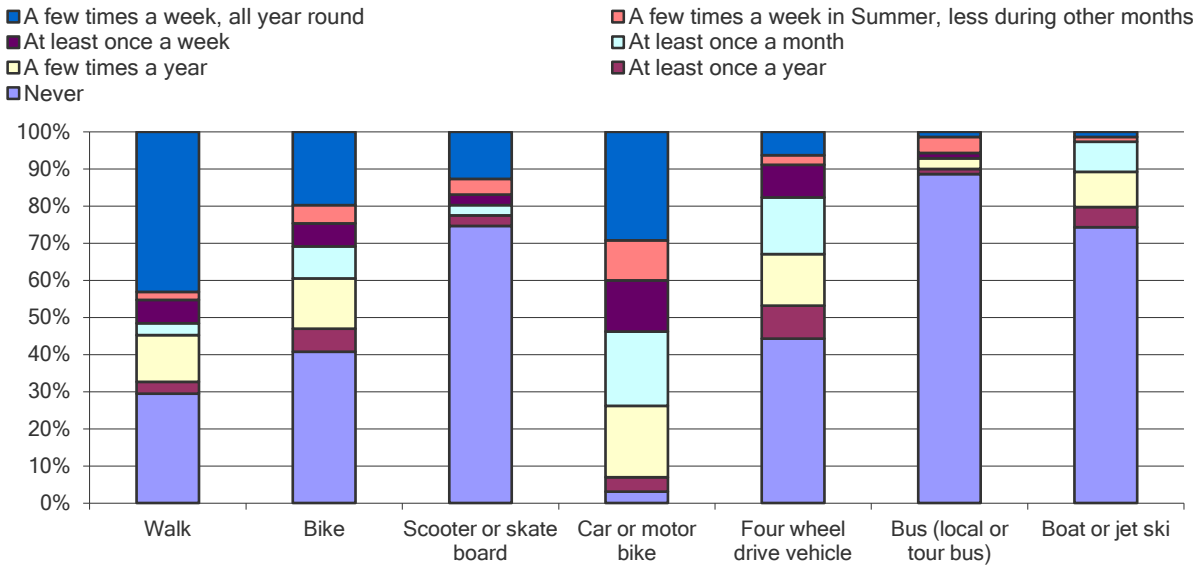

Figure 2 - How do you travel to the coast?

Question 6 was intended to give an idea of what activities the community enjoyed when at the coast. The most popular activities undertaken sometimes or often were rock platform, beach and bush walking, whale watching, enjoying the view, swimming and picnics. The activities enjoyed least frequently were commercial fishing, kite or wind surfing and cultural and conservation activities. **Error! Reference source not found.** shows how frequent each activity is undertaken by the respondents.

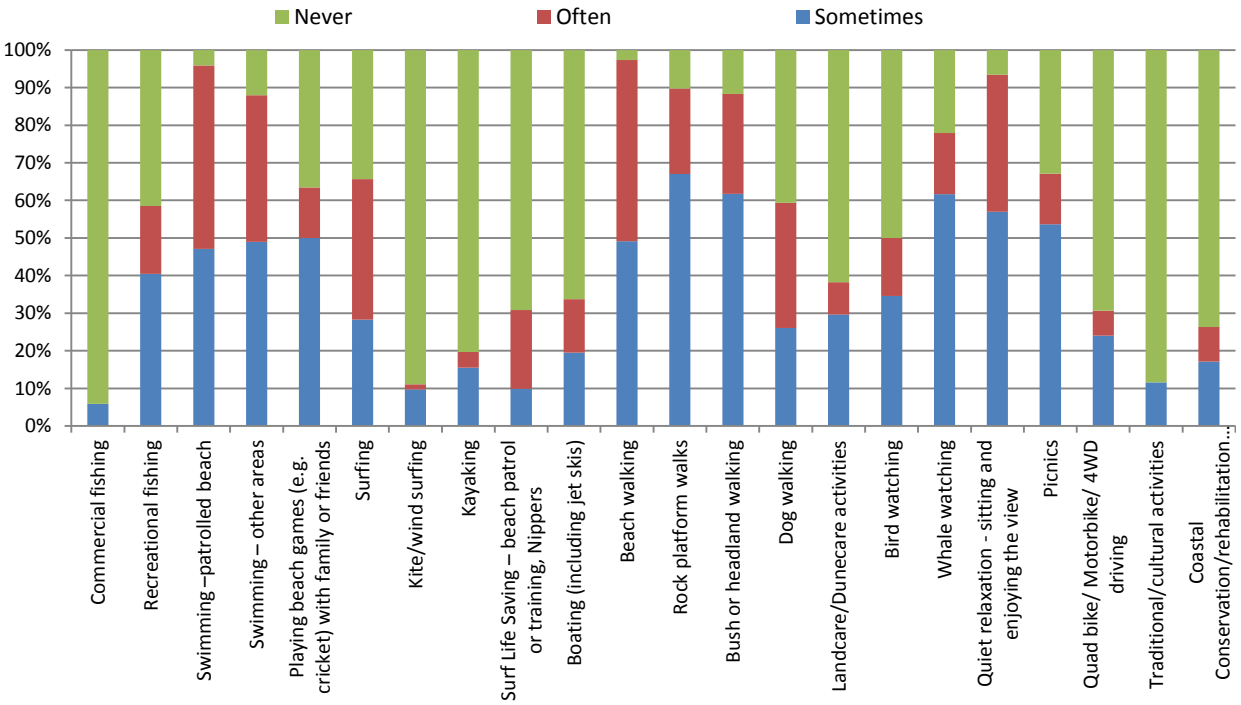

Figure 3 - What do you do when you visit the coast?

