

# HUNTER ESTUARY COASTAL MANAGEMENT PROGRAM

Scoping Study | February 2023



**HEAL**

HUNTER  
ESTUARY  
ALLIANCE

BRINGING LIFE TO THE ESTUARY.

Proudly supported by:  
City of Newcastle  
Port Stephens Council  
Maitland City Council  
Cessnock City Council  
Dungog Shire Council  
Hunter Water  
NSW Government



# ACKNOWLEDGEMENT OF COUNTRY

**We acknowledge the Traditional Owners and Custodians of the Hunter Estuary and its catchments.**

The Councils of Maitland, Newcastle, Port Stephens, Dungog and Cessnock, Hunter Water and Hunter Local Land Services, pay respect to all Aboriginal Elders, past, present and future with a spiritual connection to these lands.

Our Councils recognise the vast knowledge the Traditional Owners provide to the management of the Hunter Estuary and thank them for their support in the development of the coastal management program.

# ABOUT THE SCOPING STUDY

**The Scoping Study is written using a two-stage process of Stage 1A and 1B.**

Stage 1A is Hunter River Estuary Coastal Management Program - Stage 1A Scoping Study by Umwelt Environmental & Social Consultants, November 2021. The compiled scoping study comprising of sections Stage 1B was developed by Deanne Nelson-Pritchard - Maitland City Council October 2022.



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# 1.0 INTRODUCTION

**The Hunter River is iconic in that it defines a region and as it passes through a variety of towns and properties is a community focal point for aesthetics, recreation and livelihoods.**

The Hunter Estuary, floodplain, wetland and tributary catchments are of cultural significance to indigenous communities and as traditional owners and custodians of the estuary, Australia's first people provide the valuable contribution of knowledge, management and spiritual beliefs.

The Hunter Estuary, where the river meets the sea and at the juncture of two bioregions, is one of the largest and biologically diverse in New South Wales, reaching further inland than any other estuary and one of the largest catchments being 21,267 km<sup>2</sup>. The Hunter River is a significant economic zone with Newcastle being one of Australia's major ports contributing \$26 billion to the National Economy every year. It is also a significant region for agriculture, coal mining, research and development and tourism.

The Hunter Estuary is one of the most complex estuaries in NSW. Subject to a range of pressures from mining, agriculture, industry and urbanisation, the estuary also provides a home to internationally

important shorebirds, wetlands and a variety of threatened species and ecological communities. The Estuary provides ecosystem services that support community economic, social, physical and spiritual wellbeing whilst also being sensitive to such risks as floods and sea level rise.

The Hunter Estuary is a significant landscape feature that contributes to the identity of regional communities and the amenity of the region. The estuary will continue to be a growing focus for recreational activities with an increasing local population and visitors to the region undertaking activities including fishing, boating, swimming, bird watching, cycling, sightseeing and walking.



## 1.1 PURPOSE OF A COASTAL MANAGEMENT PROGRAM

**The purpose of a Coastal Management Program (CMP) is to set the long-term strategy for the coordinated management of the coastal zone with a focus on achieving the objects of the Coastal Management Act 2016 (CM Act) in accordance with the NSW Coastal Management Manual 2018.**

The process of developing and implementing a CMP is an important strategic opportunity for Councils and public authorities to work together in an 'Estuary Alliance'. This alliance aims to achieve shared objectives and overcome key constraints to coordinated, effective and sustainable management of the Hunter Estuary for the social, cultural, and economic wellbeing of the community now and into the future.

The Coastal Management Manual 2018 recommends that a five-stage risk management process for the preparation and implementation of a CMP be followed.

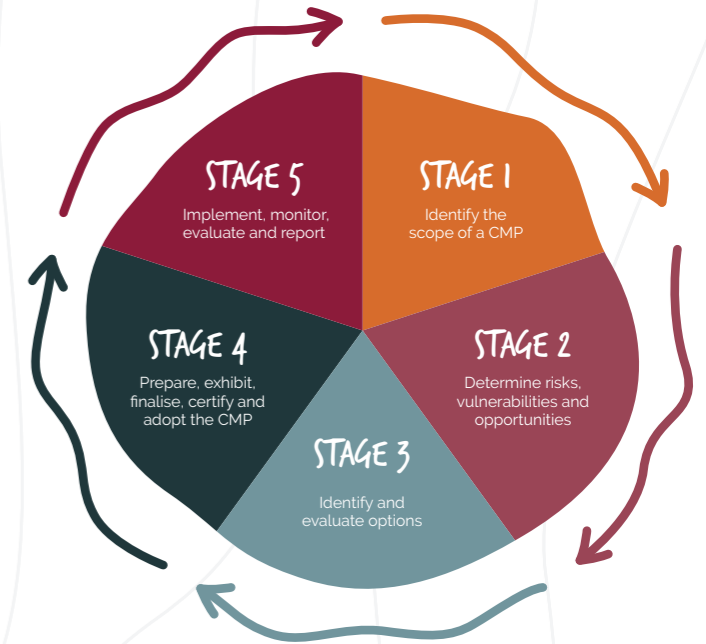


Fig 1 (Right): Five stages of the coastal management program development

## 1.2 PURPOSE OF THE SCOPING STUDY

**Stage 1 of the CMP process is the development of the Scoping Study- this document.**

The scoping study reviews plans, policies and guidelines to identify current management progress of issues relating to the Hunter Estuary since the certification of the existing Hunter Estuary Coastal Zone Management Plan. This stage is an opportunity to review the governance of the estuary and come to an

agreed understanding of current issues, risks and gaps relating to the system. This document identifies the focus of the new CMP and guides the development of key priority projects for the management of the Hunter Estuary.

# 1.0 INTRODUCTION

## 1.3 EXISTING MANAGEMENT PLANS

The scoping study is required to consider the effectiveness of current management practices and arrangements for the Hunter Estuary. A review was undertaken of strategic plans and documents as provided below to provide context of activities, proposed actions and direction of key stakeholder agencies.

- » Hunter Estuary Zone Coastal Management Plan was certified in 2018 and provides actions for remediation of the estuary. Certification of this plan will end December 2023 and will be replaced by the CMP.
- » NSW Local Land Services Local Strategic Plan Hunter 2021- 2026 defines the specific actions and priorities tailored to meet the issues, risks and opportunities that characterise communities, industries and landscapes of the region.
- » Hunter Regional Plan 2036 (NSW Department of Planning and Environment, 2016). The Plans vision acknowledges the opportunities provided by natural resources and strong communities and sets the following regionally focused goals:
  - A strong and dynamic regional economy
  - A healthy environment with pristine waterways
  - Strong infrastructure and transport networks for a connected future
  - Attractive and thriving communities
- » Greater Newcastle Metropolitan Plan 2036 (NSW Department of Planning and Environment, 2018). The Plan sets out strategies and actions that will drive sustainable growth in the Greater Newcastle area which includes, Cessnock, Lake Macquarie, Maitland, Newcastle and Port Stephens communities.
- » Each Council has developed a Local Strategic Planning Statement and Local Environmental Plan along with planning documentation for the actions in the Local Government Areas (LGAs) derived from their Community Strategic Plans.
- » Hunter Wetlands National Park Plan of Management (NSW Department of Planning, Industry and Environment, 2020) supports the protection of this significant environmental asset.
- » Lower Hunter Water Security Plan (NSW Department of Planning and Environment, April 2022) is a whole of government approach to ensuring the region has a resilient and sustainable water future for the Hunter community.

## 1.4 HUNTER ESTUARY ALLIANCE (HEAL)

The Hunter Estuary Alliance is a group of influential government entities in the Hunter Region that are uniting efforts to “heal the estuary”. United as government working together, HEAL is directed by:

- CITY OF NEWCASTLE
- PORT STEPHENS COUNCIL
- MAITLAND CITY COUNCIL
- CESSNOCK CITY COUNCIL
- DUNGOO SHIRE COUNCIL
- HUNTER LOCAL LAND SERVICES
- HUNTER WATER
- DEPARTMENT OF PLANNING & ENVIRONMENT

HEAL provides a platform for all stakeholders associated with the Hunter Estuary to work together towards dedicated projects to the betterment of estuary health; to drive development of resilience to the

changing climate; and find balance in the complexity of multiple demands of the river. As progress occurs within estuary management additional agencies maybe included into HEAL to ensure effective communication.

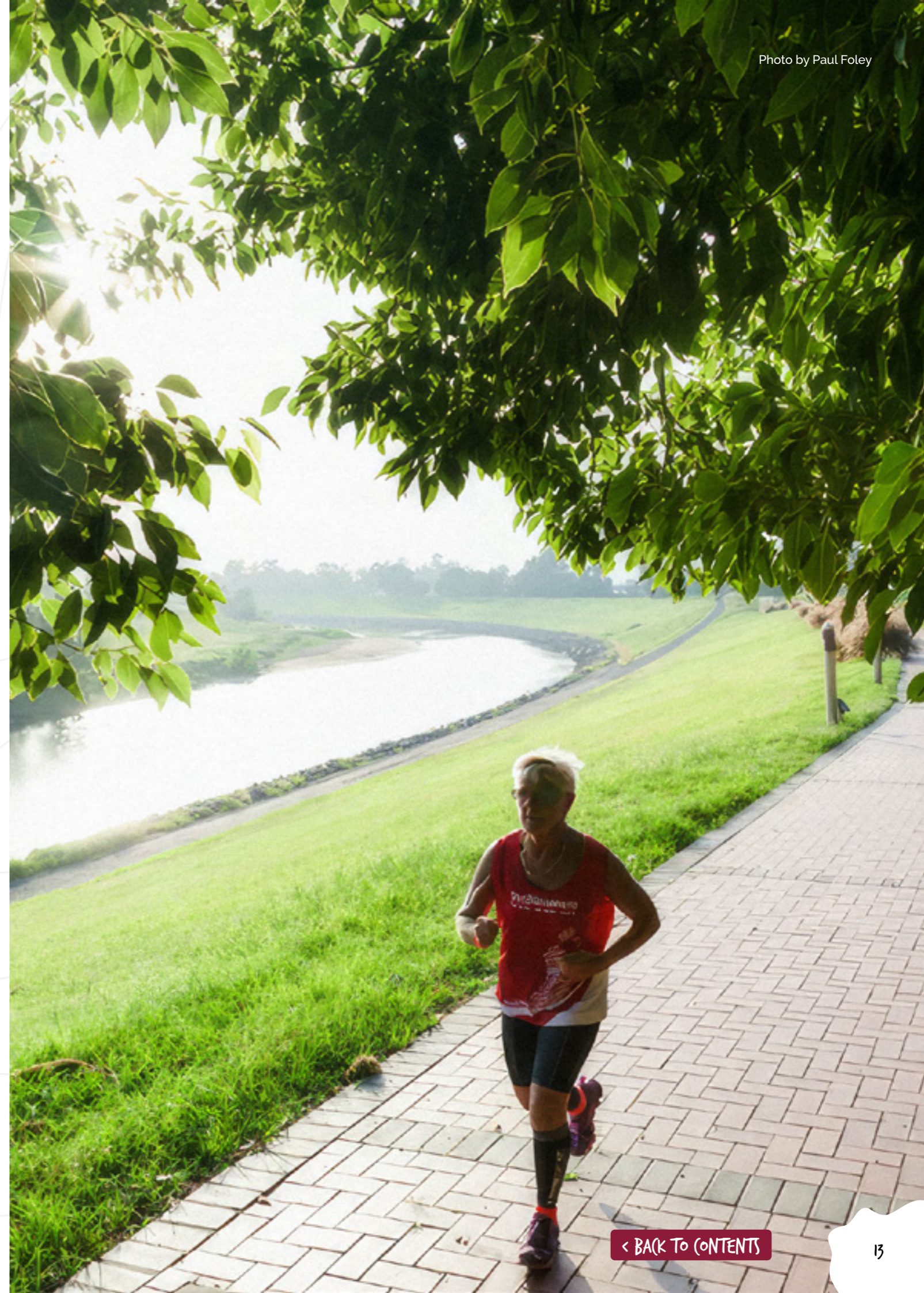


# 2.0 VISION AND OBJECTIVES

**The Hunter Estuary is celebrated for its cultural significance, important ecosystems and the diversity of activities it supports. The people of the Hunter connect with the Estuary and are united in their stewardship of the Estuary for future generations. The Hunter Estuary is flourishing, resilient to change and rich in natural beauty.**

- » Protect and enhance natural estuary processes and environmental values through restoration and rehabilitation.
- » Maintain and enhance public access, amenity and safe use recognising the benefits that nature brings to human health and wellbeing.
- » Acknowledge, respect and protect indigenous communities' spiritual, social and economic use.
- » Support the strategic economic importance of the Hunter Estuary.
- » Facilitate ecologically sustainable development
- » Mitigate current and future risks from coastal hazards and climate change to improve resilience of the estuary.
- » Enhance community stewardship of the estuary through consultation and engagement.

Photo by Paul Foley



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# 3.0 SCOPE OF THE CMP

**An estuary is a coastal water body where freshwater runoff from the land meets the saltwater of the sea. The reach of the estuary is defined by the extent of the tidal influence from the mouth entrance at the ocean up the rivers and tributaries.**

The Hunter is a large barrier river estuary, and the CMP area extends from the mouth of the Hunter River at Newcastle Port to the length of the mapped coastal area. The area does not include Little Beach and Horseshoe Beach which are covered by the Southern Beaches Coastal Management Program being developed by City of Newcastle and whilst it includes the inland area of Stockton,

the Stockton beach area is covered by the Stockton Coastal Management Program- City of Newcastle (Royal Haskoning DHV, Aug 2020).

Whilst the Newcastle Port is part of the study area it is recognised that the SEPP (Three Ports) 2013 outlines the zoning boundaries which provide development provisions within the environmental planning instrument.

## 3.1 MAPPED HUNTER ESTUARY AREAS

**The extent of the Hunter Estuary is mapped as 65 kilometres along the Hunter River to Oakhampton within close proximity to Melville Ford Bridge, 75 kilometres from the ocean along Paterson River to Gostwyck Bridge and 46 kilometres from the ocean along the Williams River to the Seaham Weir.**



Fig 2 (right): Mapped Hunter Estuary extent

## 3.2 COASTAL ZONES

The State Environmental Planning Policy (Resilience and Hazards) 2021 (SEPP) outlines a range of planning and development controls that aim to preserve and protect sensitive coastal environments, manage risk from coastal hazards and support appropriate

development. The SEPP identifies four coastal management areas that when combined define the coastal zone and the spatial extent of the CMP. Figures 3-6 provide the mapped area by estuary reach.

### 3.2.1 COASTAL WETLAND AND LITTORAL RAINFOREST AREA

State Environmental Planning Policy (SEPP) No.14 - Coastal Wetlands and State Environmental Planning Policy No. 26 - Littoral Rainforests are replaced by the Resilience and Hazards SEPP 2021, which continues to provide protection for coastal wetlands and littoral rainforests.

Mapping of coastal wetlands has been updated by NSW Government since their original mapping in 1985, although there is provision to propose additional areas to be included if strategic assessment suggests that their inclusion will assist estuary health. The mapped coastal wetland areas display a range of hydrological and floristic characteristics, include estuarine and freshwater wetlands, and provide important habitat for a range of species and, when healthy, can assist with estuarine dynamics.

Littoral Rainforest have been managed by State Environmental Planning Policy's since 1988. These areas are generally closed forests, the structure and composition of which is strongly influenced by its proximity to the ocean. These areas have been impacted heavily by urban development associated with increasing coastal populations and are considered an Endangered Ecological Community in NSW.

No Littoral Rainforest areas have been mapped in the Hunter Estuary reach, however significant remnants of floodplain rainforest exist within the CMP area. Revised mapping and reestablishment of littoral rainforest could be investigated through the CMP.

**The CM Act management objectives for the coastal wetlands and littoral rainforests area are:**

- » to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity.
- » to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests.
- » to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.
- » to support the social and cultural values of coastal wetlands and littoral rainforests.
- » to promote the objectives of State policies and programs for wetlands or littoral rainforest management.



## 3.0 SCOPE OF THE CMP

### 3.2.2 COASTAL VULNERABILITY AREA

**The Coastal Vulnerability Area is land which is subject to current and future hazards as defined in the CM Act. The intent of the development controls for this area is concerned with managing risks to human life, infrastructure, and public and private property that may be impacted by "coastal hazards" as defined by the CM Act.**

Management objectives are noted in the CM Act for the coastal vulnerability area, however, no mapping has been provided in the SEPP Resilience and Hazards to identify these areas.

**Coastal Hazards in an estuary as they are defined by the CM Act would extend to:**

- » Tidal inundation
- » Coastal inundation
- » erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters. management

### 3.2.3 COASTAL ENVIRONMENT AREA

**The coastal environmental area is identified and mapped as land containing coastal features such as coastal waters, estuaries, coastal lakes, coastal lagoons, and the land adjoining those features.**

**The CM Act management objectives for coastal environment area are:**

- » To protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lake/s and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity,
- » To reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change
- » To maintain & improve water quality & estuary health

- » To support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons
- » To maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place
- » To maintain and, where practicable, improve public access and use of beaches, foreshores, headlands and rock platforms.

### 3.2.4 COASTAL USE AREA

**The coastal use area is identified as land adjacent and buffering coastal features including coastal waters, estuaries, coastal lakes, coastal lagoons where development is or may be carried out (at present or in the future).**

**The CM Act management objectives for coastal use area are:**

- » to protect and enhance the scenic, social and cultural values of the coast by ensuring that -
  - the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast, and
  - adverse impacts of development on cultural and built environment heritage are avoided or mitigated, and

- urban design, including water sensitive urban design, is supported and incorporated into development activities, and
- adequate public open space is provided, including for recreational activities and associated infrastructure, and the use of the surf zone is considered.
- » to accommodate both urbanised and natural stretches of coastline.



# 3.0 SCOPE OF THE CMP

## 3.3 COMPONENTS OF AN ESTUARY

For the purposes of this scoping study the spatial extent will remain the mapped coastal area in accordance with the SEPP and DPE advice. However, it is important to recognise that the area of influence, and impact to the estuary is far greater than the mapped area.

During the coming stages of the CMP these influences will be investigated and if areas that are unmapped have large impacts to estuary health the opportunity will be reviewed to:

- » map further areas in accordance with a planning proposal to amend the SEPP, or
- » look for plans/policies or a body of work that will integrate with the CMP to manage these influences.

To provide integrated management of the estuary, technical research in Stages 2 and 3 may investigate issues in the following:

- » the mapped coastal area
- » the floodplain and floodplain wetlands associated with the estuary, including Woodberry wetland, Tarro wetland, Barties Creek wetlands, Saltwater Gully wetlands, Four Mile Creek wetlands (also known as Tenambit Wetlands), Wentworth Swamp and wetlands on the floodplain below the natural tidal limit of Wallis Creek.

- » Fullerton Cove and land south of Cabbage Tree Road (Tomago) or west of Nelson Bay Road at Fern Bay
- » Hexham Swamp and its tributary creeks east of the Pacific Motorway (e.g. Minmi Creek), noting that these catchments include intensive residential development at Maryland and Fletcher.
- » catchments of tributaries that flow directly to the estuary. These include catchments flowing to the upper estuary (e.g. Wallis Creek, Swamp Creek, Four Mile Creek), mid estuary and lower Williams River (e.g. Purgatory Creek, Scotch Creek, Francis Greenway Creek, Windeyers Creek) and lower estuary (e.g. Cottage Creek, Throsby Creek, Ironbark Creek).
- » tributary catchments that join the Paterson River downstream of the tidal limit.
- » those parts of urban areas which drain to the Hunter River or its estuarine tributaries.

Further advice is provided in the DPE Factsheet Coastal Management Programs and integration with catchment management 2022,

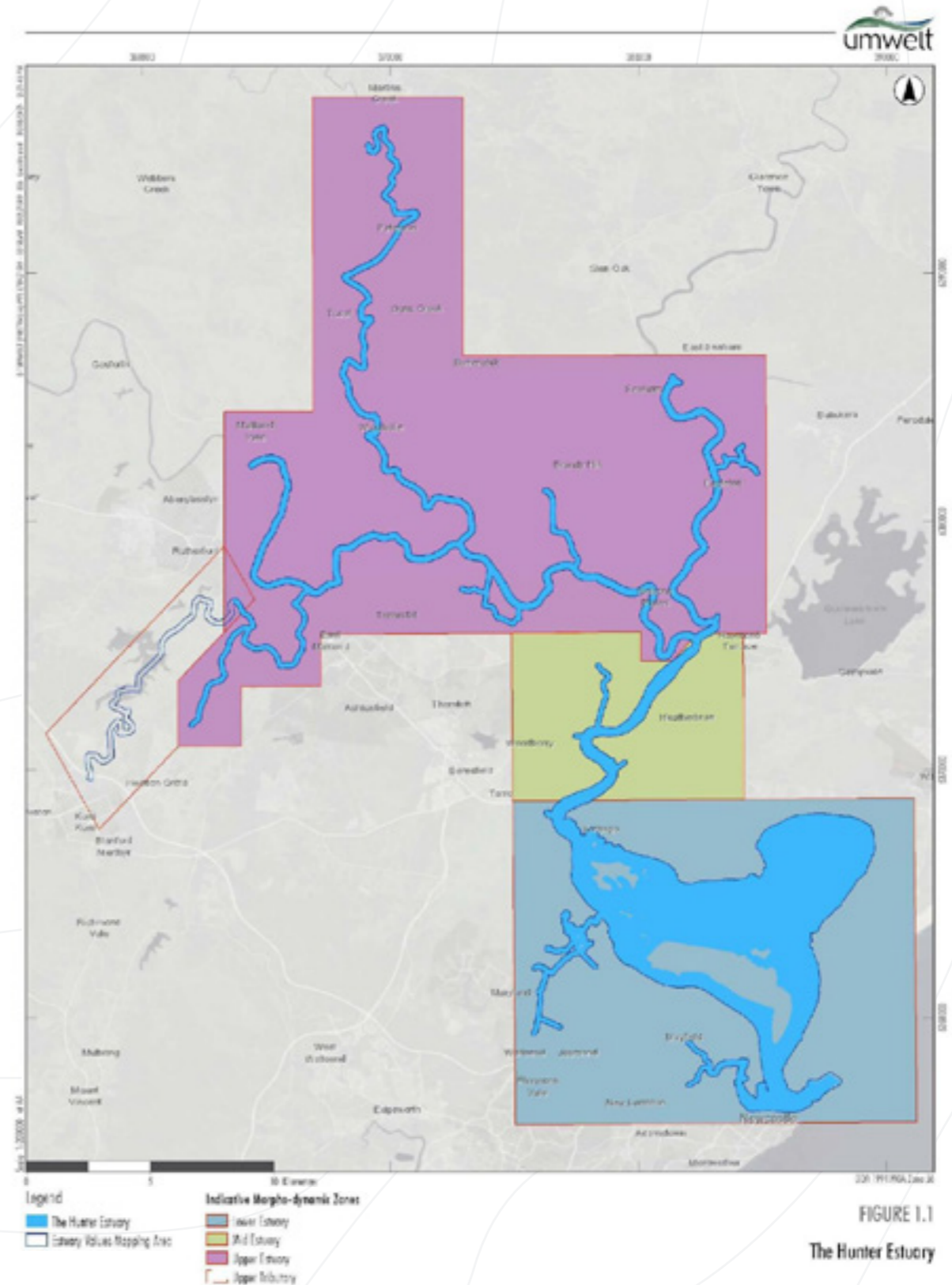


Fig 3: Umwelt's Stage 1A Graphical interpretation of the estuary zones based on WRL's Hydrodynamic model reflecting morphology and processes of the estuary.