The local places where the previous questions activities are mostly undertaken are shown in **Figure Error! No text of specified style in document.**.1. The most popular place for

general recreation is at Redhead, with Dudley the next favoured location. Swansea Heads is considered the best place for fishing and boating.

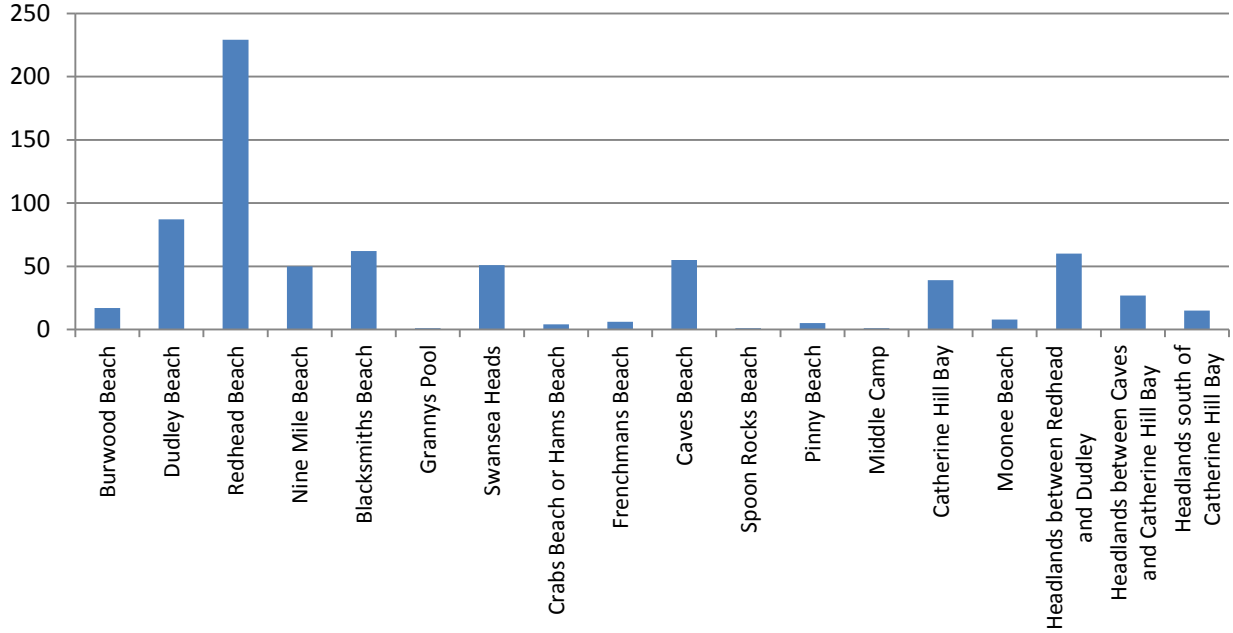

Figure Error! No text of specified style in document.**.1 Where is the best place to undertake those activities?**

Question 7 asked respondents to rank values based on their importance and suggest any others. The most important features and values considered by the public were that the area was free of litter, water is clean, and beaches are safe for swimming. The least important were being close to a boat ramp, being members at a surf club and having tracks for bush bike riding as shown in **Figure Error! No text of specified style in document.**.2.

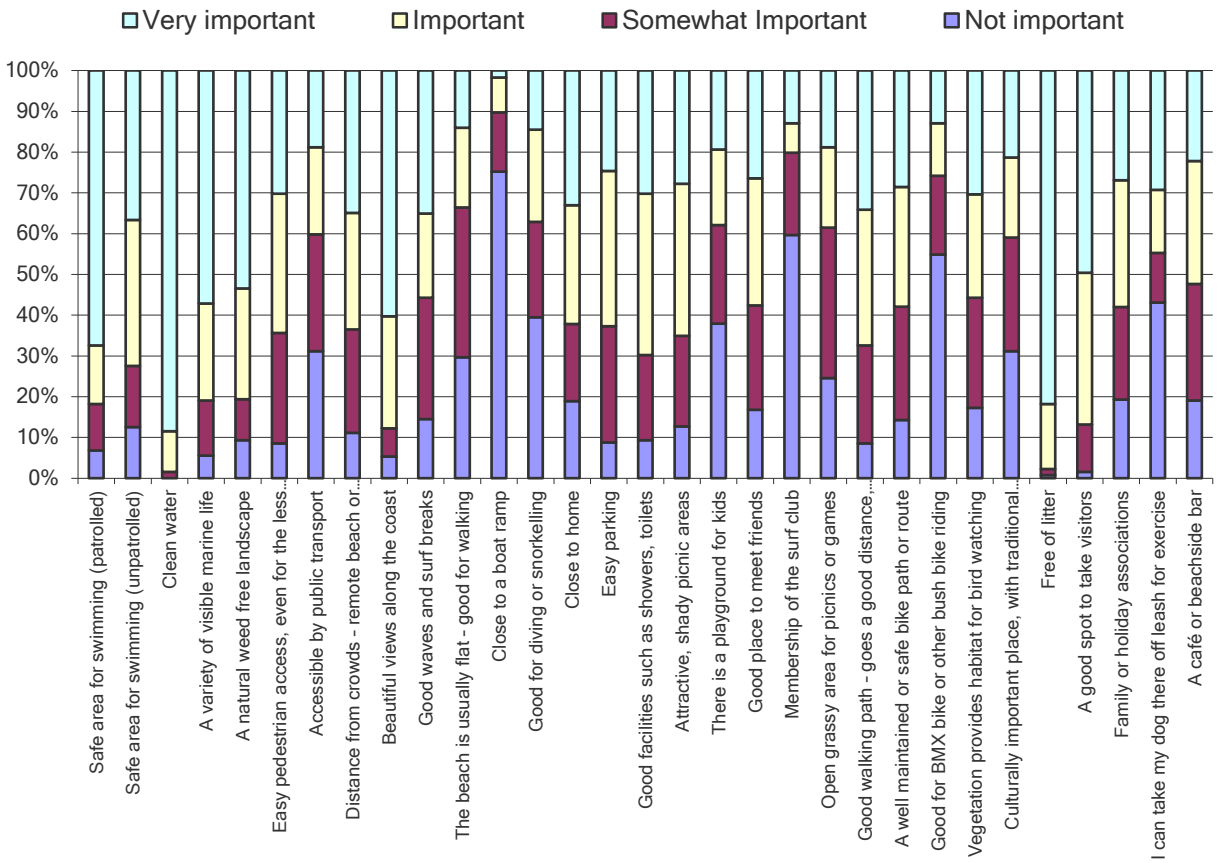

Figure Error! No text of specified style in document.**.2 How important are the following features/values to you?**

Question 8 asked for respondents to give their opinions on if and how the coastal areas and facilities have changed in the last five years. The 42.6% thought there had been little change in the last five years, with 22.8% thinking things had improved. Quite a small percentage thought things had degraded or didn't know.

The general consensus of the written responses is that there have been some improvements made in some areas, however others are lacking. Many like the Fernleigh Track and the improvements to the Belmont Wetlands Park. Some of the buildings and facilities have been painted and refreshed in appearance (e.g. Redhead SLSC), however some need more thorough refurbishment (e.g. Blacksmiths, amongst others). Dune and Landcare activities have improved the dune vegetation in areas; however there is little connectivity between the areas targeted for upkeep and the neighbouring tenures. Of those who considered the area to have degraded in the past 5 years, it was mainly related to the lack of maintenance and upkeep of the current facilities and walkways, the erosion of the beach due to natural and anthropogenic causes (e.g. 4WDs) and increases in litter.

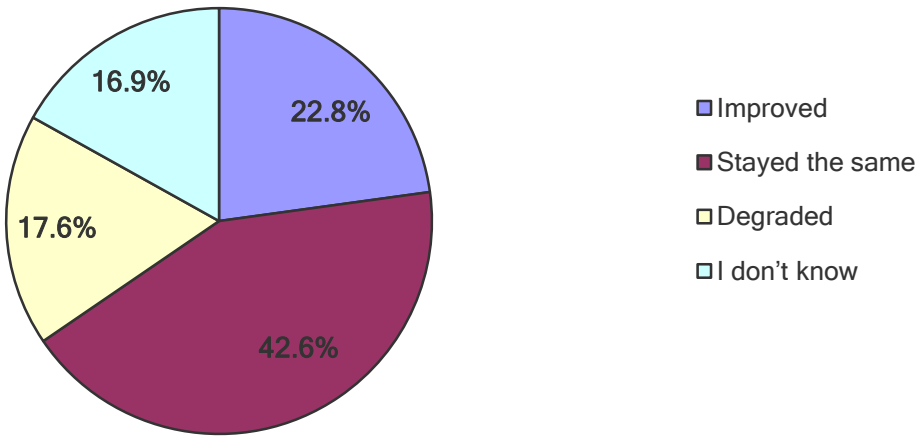

Figure Error! No text of specified style in document.**.3 How has the Lake Macquarie coast (including the facilities) changed in the last five years?**

Following on from that question, the next asked 'What changes would you like to see along the Lake Macquarie coastline?'. The responses were numerous and varied and covered a number of themes including recreation, access, amenity, dune conservation, development and infrastructure. **Table x** summarises these responses, in the context of concerns and issues.