# 3.0 SCOPE OF THE CMP

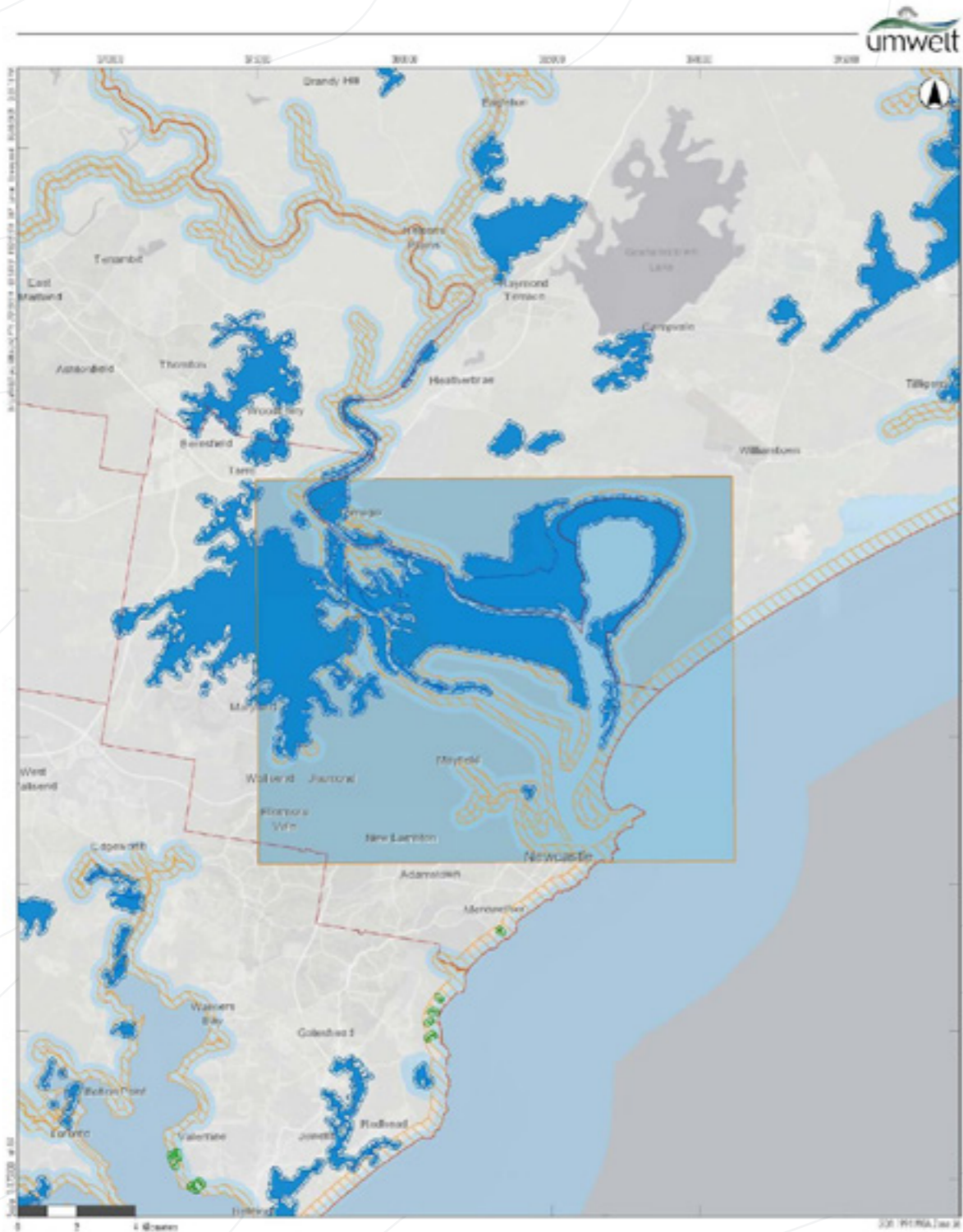


FIGURE 4.1  
Coastal Management SEPP Mapping - Lower Estuary

Fig 4: Coastal Management SEPP Mapping – Lower Estuary

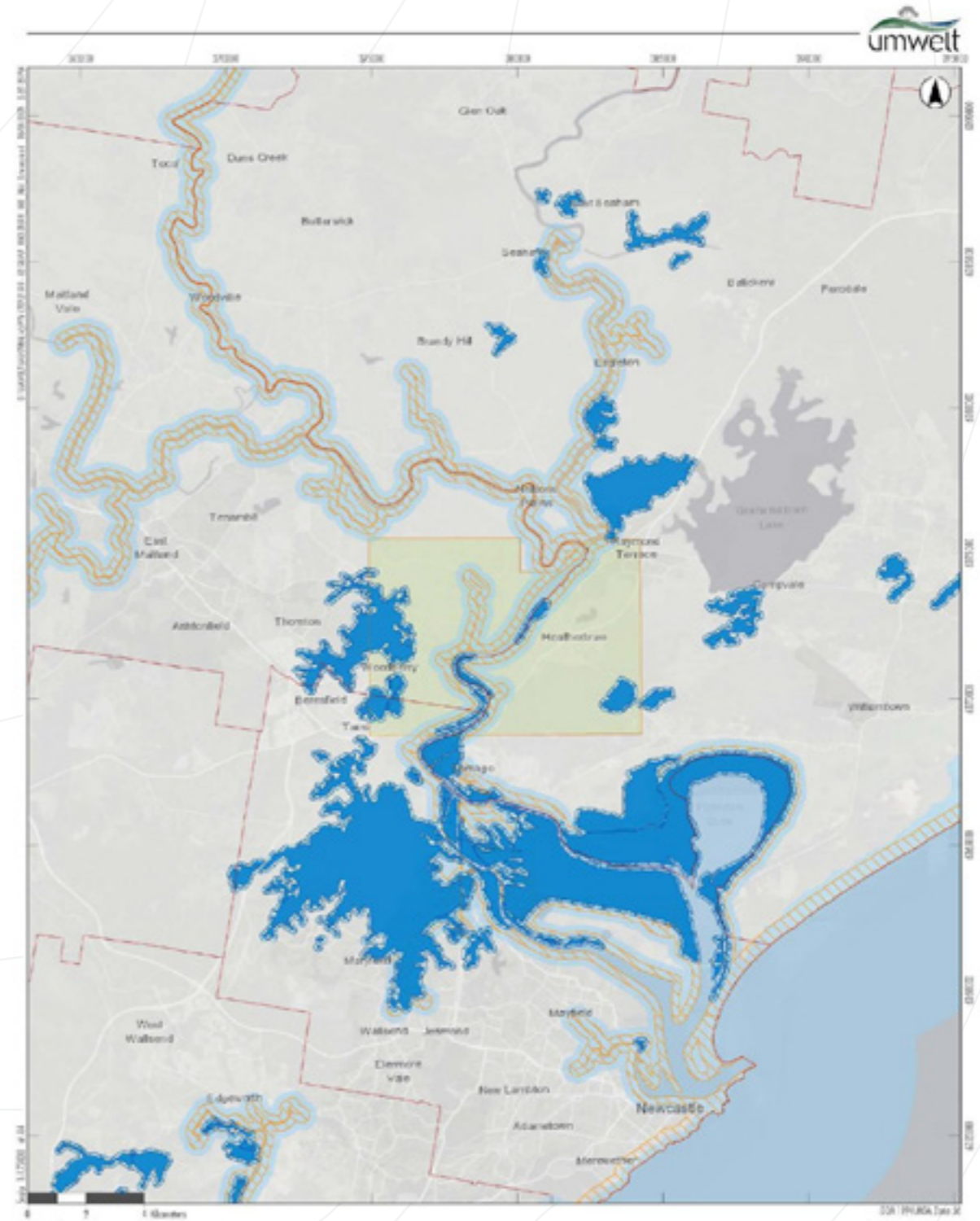


FIGURE 4.2  
Coastal Management SEPP Mapping - Mid Estuary

Fig 5: Coastal Management SEPP Mapping – Mid Estuary

# 3.0 SCOPE OF THE CMP

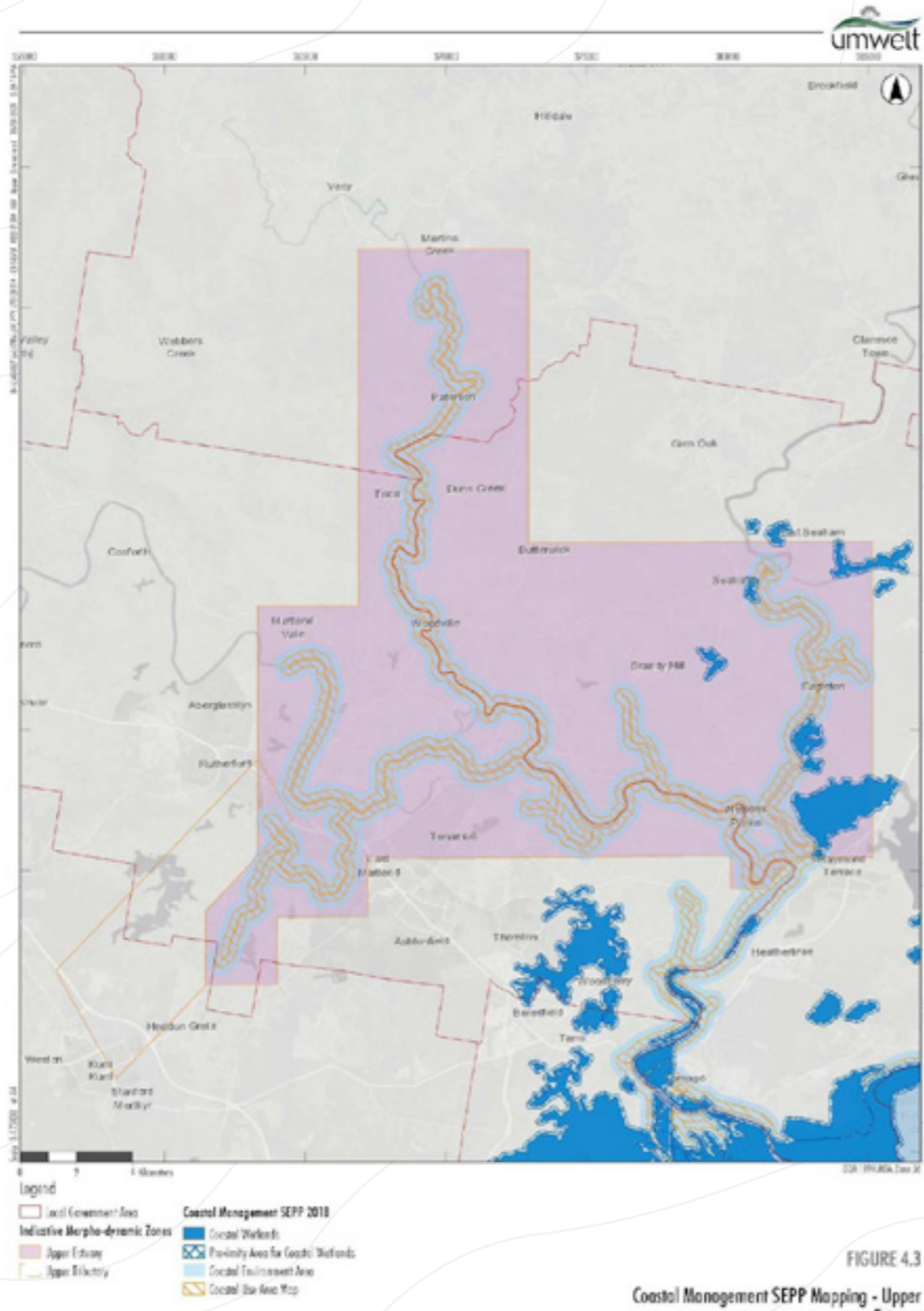


FIGURE 4.3  
Coastal Management SEPP Mapping - Upper Estuary

Fig 6: Coastal Management SEPP Mapping – Upper Estuary



# 4.0 CURRENT STATE OF THE HUNTER ESTUARY

**Management of the Hunter Estuary illustrates, more than most estuaries, the complex history and diverse priorities of coastal management in Australia. Before the arrival of British convicts and settlers in the early nineteenth century, the Hunter coastline, estuary and catchment were looked after by Awabakal, Worimi and Wonnarua people.**

Transformation of the morphology of the estuary, and its relationship with the open coast and its catchment, commenced from the early nineteenth century with ongoing and cumulative impacts especially as a result of clearing riparian and floodplain forest.

Today, parts of the estuary have national and international significance, including the Hunter Estuary Wetlands Ramsar site and one of Australia's largest ports. Newcastle is the State's largest regional city. The Hunter Valley Flood Mitigation Scheme is a major engineering asset, unique in NSW. It provides protection for settlements and land use but has impacts on the riparian zone and hydrodynamic character of the estuary. Urban population is dramatically increasing creating demands and impacts across the region. Water quality is considered poor

in the freshwater tidal mid estuary area and good in the lower estuary due to good connectivity with the oceanic area resulting in frequent flushing.

Looking forward, the strategic context of the Hunter Estuary is dynamic, including new science; high regional development projections and economic transition; ongoing adjustments to climate change and sea level rise; and clear evidence of impacts of legacy and continuing pollutant sources on the health of the estuary.

Community values are changing, recognising environmental impacts and the linkage of healthy ecosystems to human health, and the desire to interact with the estuary and river.

See next page for overview of the timeline of major management interventions, leading to the first whole of estuary plan (CZMP 2017, certified 2018), progress towards implementation and steps towards a CMP.

## AN OVERVIEW OF APPROACHES TO HUNTER ESTUARY MANAGEMENT

### Historical management intervention

<b>Pre 1800</b>	Aboriginal stewardship of country including the Hunter coast, estuary and catchment
<b>1820s</b>	Changes to the entrance area to the estuary, including Macquarie Pier, removal of oyster reefs for colonial lime resources
<b>19th Century</b>	Land reclamation for industrial and port lands around the lower estuary, construction of full entrance training works; clearing, floodplain drainage and protection works across the entire estuary and floodplain
<b>20th Century</b>	Major industrial development and pollution of the lower estuary; dredging and extensions of port facilities; expansion of urban development; development of reticulated sewage services, treatment plants and point source discharges. Riparian land clearing, and bank erosion treatments throughout the catchment and estuary; major modifications to catchment flow patterns. Extension of entrance breakwalls and major channel dredging in the Port to allow access by larger ships
<b>1950s</b>	Hunter Flood Mitigation Scheme commenced (response to the 1955 floods)
<b>1984</b>	Parts of the Hunter Estuary and wetlands listed as a Ramsar site – wetlands of international importance
<b>1989 – now</b>	Major estuary management and rehabilitation projects such as Throsby Creek, Hexham Swamp, Kooragang wetlands including Ash Island and Stockton Sandspit, Tomago Wetland, remediation of contaminated reaches of the South Arm of the Hunter River and establishment of Hunter Wetlands National Park

### Key milestones in modern planning processes

<b>2002</b>	Integrated Catchment Management Plan for the Hunter Catchment
<b>2003</b>	Estuary Processes Study
<b>2009</b>	Estuary Management Study
<b>2009</b>	Coastal Zone Management Plan (CZMP) adopted by the Councils of Newcastle, Port Stephens and Maitland
<b>2017</b>	Review for certification under CP Act 2016
<b>2018</b>	CZMP certified with 25 management objectives
<b>2018</b>	CM Act commenced
<b>2019</b>	Completion of predictive numerical model of the Hunter Estuary
<b>2020</b>	Maitland Council – strategic advice on requirements and process
<b>2021</b>	Project Steering Committee to establish governance model, funding and progress Stage 1

# 4.0 CURRENT STATE OF THE HUNTER ESTUARY

## 4.1 CLIMATE

The Hunter Region is classified as sub-tropical to temperate with an annual rainfall across the region averaging 870 mm per year. Rainfall varies across the region with the coastal and mountainous areas of the region receiving higher rainfall than the inland upper Hunter. It is mild to warm in summer throughout much of the region and winters are cool with mountainous areas and inland receiving the colder temperatures at that time.

The Hunter Region has been experiencing fluctuations to the norm in recent times. The Hunter experienced the worst drought on record between 2017 and 2020 with water restrictions needing to be put in place for the first time in a number of years. From 2020 until 2022 the Hunter has experienced heavy rainfall and floods associated with La Nina climatic conditions. Heatwaves are also becoming more prevalent.

Climate projections suggest that the Hunter is expected to experience an increase in all temperature variables for the near future (2030) and far future (2070). Projections forecast there are to be more hot days and fewer cold nights. Rainfall is projected to decrease in spring and winter and to increase in autumn (OEHL, 2014).

### Projected changes:



PROJECTED TEMPERATURE (CHANGES)	
Maximum temperature are projected to <b>increase</b> in the near future by 0.4-1.0°C	Maximum temperatures are projected to <b>increase</b> in the far future by 1.6-2.6°C
Minimum temperatures are projected to <b>increase</b> in the near future by 0.5-0.9°C	Minimum temperatures are projected to <b>increase</b> in the far future by 1.5-2.5°C
The number of hot days will <b>increase</b>	The number of cold nights will <b>decrease</b>
PROJECTED RAINFALL (CHANGES)	
Rainfall is projected to <b>decrease</b> in spring and winter	Rainfall is projected to <b>increase</b> in autumn
PROJECTED FOREST FIRE DANGER INDEX (FFDI) (CHANGES)	
Average fire weather is projected to <b>increase</b> in summer, spring and winter	Severe fire weather is projected to <b>increase</b> in summer and spring

Fig 7: Projected Changes noted in "Hunter Climate Change Snapshot" – Adapt NSW, Officer of Environment and Heritage (2014)

Communities living around estuaries are particularly vulnerable to climate change because of the number of people, residences, commercial areas, recreational facilities and transport infrastructure that are on low lying land, potentially impacted by tidal inundation and the combined impacts of catchment flooding and tidal processes in coming decades.

Sea level rise is not uniformly distributed and for NSW mean model predictions suggest a sea level rise of up to 10% above the global average (OEHL, 2018a). Modelling suggests that the Hunter River is the 6th most exposed estuary system in NSW to the impacts of sea level rise, based on the number of properties predicted to be exposed to inundation under a variety of scenarios (OEHL, 2018a). This is largely due to the extensive development that has occurred on low-lying areas adjacent to the lower estuary. Sea level rise will also affect the efficiency and effectiveness of flood plain drainage systems and the viability of low-lying agricultural land.

### The potential implications of sea level rise and climate change for the Hunter Estuary therefore include:

- » higher projected storm surge and inundation levels
- » saltwater intrusion and landward advance of tidal limits within estuaries impacting agricultural enterprises.
- » landward recession of sandy shorelines
- » existing coastal gravity drainage, stormwater infrastructure and sewerage systems may become compromised over time as mean sea level rises (this is relevant to low lying urban areas such as Maryville and Carrington in City of Newcastle)

- » altered catchment flood behaviour, associated with changes to storm intensity and frequency
- » changes to drought frequency and intensity also have the potential to drive periods of very low flow into the estuary and impact on water quality
- » decrease in the level of protection provided by existing seawalls and other hard engineering structures (this applies both to structures in the lower estuary, around the harbour and tributary creeks such as Throsby Creek and Cottage Creek, and to flood infrastructure in the mid and upper estuary)
- » Changes in salinity and inundation will change the environmental growing conditions for habitat resulting in relocation of current areas such as saltmarsh and mangroves.
- » Movement of habitat further inland will have impacts to the current Ramsar site with implications to original conservation principles.

# 4.0 CURRENT STATE OF THE HUNTER ESTUARY

## 4.2 POPULATION

The Hunter region is home to over 9% of the NSW population and is the largest growth centre outside the Sydney Metropolitan area (Regional Development Australia website 2021). Newcastle is Australia's 7th largest city.

The "Greater Newcastle Area" which includes Maitland, Raymond Terrace, Northern Lake Macquarie and Newcastle had a population of around 540,000 residents in 2016. The population of Newcastle is projected to grow by more than 41,000 people, Maitland is projected to increase by 54,800 and Port Stephens is projected to increase by 16,818 by 2040.

**These projected population increases have important implications for the Hunter estuary, including:**

- » higher demand for water supply, affecting flows particularly into the estuarine reaches of the Williams River.
- » increases in wastewater discharges to the estuary and its tributaries (unless diverted to recycling).
- » increases in the area of urban land, especially around the upper estuary; rapid expansion of urban areas adjacent to the floodplain to meet housing demand results in stormwater management issues, flash flooding and likely further impacts on water quality and ecosystem health in the upper estuary.

- » increasing demand for lifestyle and liveability, and associated access to the banks and waterway of the Hunter estuary, for recreational uses. This includes the potential for swimming in the upper estuary, access for kayaks and rowing, and along-bank walking routes. It may also lead to changed preferences for vegetation management and shade-providing trees along the riverbank.
- » as a 'river city', recreational and amenity access to the Hunter Estuary will be increasingly important for Maitland's growing population. There is limited council owned and managed land along the upper estuary, and this constrains access opportunities, especially along the riverbank.
- » further downstream in the navigable reaches (which are still within 15 minutes' drive of growing population centers), increased pressure on boating infrastructure such as ramps and jetties is also expected.

## 4.3 HERITAGE: 4.3.1 INDIGENOUS HERITAGE

The Hunter Estuary, floodplain, wetlands and tributary catchments are of cultural significance to indigenous communities, including traditional owners and the Awabakal, Worimi, Mindaribba and Karuah Local Aboriginal Land Councils. The Hunter River and the estuary have various language names, including Coquun, Myan and Coonanburra.

Aboriginal people have occupied the Hunter Valley for up to 60,000 years and a few sites with late Pleistocene dates are known from both the upper and lower Hunter.

The early European settlement of the Hunter region means there are widespread records of the economic and cultural activities of Aboriginal people in the region (e.g. see the reviews in Brayshaw 1986 and Albrecht 2000), although the resources noted in the colonial reports and art works do tend to focus on European perspectives.

Aboriginal culture in the early years of European settlement of the estuary is recorded in drawings by Lycett and others and in the records of Rev. Threlkeld. Aboriginal people living around the estuary accessed diverse fish and shellfish species, which are evidenced in records, artwork and in archaeological sites (open campsites and middens). They had access to a wide range of plant resources from the wetlands and forests that lined the middle and upper estuary. There are also grinding groove sites within the channel in the upper estuary.

**Whilst the Hunter Estuary is rich in cultural value there has been loss of archaeological evidence due to a combination of factors, including:**

- » many activities and tools involving plant materials are poorly preserved archaeologically
- » there have been significant channel changes along the estuary, removing areas of archaeological potential
- » large parts of the floodplain around the upper estuary rapidly accreted sediment in the nineteenth century which would have both buried evidence of Aboriginal cultural activities and changed the context and productivity of the floodplain and wetland areas
- » in the lower estuary, there has been extensive channel change and land reclamation, removing previously resource rich areas (historically, it is reported that both natural oyster reefs and midden sites were 'mined' for lime resources for the colony)
- » early Newcastle developed over the sites of Aboriginal economic, cultural and spiritual activity.

Detailed work on the cultural values of the estuary has progressed through the review of the HVFMS and forms a strong basis for further engagement and codesign of any further cultural studies with the relevant Aboriginal community stakeholders.



## 4.0 CURRENT STATE OF THE HUNTER ESTUARY

### 4.3 HERITAGE:

#### 4.3.2 HERITAGE NON-INDIGENOUS HERITAGE

**Newcastle and surrounds were one of the first sites of European settlement in NSW and the Hunter Estuary includes a unique variety of historical structures and sites of local, state and national significance.**

##### Early Colonial Heritage

- » Coal reserves at the entrance to 'Coal River', later known as the Hunter River, were reported by convicts and soldiers in 1796 and confirmed by Shortland in 1797; i.e. less than a decade after the establishment of the colony in Sydney. After an initial unsuccessful attempt, a convict and military outpost was established at the mouth of the river in 1804. The Macquarie Pier connecting Nobbys Island to the southern headland of the harbour was constructed between 1818 and 1846. Convict workers remained in Newcastle until 1855. The Coal River lumberyard, established from 1804, is of national significance. Other elements of the early settlement of Newcastle are recognised as being of at least State significance.
- » When the European settlement commenced in the lower estuary, the area featured extensive natural oyster reefs in shallow waters and the shoreline was lined with large shell middens. Oyster shell was dredged (e.g. from Fullerton Cove), mined, burnt in pits and heaps, to provide lime for the construction of buildings in Sydney and elsewhere. Shell was a major product in early colonial shipping. Removal of oyster reef and shoreline midden was one factor contributing to morphological transformation of the lower estuary, along with land reclamation, hardening of the foreshore, entrance control and navigation dredging.

- » The history of Ash Island, documented in colonial scientific studies and art works, including studies and drawings by John and Elizabeth Gould, Conrad Martens, Ludwig Leichardt and the Scott family who owned the land on the island at the time, illustrates the flora, fauna and landscape of the mid nineteenth century estuary.
- » Morpeth became the major port of the Hunter Valley between 1832 and 1890 with a regular steamer service operating in Maitland up to Paterson and down to Newcastle. Today Morpeth is a tourist destination with many of the heritage buildings remaining intact.

##### 20th Century Industrial and Port Development

- » The heritage of the Hunter estuary illustrates and is critical to the development of Australia's industrial and maritime sectors during the twentieth century. This includes the development of the port for coal and other commodities, and the development of the BHP Steel works at Mayfield. This industrial and maritime heritage is unique to the Hunter in terms of long-term use of barrier estuaries in Australia.

## 4.4 SEDIMENT COMPARTMENTS

**The coastal zone of the Hunter lies within a primary sediment compartment that extends from Gosford to Port Stephens (Birubi Point), a distance of 97.8km (Carvalho and Woodroffe 2015). Two secondary sediment compartments (Birubi Point to Nobbys Head and Nobbys Head to Redhead) define linked areas of the open coast.**

The barrier system that separates the Hunter Estuary from the open coast is within the Birubi Point to Nobbys Headland sediment compartment, with rocky coast and smaller embayments occupying the Nobbys to Redhead compartment.

Active sediment exchange occurs between the lower parts of the Hunter Estuary and the open coast within the Birubi Point to Nobbys Headland sediment compartment (see the Stockton CMP 2020 for further information).

## 4.5 WATER QUALITY

**The catchment of the Hunter Estuary has been highly modified by human activity and includes many land uses. The upper catchment is predominantly agricultural land with a number of large open pit coal mines whereas the mid-lower catchment includes extensive urban areas, and industrial area around the Port of Newcastle.**

The Department of Planning and Environment undertake a water quality monitoring program for NSW estuaries and have recently assessed the Hunter River as having poor water quality. Reporting has ranked the Hunter Estuary as 124 out of 160 estuaries in the lower estuary and the worst water quality (in NSW) in the upper part of the estuary.

Contamination by industrial chemicals is a long-standing feature of the lower Hunter estuary. Multiple legacy sources occur around the Port of Newcastle. Risks from contamination in a section of the South Arm of the estuary have been reduced through an extensive dredging and remediation project. Legacy

contamination from historical heavy industry remains an issue in the sediments of Throsby Creek (Swanson et al., 2017).

Contamination of parts of the Hunter River and connected wetlands and groundwater by Per and Poly Fluoroalkyl Substances (PFAS) was reported in 2017 and impacts continue. This group of manufactured chemicals was used, until recently, in firefighting foams at the Williamtown RAAF Base. It has also been used at other industrial sites around the estuary. The impact of these substances on the Hunter Estuary is still under investigation and will need to be considered in future management actions.



# 4.0 CURRENT STATE OF THE HUNTER ESTUARY

## 4.6 ESTUARY HEALTH

In 2017 OEH published **Health of the Hunter – Hunter River estuary report card 2016**, which provided a snapshot overview of the health of the Hunter Estuary in 2014–16, based on the findings of the Lower Hunter River Health Monitoring Program and a preliminary ecological assessment.

The Hunter Estuary is not healthy now, with poor scores for:

- » turbidity (upper estuary)
- » estuary form and function (lower estuary)
- » nutrient pollution (all parts of the estuary)
- » metal contamination (mid and lower estuary)
- » microalgal growth on the bed (middle estuary)
- » sediment oxygen demand (mid estuary)
- » mangrove health (mid and lower estuary)

The report found that there has been an improvement in water quality in the lower estuary of the Hunter River in the past decade, due to significant changes in portside land use, introduction of pollution reduction programs, regulation of discharges and remediation of contaminated lands. However, ecological processes are still impaired and will take longer to recover.

OEH 2017 provides a conceptual model (Figure 8) of the pressures affecting the health of the Hunter estuary, including diffuse and point source pollution and the differential impact of pollutants in parts of the river with slow rates of tidal flushing and long residence times.

Diffuse pollution from agricultural, urban and industrial areas surrounding the estuary is substantial following rainfall in the catchment. Point source pollution from industrial sites contributes pollutants daily to the lower estuary in licensed discharges. High levels of dissolved inorganic nutrients, sediment or toxicants in estuary waters become 'stressors' on the ecosystem, as illustrated Figure 8 (See Next page).

Two interacting estuary health issues in the Hunter Estuary are suspended sediment load (and associated water clarity) and nutrient loading leading to high phytoplankton populations and eutrophication. Spatial and temporal patterns of sediments and phytoplankton are illustrated in Figure 9 and Figure 10 (See Next page).

Sediments that form the riverbed play a vital role in aquatic ecosystems. Unhealthy (nutrient loaded) sediments consume more oxygen than they produce and are unable to recycle nutrients and instead become a source of nutrients to estuarine waters. Sediments in the North Arm adjacent to the Hunter Wetlands National Park appear to be reasonably healthy.



Fig 8: Conceptual Diagram of Pressures on the Hunter River Lower Estuary

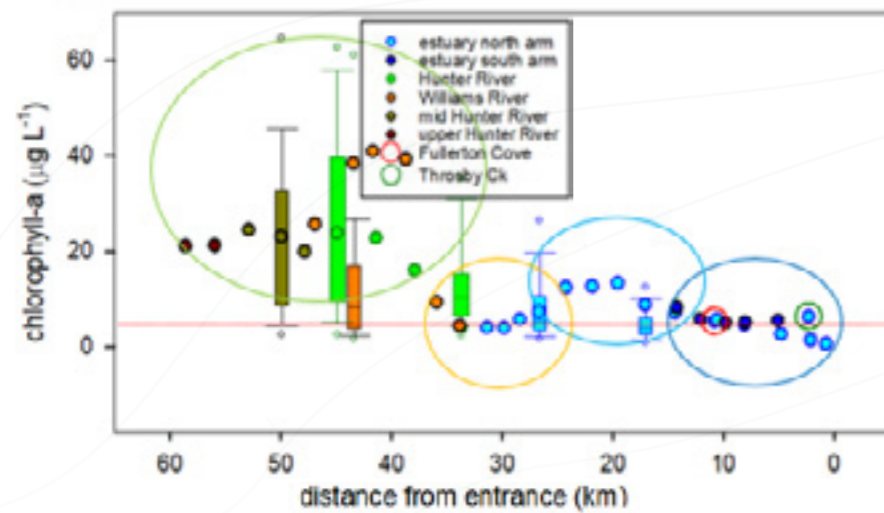


# 4.0 CURRENT STATE OF THE HUNTER ESTUARY



## Eutrophication

- Phytoplankton growth responds to excess nutrients
- Biomass is limited by residence times



## Floods

Very high suspended sediment concentrations and turbidity occur during floods due to inputs of eroded catchment soils

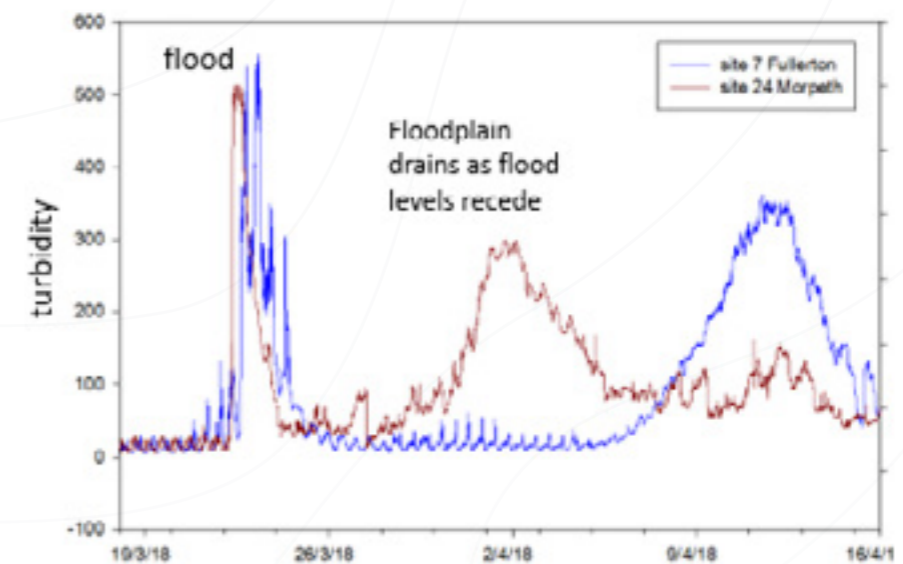


Fig 9: Tidal Circulation, Residence Time and Evidence of Eutrophication of the Hunter Estuary  
Source: DPIE presentation to Stage 1A stakeholder workshop, July 2021

Fig 10: Suspended Sediment Transport During Floods and High Flows  
Source: DPIE presentation to Stage 1A stakeholder workshop, July 2021

# 4.0 (CURRENT STATE OF THE HUNTER ESTUARY

## 4.7 ESTUARY WETLANDS: 4.3.1 RAMSAR WETLANDS

The wetland system in the Hunter Wetlands National Park is of international significance and part of the system was listed under the Ramsar Convention on Wetlands in 1984. It is one of 12 Ramsar listed wetland sites in NSW, of which four are coastal wetlands. It is protected under the Ramsar convention and the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The Kooragang component of the Hunter Estuary Wetlands Ramsar site is located on the North Arm of the Hunter River and covers an area of 2,926 hectares. The Ramsar site comprises:

- » the bed of Fullerton Cove
- » the northern part of Kooragang Island (including the Kooragang Dykes)
- » the eastern section of the Tomago Wetlands. The Tomago Wetlands were converted to grazing land in the mid twentieth century by drains and levees which lie to the west of Fullerton Cove. Tidal circulation to the site has been restored and the wetland rehabilitated over the last decade.
- » the fringing mangroves and islands within Fullerton Cove and part of the North Arm, as well as Stockton Sandspit and the Kooragang Dykes.

The Ramsar site is recognised because:

- » The Hunter estuary wetlands are of exceptional conservation value, containing the second largest area of mangroves in New South Wales and extensive areas of coastal saltmarsh.
- » The national park provides mudflat and saltmarsh habitat for a diversity of wildlife including 41 threatened species such as the Australasian bittern (*Botaurus poiciloptilus*), green and golden bell frog (*Litoria aurea*) and breeding habitat for the eastern freetail-bat (*Mormopterus norfolkensis*).
- » The national park provides important habitat for migratory bird species listed under international agreements, including the curlew sandpiper (*Calidris ferruginea*), sharp-tailed sandpiper (*C. acuminata*) and the red knot (*C. canutus*). It is a site on the East Asian – Australasian Flyway and is part of the Hunter Estuary Important Bird Area (DPIE, 2020a).

Table 1: Ramsar Wetlands and Strategic Context

KEY FEATURE	CONTEXTUAL ISSUES
The Ramsar wetlands and habitat for listed species are vulnerable to sea level rise	Sea level rise could change the habitat value of the Stockton sandspit and inundate the Kooragang Dykes for more time, reducing feeding and roosting space in the estuary
Wetland resilience and recovery potential	Success of the Hexham Swamp and Tomago Wetlands restoration projects is a key piece of strategic context for the Hunter Estuary as it demonstrates the resilience and recovery potential of degraded wetland habitat, provided other threats can be controlled
Wetlands illustrate the diverse sources and complex dynamics of legacy and contemporary contamination in the estuary	<p>A Formal Assessment of Change in Ecological Character was prepared for the Ramsar site in 2019 (Arcadis and Umwelt, 2019), investigating evidence that contamination has impacted on the Ramsar components, processes and services (CPS) of the Kooragang component of the Ramsar site since its listing.</p> <p><b>The Formal Assessment considered accumulation profiles (in waters and sediments), the persistence of toxicity profiles and potential for bioaccumulation of a wide range of chemicals, including nutrients, sediment, metals and heavy metals, PAH and other petroleum hydrocarbons, pesticides, PFOS/PFAS and other emerging contaminants such as hormones, antibiotics and microplastics. These contaminants derive mainly from industry, but also from agriculture and urban stormwater.</b></p> <p>The Formal Assessment found that for most Ramsar CPS, a change associated with the impacts of contaminants is considered likely but there is insufficient evidence for a conclusive determination. As the site manager, NPWS is considering further data collection and analysis opportunities to clarify the trends in contamination and implications for the Ramsar values of the site.</p>
Complexity and the value of quality science	The interactions of hydrodynamic processes, pollution control, temporal change and stakeholder responsibilities that affect the Ramsar CPS illustrate why complexity is critical strategic estuary context for the Hunter Estuary
The importance of partnerships across all levels of government and between industry, universities, citizen scientists and government	Managing and protecting Ramsar CPS will require partnerships with Defence, DAWE, and DPE EES, as well as industry, university and community organisations illustrates issues to be considered in the development of an effective governance model for managing the estuary

## 4.0 (CURRENT STATE OF THE HUNTER ESTUARY

### 4.7 ESTUARY WETLANDS:

#### 4.7.2 FLOODGATES AND WETLAND REHABILITATION

**There are 176 floodgates on the Hunter River and its tributaries, most of which were constructed as part of the HVFMS (Winning and Saintilan, 2009). The role of floodgates in preventing or restricting tidal flows and controlling floodwaters (in combination with land clearing) has also led to significant changes in vegetation. In Hexham Swamp alone, from 1971 to 2005, the area of mangroves had decreased by 94%, saltmarsh by 92% and brackish swamp by 98% (Winning and Saintilan, 2009).**

Rehabilitation projects to reverse these impacts have been successful in Hexham Swamp, following the opening of the floodgates on Ironbark Creek, and in the Tomago wetlands, following modification of floodgates at Fullerton Cove. The successful wetland rehabilitation projects create habitat and biodiversity value (Tomago wetland is within a Ramsar site) but also have measurable benefits for fishery productivity (Boys 2015, Boys and Pease 2016). The drivers, process and benefits of these wetland projects are summarised in Coast Adapt 2015:

[https://coastadapt.com.au/sites/default/files/case\\_studies/CSO4\\_Coastal\\_adaptation\\_Hunter\\_River.pdf](https://coastadapt.com.au/sites/default/files/case_studies/CSO4_Coastal_adaptation_Hunter_River.pdf)

DPE has recently completed an assessment of tidal inundation risks and opportunities as part of the review of the HVFMS. This assessment investigated controlled tidal flushing to increase in-drain salinity levels for the control of freshwater weeds and exotic vegetation. This management option has been successfully implemented in several locations across NSW, including at Tomago wetlands and Kooragang Island.

In addition to improving the hydraulic efficiency of the drains, tidal flushing has added co-benefits including a reduction of pesticide use, the creation of intertidal habitat, the neutralisation of acid-sulfate soil runoff and the reduction of fish barriers (Water Research Laboratory UNSW, 2020).



# 4.0 CURRENT STATE OF THE HUNTER ESTUARY

## 4.7 ESTUARY WETLANDS:

### 4.7.3 OTHER WETLAND AND RIPARIAN COMMUNITIES

Diverse wetland communities were reported in the Estuary Processes Study (MHL 2003), based on mapping available at that time. Councils, DPI Fisheries, DPE (formerly OEH) estuary science, and Hunter LLS have conducted more recent mapping of selected wetland and riparian communities in the estuary. It is important to note that not all the wetlands on the floodplain of the Hunter Estuary are included in the CM SEPP, because of the width of the floodplain and the diversity of wetland types.

#### Communities include:

- » estuarine wetlands such as mangrove and saltmarsh, more recently mapped in the CM SEPP.
- » freshwater wetlands on the floodplain (mostly highly modified) including backswamps and cut off lagoons associated with former channel alignments of the Hunter River. Examples include part of Hexham Swamp, part of the Shortland Wetlands, Woodberry Swamp and Irrawang Swamp. However, there are extensive areas of ephemeral freshwater wetland across the floodplain of the middle and upper estuary, where standing water accumulates in old channels or backswamps after extended rain.
- » WRL 2016 completed a detailed study of the hydrology of Woodberry Swamp, one of the largest (currently) freshwater wetlands. The swamp has a local catchment of 4350 ha and includes permanent open water, intermittently inundated wetlands and pasture areas. It is connected to the Hunter River via Greenways Creek. The hydrology of the wetland is controlled by drains, floodgates and levees (including some in poor condition which constrain internal drainage processes), stormwater runoff from expanding urban areas and licensed

discharges from industry. The licensed industrial discharge accounts for over 85% of N and over 90% of P load in the Woodberry Swamp catchment and is licenced to discharge 2.3 Mega Litres per day directly into the swamp. This is a key factor (along with drainage changes) in the changes to vegetation communities. The wetland and pasture areas are impacted by invasive vegetation species and are also a source of deoxygenated 'blackwater' events after rainfall which often are released into the Hunter River.