The last question asked respondents to consider the five most important issues for the Lake Macquarie coast, and rank them from most to least important. The results of this are shown in **Figure Error! No text of specified style in document.**.4. The results are averaged and graphed and ordered from most to least important for ease of reference. The clear message from this is that the community is considered with the coastal zone being overdeveloped, rubbish dumping and damage to costal habitats and vegetation. Alternately the least important issue was underdevelopment, followed closely by the lack of clear boundaries between tenures and safety on headland tracks.

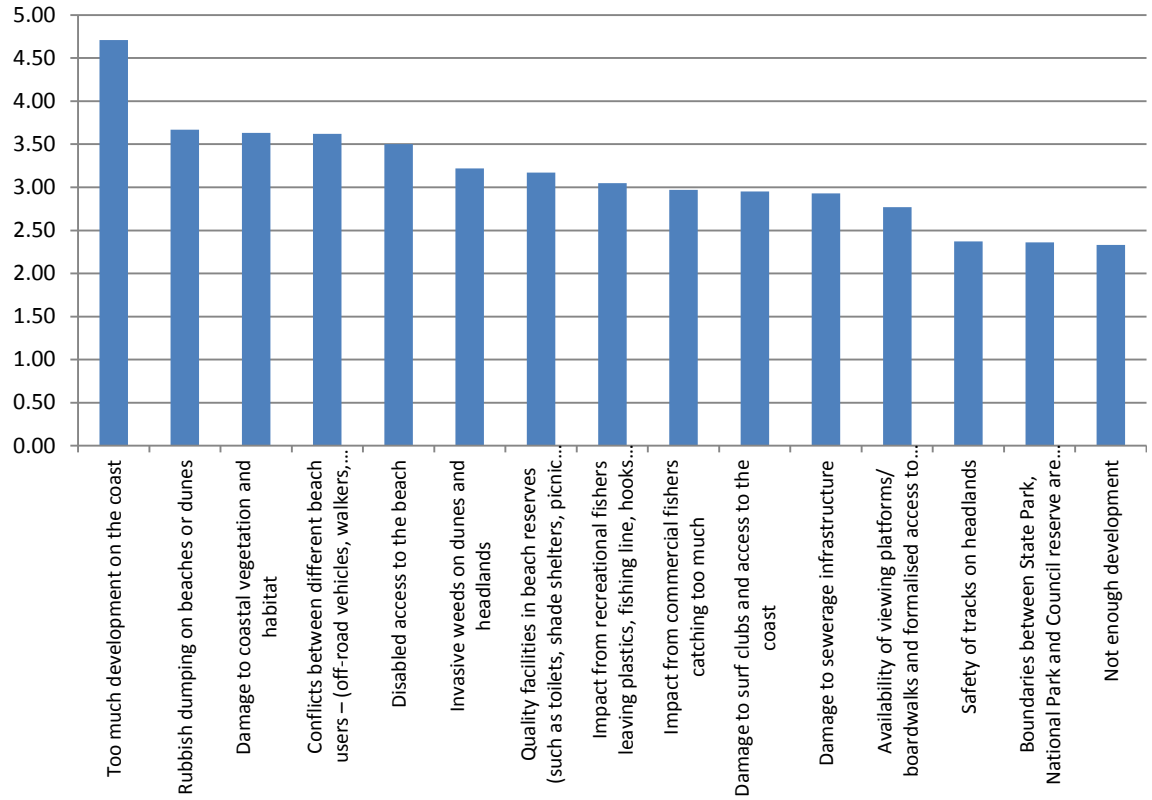

Figure Error! No text of specified style in document.**.4 What do you think are the five most important issues for the Lake Macquarie coastline? (1 being least important, 5 being most important)**

1.1.1.1 Summary of Community Concerns and Issues

Table Error! No text of specified style in document.**.1 Community concerns and issues**

Theme	Issue	Details
Recreational use	Dogs on beaches	Concern over the allowance of dogs on certain beaches and dog waste.
	Walkways and pathways	Maximising connectivity between pathways and walking tracks along the foreshore, especially at Redhead and Blacksmiths (where there is no path). Construct a beach boardwalk. Possibility of path connecting lake to beach.
	Grannies Pool	Re-establishment to its former state.
	Community events	Music, events for kids
	Exercise facilities along established tracks	The tracks and pathways most used for recreation, add some exercise bars etc.
Access	Disabled or mobility impaired	Some beach areas are lacking in accesses for less able and aged community members.
	Unusable access ways	Some accesses are over grown and not passable.