- » fresh/brackish wetlands
- » reed swamps (*Phragmites australis*) and phragmites lined sections of the channel such as along the Williams River. The community is affected by cattle grazing and access to the waterway.
- » *Casuarina glauca* and *Melaleuca* sp stands and remnant forests
- » seagrass is largely absent from the Hunter estuary. MHL 2003 reported that at that time, seagrass beds had not been seen along the foreshores of the lower estuary for at least 30 years (other than a small area of *Ruppia* spp on Kooragang Island)

Woodberry Swamp and the wetlands of catchments such as Wallis Creek and Swamp Creek (e.g. Wentworth Swamp) illustrates strategic challenges for freshwater and brackish wetland management along the estuary, including:

- » robust science is necessary to understand the complex interactions of freshwater hydrology, groundwater and tidal dynamics in these systems, all influenced by historical structures and systems of drainage, floodgates and very high rates of floodplain sedimentation. There are historical reports of metres of sediment accumulation across the floodplain in major flood events in the late nineteenth and twentieth century.
- » the wetlands are natural filters and processors of sediment and nutrients and along with restored riparian communities are a key part of any approach to reduce nutrient loads in the Hunter estuary. Highly degraded and modified wetlands change from being natural biodiversity protection areas to sediment and nutrient exporters and threats to estuary health.

- » while many floodplain wetlands are currently fresh and are part of the grazing land use of the floodplain, they are vulnerable to sea level rise, with increasingly likely overtopping of floodgates and changes to the balance between fresh and saline standing water. The transformation of wetland hydrology and salinity will change their nutrient processing functions in ways that are not fully understood.
- » floodplain wetlands would have been a highly attractive environment for the Aboriginal people living in the region, especially over the last 10,000 years when sea level was at approximately its current level. The cultural heritage and archaeological value of the wetlands is poorly documented.
- » there are complex interactions between riparian vegetation, flood protection infrastructure and bank stability which need to be resolved to find an adaptive pathway for the channel as sea level rises; and to reduce the contribution of local sediment load to poor estuary health.

# 5.0 REVIEW OF CURRENT MANAGEMENT PRACTICES AND ARRANGEMENTS

The Certified Hunter Estuary Coastal Zone Management Plan (CZMP 2017) presented a series of 25 prioritised management objectives which essentially defined the 'goal posts' towards which future management of the estuary would be targeted.

The top five priorities were:

- » protecting estuarine biodiversity
- » increasing native riparian vegetation
- » preventing pollution
- » optimising the management of flood mitigation works and other flow control structures
- » minimising and remediating bank erosion throughout the estuary.

These highest priority objectives from the CZMP continue to be of concern to stakeholders today.

## 5.1 CZMP IMPLEMENTATION

Although a significant effort from councils, public authority stakeholders and peak community organisations contributed to the preparation of the CZMP, much of the data and analysis is now out of date. The strategic context has changed; a new statutory framework is in place; new issues, threats and risks have emerged; and some new tools are available.

The existing CZMP does not meet current requirements of the updated Coastal Management Manual, 2018. CZMP's were written as guiding documents for each responsible agencies actions not as business case led strategic documents as required by the manual.

The complex governance of the Hunter Estuary has reduced joint accountability, limited delivery of priorities in the CZMP, and allowed poor formal communication between key stakeholders. Progress towards the objectives of the CZMP is patchy, uncertain and poorly documented. No shared understanding exists of the current status of implementation, of estuary health or of the management of coastal hazards and risks in the estuary context, or of access and amenity opportunities.

The CZMP was written to the standards of the time and the strategies were applicable to the possible actions available to each responsible agency.

Of the 25 strategies proposed, 20 were completed either partially or fully however these strategies need to be reviewed as much legislation has changed as have the government agencies. A full list of strategies and actions undertaken is provided in Appendix 1.

Whilst the CZMP provides valuable information to assist understanding of the CMP, the coastal manual provides the development of a strategically different document. A new governance framework will assist in developing a document that is known to all estuary stakeholders and has commitment from them prior to building the business case for projects provided in the new CMP.

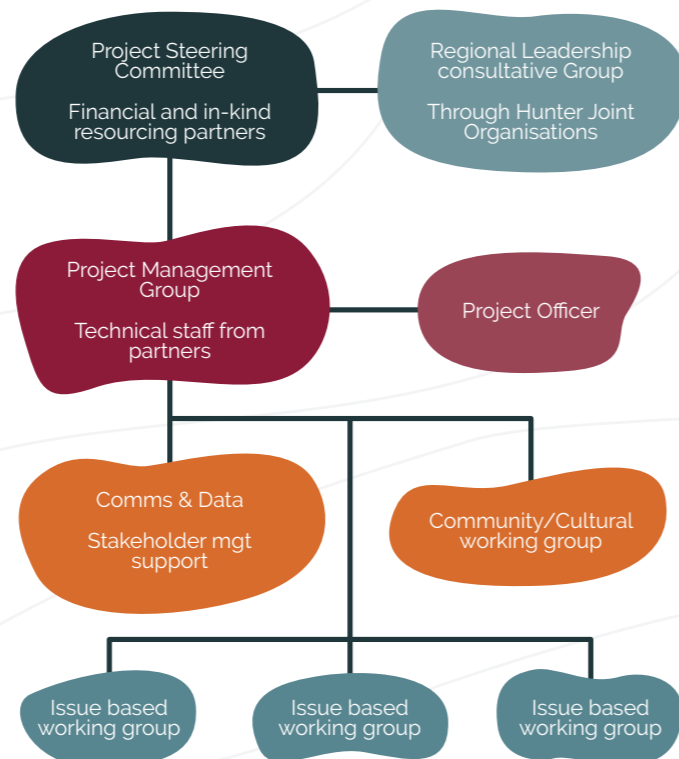
# 6.0 IDENTIFICATION OF ROLES AND RESPONSIBILITIES – GOVERNANCE

The Hunter River is one of the largest estuaries in NSW, and arguably one of the most complex from an administrative perspective. The Hunter Estuary intersects five LGAs; Maitland, Newcastle, Port Stephens, Cessnock and Dungog. Multiple other public authorities also have management responsibilities for key issues affecting the health of the estuary and the values it provides for the communities of the Lower Hunter region. Recent restructures of several public authorities, together with other staff changes, mean that responsibilities for estuary management are evolving.

The strategic context of the Hunter Estuary is dynamic. Important recent and ongoing changes to strategic context include (but are not limited to) the rapid population growth of Maitland City and its impact on the local catchment context of the estuary; ongoing and increasing demand for estuary based recreational opportunities on the banks and in the waterway, linked to emerging NSW government policy for sustainable urban areas; a wide-ranging review of the Hunter Valley Flood Mitigation Scheme (HVFMS); and new information about the future impacts of sea level rise and climate change on the hydrodynamics of the estuary and its floodplain wetlands.

The complexity of these responsibilities means that governance arrangements are a critical issue for Stage 1 of the preparation of the CMP. Governance arrangements established in Stage 1 will support the completion of the CMP, certification process and implementation of the certified CMP. As estuary management progresses Governance arrangements may change to bring additional groups or agencies together to ensure effective communication.

The following chart provides the governance arrangements chosen for the development of the CMP:



## The Project Steering Committee

Nominally the "Hunter Estuary Alliance (HEAL)" the committee consists of groups which provide a financial or in-kind support to the development of the coastal management program and have direct influence on matters pertaining to the Hunter Estuary. The Project Steering Committee provides a governing role and will work to collaboratively share information to resolve coastal and estuary management issues to the benefit of all stakeholders, community, and the environment in the Hunter Estuary.

The Project Steering Committee is comprised of senior management level staff from:

- » City of Newcastle
- » Port Stephens Council
- » Maitland City Council – provides dedicated project officer
- » Cessnock City Council
- » Dungog Shire Council
- » Hunter Local Land Services
- » Hunter Water
- » NSW Department of Planning and Environment – non-voting

The Steering Committee has a "Memorandum Of Understanding (MOU)" that has been signed by all voting committee members.

The key objectives of the MOU are to:

- » Provide guidance and a framework to ensure a productive partnership that builds capacity for all participants to deliver the project
- » Create a working relationship between all participants to develop an open communication and information sharing atmosphere
- » Provide a basis to actively seek grants for projects as a collaboration of estuary stakeholders.

## The Project Management Group

Consists of staff from HEAL- the project steering committee at a technical expertise level. This group's role is to manage the core projects to develop the coastal management program.

The Project Management Group has a "Terms of Reference" endorsed by the group to facilitate regular liaison between staff pertaining to the Hunter Estuary CMP.

## The Communications and Data Group

Consists of the communication and / or engagement staff in each HEAL group and data specialists where they are available. This group is responsible for the development of an engagement plan and website development.

## The Community / Cultural Working Group

Discussions are being held with key stakeholders to investigate how they wish to be involved in the coastal management program development. Early indications suggest that the Traditional Owners would value a groups development. This opportunity and terms of reference will be developed as Stage 2 is undertaken to assist with key issue investigations.

## Issues Working Groups

Groups will be developed to aid in direction of key issue investigations. These groups may be short or long term depending on the need of the project. Whilst representatives from the project management group and appropriate technical staff from HEAL will be part of the groups, other major stakeholders are envisioned to be part of the issue groups and are detailed below.

The list of stakeholders for the Hunter Estuary is many and varied. Whilst public authorities can be defined in the following Table 2, stakeholders also include groups from the economic facet such as irrigators, fishing and aquaculture enterprises, coal associated industries, development; social facet such as community and other Councils outside the coastal area; cultural facet such as traditional owners and European Heritage interests; and environmental facet such as the Hunter Wetlands Centre and other community groups.

## 6.0 IDENTIFICATION OF ROLES AND RESPONSIBILITIES – GOVERNANCE

Table 2: Key Public Authority Stakeholders

ORGANISATION	ROLE
<b>Coastal Councils</b>	Prepare and oversee implementation of the CMP as managers of the LGA in which the coastal interface is located. Councils also manage landuse planning through zoning and development approval which impact waterways and land management.
<b>Hunter Valley Flood Mitigation Scheme (HVFMS)</b>	Designed by DPE, the scheme is designed to mitigate flood damage using a system of levees, floodgates and drains on the Hunter, Paterson and Williams Rivers. The HVFMS team is within the Water Group of DPE.
<b>Hunter Local Land Services (Hunter LLS)</b>	Hunter LLS delivers services and programs that add value to local agricultural industries, enhance natural resources, protect primary production from pests and disease, and help local communities prepare for and respond to emergencies, such as flood and fire.
<b>Marine Estate Management Authority (MEMA)</b>	The Marine Estate Management Authority is working to implement the NSW Marine Estate Management Strategy outlining how to protect and enhance waterways, coastlines, and estuaries over the next ten years.
<b>Office of Local Government</b>	The Office of Local Government is responsible for strengthening the performance of the local government sector including the local councils involved in the CMP.
<b>Hunter Joint Organisation of Councils</b>	A collaborative body of ten Hunter region councils aiming to provide cohesion for key regional strategic priorities. This is important as the mapped coastal area is only a small portion of a larger connected river and catchment which has implications to the health of the estuary.
<b>Department of Planning and Environment (DPE)</b>	DPE manages planning, industry and environment for urban and regional NSW and upholds regulatory frameworks for biodiversity conservation, sustainable development and productive farming. Coast and estuary management is supported by the Biodiversity and Conservation Division.
<b>NSW Crown Lands</b>	This Authority administers public land across NSW which includes the beds of most tidal and non-tidal waterways.
<b>National Parks and Wildlife Service (NPWS)</b>	NSW NPWS is a part of the NSW DPE and manages more than 870 NSW national parks including the Hunter Wetlands National Park.
<b>Local Aboriginal Land Councils (LALCs) NSW Aboriginal Land Council (NSWALC) Aboriginal Affairs</b>	LALCs are at the heart of the organisational structure of the land rights network, representing the many Aboriginal communities across NSW and overseen by the NSW Aboriginal Land Council (NSWALC). Aboriginal Affairs NSW works with Aboriginal communities to promote social, economic and cultural wellbeing through opportunity, choice, healing, responsibility and empowerment.

ORGANISATION	ROLE
<b>Commonwealth Department of Climate Change, Energy, the Environment and Water. Commonwealth Department of Agriculture, Fisheries and Forestry</b>	The departments of the Australian Government which regulate Australia's agriculture, environment and heritage, and water. These departments manages matters of environmental significance in accordance with the EPBC Act and is the administrative authority for the Ramsar Convention on wetlands. These departments also provide funding to stakeholders including regional natural resource management (NRM) organisations such as Hunter Local Land Services.
<b>Hunter Water Corporation</b>	A state-owned Corporation that provides water services across the Lower Hunter and manages seven key water catchment areas.
<b>Department of Planning and Environment – Water</b>	This division of DPE manages the surface and groundwater in NSW, develops and implements plans for water security, and manages regional and metropolitan water supply and usage.
<b>Natural Resources Access Regulator (NRAR)</b>	The Natural Resources Access Regulator is responsible for the enforcement of water laws in NSW through licensing, monitoring compliance, and education.
<b>Department of Primary Industries – Fisheries (DPI)</b>	DPI is responsible for administering fisheries laws governing the fisheries resources and is actively involved in protecting and rehabilitating wetlands via legislation regulating and creating Marine Protected Areas.
<b>Environment Protection Authority (EPA)</b>	EPA is the primary environmental regulator and consults with communities, industries, governments, and businesses on activities and issues that affect the NSW environment. They also respond to environmental emergencies and enforce regulations.
<b>Department of Defence</b>	The Defence Environmental Strategy (2016) focuses on five strategic aims to manage environmental challenges and opportunities regarding environmental impacts, resource consumption, biodiversity conservation, pollution and contamination, and heritage values. The Williamtown RAAF Base lies to the north-east of Fullerton Cove, within the lower estuary.
<b>Port of Newcastle Port Authority of NSW</b>	The Port of Newcastle maintains both an Environmental Management Plan and an Environmental Management System that outlines port activities and ensures commitment to environmental standards. Port of Newcastle also manages biosecurity threats and undertakes regular environmental monitoring. Port of Newcastle manages ongoing navigation dredging and survey in the Port.  Port Authority of NSW manages navigation, safety security and operational needs of Newcastle Harbour (and five other major commercial ports in NSW)
<b>University of Newcastle (UON)</b>	The University leads an Environmental Sustainability Plan to achieve environmental sustainability outcomes and is participating in the Newcastle Wetland Connections Project. UoN also plays an extensive role in teaching, research, and innovation in energy, biodiversity and environmental areas.
<b>Transport for NSW (TfNSW)</b>	TfNSW is committed to delivering a sustainable transport system for NSW in a manner that balances economic, environmental and social issues. Current major projects with implications for the estuary include the M1 Pacific Motorway Extension to Raymond Terrace and the proposed Lower Hunter Freight Corridor.



# 7.0 ENGAGEMENT, VALUES, OUTCOMES AND ISSUES

## 7.1 STAKEHOLDER ENGAGEMENT – VALUE IDENTIFICATION

Many Hunter estuary stakeholders have thought about and identified values of the estuary – what the estuary means to their organisation, their customers, community, partners and regulators. These value reviews, conducted over the last decade, each offer a slightly different perspective. Value statements have been informed by a number of consultation processes involving the community of the lower Hunter region, through which the Hunter Estuary flows. These previous consultation programs and value statements provide a strong start to understanding the different perspectives on the values of the estuary.

For this project the vision and values are interrelated. The vision was directed by initial consultation that had occurred prior to the program. Further engagement reinforced the community values and the desired vision and therefore provides the anticipated outcomes required. Whilst the objectives are extrapolated from the Coastal Management Act 2016 these directly reflect the communities' values.

Values change over time as community need varies, more research is undertaken, and environmental conditions change such as sea level rise. Identifying the current community values directs the identification of risks associated to meeting these values in the Hunter Estuary, and therefore the need for data and research to identify projects which will manage the system.

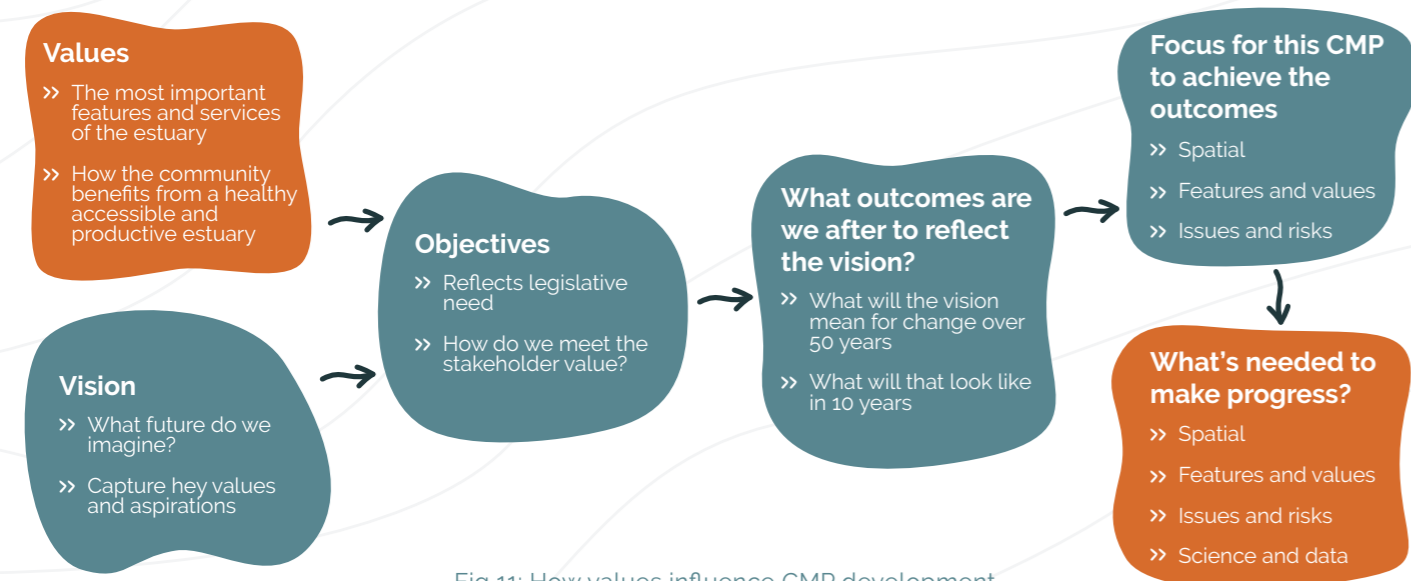


Fig 11: How values influence CMP development

Recently a number of projects have undertaken community and/or stakeholder engagement which has assisted the understanding of the value of the river, estuary and environment.

### Consultation undertaken for this scoping study:

- » participants at seminar on the Hunter Estuary hosted by Hunter Environmental Institute. The 66 attendees included a mix of council, public authority, consultant, academic and community representatives – June 2021
- » Senior Managers briefing of Maitland City Council by council's environmental staff to assist with broader planning development reflecting on the value of the estuary to their community. – June 2021
- » workshop which included 35 participants from multiple stakeholder groups to support analysis of governance development – July 2021
- » briefing of Hunter Local Land Services – December 2021
- » briefing Newcastle Coastal Management Program Working Group December 2021
- » briefing Port of Newcastle – January 2022
- » briefing Hunter Water – February 2022
- » briefing Hunter Joint Organisations group – May 2022
- » briefing General Managers Advisory Committee – May 2022
- » briefing Cessnock City Council – May 2022
- » briefing Mindaribba Local Aboriginal Land Council – June 2022
- » stakeholder tour of estuary and workshop – August 2022
- » Cessnock area values identification – September 2022
- » Dungog area values identification – September 2022

### Consultation projects which provide important information for value identification:

- » Hunter Water undertook Community and Stakeholder engagement in 2020 to identify catchment values for the Wastewater Masterplan currently being developed.
- » all Councils have undertaken community engagement for their community strategic plans in accordance with the Integrated Reporting and Planning guidance and have undertaken community satisfaction surveys in 2022. This data provides a wealth of information on community expectations of environmental protection and engagement with their natural resources including the river
- » NSW Department of Planning and Environment undertook a community survey to identify community values of the river to assist with the creation of NSW Water Quality Objectives in 2022.
- » Hunter Wetland Centre Australia hosted a Hunter Estuary Forum to bring together estuary stakeholders to consider the future of the estuary and the Ramsar listed wetlands in 2022. A deliverable from the forum was the development of a list of issues and values of the estuary.

All consultation with stakeholders to date were evaluated and value themes identified and are summarised below. Whilst these values have been placed in selected domains it is recognised that all values are related and not independent; for example water quality is important to estuary health, however without good water quality you will not achieve a healthy lifestyle or productivity.