Theme	Issue	Details
	Repairs to access ways and maintenance	Some access tracks also require more frequent routine maintenance.
	Restrict and formalise access points (4WDs, quad bikes)	Restrict access to some areas and formalise remaining access points.
Amenity	Lack of facilities	- Picnic/ bbq facilities with shade - Bike racks - Footpaths - Toilets/showers
	Beach Erosion	Lack of dry beach width for recreation with increased erosion.
	Rubbish and marine debris	Lack of bins and cleanup crews. Bins should be emptied daily or twice daily during summer. Better policing of refuse dumping.
	Condition of current facilities	The maintenance and upkeep of facilities is seen to be lacking e.g. toilet blocks, showers, surf clubs.
Misc.	Landcare, dunecare and conservation	Better and more consistent management of these activities.
	Education	Relating to all aspects of coastal management, climate change, SLR, dune vegetation etc.
	Water quality	Ensure quality is monitored for recreational health.
	Invasive species and weed management	Removal of unfavourable species and weeds, and replaced with natives.
	Population pressures and infrastructure	Focus on primary infrastructure, roads, storm water etc. and amenity infrastructure such as car parks.
	Better communication	More information for residents when Council makes decisions that affect them.
	Social behaviour	Better policing for vandalism, graffiti, littering etc.
	Swansea Channel Dredging	Conflicting opinions, some want more dredging, some want it to stop.
	Limit development	Limit the amount and type of development in the coastal zone.

APPENDIX 3
LMCC COASTAL ZONE EMERGENCY ACTION SUB-PLAN

1 INTRODUCTION

1.1 Coastal Zone Management Planning

The process for managing coastal hazards and coastal risks along the New South Wales coast is through the preparation of Coastal Zone Management Plans. Through the development and subsequent implementation of these plans, the coastal hazards are identified and, as appropriate, the risks are addressed through a range of planning and protection measures. In this way the likelihood of emergencies resulting from erosion during storm events is minimised. The need for unplanned protection is reduced and the risk to life and property managed. The residual risk to properties, assets and life until such time as the key elements of the plan have been adopted or as a result of potential unforeseen outcomes or storm severity are covered by this Coastal Erosion Emergency Action Subplan (EASP).

The EASP is a required component of the preparation of a Coastal Zone Management Plan (CZMP) as set out in the NSW *Coastal Protection Act 1979* (the CPA). Section 55C(1)(b) of the CPA states a CZMP must provide for *'emergency actions carried out during periods of beach erosion, including the carrying out of related works, such as works for the protection of property affected or likely to be affected by beach erosion, where beach erosion occurs through storm activity or an extreme or irregular event'.* Section 4 of the CPA states that the part of a CZMP that deals with the matters specified in Section 55C(1)(b) is an emergency action sub plan (OEH 2011, page 1).

1.2 The Role of the Coastal Erosion Emergency Action Sub-plan

"The emergency action sub-plan forms an integral component of a CZMP. It outlines a council's intended response to a coastal erosion emergency and explains ways in which and where beachfront property owners can place emergency coastal protection works according to the Coastal Protection Act 1979 (CPA)" (OEH 2011, page 1).

"Section 55C(2)(a) of the CPA requires that CZMPs ***must not*** *include matters dealt with in any plan made under the State Emergency and Rescue Management Act 1989 (SERMA) in relation to emergency responses.*

The roles and responsibilities of government agencies, councils and other relevant organisations during severe storm events (including events that cause erosion) are detailed in the NSW State Storm Plan (SES 2007)" (OEH 2011, page 1).

1.3 Extent of the Coastal Erosion Emergency Action Sub-plan

The OEH Guide (2011) advises that *"The minimum area to be covered by an emergency action sub-plan would be either:*

- *any area defined by a direction from the Minister according to Section 55B of the CPA; or*
- *all beachfront margins where erosion is likely to threaten public and private infrastructure or assets.*

The sub-plan may also cover areas of the coastline accessed or utilised by the general public where there is an identified threat posed by erosion, e.g. walking tracks through coastal parkland."

No direction has been issued under Section 55B for the Lake Macquarie Local Government Area (LGA) coastal zone. The extent of this EASP is, therefore defined as the coastal margins of the ocean beaches and headlands within the city boundaries, extending from Dudley Beach in the North to Wybung Head in the south.

1.4 Minimum Requirements for Emergency Action Sub-plans

The EASP must be consistent with and not duplicate or contradict any plans prepared under the *State Emergency and Rescue Management Act 1989* (SERM Act). The relationship between these two planning frameworks is indicated in Table 1 which has been adapted from OEH, 2011 (page 14).

Table 1 Contents of EASP and SERM Act plans (adapted from OEH, 2011)

Emergency Action Sub Plans	SERM Act Plans
Any coastal protection works / physical mitigation works or other actions to be carried out by council when coastal erosion is imminent or occurring, or in recovering from coastal erosion.	Actions in relation to the prevention of, preparation for, response to and recovery from emergencies, excluding permanent or temporary coastal protection works.
Any additional requirements for landowner placement of emergency coastal protection works beyond those in the *Coastal Protection Act 1979* (e.g. constraints on access and the location of works) *	Actions are consistent with the NSW State Disaster Plan and the State Storm Sub Plan.