## 7.0 ENGAGEMENT, VALUES, OUTCOMES AND ISSUES

ESTUARY HEALTH	HEALTHY LIFESTYLE	PRODUCTIVITY
Water Quality	Liveability	Jobs and Growth
Connectivity	Resilience	Resilience
Biodiversity/ Habitat/ Shorebirds	Community knowledge & understanding	Heritage
Wetlands	Recreation	Fisheries /Aquaculture
Resilience	Community Access	Creative and beautiful cities-urban design and liveability
Ecological Health	Amenity /scenic quality	Economy activated
Protecting and increasing native vegetation	Nature/Green Spaces	Tourism
Flow	Community	Flood mitigation
Healthy Riverbanks	Flood planning & emergency response	Agriculture
Significant species	Indigenous Culture	Water extraction- drinking
Indigenous Culture		Port and associated industry
		Research base
		Indigenous Culture

Table 3: CMP Objectives meeting community / stakeholder values

OBJECTIVE	VALUES
<b>Protect and enhance natural estuary processes and environmental values through restoration and rehabilitation</b>	Estuary Health
<b>Maintain and enhance public access, amenity and safe use recognising the benefits that nature brings to human health and wellbeing</b>	Healthy Lifestyle Estuary Health
<b>Acknowledge, respect and protect indigenous communities' spiritual, social and economic use</b>	Estuary Health Healthy Lifestyle Productivity
<b>Support the strategic economic importance of the Hunter Estuary</b>	Productivity
<b>Facilitate ecologically sustainable development</b>	Estuary Health Healthy Lifestyle Productivity
<b>Mitigate current and future risks from coastal hazards and climate change to improve resilience of the estuary</b>	Estuary Health Healthy Lifestyle Productivity
<b>Enhance community stewardship of the estuary through consultation and engagement</b>	Estuary Health Healthy Lifestyle

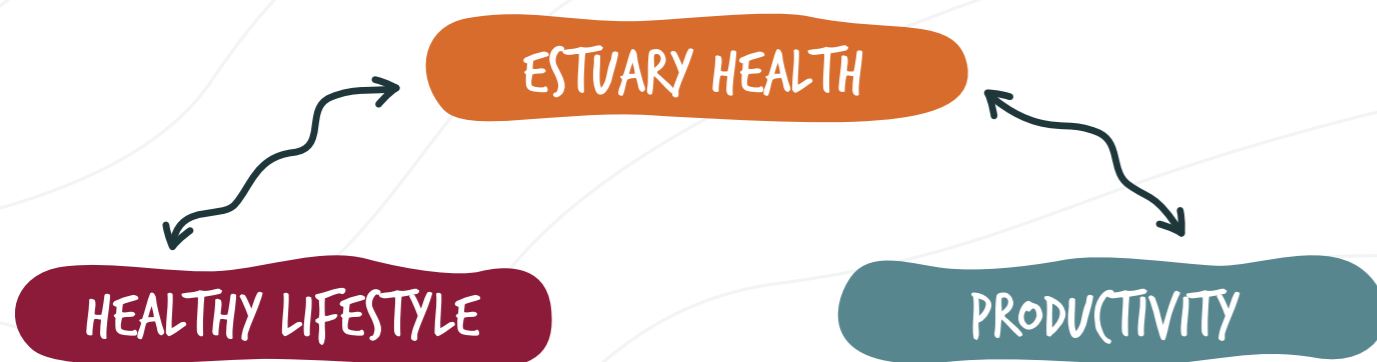


Fig 12: Interrelationship of estuary values



## 7.0 ENGAGEMENT, VALUES, OUTCOMES AND ISSUES

### 7.2 OUTCOME – A HEALTHY ESTUARY

Estuary health is nominated by many stakeholders as a key value and an objective of estuary management. Participants in the Scoping Study multi-stakeholder workshop provided feedback on what they saw as critical characteristics of a healthy estuary.

This feedback complements the measurable indicators used by the NSW Government to assess the health of estuaries in NSW (OEH, 2017).

Both groups of estuary health characteristics are shown in Figure 13. These characteristics highlight the outcomes to be achieved by changes to estuary management in the Hunter over the next 10 years and beyond.

#### DPE science indicators of estuary health

- » Degree of modification of morphology and hydrodynamics
- » Nutrient load and nutrient cycling
- » Water clarity
- » Algal production (Chlorophyll-a)
- » Free from water pollutants and contamination in sediments
- » Health of mangroves
- » Fish diversity

#### Workshop descriptors of estuary health

- » Stable, natural vegetated riparian zone -banks and shorelines
- » Consistently high water quality
- » Healthy wetlands
- » High in-stream biodiversity
- » Accessible for diverse recreation - shorelines and on water
- » Supports productive primary industries (fishing and agriculture)
- » Stable catchment

Figure 13: Indicators and Descriptors of a Healthy Estuary

Together, the characteristics identified in DPE guidance and by participants in the workshops, point to a suite of outcomes to be achieved from the CMP for the Hunter Estuary (Table 4).

Table 4 Outcomes from successful management of the Hunter estuary

OUTCOME	WHAT WOULD HAVE HAPPENED WHEN THIS OUTCOME IS ACHIEVED?
<b>Stable, vegetated riparian zone in all parts of the estuary</b>	Bank erosion severity and extent reduced in the estuary and the near catchment
<b>Restored hydrodynamic processes and functions</b>	Restored tidal circulation to estuarine wetlands and floodplains Improve interaction of catchment floods and floodplain wetlands
<b>Improved water quality</b>	Reduced nutrient load from all sources, so that nutrient processing functions effectively in the waterway and no part of the estuary is eutrophic Metal and PFAS contamination impacts reduced to negligible Improved water clarity in the upper estuary
<b>Healthy wetlands and instream biodiversity</b>	Improved mangrove health Priority saltmarsh areas restored and resilient Function restored in floodplain wetlands in tributary catchments Fish and water bird diversity is maintained
<b>Cultural landscape values are recognised and protected</b>	Aboriginal community has a voice in deciding actions and priorities to protect and restore the health and condition of places, natural systems and biodiversity of the estuary that support cultural values
<b>Productive, sustainable agriculture, fisheries and port operations</b>	Decisions have been made about sustainable floodplain land uses and transition is underway where necessary The port continues to connect the Hunter region to the world, while balancing port operations and economic value with a healthy and stable estuary
<b>An accessible waterway</b>	Waterway health is suitable for diverse recreational uses in the upper estuary as well as the middle and lower estuary Increased accessibility at points and along bank/shoreline
<b>Residential land use does not increase risks</b>	Water sensitive urban development contributes to wetland and waterway health Integrated water cycle management is functioning across local and regional catchment flows, supply, demand and wastewater – to drive reduced nutrient loads Flood risks from catchment floods, local flash flooding and tidal inundation recognised and mitigated in urban planning and design.
<b>Barriers to coordinated efforts to achieve improved estuary health are reduced</b>	Governance arrangements support information sharing, coordination of stakeholder priorities and actions and regular reporting of progress, successes and lessons learnt so that estuary health continues to improve
<b>The community has a say in how the estuary is managed</b>	The community is more informed and resilient The community celebrates a healthy estuary and understands the trade-offs involved

## 7.0 ENGAGEMENT, VALUES, OUTCOMES AND ISSUES

### 7.3 OBJECTIVES MEETING OUTCOMES

To ensure that the CMP objectives meet the community and stakeholder outcomes a review has been undertaken to ensure that they are aligned.

The objectives are also reviewed to ensure that the objectives of the CM Act, MEMS and regional plans and policies are being met.

Table 5 provides this analysis which shows that each objective contributes to several outcomes, reflecting the interconnected nature of estuary values, objectives and outcomes.

Table 5: CMP Objectives meeting CMP outcomes

CMP OBJECTIVES	EXPLANATION/ALIGNMENT	RELATED OUTCOMES
<b>Protect and enhance natural estuary processes and environmental values through restoration and rehabilitation.</b>	CM Act Object (a) and (g) MEM Act object (a) (ii) CZMP objectives 1 to 5, 10, 12 to 15, 18 to 20 (some of these CZMP objectives could become specific strategies or targets for moving towards the broader objective of natural processes, character and ecosystem diversity and integrity)	Stable vegetated riparian zone in all morphological zones of the estuary  <b>Restore hydrodynamic processes and functions</b> » tidal circulation to estuarine wetlands and floodplains » improve interaction of catchment floods and floodplain wetlands  <b>Improved water quality</b> » Reduced nutrient load from all sources, so that nutrient processing functions effectively in the waterway and no part of the estuary is eutrophic » Metal and PFAS contamination impacts reduced to negligible » Improved water clarity in the upper estuary  <b>Healthy wetlands and instream biodiversity, including</b> » Improved mangrove health » Priority saltmarsh areas restored and resilient » Function restored in floodplain wetlands in tributary catchments » Fish and water bird diversity is maintained
<b>Maintain and enhance public access, amenity and safe use recognising the benefits that nature brings to human health and wellbeing.</b>	CM Act object (b) and (l) MEM Act object (a) (ii) MCC vision PSC vision Hunter Regional Plan Greater Newcastle Metropolitan Plan CZMP objectives 11, 21, 22	<b>A more accessible waterway</b> » Waterway health is suitable for diverse recreational uses in the upper estuary as well as the middle and lower estuary » Increased accessibility at points and along bank/shoreline  Waterway health is suitable for diverse recreational uses, with improvement in the Upper estuary

CMP OBJECTIVES	EXPLANATION/ALIGNMENT	RELATED OUTCOMES
<b>Acknowledge, respect and protect indigenous communities' spiritual, social &amp; economic use</b>	CM Act object (c) MEM Act object (a) (ii) CZMP objective 25	<b>Cultural landscape values are recognised and protected</b> » Aboriginal community has a voice in deciding actions and priorities to protect and restore the health and condition of places, natural systems and biodiversity of the estuary that support its cultural values
<b>Support the strategic economic importance of the Hunter Estuary</b>	CM Act Object (d) MEM Act object (a) (i), (ii) Hunter Regional Plan Greater Newcastle Metropolitan Plan CZMP objectives 3, 15, 23, 24	<b>More sustainable productive land uses (agriculture, fisheries and port operations), adapting to change</b> » Decisions made about sustainable floodplain land uses and transition underway where necessary » The port continues to connect the Hunter region to the world, while balancing port operations and economic value with a healthy and stable estuary
<b>Facilitate ecologically sustainable development</b>	CM Act object (e) NCC LSPS CZMP objectives 11, 13, 20, 23, 24 (plus those that refer to impacts of specific industries or activities on the health or resilience of the estuary)	<b>Productive, sustainable agriculture, fisheries, aquaculture and port operations</b> Cultural landscape values are recognised and protected » Aboriginal community has a voice in deciding actions and priorities to protect and restore the health and condition of places, natural systems and biodiversity of the estuary that support its cultural values  Residential land use does not increase risks » Water sensitive urban development contributes to wetland and waterway health » Integrated water cycle management is functioning across local and regional catchment flows, supply, demand and wastewater – to drive reduced nutrient loads » Flood risks from catchment floods, local flash flooding and tidal inundation recognised and mitigated in urban planning and design.  Decisions made about sustainable floodplain land uses and transition is underway where necessary
<b>Mitigate current and future risks from coastal hazards and climate change to improve resilience of the estuary</b>	CM Act object (f) and (i) Alluded to in Hunter LLS vision (resilient) CZMP objectives 4 and 16  This is a significant omission in the vision for LSPS and regional planning documents	<b>Residential land use does not increase risks</b> » Flood risks from catchment floods, local flash flooding and tidal inundation recognised and mitigated in urban planning and design.
<b>Enhance community stewardship of the estuary through consultation &amp; engagement</b>	CM Act Object (k) CZMP objective 6	<b>The community has a say in how the estuary is managed</b> » The community is more informed and resilient » The community celebrates a healthy estuary and understands the trade-offs involved » Community is active in estuary management

# 8.0 STRATEGIC CONTEXT

**Strategic context refers to the characteristics of the Hunter Estuary, its catchment, land use and management processes, which set it apart from other systems and have a significant influence on management issues, opportunities, feasible approaches and outcomes.**

The strategic context includes environmental, governance (including legal), social, cultural, economic and technical factors which may affect coastal management.

**These factors may:**

- » increase coastal vulnerability, sensitivity or risks, or conversely enhance resilience
- » amplify or reduce the risks associated with climate change and sea level rise
- » affect community attitudes to risk and their willingness to engage in or pay for coastal risk mitigation
- » increase uncertainty
- » affect community knowledge and capacity to adapt to change (for example, rapidly growing communities are likely to include relatively fewer people with experience of the local impacts of coastal hazards; aging communities generally have a higher level of vulnerability)

- » add complexity to decision-making processes, with multiple stakeholders, having different objectives and perspectives on risk or priority responses
- » make avoidance of coastal risks challenging, for instance where historical land use planning decisions have resulted in existing intensive development in high-risk areas
- » add complexity to responsibility and accountability, for instance through complex land tenure or significant lags in aligning detailed plans of management for public land to the strategic direction set in the CMP, and
- » create barriers to an effective business case and equitable sharing of costs and benefits.

This section presents an overview of the strategic implications of the environmental, governance, and socio-economic context of the Hunter Estuary.

## 8.1 STRATEGIC ASPECTS OF ENVIRONMENTAL CONTEXT

Table 6 summarises the strategic elements of the environmental context of the Hunter Estuary.

STRATEGIC ELEMENT	CHARACTERISTICS	STRATEGIC CONTEXT SIGNIFICANCE
<b>Scale</b>	<ul style="list-style-type: none"> <li>» The catchment area is more than 22,000 km<sup>2</sup>. It is the largest coastal catchment in NSW.</li> <li>» The Hunter Estuary is at the juncture of the NSW North Coast Biogeographic Region to the North and Sydney Basin Biogeographic Region to the South</li> <li>» Tidal limit of the Hunter River at Oakhampton is 65 km from the coast. Tidal circulation above Morpeth is very slow. Tidal limits on the Williams River (at Seaham Weir and Paterson River are 46km (at Seaham Weir, which protects drinking water supplies) and 75km respectively</li> <li>» A network of large and small tributaries with rural, urban and industrial catchments, including the Williams River, Paterson River, Wallis, Fishery, Four Mile, Windeyers, Ironbark, Throsby, Styx and Cottage Creeks</li> </ul>	<p>The interactions of wider catchment, local catchment and tidal flows in the upper and mid estuary are critical to improving water quality improvements and estuary health.</p>
<b>Geomorphology and Geodiversity</b>	<ul style="list-style-type: none"> <li>» The Hunter Estuary and its associated coastal barrier systems incorporate one of the most diverse and best documented coastal sedimentary sequences in Australia. This dated sedimentary sequence is a significant scientific and geo-heritage feature of the estuary.</li> <li>» The natural morphology of the lower estuary included a sinuous river channel and well-developed bay head and flood tide deltas, multiple islands, coastal wetlands and extensive oyster reefs. Contiguous floodplains with backwater swamps and cut-off bays are the remnants of former back barrier lakes.</li> <li>» The catchment scale and magnitude of major floods means that sediment and nutrient load from the catchment are major influences on estuary processes and estuary condition in wet periods</li> <li>» The estuary includes rare evidence of high sea levels during the last Interglacial period (at Largs), adding to its geo-heritage significance</li> </ul>	<p>Extensive and systemic hydrodynamic, morphological and ecological modification is a key feature of the Hunter Estuary and contributes to its poor condition in DPE assessments.</p> <p>The entire estuary and almost all of its catchment have been modified and impacted over the 200 years of European occupation.</p>

## 8.0 STRATEGIC CONTEXT

STRATEGIC ELEMENT	CHARACTERISTICS	STRATEGIC CONTEXT SIGNIFICANCE
<b>Extent of modification</b>	<ul style="list-style-type: none"> <li>Entrance form and stability, channel length, sinuosity, depth, wetland area, floodplain morphology and sediment character and tidal processes are highly modified. The floodplain and riparian zones are almost entirely cleared of native vegetation. Major impacts commenced with European settlement in the early nineteenth century.</li> <li>These changes have impacted on all aspects of estuary function and health, including catchment hydrology (floods and droughts), tidal hydrodynamics and interactions between the catchment and tidal flows. They impact on habitat and biodiversity, erosion and sedimentation, and water quality.</li> <li>During the twentieth century flood mitigation works and floodplain drainage structures reduced tidal ventilation and inundation of former intertidal areas, reducing the area and functions of saltmarsh and mangrove wetland systems.</li> </ul> <p>Over the last 15 years, some floodgate systems have been modified, facilitating the recovery of coastal wetland in Hexham wetland and at Tomago/Kooragang. In the long term, tidal inundation is also a hazard and a risk to floodplain agriculture.</p>	<p>The estuary is in poor condition.</p> <p>The extent of modification and the economic significance of modifications affect what can be considered as a healthy Hunter Estuary.</p> <p>The impacts of these historical and ongoing development pressures mean difficult decisions must be made to balance social and economic values with restoring the health of the estuary. Difficult decisions require systematic and transparent processes and suitable data to ensure fairness and scientific credibility.</p>
<b>Estuary processes, hazards and knowledge</b>	<ul style="list-style-type: none"> <li>A detailed hydrodynamic and water quality model (the WRL Model) to simulate ecological processes in the Hunter Estuary, and to ensure the widespread, robust application of the approach, has been developed to assess estuary processes and catchment management options to improve estuary water quality and health. The model outcomes are linked to water sharing plans and pollution reduction plans in the Hunter.</li> <li>Hazards (f) (tidal inundation erosion) and (g) (inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters) from the CM Act, are directly relevant to the Hunter Estuary.</li> </ul>	<p>The WRL model (Glamore et al 2019) is now an important part of the strategic context for managing the Hunter Estuary. It facilitates quantitative testing of scenarios of estuary change and catchment and estuary management. This is essential for making decisions about a large, complex and dynamic estuary system.</p>

STRATEGIC ELEMENT	CHARACTERISTICS	STRATEGIC CONTEXT SIGNIFICANCE
<b>Estuary health</b>	<ul style="list-style-type: none"> <li>The Hunter Estuary is not healthy now, with poor scores for: <ul style="list-style-type: none"> <li>turbidity (upper estuary)</li> <li>estuary form and function (lower estuary)</li> <li>nutrient pollution (all parts of the estuary)</li> <li>metal contamination (mid and lower estuary)</li> <li>microalgal growth on the bed (middle estuary)</li> <li>sediment oxygen demand (mid estuary)</li> <li>mangrove health (mid and lower estuary)</li> </ul> </li> <li>The Upper section of the Hunter River Estuary has the worst water quality in NSW (for the freshwater tidal zone)</li> </ul>	<p>Health of the lower estuary is affected by legacy issues such as harbour structures and contaminants from heavy industry, as well as ongoing port and industry functions.</p> <p>The middle and upper estuary, where dynamic interactions between catchment and tidal flows occur, are affected by sediments/turbidity and excess nutrient load. These point and diffuse source pollutants interact with each other in complex ways in space and time, across the estuary waterway, floodplain, wetlands and local catchments.</p> <p>The best ways to manage sources and interactions to improve estuary health are not well understood.</p>
<b>Wetland values</b>	<ul style="list-style-type: none"> <li>The wetland system in the Hunter Wetlands National Park is of international significance and was listed under the Ramsar Convention on Wetlands in 1984.</li> <li>The Hunter Estuary Wetlands Ramsar site of the Hunter Wetlands National Park (Tomago and Kooragang wetlands) and Shortland Wetlands (Hunter Wetlands Centre) along with Hexham Swamp in the National Park are outstanding case studies in wetland rehabilitation and resilience and the necessity of partnerships across all levels of government, and between industry, universities, citizen scientists and government.</li> <li>Wetlands, including estuarine saltmarsh, floodplain backswamps and wetlands at or just above the tidal limit of tributaries are a key feature of the Hunter estuary. Their natural functions include mediating catchment flows (local and whole of Hunter), floods and nutrient loads. most are now heavily degraded by clearing, grazing, cultivation, hydrological and hydrodynamic modification.</li> </ul>	<p>Restoring and enhancing the natural functions of wetlands across the floodplain and local catchments should be a priority component of Hunter estuary management</p>
<b>Climate change vulnerability</b>	<ul style="list-style-type: none"> <li>The Hunter estuary, floodplain and associated communities are the 6th most vulnerable system to climate change in NSW</li> <li>The Hunter estuary is strongly impacted by extreme catchment flooding events and by extreme drought when freshwater flows into the upper estuary are minimal.</li> <li>HVFMS Review shows the vulnerability of land uses and infrastructure function on low lying land, where tide gates are likely to be overtopped by tidal process in coming decades. In the lower estuary urban areas, stormwater system functions are impacted by high tides</li> <li>Studies of climate change risks that have been prepared by key industries and management authorities, including HVFMS, Port of Newcastle, Hunter LLS, Hunter Water Corporation, other infrastructure providers and local councils provide local detail supplementing the broader climate risk and vulnerability assessments prepared by the NSW government</li> </ul>	<p>Climate risks in the Hunter Estuary are diverse but significant.</p> <p>The processes and hazards driving climate risks vary widely across the estuary and floodplain, because of the scale, distance inland to the tidal limit, morphological differences and the patterns of development, assets and natural resource values.</p> <p>A related component of strategic context is that these risks are not well understood across the broader community. This lack of understanding will make negotiation of trade-offs and land use change challenging.</p> <p>Emissions reduction is a key consideration in relation to the implementation of the CMP and activities such as carbon sequestration through riparian revegetation and blue carbon should be considered for dual benefit of this and habitat creation.</p>

## 8.0 STRATEGIC CONTEXT

### 8.1.1 COASTAL PROCESSES AND HAZARDS: 8.1.1.1 COASTAL HAZARDS

The CM Act identifies seven coastal hazards, including two which are directly relevant to the Hunter Estuary:

#### (f) tidal inundation

These hazards affect the health and functions of wetlands, channel stability, the viability of agricultural land, land suitable for residential and recreational uses, community safety and resilience.

Tidal inundation (hazard (f)) is both a hazard and a factor in estuary function, health and productivity. During the twentieth century flood mitigation works and floodplain drainage structures reduced tidal ventilation and inundation of former intertidal areas, reducing the area and functions of saltmarsh and mangrove wetland systems.

Over the last 20 years, some floodgate systems have been modified, facilitating the recovery of coastal wetlands in Hexham Swamp and at Tomago/Kooragang. In the long term, tidal inundation is also a hazard and a risk to floodplain agriculture.

Hazard (g) is illustrated by ongoing bank erosion and bed sediment resuspension by tidal currents and flood flows. Review and analysis of bank erosion hazards by Soil Conservation Service on behalf of HVFMS and Hunter LLS indicates some current high-risk locations where rates of bank recession and channel widening are high.

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

#### Ongoing bank erosion along the estuary:

- » increases sediment and nutrient load into poorly flushed reaches of the waterway
- » threatens flood mitigation infrastructure such as levees
- » reduces potential riparian vegetation recovery
- » affects access.

Both hazard (f) and hazard (g) are expected to extend in their reach and impact as sea level rises and climate warms in the coming decades.

Detailed studies by HVFMS associated with the review of the scheme indicate that sea level rise will affect the banks and floodplain of the estuary by:

- » Reducing the efficiency of drainage channels and floodgates that currently protect low lying agricultural land. Some sections of the floodplain that currently drain will become permanently wet with sea level rise, reducing their viability for farming.
- » Increasing the likelihood of riverbank erosion that impacts on existing levee banks.
- » Increasing the likelihood of tidal overtopping of low-lying levees on the estuarine floodplain.

Figure 14 shows the additional area expected to be inundated by a 20% flood event by the end of the century, based on "Representative Concentration Pathway" (RCP) 8.5 (assumed sea level rise of 0.5 m by 2050 and 0.9 m by 2100).

The entrance to the Hunter Estuary is controlled by extensive training wall structures, so there is no lateral migration of the entrance. However, the entrance area is still affected by tidal delta processes, with associated impacts on dredging to maintain navigability for the large vessels accessing the Port, and for the sediment budget of the broader coastal sediment compartment.

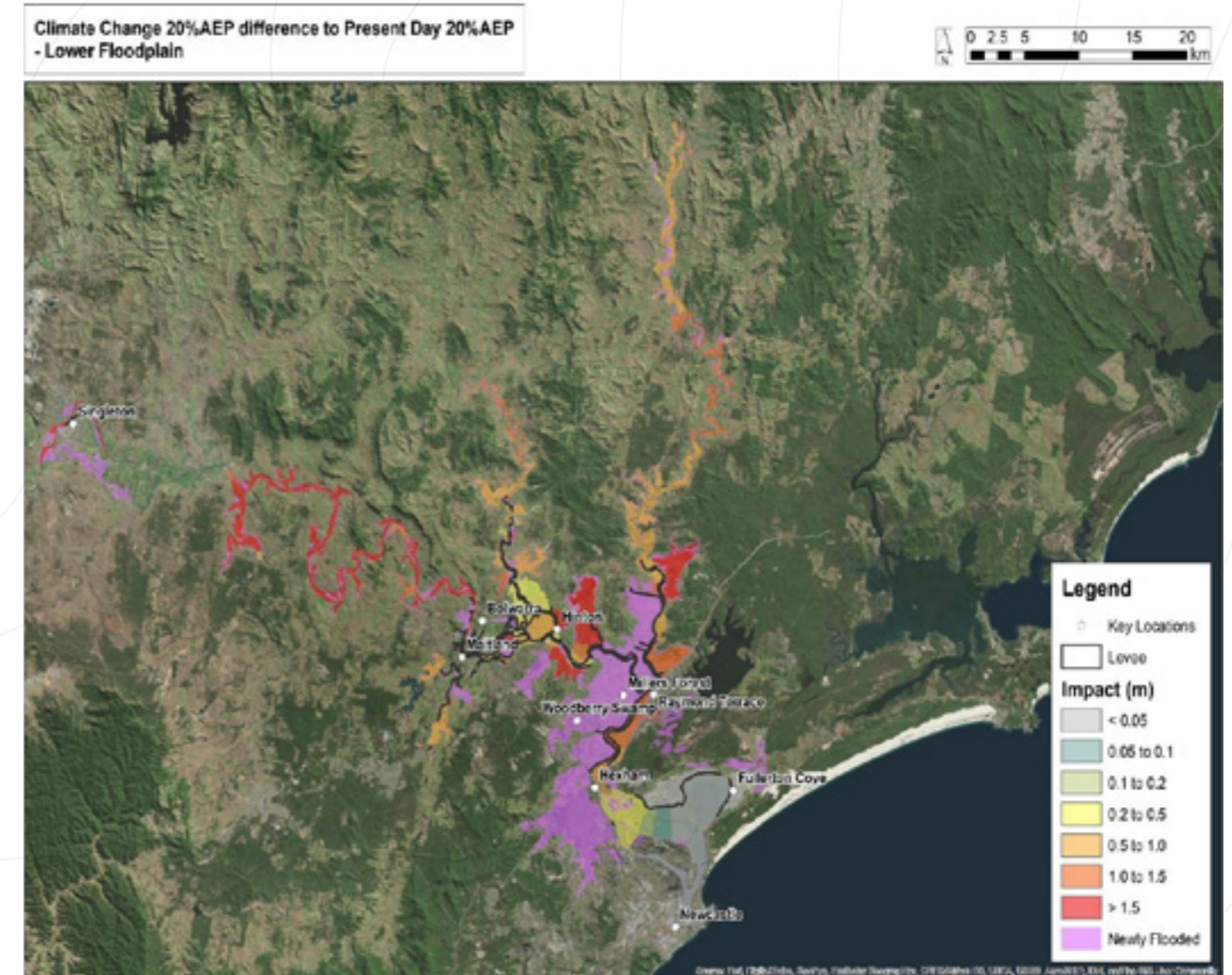


Fig 14: Climate Change 20% AEP Difference to Present Day 20% AEP Flood Areas, Lower Floodplain  
Source HVFMA Presentation to Hunter Environment Institute, June 2021.

## 8.0 STRATEGIC CONTEXT

### 8.1.1 COASTAL PROCESSES AND HAZARDS: 8.1.1.2 HUNTER ESTUARY HYDRODYNAMIC MODEL

**An understanding of hydrodynamic processes and hazards is fundamental to managing the estuary.**

To support the assessment of threats, hazards and risks in the estuary, an estuary wide scoping study was undertaken in 2014 to determine the 'state of the science' for modelling and data in the Hunter Estuary (Glamore et al., 2014). The outcomes of this study highlighted numerous data gaps and the lack of adequate models of the broader hydrodynamic and water quality dynamics of the estuary.

An overarching independent committee, the Hunter Estuary Hydrodynamic Modelling Platform Committee, was formed to oversee the development of a detailed hydrodynamic and water quality model to simulate ecological processes in the Hunter Estuary, and to ensure the widespread, robust application of the approach.

Following an extensive three-year multi-disciplinary field campaign, WRL developed a multi-faceted hydrodynamic model to assess estuary processes and catchment management options to improve estuary water quality and health. The model outcomes are linked to water sharing plans, pollution reduction plans and coastal reform in the Hunter.

The WRL model (Glamore et al 2019) is now an important part of the strategic context for managing the Hunter Estuary. It facilitates quantitative testing of scenarios of estuary change and catchment and estuary management. This testing capacity is essential for making decisions about a large, complex and dynamic estuary system.

**The hydrodynamic model refers to three zones which reflect the morphology and processes of the estuary:**

- » The Lower Estuary combines the bay head delta and the tidal delta components of the estuary. It includes Newcastle Harbour/Port of Newcastle, the South and North Arms of the Hunter Estuary, and the Hunter estuary wetlands. These are Fullerton Cove, Hexham Wetland and Kooragang Island/ Ash Island, which are remnants of the many islands formerly occurring in this area.
- » The Mid Estuary includes the reach from just north of Hexham Bridge upstream to the Williams River junction.
- » The Upper Estuary (sometimes referred to as the tidal pool) includes the Williams River (below Seaham Weir), the Paterson River (to below Gostwyck Bridge) and the Hunter River (from the Williams River junction upstream to around Aberglasslyn). The upper estuary has low tidal circulation and may be dominated by fresh water in wet periods. It becomes strongly saline in extended dry periods.

## 8.2 SUMMARY- STRATEGIC CONTEXT THAT DIFFERENTIATES THE HUNTER

**There are 12 strategic and interconnecting factors which influence the scope and approach to the Hunter Estuary CMP.**

<b>COMPLEX ESTUARY</b> Scale, diversity and complexity: a large estuary with complex evolution and pressures	<b>INTERNATIONALLY IMPORTANT</b> Internationally significant wetlands and shorebird habitat in the lower estuary. Estuarine and floodplain wetlands across the system are critical to recovery of estuary health. Wetlands are threatened by ongoing rural, urban and port development and sea level rise	<b>POOR WATER QUALITY</b> Poor to very poor water quality, worse in the upper estuary; poor water clarity, very high nutrient levels
<b>HIGHLY MODIFIED</b> Major long term and ongoing morphological modification and adjustment, supporting national level economic values	<b>POOR RIPARIAN VEGETATION</b> Riparian vegetation removed, mangroves in poor condition, but clear evidence that wetland and estuarine habitat and function can be restored; opportunities for "blue carbon" projects	<b>PATCHY DATA</b> A much studied waterway, but still limited robust data on the performance of specific responses to key drivers of poor estuary health - low confidence in management decisions.
<b>CLIMATE CHANGE</b> Flood protection infrastructure is vulnerable to climate change and sea level rise, with implications for floodplain land use and productivity	<b>URBANISATION</b> Urbanisation of all flood free immediate catchment lands, increasing local stormwater issues, increasing flash flood risks and reducing agricultural flood refuge	<b>RECREATIONAL NEED</b> Increasing demand for quality river and harbour based recreation opportunities, highlighting existing poor connectivity of 'green' public land; on water risks and conflicts
<b>CULTURAL SIGNIFICANCE</b> Engagement about the scope and significance of Aboriginal culture and heritage, not well documented.  National heritage significance of early estuary settlement - not fully recognised and protected	<b>GOVERNANCE</b> Clarity and continuity of communication between public authorities, coordination of management responses, accountability for outcomes are all limiting management progress	<b>COMMUNICATION</b> How best to engage a diverse urban and rural community, spread across several local council areas, with different perspectives on values and priorities

Fig 15: Twelve Elements of Strategic Context



# 9.0 PRELIMINARY RISK ASSESSMENT

In accordance with the objects of the CM Act and guidance from the Coastal Manual, the scoping studies of CMP are required to undertake a first pass risk assessment.

This assessment is to be based on current knowledge and is to identify what values and assets might be at risk, and to establish whether these risks are high enough to warrant more detailed assessment in Stage 2 of the CMP.

The Coastal Manual suggests the use of the Threat and Risk Assessment (TARA) developed for the Marine Estate Management Strategy in 2015.

The top risks identified in the TARA Hunter Estuary are:

## TARA CENTRAL REGION PRIORITY THREATS

### Environmental

- Urban stormwater discharge
- Foreshore development
- Entrance modification
- Shipping (large commercial vessels and port industries)
- Agricultural diffuse source runoff
- Clearing riparian and adjacent habitat including wetland drainage
- Climate change 20 years
- Recreational Boating and boating infrastructure
- Sewage effluent and septic runoff
- Navigation and entrance management/ dredging
- Modified freshwater flows

### Socio-economic

- Water pollution on environmental values – urban stormwater
- Water pollution on environmental values – agricultural diffuse source runoff
- Water pollution on environmental values – litter, solid waste, marine debris, microplastics
- Sediment contamination (toxicants in sediment, particularly in Greater Sydney waterways)
- Inadequate social and economic information
- Anti-social behaviour and unsafe practices
- Limited or lack of access infrastructure to the marine estate
- Lack of compliance with regulations (by users) or lack of compliance effort (by agencies)
- Reductions in abundances of species and trophic levels
- Climate change stressors 20 years

A stakeholders meeting was held to further review known threats/risks to the estuary to develop a preliminary risk assessment. The results are provided in Appendix 2. It is noted that stakeholders that would represent the economic industry were not well represented at meetings. For stage 1 purposes it is assumed that impacts to the environment would impact industry, however these will be further investigated in the more in-depth risk assessment in Stage 2.

The "extreme" rated risks and those high risk assessed by the project management group to be notable issues that require additional research are provided below. These risks will form the basis of research projects in Stage 2 of the CMP.

Table 7 Preliminary risk assessment highest issues

RISK DESCRIPTION	RATING	ISSUE
Knowledge held with people without system / network for managing / retaining	Extreme	Governance
Changed weather patterns	Extreme	Climate Change
Changed weather patterns- NPWS land / Ramsar site	Extreme	Climate Change
Urban runoff is of poor quality and not sufficiently treated before discharge into waterways	Extreme	Water Quality
Upper catchment contribution of nutrients, sediments and other pollutants	Extreme	Water Quality
Unstable riverbanks	Extreme	Water Quality
Carp- reducing water quality through bank and bed feeding, out competing native fish	Extreme	Water Quality
Lack of riparian vegetation, inappropriate riparian vegetation causes unstable riverbank- leads to erosion	Extreme	Water Quality
Increased pollution, increased runoff, land clearing	Extreme	Water Quality
Use of boats creating wake impacts	Extreme	Water Quality
Lack of catchment vegetation, poor sediment and erosion control	Extreme	Water Quality
Habitat Loss	Extreme	Biodiversity
Poor water quality	Extreme	Water Quality
Flood mitigation infrastructure eg flood gates and flaps limits natural intrusion of brackish water from river to tributaries/ floodplain/wetlands	Extreme	Biodiversity
Black water events eg Woodberry Swamp	Extreme	Water Quality
Lack of single direction to create healthier estuary	Extreme	Governance
More extreme events – bigger floods, worse droughts	Extreme	Climate change
Sea Level Rise	High	Climate Change

## 9.0 PRELIMINARY RISK ASSESSMENT

### 9.1 HUNTER ESTUARY ISSUES

In Table 8, the issues which were identified in the Hunter Estuary CZMP (certified 2018) have been organised into categories, and a simple discussion of scope and scale is presented as a starting point for understanding which are the most important for future management.

For each group of issues, the objects of the CM Act to which the issue could be relevant (in whole or in part) are noted. Links to the MEMA TARA rankings (MEMA, 2015) for threats to environmental assets for the Central Region (Stockton to Shellharbour) are also identified to provide consistency.

Table 8 Review of 'Key Estuary Issues' from the CZMP (2018)

ISSUE	INDICATIVE PERFORMANCE
<b>Biodiversity: Object (a) of the CM Act</b>	
<b>Habitat loss</b>	Hunter Strategic Context
<b>Impacts on native flora and fauna</b>	» Riparian vegetation removed, mangroves in poor condition, but clear evidence that wetland habitat and function can be restored
<b>Lack of riparian vegetation</b>	» Internationally significant wetlands and shorebird habitat in the lower estuary, with values threatened by ongoing port and industry development, relic contamination and sea level rise
<b>Mangroves and noxious weeds invasion</b>	As a group, these issues relate to riparian and estuary wetland habitats, some of which have specific statutory protection.  Loss of these habitats has important implications for water quality and response to climate change.
<b>What's missing from this group</b>	
Loss of function and diversity in floodplain wetlands and saltmarsh in the lower estuary with changes to nutrient load, drainage, tidal circulation, clearing, cultivation; increasing threat from more intensive catchment/urban development and sea level rise; lack of ecological connectivity; oyster reef extent and condition	
<b>Ranking of this group in the TARA?</b>	
Clearing of riparian and adjacent habitat including wetland drainage was overall ranked 6 (as a threat to the environment) for the Central Region	

ISSUE	INDICATIVE PERFORMANCE
<b>Estuary processes: Object (a) of the CM Act, potentially object (g), climate change is object (f)</b>	
<b>Bank erosion and sedimentation</b>	Hunter Strategic Context
<b>Changes to estuarine hydraulics</b>	» Flood protection infrastructure is vulnerable to climate change and sea level rise, with implications for floodplain land use and productivity
<b>Climate change</b>	» Urbanisation of all flood free immediate catchment lands, increasing local stormwater issues, increasing flash flood risks and reducing agricultural flood refuge
<b>Coastal inundation</b>	» Major long term and ongoing morphological modification and adjustment, supporting national level economic values
Climate change is projected to impact on the frequency and duration of tidal inundation and to change catchment flooding patterns.	
<b>What's missing from this group</b>	
Linkages to flood mitigation works; modified freshwater flows	
<b>Ranking of this group in the TARA?</b>	
Estuary entrance modification (which affects hydrodynamics) was overall ranked 3 for the Central Region	
Climate change generally was overall ranked at 7 for threats to environmental assets for the Central Region, and 10 for threats to social and economic values.	

ISSUE	INDICATIVE PERFORMANCE
<b>Estuary values, impacts and conflicts: Objects (a), (b), and (c) of the CM Act</b>	
<b>Protecting estuary natural significance</b>	Hunter Strategic Context
<b>Estuary users and conflicts</b>	» Increasing demand for quality river and harbour based recreation opportunities, highlighting existing poor connectivity of 'green' public land; on water risks and conflicts
<b>Heritage</b>	» Engagement about the scope and significance of Aboriginal culture and heritage, not well documented. National heritage significance of early estuary settlement - not fully recognised and protected
<b>Scenic quality</b>	
<b>Fishing</b>	
<b>Need for foreshore reserves</b>	User conflict will become increasingly relevant as populations continue to grow in the Hunter River catchments, and the scenic and recreational value of the estuary becomes more important.
<b>What's missing from this group</b>	
Tourism, cultural values, litter/marine debris	
<b>Ranking of this group in the TARA?</b>	
In relation to threats to environmental values, Recreational boating was overall ranked 8 for the Central Region. For social and economic values, threats 6, 7 and 8 relate to recreational users	

## 9.0 PRELIMINARY RISK ASSESSMENT

ISSUE	INDICATIVE PERFORMANCE
<b>Catchment development/land use: Object (e) of the CM Act, and object (d) regarding economic value</b>	
<b>Development pressures and land management</b>	Hunter Strategic Context
<b>Flood mitigation works</b>	» Poor to very poor water quality, worse in the upper estuary; poor water clarity, very high nutrient levels
<b>Water quality</b>	Water quality issues are of key importance in the Hunter Estuary, including both point source (industrial and wastewater) and diffuse sources (catchment runoff, urban stormwater), risks increased by loss of floodplain and riparian biofiltering functions. Diffuse Source Water Pollution Strategy (Department of Environment and Climate Change 2009) priorities are sediment, nutrients and pathogens.
<b>Agricultural inputs</b>	
<b>Urban inputs</b>	
<b>Industrial inputs</b>	
<b>Water extraction</b>	
<b>Dredging and commercial sand and gravel extraction</b>	Water quality in the upper estuary is poor (OEH 2017)
<b>Port operations</b>	
<b>Condition of sea walls</b>	
<b>What's missing from this group?</b>	
Service infrastructure (particularly in relation to pipes, cables, trenching and boring activities); thermal discharges; mining in the upper catchment; PFAS contamination; litter/marine debris	
<b>Ranking of this group in the TARA?</b>	
In relation to the environmental values: Urban stormwater discharge was ranked 1, foreshore development 2, port operations 4, sewage effluent and septic runoff 8 and industrial discharges 12 for the Central Region	
Agricultural diffuse source runoff into estuaries was ranked 5 and stock grazing of riparian and marine vegetation at 14 for the Central Region	
In relation to socio-economic and cultural values, aspects of water pollution ranked at 1, 2 and 3 in the TARA, with sediment contamination at 4. litter/marine debris was of significant concern to the community in community values as highlighted in 9.0 above	

ISSUE	INDICATIVE PERFORMANCE
<b>Governance: Object (h) and object (j) of the CM Act</b>	
<b>Estuary management coordination (CZMP)</b>	Hunter Strategic Context
	» Clarity and continuity of communication between public authorities, coordination of management responses, accountability for outcomes are all limiting management outcomes
	» A much-studied waterway, but still limited robust data on the performance of specific responses to key drivers of poor estuary health - low confidence in management decisions.
	» How best to engage a diverse urban and rural community, spread across several local council areas, with different perspectives on values and priorities
	Finding a workable governance and funding arrangement for a large estuary system with conflicting values from one end to the other an important issue
<b>What's missing from this group?</b>	
The role of public participation in the management of the estuary	
<b>Ranking of this group in the TARA?</b>	
This is not listed as a threat in the TARA, which is based on activities.	

## 9.0 PRELIMINARY RISK ASSESSMENT

### 9.1.1 INTEGRATION – KEY ISSUES FOR THE HUNTER ESTUARY CMP

In combination, the Strategic context of the Hunter Estuary, the priority regional issues identified in the TARA, the previous assessments for the CZMP and recent technical and risk studies highlight the following issues as the most important to be addressed in a coordinated way in the CMP.

#### Some Key CMP Issues

- » Restoration of the riparian zone throughout the estuary. This includes bank stabilisation processes and restoration of riparian vegetation. It also includes tenure and land management arrangements along floodplain margins. Investigate opportunities for oyster reefs as streambank reinforcement instead of rock revetment.
- » Restoration of wetland condition and function, including saltmarsh, floodplain wetland, wetlands at the tidal limits of tributaries
- » Roles and responsibilities of floodplain land-owners and managers, to ensure that drainage, levees, access, grazing and water rights, nutrient management and other land management processes are managed effectively and fairly
- » Processes to help local communities better connect waterway and public recreation values to estuary health values
- » Improving understanding of sub-catchment contributions to estuary sediment and nutrient loads
- » Finding the right balance between point source and diffuse source pollutants (urban and rural) to improve water quality and the health of the estuary
- » Engaging Aboriginal traditional owners and others in the Aboriginal community in defining and protecting estuary values through cultural stewardship and participation in estuary management
- » Enhancing opportunities for communities to access the banks and waterway for public recreation
- » Developing a land use and infrastructure/asset adaptation and transition process for low lying land that is impacted by rising sea level over the next two decades and onward
- » Understanding climatic change implications on existing habitat, ecological adaptation and transition process for migration along the estuary
- » Strengthening data and knowledge sharing for more effective management
- » Building confidence in the capacity to manage the challenges of the Hunter estuary. Establish governance that allows projects to move forward to deliver change and uniting as a region to focus our efforts and resources towards the same goal.

## 9.2 GAP ANALYSIS

- » Although the region has a wealth of research opportunities and information from groups such as University of Newcastle, Hunter Water, Hunter Valley Flood Mitigation and Hunter Research Foundation, a number of knowledge and data gaps are also apparent, particularly studies linking science to management. These gaps hinder decision making and evaluation of the effectiveness of management interventions in a complex system with diverse

interrelated processes. They reduce certainty and confidence in the management process and the outcomes that can be achieved.