** No locations for emergency coastal protection works in accordance with the CPA 1979 have been identified in the Lake Macquarie LGA coastal zone.*

Where landowners are eligible to place emergency coastal protection works, the EASP is to be prepared with direct consultation with landowners affected by the subplan. In the Lake Macquarie LGA coastal zone at present there are no private properties identified as eligible to place emergency coastal protection works in accordance with the CPA (Part 4C). Therefore, this requirement is not currently applicable.

The minimum requirements for a Coastal Erosion Emergency Action Subplan are set out in the NSW Government Guideline (OEH, 2011) which reflects the requirements expressed in the CPA 1979. These are:

- describing intended emergency actions to be carried out during periods of beach erosion, such as coastal protection works for property or asset protection, other than matters dealt with in any plan made under the *State Emergency and Rescue Management Act 1989* relating to emergency response (sections 55C(1)(b) and (g) of the CPA *1979*)
- describing any site-specific requirements for landowner emergency coastal protection works
- describing the consultation carried out with the owners of land affected by a subplan.

2 EMERGENCY PLANNING HIERARCHY

2.1 Declared Storm Emergency

There is a clear hierarchy in planning and responsibility that applies to emergency management in NSW, including those emergencies resulting from a defined storm or disaster. The NSW State Emergency Service is the designated Combat Agency for dealing with these events and are in charge of the emergency response. The various roles and responsibilities are defined in the NSW State DISPLAN and within the Lake Macquarie Local Disaster Plan (DISPLAN) 2011, as follows.

- Section 1.4 ACTIVATION FOR FLOOD AND STORM of the DISPLAN states "*in both flood or storm emergencies, the Local DISPLAN for the area to which the emergency applies is automatically active and Police and other Emergency Services and Functional Areas are to provide support and resources if requested by the appointed Local State Emergency Service Controller*".
- Part 2 – Agency Roles and Responsibilities Section 2.1 of the DISPLAN identifies the organisations from either the NSW State DISPLAN or by local arrangement as the agencies primarily responsible for controlling the following hazards / emergencies of relevance to this EASP:

Hazards / Emergency Events	**Agency or EOCON Responsible for Control and Initial Recovery**
Coastal Erosion	**NSW State Emergency Service** – protection of readily moveable household goods and commercial stock and equipment. **Lake Macquarie City Council** – construction of physical mitigation works for protection of coastal property on land under its care and control.
Tidal Inundation	**NSW State Emergency Service**

The Lake Macquarie DISPLAN therefore informs this Coastal Erosion Emergency Action Sub-plan.

The role of Council in a storm emergency is limited to those activities that may be requested by the SES to assist with the emergency relief or to activities (including protection works) undertaken by the Council to protect assets under Council control. Where any proposed protection works require development approval, Council must only undertake such works during an emergency where the consent has been obtained in advance. Where the works are exempt (such as minor works or emergency works to protect a road or stormwater system under SEPP (Infrastructure) 2007) Council must first undertake an assessment to determine that the works will not result in a significant adverse environmental impact. Before undertaking any works, Council must also confirm that the works proposed are in accordance with the currently gazetted (or adopted) Coastal Zone Management Plan.

There are no protection works proposed for emergency management purposes under this EASP that require development consent.

Following the emergency, Council is involved in the remediation of damage or hazards and the reinstatement of the dunes, beaches and accessways in an appropriate and safe manner. This will include works of varying priorities and timeframes in accordance with usual Council maintenance procedures.

2.2 Coastal Erosion Emergency (not triggered by a storm)

Where the erosion emergency arises from events other than a declared storm event, then the requirement of the State Storm Plan and Lake Macquarie DISPLAN are not activated. Such an event could arise for example from a period of high tides and large swell, resulting in substantial erosion to the back of the beach. For these conditions it is likely that the erosion resulting would be substantially less than that which would result from the design storm event (unless such an event was to occur immediately following a severe storm event).

It is not possible to determine a trigger event for such an occurrence. Therefore, the determination to invoke this emergency sub-plan (in this case by Council) would need to be based on monitoring of the beach state (such as outlined for specific locations in the Lake Macquarie CZMP and preceding documents). In such a case, the EASP would be implemented following a request from the designated Council Officer.

2.3 Assets and Development at Threat

The extent of coastal hazards within the Lake Macquarie LGA coastal zone is defined in the Lake Macquarie Coastal Zone Hazards and Risk Assessment (BMT WBM, 2012). This study maps the probably landward extent of erosion hazards that may be anticipated for various planning timeframes. Specifically, the probable landward extent of erosion hazards at present are defined in Maps included in the Lake Macquarie Coastal Zone Hazards and Risk Assessment (BMT WBM, 2012) in Figures A1 to A9 and form the basis for defining the extent of the erosion hazard at present.

Within the Lake Macquarie LGA coastal zone the 'unlikely' extent of beach erosion at the immediate (present) timeframe is mainly restricted to the sandy beach area with little public infrastructure or private property likely to be affected. Significant encroachments of the storm erosion extent threatening existing development are limited to the following locations:

- Redhead Surf Life Savings Club (SLSC) and adjacent carpark and amenities, and private sewer line to the surf club on Redhead Beach (BMT WBM (2012) Figure A-2 and G-2);
- Belmont-Swansea SLSC and adjacent car park and amenities on Blacksmiths Beach (BMT WBM (2012) Figure A-5); and
- Caves Beach SLSC and adjacent car park and amenities on Caves Beach (BMT WBM (2012) Figure A-6); and
- Carparks, Flowers Drive and disused railway line (heritage listed) on Middle Camp Beach, Catherine Hill Bay (BMT WBM (2012) Figure A-8 and G-8).

Minor encroachments of the erosion extent may also threaten private property in the following locations:

- Up to three properties on Ebsworth Street, Redhead (and associated sewer and water lines) (BMT WBM (2012) Figure A-2 and G-2)

- One private property on Flowers Drive, Catherine Hill Bay (BMT WBM (2012) Figure A-8).
- The outfall and effluent main to Belmont Sewage Treatment Works on Nine Mile Beach (BMT WBM (2012) Figure A-4 and G-4).

In addition to these specific assets there are different types of activities, development and areas that may be impacted during an erosion emergency. These include:

- stormwater and drainage outlet structures located on beaches;
- defined beach and dune access tracks under care and control of Council; and
- the beaches and dunes.

These exist within an area of known high hazard and are either designed to accommodate the erosion events (such as the stormwater outlets), or are temporarily affected by erosion, limiting their use by the community (such as beaches and accessways). In each case the opportunity to protect the asset prior to an erosion event is low and the risk to life during an event is low. Similarly, the opportunity to undertake emergency works during an event is low and the preferred approach is to identify and assess impacts and repair the asset following the event. In most instances this becomes a routine maintenance role.

The landward extent of the erosion hazard as considered in this EASP may increase into the future as sea level rises. The impacts on the future revisions of the EASP should take this into account at each plan review.

3 EMERGENCY RESPONSES

3.1 Communication

3.1.1 Storm Emergency

Where coastal erosion is anticipated as a result of a declared storm emergency, the responsibility for communicating the potential hazards defaults to the SES and the Local Emergency Operations Controller (LEOCON). Activation of the Lake Macquarie DISPLAN would trigger this EASP. Council would assist in the provision of information on the current state of beaches as well as potential for impacts on beach access. Internally, Council staff with relevant responsibilities should be placed on standby and commence monitoring the impacts. Council employed Lifeguards and local Surf Life Saving Clubs should be contacted with a view to closure of beaches and ocean pools.

As the emergency progresses Council is required to continue monitoring these areas and updating information through the LEOCON as appropriate. Where specific hazards are resulting in damage, Council will provide this information to the LEOCON and for distribution through the media or directly to community as appropriate.

Following the emergency, Council is responsible for advising the current state of beaches in the Council area (when/if they are re-opened for the public). Where residual hazards remain to be addressed, Council should take appropriate action to convey this to local communities including the use of signage and the release of media bulletins.

3.1.2 Non Storm Erosion Emergency

Where the emergency does not trigger the NSW State DISPLAN or Lake Macquarie DISPLAN, Council is responsible for initially monitoring the potential progress of erosion and subsequently implementing this EASP. The roles and responsibilities of Council in communicating the emergency to the community remain the same except that information needs to be provided by Council directly through the media rather than through the LEOCON as outlined in Section 3.1.1 above.

3.2 Landowner Initiated Actions

There are no locations in the Lake Macquarie LGA coastal zone at which temporary emergency coastal protection works (CPA 1979, Part 4c Sand/Sandbags ECPW) are permitted. This includes properties within the immediate ‘unlikely’ erosion hazard line in the LGA, such as at Redhead Beach (up to 2 properties) and Catherine Hill Bay (1 property). Temporary emergency coastal protection works are only permitted under the CPA 1979 at locations listed in Schedule 1 of that act, none of which exist in Lake Macquarie LGA.

Property owners at those locations within the immediate ‘unlikely’ erosion hazard line shall only be permitted to submit development applications to install permanent protection works if such works are a stated action with the Lake Macquarie CZMP once it is certified. Where property owners wish to install permanent protection works (either prior to or during a coastal erosion emergency):

- they must submit a development application for the works,
- they must have a valid approval, and

- they must comply with all conditions of consent applying to that approval, before proceeding with the works.

Any illegal works placed by a property owner may result in prosecution of the person and removal of the works.

A property owner may be able to undertake minor works to minimise damage to their property and/or dwelling where such works do not require development approval and do not result in adverse impacts. The types of things permitted without consent are unlikely to provide significant protection from any coastal erosion that is occurring but may limit consequential damage, for example: Sealing of the space at the bottom of a doorway to limit water entry, repair/replacement of damaged windows, cladding or roofing, clearing of drains, pumping of ponded water, removal of objects from proximity to an escarpment (such as fences, sheds, furniture), etc.