- » Examples of knowledge gaps, knowledge transfer gaps and limited evidence bases for decision-making have been noted from literature review and from discussion with stakeholders. Important gaps are summarised below.

### 9.2.1 KNOWLEDGE GAPS

- » The NSW Government and the Manual have stated expectations that management actions should deliver value for money for the people of NSW and for coastal regions.

**To demonstrate value for money, quality data on community and environmental values, as well as financial costs, are required.** Multiple organisations in the lower Hunter region have reviewed community values and the nature of values is understood. **Most often, quantitative information to support robust analysis (in a cost benefit analysis) is not available. This includes recreational use data for the estuary and relevant quantified indicators of environmental benefit.**

- » Although there have been estuary monitoring programs at various times, there is no continuous monitoring or performance indicators for the whole of the estuary and its near tributaries to show change as projects are undertaken.

**There is strong agreement that diffuse source pollutants from the catchment have a major influence on estuary water quality and estuary health. However, there are no sub-catchment**

**specific data on sub-catchment flows and water quality which can be used to provide a detailed analysis of catchment risks. Risk assessment is currently based on generic pollutant loads linked to land use.**

- » The WRL hydrodynamic model of the Hunter estuary is a powerful tool for testing scenarios such as climate change, estuary processes and estuary morphological and health response.

**More work is necessary to better understand risks, such as individual and interacting pressures, hazards and responses, particularly the impacts of climate change in a highly modified and dynamic system. These include system responses:**

- ongoing maintenance dredging of the harbour
- interactions of future runoff variability (extreme flood and drought events) on channel stability, water quality and wetland health
- the capacity of saltmarsh and floodplain wetlands to accommodate sea level rise and how to manage adaptation and transition

## 9.0 PRELIMINARY RISK ASSESSMENT

### 9.2.2 KNOWLEDGE TRANSFER GAPS

- » The sharing of current knowledge on the environmental context of the Hunter Estuary is inconsistent and not transparent. Some research and management programs are published in peer reviewed journals; some reports are on council or agency websites; some reports are never made public. There is no consolidated public reporting of progress in estuary management for the Hunter.
- » There are multiple organisations pursuing data for specific issues within their statutory responsibilities; but an overarching program of research and monitoring to support initiatives to improve estuary health has not been developed. With the diverse interests of the coastal councils and multiple state authorities, there is significant risk of duplication but also of missing opportunities to connect studies to inform management of interconnected natural systems.

### 9.2.3 LIMITATIONS IN THE EVIDENCE BASE

- » There is an interest in the efficiency and effectiveness of management actions. This is strongly promoted by the Natural Resources Commission and the Coastal Manual. Various grant funding programs for catchment management and estuary management over the last decade or more have required some element of monitoring of outcomes, over a short period following the funded works. It is apparent that these short-term, grant-linked monitoring programs do not provide the robust science that is necessary to strengthen confidence in management decisions.

**Well-structured monitoring programs, linked to specific hypotheses about specific estuary health improvements are necessary. Pilot studies at a sub-catchment scale would be very beneficial.**

## 9.3 STAGE 2 RESEARCH

The preliminary risk assessment, issue identification and gap analysis provided a list of research projects that will be undertaken in Stage 2 to assist in the development of the CMP.

- » Business case for lead project group beyond the development of the CMP
- » Map of inundation and impact to the Hunter Estuary catchment from predicted climate change. Predictive identification of those areas to be prioritized for impact assessment and resilience actions.
- » Sub-catchment evaluation of water quality and prioritising actions for those catchments that will provide greatest water quality benefit to the estuary.
- » Catchment review for prioritized riverbank management and user education
- » Evaluation of risk from carp and impact of current carp management plans.
- » Alignment of catchment management controls across all Hunter Estuary Coastal Councils.
- » Habitat mapping, prioritization of rehabilitation projects particularly informed by climate change data.
- » Socio economic analysis to inform the values of the estuary.

# 10.0 COMMUNITY ENGAGEMENT STRATEGY STAGES 2-4

**The Coastal Management Manual suggests that in Stage 1 a “Community and Stakeholder Engagement Strategy be developed to identify opportunities and important timing at which engagement should occur. It is a requirement of the Coastal Management Act 2016 that Councils consult with the community and stakeholders before adopting the CMP. To ensure the stakeholders have an understanding and commitment to the CMP it is therefore crucial that engagement be undertaken throughout the CMP development process.**

Stage 1 engagement has been undertaken as discussed in section 7 of this scoping study, and Molino Stewart (Water Technology) was engaged to develop a strategy for stage 2-4. This is provided in Appendix 3.

The strategy provides an indication of timing of engagement for each stage. Further refinement of the engagement will need to be undertaken in each stage depending on the research topic and related impacts.

Crucial to the development of the CMP is to ensure that the community is kept informed of its progress and given opportunity to comment at a time that suites the stakeholder which importantly links to an effective website development.



# 11.0 PRELIMINARY BUSINESS CASE

Developing a CMP is a strategic opportunity to unite the Hunter Region in the management of the Hunter Estuary to increase the environmental health, usability, resilience and spiritual wellbeing of the community. The following table provides the benefits of developing the CMP.

Table 8 Review of 'Key Estuary Issues' from the CZMP (2018)

ITEM	DISCUSSION	BUSINESS CASE –INDICATIVE ASSESSMENT
<b>The complexity of management issues and decisions</b>	The Hunter Estuary is a large, high value, multi-stakeholder system. It traverses five local council areas. While there is general agreement among the public authority stakeholders that work is needed to improve the health of the estuary, there is less agreement on strategic and priority issues and actions.	Preparation of the CMP is an opportunity to refine the approach to managing the estuary and focus on strategically important responses, implemented at the right scale.
<b>The level of understanding about coastal (estuary) issues and coastal change</b>	<p>The Hunter Estuary has been the subject of many detailed studies of processes, ecological values, productivity, physical and biodiversity threats and risks. There are long historical records of estuary condition of the estuary (particularly the upper estuary) are poor.</p> <p>There is difficulty in ascertaining change created by successful estuary health initiatives due to the number of negative influences and the complex nature of the estuary system.</p>	<p>Preparation of the CMP is an opportunity to strengthen structured responses to key estuary health issues, including collecting data on what contributes to sustainable beneficial outcomes, and how significant implementation risks can be managed.</p> <p>The CMP process will also enhance knowledge sharing across organisations with management and estuary health roles and responsibilities.</p>

ITEM	DISCUSSION	BUSINESS CASE –INDICATIVE ASSESSMENT
<b>The level of uncertainty about risks and outcomes</b>	<p>There is abundant evidence of changes to estuary processes, associated with development and engineering works in the lower, mid and upper estuary and in the large Hunter River catchment. A detailed hydrodynamic model was developed by WRL in 2018 and enables testing of diverse scenarios and responses in the estuary. Detailed risk analysis has recently been completed as part of the review of the HVFMS. Compared to other estuaries, there is a greater certainty about the impacts of current and future threats and hazards on the health of the estuary.</p> <p>More uncertain is the most effective way to mitigate risks from threats and hazards affecting the estuary.</p>	<p>Whilst there is a lot of work undertaken to achieve some positive outcomes, the overall condition of the estuary remains poor. This suggests that there is uncertainty about appropriate outcomes and how to achieve and maintain them.</p> <p>The CMP offers an opportunity to clarify appropriate estuary health outcomes for the Hunter Estuary and to increase certainty about what is needed to achieve them.</p>
<b>The budget allocated to coastal management activities</b>	<p>More work is needed to understand the total cost of current 'coastal management' activities associated with the ecological health, use and physical stability of the Hunter Estuary.</p>	<p>Preparation of the CMP offers an opportunity for stakeholders to collaborate to understand the actual cost and benefits of efforts by all responsible organisations, public and private, to maintain or restore the health of the Hunter Estuary. Importantly, this will require better understanding of the environmental, social and economic benefits of a healthy and productive estuary system.</p>
<b>The capacity and willingness of the community and other private and public entities to contribute to the future cost of coastal management, particularly to the ongoing cost of management of areas exposed to current and future risk from coastal hazards or in coastal vulnerability areas</b>	<p>The willingness of the Lower Hunter community to contribute to the cost of natural hazard management has been tested with the ongoing HVFMS levy. Hunter LLS currently contributes 25% of the operating and maintenance costs of the HVFMS with funds derived from the Hunter Catchment Contributions levy (under the Water Management Act 2000). The HVFMS is a state-owned engineering work, protecting private interests. It is valued at more than \$860 million and provides significant flood protection to community and commercial interests. However, future specific coastal hazards in the estuary include tidal inundation of low-lying agricultural land (mostly pasture) separate to catchment flooding impacts. In the lower estuary, there are also tidal inundation impacts on residential and recreation land.</p> <p>The cost of managing the lower estuary to support the operations of the Port of Newcastle is known (as is the willingness of stakeholders to meet these costs to protect port operations).</p>	<p>Recent work by HVFMS and HWC provides some information about the costs and benefits of aspects of estuary management, how those costs and benefits are, or could be, shared and the willingness (or capacity) of beneficiaries to pay for higher investment in improving the health of estuary systems (particularly water quality and estuarine ecology).</p> <p>Hunter LLS also has some evidence of the willingness of landholders to contribute to the cost of estuary health.</p> <p>Preparation of the CMP will facilitate sharing lessons from existing studies and improve the use of economic analysis in decision making.</p>

## 11.0 PRELIMINARY BUSINESS CASE

ITEM	DISCUSSION	BUSINESS CASE –INDICATIVE ASSESSMENT
<b>The value of economic activity in the area that is dependent on the coast</b>	The lower Hunter estuary (the Port of Newcastle) is Australia's largest coal export port and contributes to the value of a major resources sector. The estuary also supports a moderate commercial fishing industry, recreational fishing and other recreational boating. The estuary provides landscape amenity for a growing regional population (Maitland as a 'river city'). Maitland also promotes its fresh rural produce – a city surrounded by productive farmland. Some of this is irrigated out of the tidal pool of the estuary, or from groundwater under the estuary floodplain. The NSW government has invested in recreational amenity along the Newcastle foreshore of the lower estuary.	Preparation of the CMP will strengthen understanding of the ways in which estuary systems contribute to the economic success of the lower Hunter region.  Even without detailed analysis it is apparent that the Hunter Estuary contributes a significant share of the NSW economy.  The CMP will facilitate consideration of changes in the land/waterway uses and economic value of the estuary and floodplain over the coming decades, as sea level rise and climate change factors become more influential.
<b>The economic and ecosystem service value of a healthy coastal environment</b>	The economic value of healthy estuary systems is continuing to be refined, with studies on the economic contribution (e.g. through productive fisheries) of healthy mangrove and saltmarsh systems, stable banks protecting agricultural land and pump sites, flood mitigation infrastructure) and water quality suitable to support recreational aspirations (e.g. see studies for swimming in the Parramatta River). Some of these are studies from the Hunter Estuary and its wetlands. Others would need to be reviewed and adapted before use in the Hunter estuary context.	There is strong agreement that healthy estuary systems have high ecosystem service and economic value across a range of indicators, but regionally appropriate values are not currently available.
<b>The potential cost and liability of future coastal impacts if known threats are not addressed; and the added social, economic and environmental value if coastal threats and opportunities are well managed</b>	Work has been undertaken to review implication of coastal hazards on the flood mitigation system and Hunter Water infrastructure. However, neither of these cover the whole picture of estuary management. Strategic analysis of the costs of not managing climate change impacts on the estuary and associated land uses has been prepared by Hunter JO and DPE EES, noting that sea level rise and estuary health impacts are only one part of the broader spectrum of climate change risks to community resilience and sustainability.	Preparing the CMP provides an opportunity to better understand roles and responsibilities for critical issues and aspects of estuary management and to review how costs and benefits are distributed in relation to roles and responsibilities. It will facilitate a strategic review of where liabilities from not managing risk may be accruing and where investment is supporting benefits that more than offset risk.

ITEM	DISCUSSION	BUSINESS CASE –INDICATIVE ASSESSMENT
<b>How Council currently generates funding and allocates resources to priorities and whether these sources and mechanisms are sustainable for coastal management</b>	The current situation in the lower Hunter, with five councils, a JO and multiple state level public authorities suggests that current funding frameworks need clarification and are likely not sustainable in their current form.  None of the councils are in a position to lead estuary management with their available resources. The grants scheme offers approximately 2 for 1 funding for planning.	Preparing the CMP offers an opportunity to review funding sources and mechanisms and how these can be used more effectively to achieve agreed outcomes for the estuary. Funding will be allocated to projects by ensuring the CMP is linked to the IP&R framework.
<b>The proposed timeframe for preparing the CMP</b>	Given the extension of the certified plans to December 2023, this now provides greater opportunity for the CMP's to be developed.	Whilst the development of the CMP's by December 2023 will be a dedicated task that will require extensive resourcing to ensure this occurs, completing the CMP is urgent so that the Councils and other public authority stakeholders can access funding to meet the requirements of necessary estuary projects.



# 12.0 STAGING OF THE CMP DEVELOPMENT

## Stage 2: Determine Risks, Vulnerabilities and Opportunities

Stage 2 of the CMP involves undertaking detailed studies that help us to identify, analyse and evaluate risks, vulnerabilities and opportunities.

The Coastal Management Manual identifies the following for Stage 2:

- » Engaging with the community and stakeholders
- » Refining understanding of key management issues
- » Identifying areas exposed to coastal hazards and threats to coastal values
- » Analysing and evaluating current and future risks (details risk assessment)

- » Identifying scenarios for social and economic change and related opportunities for coastal communities
- » Preparing a planning proposal to amend maps of coastal management areas, to commence the Gateway process if required
- » Identifying timing and priorities for responses, thresholds and lead times.

These works have begun during the Stage 1 process and will continue through to completion of the Stage 2 forecast for June 2023

## Stage 3: Identify and evaluate options

Stage 3 involves the identification and evaluation of options following the research of risks investigated in Stage 2.

The Coastal Management Manual identifies the following for Stage 3:

- » Identifying and collating information on management options
- » Evaluating management actions, considering:
  - Feasibility (is it an effective and sustainable way to treat the risk)
  - Viability (economic assessment)
  - Acceptability to stakeholders
- » Engaging public authorities about implications for their assets and responsibilities
- » Evaluating mapping options and implications if a planning proposal is being prepared
- » Identifying pathways and timing of actions
- » Preparing a business plan for implementation

Stage 3 is forecast to be prepared by October 2023

## Stage 4: Prepare, exhibit, finalise, certify and adopt the CMP

Stage 4 delivers the development of the coastal management program following public exhibition, adoption by all 5 Councils and submission to the Minister for certification.

The Coastal Management Manual identifies the following for Stage 4:

- » Preparing a coastal management program (CMP)
- » Exhibiting the draft CMP and any related planning proposal
- » Reviewing and adopting the draft CMP
- » Submitting the draft CMP to the Minister for certification
- » Publishing the certified CMP in the Gazette.

Stage 4 is forecast to be undertaken to adoption by the Council and submission for certification by the Minister, by December 2023.

## Stage 5: Implement, monitor, evaluate and report

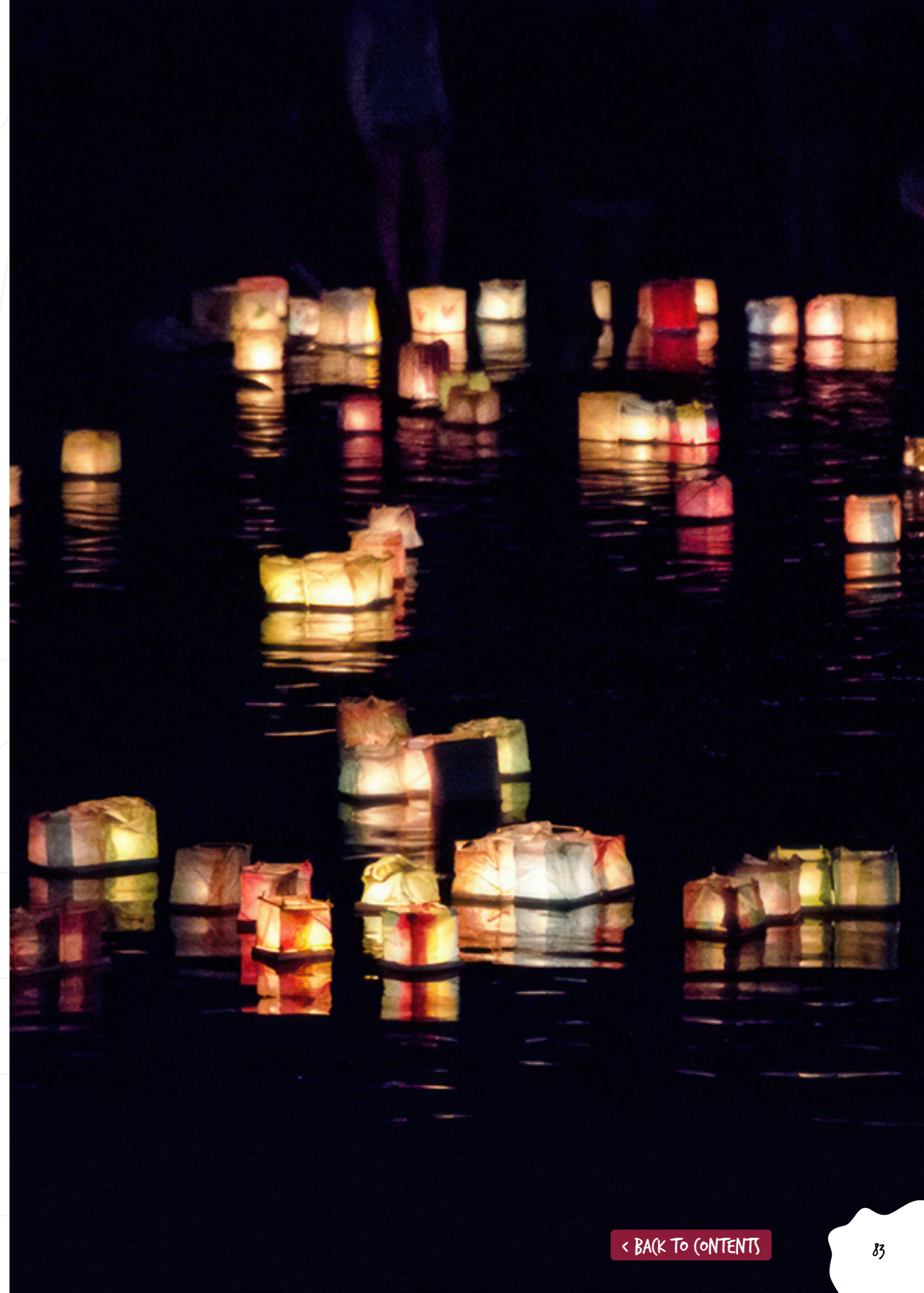
Stage 5 will be implemented following Ministerial certification of the CMP. Governance should be reviewed at that time to ensure the best model is created to deliver the CMP business case projects.

Interim review of the CMP should be undertaken yearly and in more detail in the fifth year, with a full review and rewrite at year 10.



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- » Winning G and Saintilan N (2009) Vegetation changes in Hexham Swamp, Hunter River, New South Wales, since the construction of floodgates in 1971, Cunninghamia 11(2): 185–194.