The owner of a property has the right to undertake a wide variety of activities/maintenance in relation to their property which may or may not result from damage during a storm event and which, generally are of a minor nature. As with all activities there is a common law obligation not to cause a nuisance to neighbours or damage to adjacent properties. Generally those works resulting in structural alterations to a building (including demolition or removal), or significant construction (such as a retaining wall or underpinning a structure) or significant earthworks (excavation or placement of fill) would require prior development/building approval.

3.3 Council Actions Prior to a Coastal Erosion Emergency

- Where the likelihood of an emergency event is identified (e.g. Storm warnings or coastal erosion warnings from the SES/BOM), the local Lifeguards (employed by Council) will inform the local Surf Life Saving Clubs. The Council Lifeguards and / or the local SLSCs will then take the appropriate action in terms of closing the beaches.
- Where difficulties/damage are known to exist on beach accessways and these are likely to be exacerbated by storm erosion, then Council at their discretion may close those walkways and place appropriate signage.
- Council will commence monitoring the effects of the erosion on assets and development potentially at threat (Section 2.3).
- As appropriate, the Council EASP controller will initiate the EASP.

3.4 Council Actions During a Coastal Erosion Emergency

The following activities would be undertaken by Council during the emergency:

- Council activities during a coastal erosion emergency will be guided by issues relating to the safety of Council staff.
- Where damage to walkways is identified and/or reported to Council, as practical Council will take appropriate action to close off the accessways and/or advise the local community of the hazards at the first opportunity.

- Where damage to assets is identified through monitoring (Section 2.3), Council will assess the damage and any opportunities for limiting further damage that may be appropriate during the event.
- Where repairs are permissible (as outlined in Section 2.1) and may be readily and safely undertaken, this will be done at the first opportunity.
- At the appropriate time the EASP controller will determine that the emergency has passed and that the remediation stages of the plan are to commence.

3.5 Council Actions Following the Cessation of a Coastal Erosion Emergency

The following activities would be undertaken by Council following the emergency, within their usual maintenance programs.

- Following the erosion emergency, Council will undertake an inspection of all beach accessways to determine any damage to the access or dangers to the public in using the access to the beach.
- Where an accessway is considered unsafe, action will be taken to close the access (top and/or bottom) and to place appropriate signage to warn the public that the accessway is unsafe for use.
- Council will prioritise the work required to repair and reopen any damaged or unsafe accessways in accordance with the Council maintenance works schedule.
- Where an erosion escarpment has been created at the back of the beach (height greater than 1.5m), Council will document the extent of the escarpment and at the earliest opportunity undertake a risk assessment of the likely hazard to beach users (both to persons on the beach and to persons on the dune above the scarp) from collapse of the erosion scarp.
- Where the risk is deemed unacceptable, Council will at the earliest opportunity undertake appropriate mitigation works which may include:
  - regrading the escarpment to a stable slope (following approval from Council's environment division);
  - fencing and signposting escarpments, to discourage public access (top and/or bottom) until such time as the beach recovers naturally; and / or
  - keeping the beach closed until such time as the risk has reduced to an acceptable level.
- At the appropriate time the Council EASP controller will declare the emergency has finished and the EASP is no longer operative.

4 RESPONSIBILITIES

Specific responsibilities under the EASP are provided in Table 2. Council through the nominated EASP controller must tabulate relevant Council positions and responsibilities for implementation and execution of the EASP. This will require an up to date list (names and contact numbers) for relevant contacts to be maintained by Council and updated as positions or responsibilities change. This list is to be readily available within Council and communicated to each of the nominated contact persons following any update.

Table 2 Specific Responsibilities in implementation of the EASP

Position	Responsibilities
Local Emergency Operations Controller (LEOCON)	Execution of the Local DISPLAN, including aspects relating to coastal erosion
Council EASP controller	Liaison with LEOCON during storm emergency. Implementation of the EASP during non-storm erosion emergency
Council Recreation Services Manager	Monitoring repair of beaches and dunes. Closure of Beaches and ocean pools as appropriate. Post storm remediation.
Council Media Liaison Officer	Distribution of warnings and closures via the media.

5 PLAN REVIEW

This coastal erosion emergency action sub-plan should be maintained as required and reviewed at intervals not exceeding 5 years from its initial adoption. Earlier review may be triggered by:

- occurrence of a coastal erosion emergency that exceeds the immediate 'rare' hazard extent as outlined in the Lake Macquarie Coastal Zone Hazards and Risk Assessment (BMT WBM, 2012), to redefine the extent of the area covered by this EASP;
- revision of the NSW State Storm Plan, the Local DISPLAN (revised each five years) or the *Coastal Protection Act 1979* and associated guidelines, to ensure the plan remains consistent with their objectives;
- unsatisfactory outcomes or concerns following a coastal erosion emergency; or
- proposed changes to the gazetted Coastal Zone Management Plan.