# APPENDIX 1: (ZMP IMPLEMENTATION

ZMP STRATEGY	ZMP "SUGGESTED ONLY" ACTIONS	IMPLEMENTATION	ACHIEVED
1. Establish or modify local planning guidelines and controls to allow appropriate assessment and consideration of estuarine habitats and biodiversity as part of any future development within the estuary and its surrounds	Investigate opportunities to develop compatible land use zonings and/or LEP mapping overlays (particularly near LGA boundaries) along the foreshore for each of the LGAs in consultation with community and government authorities	Considered at the time of the Standard LEP instrument being implemented by Councils	Yes
	Investigate new LEP provisions relating to the protection of the estuary identified by LEP overlays	Considered at the time of the Standard LEP instrument being implemented by Councils	Yes
	Organise a series of workshops to be attended by planning departments from each of the councils and aimed at establishing a unified and consistent approach to environmental planning on lands surrounding the estuary	Undertaken at the time of LEP development	Yes
	Investigate the creation of a checklist of considerations for all future development that allows assessing officers to identify and assess potential impacts on estuarine processes	Undertaken at the time of LEP development	Yes
	Continually update the checklist and associated assessment guidelines following monitoring, benchmarking and research	Not implemented	No

ZMP STRATEGY	ZMP "SUGGESTED ONLY" ACTIONS	IMPLEMENTATION	ACHIEVED
2. Investigate opportunities to protect key habitats and significant existing vegetation stands through rezoning to a more appropriate conservation zone	Councils should identify the key estuary management issues that need to be addressed by the DG's environmental assessment report which accompanies State significant listings, concept plans and project applications.	Unknown if implemented, Councils would have provided this information as a matter of course if asked	No
	Based on habitat mapping (in Strategy 3) and the conservation and Rehabilitation Masterplan (Strategy 6), along with other new information, update and/or prepare new DCPs or similar... DCP documents should incorporate buffers, offsets and considerations and numerical controls such as boundary set backs to minimise impact on key habitats and biodiversity though development restrictions	Would have been considered at the time of LEP development, however with the updated mapping this would need to be revisited.	Yes
	Overlay mapping from Strategy 3 with current zoning and land ownership maps	Not implemented	No
	Identify locations where current zoning is inadequate for conservation of existing vegetation and habitat areas	Would have been considered at the time of LEP development, however with the updated mapping this would need to be revisited	Yes
	Identify options for protection of key habitats and significant vegetation stands including voluntary conservation measures alongside zoning options	Unknown if implemented	No
	Coordinate among councils to establish a consistent approach	Not implemented	No

## APPENDIX I – CZMP IMPLEMENTATION

CZMP STRATEGY	CZMP "SUGGESTED ONLY" ACTIONS	IMPLEMENTATION	ACHIEVED
	As appropriate recommend alternative conservation agreements for areas of key habitat and existing vegetation in consultation with community and government authorities	Unknown if implemented however new biodiversity conservation Act has changed this working space.	No
3. Map estuarine /instream and riparian vegetation to determine habitat potential, health and location and extents of estuary-related EECs	Collate all available mapping of estuarine vegetation. Source may include councils, WCA, OEH, DPI Fisheries, Hunter LLS Acquire the most recent available aerial photography. Where appropriate photography was not available arrange for new air photographs to be taken	Ad hoc review and compilation of mapping has been undertaken at various sites in the estuary for various reasons (eg SEPP 2018 Coastal management; OEH report card; Hunter Water Wastewater Strategy)	Yes
4. Develop an integrated predictive numerical model of the Hunter estuary, incorporating hydrodynamics, water quality and sediment transport processes, as necessary		Model developed by WRL. Started by Hunter Estuary sub technical group and continued by Hunter Water	Yes
5. Identify all structures within the estuary that are interfering with fish passage and then replace and rehabilitate on a priority basis	Conduct an audit of all estuarine waterways in the Hunter and establish which barriers continue to impede fish passage. Identify relevant land managers/asset owners	'Bring Back the Fish' noted as an example of implementation Also work by HVFMS in their review of the scheme DPI/ Hunter LLS project on restoring stream connectivity at selected sites.	Yes
	In consultation with relevant agencies establish priorities for removal of barriers in the Hunter estuary	On going	Yes

CZMP STRATEGY	CZMP "SUGGESTED ONLY" ACTIONS	IMPLEMENTATION	ACHIEVED
6. Develop a Hunter estuary conservation and rehabilitation masterplan that provides clear priorities for implementation of future conservation and rehabilitation		Hunter LLS undertook a collation of works to date as a demonstrated masterplan	Yes
7. Incorporate objectives from the CZMP into the Plan of Management for Hunter estuary wetlands National Park and assist with support for implementation		City of Newcastle was a representative on the stakeholder working group and provided the objectives of the CZMP. City of Newcastle assisted with implementation of the PoM at the Stockton Sandspit	Yes
8. Prioritise bank erosion sites with consideration to assets (built and natural), infrastructure, River Styles condition and recovery potential, rates of recession, land tenure/use and vegetation. Implement strategies to address erosion on a priority basis		Part of this action has been undertaken by SCS for HVFMS within their strategic review of the design and operation of the scheme. This includes use of aerial imagery over the last 15 years to map rates of recession/migration of banks, and how bank retreat relates to HVFLS infrastructure. Not clear whether this type of risk assessment has been completed for other assets – such as RMS roads and bridges or private land outside the HVFMS.	Yes
9. Support volunteers and environmental group participation, including Aboriginal Land Management Teams, in revegetation of riparian zones, where appropriate include opportunities to improve public access		Actively targeted at the time with Hunter LLS, however it is unclear whether this continued	Yes
10. Build on existing riparian vegetation guidelines to encourage consistency across the estuary landscape and differing land tenures		Whilst Hunter LLS has guidelines and so do HVFMS, these need to be united as a single document and distributed widely	Yes

## APPENDIX I – (ZMP IMPLEMENTATION)

ZMP STRATEGY	ZMP "SUGGESTED ONLY" ACTIONS	IMPLEMENTATION	ACHIEVED
11. Introduce environmental planning requirements for all new development to achieve no net increase in pollutant runoff loads, through best practice stormwater management		Each Council has a Manual of Engineering Standards to assist with this knowledge piece, however this will need to be reviewed in light of the draft NSW Water Quality Objectives at the time of their finalisation.	Yes
12. Through Hunter and Central Coast Estuary Management Committee (or similar) host on a needs basis intergovernmental panel/forum with senior administrators and agency staff to streamline coordinated and integrated decision making		Not implemented at the time, however the Hunter Wetlands Centre has undertaken a forum and will look to continue this with support from Hunter stakeholders	No
13. Raise public awareness of the values of the Hunter estuary including its international significance and sustainable use of the estuary through targeted community education		Some actions have been undertaken through the Estuary Health Report Card prepared by OEH and the Plan of Management for the Hunter Wetlands, however this has not been implemented at a community level	No
14. Improve land use practices throughout the catchment to minimise soil erosion and improve water quality		At the time of writing the CZMP, Councils were supported by a community support officer in association with Hunter LLS. These positions were not continued in some Councils, and this work is now done as a "business as usual" action by Hunter LLS with interested private landholders	Yes

ZMP STRATEGY	ZMP "SUGGESTED ONLY" ACTIONS	IMPLEMENTATION	ACHIEVED
15. Develop incentive mechanisms to promote and facilitate the adoption of sustainable agricultural practices that generate a commercial and environmental benefit		Hunter LLS provides incentive programs which have adapted over time depending on State Governments directive policy	Yes
16. Conservation of key habitat and significant vegetation should be undertaken through the Biobanking scheme or through preparation and implementation of individual conservation agreements		Unknown if implemented however new biodiversity conservation Act has changed this working space.	Yes
17. Undertake estuarine and related habitat restoration through physical works, revegetation and/or change management practices of assets and infrastructure		Some specific sites have had remediation undertaken specifically from the Hunter Wetlands and into the lower area for bird habitat. More planning is required for areas in the mid to upper estuary area	Yes
18. Develop a plan of all public access points along the Hunter estuary, review which coincide with sensitive habitats and formalise those with highest recreational usage/value to provide ongoing and undiminished access to the river		Not implemented	No
19. Support and participate in research programs and run these programs in partnership with stakeholders on a case by case basis		City of Newcastle worked with WRL to develop the hydrodynamic model and worked with UON on microplastics in the lower estuary	Yes
20. Investigate impacts from climate change and potential adaptations		Council undertook climate risk and adaptation plans in 2010 which need to be updated if they haven't been done already	Yes

## APPENDIX I – CZMP IMPLEMENTATION

CZMP STRATEGY	CZMP "SUGGESTED ONLY" ACTIONS	IMPLEMENTATION	ACHIEVED
21. Undertake a critical review of the salinity trading scheme, Hunter WSP and upstream activities in terms of environmental consequences of water discharges and offtakes		Unclear if this has all been completed and considered the CZMP	<b>No</b>
22. Undertake assessments for contaminated sediments in the estuary		Assessments have been undertaken in relation to PFAS and dredging of the river mouth	<b>Yes</b>
23. Where appropriate reuse sediment dredged from the estuary			<b>Yes</b>
24. Identify and conserve heritage objects, places and landscapes in the Hunter estuary		HVFMS has undertaken some work in relation to this, however not for the whole estuary	<b>No</b>
25. Review the impact of the accumulation/migration of sediments within the Hunter Estuary		WRL has undertaken some of this work during flooding however recent floods in 2022 may have changed this	<b>Yes</b>



# APPENDIX 2: PRELIMINARY RISK ASSESSMENT

RISK RANK = <span style="color: yellow;">●</span> MEDIUM <span style="color: orange;">●</span> HIGH <span style="color: red;">●</span> EXTREME				IS THIS RISK ADDRESSED IN A MANAGEMENT PLAN?			PRESENT DAY RESIDUAL RISK			FUTURE RISK			
DOMAIN	VALUE IMPACTED	RISK DESCRIPTION	OUTCOME	AREAS	HUNTER ESTUARY (CMP)	HUNTER LUS IRRM PLAN	CONSEQUENCE	LIKELIHOOD	RISK RANK	CONSEQUENCE	LIKELIHOOD	RISK RANK	COMMENTS ON CONTROLS, PROGRAMS, STRATEGIES
Healthy lifestyle	Liveability	Riverfront land is kept within private ownership	Limited access to the river for cultural and recreation purposes		X		Insignificant	Almost certain					How is this addressed in LEPs, Region Plan, Greater Newcastle Metro Plan, LSPS's etc
Healthy lifestyle	Public safety	Climate change: more frequent flooding	Increase in injuries and/or loss of human life. Loss of infrastructure		X		Major	Likely					
Healthy lifestyle	Recreation/public safety	Primary contact poor water quality impacting public health (pathogens, algae)	Reduced opportunity for recreation and/or poor public health outcomes				Moderate	Likely					
Healthy lifestyle	Recreation	Secondary contact - poor water quality impacting public health (pathogens, algae)	Reduced access for recreation				Minor	Likely					
Healthy lifestyle	Recreation	Fishing - impacted by poor water quality leading to poor food safety	Reduced access for recreation, cultural				Moderate	Possible					
Healthy lifestyle	Recreation	Fishing - lack of habitat and poor water quality	Reduced fish stock		X		Moderate	Almost certain					
Healthy lifestyle	Recreation / Community access	Passive recreation (bird watching) limited by lack of habitat and access	Reduced recreation opportunity				Minor	Almost certain					

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Healthy lifestyle	Recreation / Community access	Recreation is limited by lack of public access to waterway and wetlands	Reduced recreation opportunity		X		Insignificant	Likely					Consider how this is addressed in the Hunter Region Plan and the Greater Newcastle Metro Plan
Healthy lifestyle	Indigenous Culture	Lack of access	Limited access to the river for cultural practices				Moderate	Likely					
Healthy lifestyle	Indigenous Culture	Shellfish closures	limits indigenous cultural practices				Moderate	Possible					
Healthy lifestyle	Indigenous Culture	Knowledge not well understood by decision-makers	Cultural practices not considered in decisions leading to destruction of cultural sites				Major	Possible					
Healthy lifestyle	Indigenous Culture	Inadequate protection for heritage sites	Loss of cultural heritage		X		Major	Possible					
Healthy lifestyle	Indigenous Culture	Stories and significance of place not known	Loss of cultural heritage		X		Major	Possible					
Healthy lifestyle	Indigenous Culture	Traditional owners not involved in management of the estuary	Important knowledge and practices not considered, no trust in the development of the CMP				Major	Possible					
Healthy lifestyle	Indigenous Culture	Loss of culturally important species from the estuary	Limited indigenous cultural practices				Moderate	Possible					
Healthy lifestyle	Indigenous Culture	Sea level rise	Inundation/ loss of important cultural heritage		X					Moderate	Possible		
Healthy lifestyle	Indigenous Culture	Erosion	Loss of important cultural heritage		X		Moderate	Possible					
Healthy lifestyle	Post contact heritage	Sea level rise	Inundation/ loss of important cultural heritage		X					Moderate	Possible		
Healthy lifestyle	Post contact heritage	Erosion	Loss of important cultural heritage		X		Moderate	Possible					
Healthy lifestyle	Community Access/ public safety	Appetite of land managers to provide green space access	Uncertainty of whether opportunity to create these spaces limits planning/ reduced access for recreation				Moderate	Possible					
Healthy lifestyle	Liveability/ Amenity	Need to manage floods	Community amenity & access blocked by flood infrastructure		X		Minor	Possible					

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DOMAIN	VALUE IMPACTED	RISK DESCRIPTION	OUTCOME	ASSETS	HUNTER ESTUARY (ZMP)	HUNTER LLS NPWS PLAN	CONSEQUENCE	LIKELIHOOD	RISK RANK	CONSEQUENCE	LIKELIHOOD	RISK RANK	COMMENTS ON CONTROLS, PROGRAMS, STRATEGIES
Healthy lifestyle	Community knowledge & understanding	Knowledge held with people without system/network for managing it	Knowledge gained can be lost over time				Major	Almost certain	●				
Healthy lifestyle	Liveability	Development/land use (urban/industrial) change doesn't consider liveability outcomes	Community loses access, amenity of waterway				Minor	Possible	●				
Healthy lifestyle	Public safety	Lack of regulation of pathogen sources	Potential community illness, lack of recreation opportunity				Moderate	Possible	●				
Healthy lifestyle	Resilience	Sea level rise	Risk to infrastructure/houses within close proximity to river/tributaries/wetlands	X			Major	Likely	●				
Healthy lifestyle	Resilience	changed weather patterns	Damage to recreational areas, infrastructure, vegetation reducing aesthetics and shade	X			Catastrophic	Almost certain	●				
Estuary health	Ramsar wetland / NPWS land	Sea level rise	Inundation, reduction in habitat available for migratory shorebirds, uncertainty of forward planning and revegetation efforts	X	X	X	Moderate	Likely	●				
Estuary health	Ramsar wetland / NPWS land	Salt water intrusion	Changing vegetation/ecosystem type, increased difficulty in maintenance and infrastructure installation	X	X	X	Moderate	Likely	●				
Estuary health	Ramsar wetland / NPWS land	PFAS discharge to Fullerton Cove	Possible impact to migratory birds	X	X		Moderate	Likely	●				
Estuary health	Ramsar wetland / NPWS land	Development pressure	Disturbance to birds and potential habitat reduction	X	X	X	Moderate	Likely	●				

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Estuary health	Ramsar wetland / NPWS land	Increase pest and weeds	Degradation of NPWS land due to increased presence of pests such as deer and increasing costs of weed maintenance as legislated species change	X	X	X	Minor	Possible	●				
Estuary health	Ramsar wetland / NPWS land	Industrial discharges	Pollution of significant international site	X	X	X	Major	Possible	●				
Estuary health	Ramsar wetland / NPWS land	Reliance on manipulation of flow	Reliance on flood mitigation system which is aging, however without issues such as wetland survival and acid sulphate soils may be impacted				Major	Likely	●				
Estuary health	Ramsar wetland / NPWS land	changed weather patterns	Increased storms creates a monetary impact to resolve damage; risk of reliance on aging flood mitigation system	X	X	X	Major	Almost certain	●				
Estuary health	Ramsar wetland / NPWS land	Loss of Assets of intergenerational significance (AIS)	Loss of habitat for species such as green and golden bell frog may mean possible extinction and loss to generations of the future			X	Catastrophic	Possible	●				
Estuary health	Water quality	Urban runoff is of a poor quality and not sufficiently treated before discharge into waterways	Water quality is below community objectives	X	X		Major	Almost certain	●				
Estuary health	Water quality	Sewage effluent and septic discharge to estuary	Water quality is below community objectives	X	X		Major	Possible	●				
Estuary health	Water quality	Industrial discharges	Water quality is below community objectives	X	X		Major	Possible	●				
Estuary health	Water quality	Upper catchment contribution of nutrients, sediment and other pollutants	Water quality is below community objectives	X	X	X	Major	Almost certain	●				
Estuary health	Water quality	Unstable riverbanks	Water quality is below community objectives		X	X	Catastrophic	Almost certain	●				
Estuary health	Water quality	Carp - reducing water quality through bank & bed feeding, out competing native fish	Increased sediment, reduced bank stability, impact to native marine animal health			X	Major	Almost certain	●				



# APPENDIX 2: PRELIMINARY RISK ASSESSMENT

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					HUNTER ESTUARY (ZMP)	HUNTER LUS IRRA PLAN							
Estuary health	Water quality	Litter in the environment results in plastics in waterways	Impact to aquatic & marine animal health	✓		✓	Major	Likely	High				
Estuary health	Water quality	Acid sulfate soil exposure	Acid discharge to estuary	✓	✓		Catastrophic	Possible	High				
Estuary health	Healthy riverbanks	Lack of riparian veg. inappropriate riparian veg causes unstable riverbank - leads to erosion	Bank erosion from flood impacts, increased velocities, sediment input, nutrient, loss of land	✓	✓	✓	Major	Almost certain	Extreme				
Estuary health	Urban development	Increased pollution, increased runoff, land clearing	Water quality & Biodiversity (all health values) impacts	✓	✓	✓	Catastrophic	Likely	Extreme				
Estuary health	Healthy riverbanks	Use of boats creating wake impacts	Boat wash impact increasing erosion of banks	✓	✓		Major	Almost certain	Extreme				
Estuary health	Healthy riverbanks	Sedimentation	Causes shallowing of river and further bank erosion		✓		Major	Possible	High				
Estuary health	Water quality	Lack of catchment vegetation, poor sediment and erosion control	Sediment in the water		✓	✓	Major	Almost certain	Extreme				
Estuary health	Water quality	Dredging	Sediment in the water, loss of habitat, change in tidal prism, potential toxin release	✓	✓		Major	Likely	High				
Estuary health	Biodiversity	Habitat loss	Potential localised extinction of species, reduced genetic stock, competition for remaining habitat, pushing species into inappropriate space	✓	✓	✓	Catastrophic	Likely	Extreme				
Estuary health	Biodiversity	Poor water quality	Loss of food sources, incompatible habitat	✓	✓	✓	Catastrophic	Likely	Extreme				

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					HUNTER ESTUARY (ZMP)	HUNTER LUS IRRA PLAN							
Estuary health	Biodiversity	Disruption of migratory bird feeding times by human activities (e.g. fishing, boating, passive recreation, located alongside incompatible land uses e.g. industrial)	Loss of biodiversity	✓	✓		Moderate	Possible	High				
Estuary health	Biodiversity	Loss of food sources due to channel modification, snag reduction, water quality	Loss of biodiversity	✓			Major	Unlikely	Medium				
Estuary health	Biodiversity	Acidification of estuary	Unsure if we have any data on this?	✓			Catastrophic	Unlikely	High				
Estuary health	Biodiversity	Loss of water/ flow due to extraction through the system impacts ecosystem health	Fresh water less available to ecosystems e.g. wetlands		✓		Catastrophic	Possible	High				
Estuary health	Biodiversity	Change in salinity in the mid to upper estuary due to sea level rise	Changes the ecosystem (type and location of aquatic species)	✓	✓		Moderate	Possible	High				
Estuary health	Biodiversity	Foreshore development	Loss of biodiversity from floodplain, loss of opportunity for migration of ecosystems with sea level rise	✓	✓	✓	Catastrophic	Possible	High				
Estuary health	Biodiversity	Flood mitigation infrastructure e.g. flood gates and flaps limits natural intrusion of brackish water from river to tributaries/ floodplain/ wetlands	Lack of flushing, poor water quality, change of ecosystem type, loss of biodiversity, loss of opportunity for future habitat and migration of ecosystems up the estuary	✓	✓		Catastrophic	Likely	Extreme				
Estuary health	Biodiversity	Black water events (Woodberry Swamp)	Pollution, fish kills	✓	✓		Major	Almost certain	Extreme				
Estuary health	Biodiversity	Over fishing	Loss of food sources, impact to economy	✓			Major	Possible	High				
Estuary health	Biodiversity	By catch	Loss of food sources, impact to economy, potential impact to threatened or significant species, nutrient source if put back into waterways	✓			Moderate	Possible	High				

# APPENDIX 2: PRELIMINARY RISK ASSESSMENT

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					HUNTER ESTUARY (CMP)	HUNTER ESTUARY (CMP)							
Estuary health	Governance	Lack of single direction to create healthier estuary	Conflicts of projects, duplication of efforts, lack of planning resulting in no action due to indecision		X		Catastrophic	Almost certain	●				
Estuary health	climate change -Flow	More extreme events - bigger flood, worse droughts	More pollution, erosion, less enviro flow, habitat changes	X	X	X				Catastrophic	Likely	●	
Estuary health	Climate change - Flow, healthy riverbanks	More intense local storms	Mobilise pollutants, riverbank erosion,	X	X	X				Major	Likely	●	
Estuary health	Climate change - All estuary health values	Sea level rise	Changes in tidal prism, mosaic of habitat (loss/change)	X	X	X				Major	Likely	●	
Estuary health	Climate change - All estuary health values	Changes in temperature	Change in species habitat/range	X	X	X				Major	Possible	●	
Estuary health	Climate change - Water quality, Biodiversity	Fire - Habitat destruction, long and short-term impacts, acid/sediment runoff	Fish kills, long recovery, ecosystem shifts, tipping points			X				Catastrophic	Possible	●	
Estuary health	Water quality	Diffuse and point source contamination	Closure of fisheries, vegetation impacts, fisheries closure, shorebird health impacts	X	X		Moderate	Possible	●				
Productivity	Indigenous Culture	Lack of access and climate change	Reduced opportunity for economic enterprises				Major	Possible	●				
Productivity	Post contact heritage	Climate change - sea level rise	Reduced opportunity for economic enterprises such as tourism at heritage buildings, wharves etc				Major	Possible	●				

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DOMAIN	VALUE IMPACTED	RISK DESCRIPTION	OUTCOME	MEAS	HUNTER ESTUARY (CMP)		CONSEQUENCE	LIKELIHOOD	RISK RANK	CONSEQUENCE	LIKELIHOOD	RISK RANK	
					HUNTER ESTUARY (CMP)	HUNTER ESTUARY (CMP)							
Productivity	Ramsar wetland / NPWS land	Impacts to Ash Island	Increasing maintenance financial implication to NPWS			X				Moderate	Likely	●	
Productivity	Fisheries	Degrading wetlands or inability to maintain wetlands due to climate change	Financial loss to the fisheries industry							Major	Likely	●	
Productivity	Research	Research groups not included in the CMP development	Loss of opportunity to share the Hunter knowledge as examples to others, loss of collaboration							Moderate	Unlikely	●	

## APPENDIX 2: PRELIMINARY RISK ASSESSMENT

SUCCESS CRITERIA					
RATING	PUBLIC SAFETY	LOCAL ECONOMY AND GROWTH	COMMUNITY AND LIFESTYLE	ENVIRONMENT AND SUSTAINABILITY	PUBLIC ADMINISTRATION
Catastrophic	Large numbers of serious injuries or loss of lives	Regional decline leading to widespread business failure. loss of employment and hardship	Region would be seen as very unattractive, moribund and unable to support its community	Major widespread loss of environmental amenity and progressive irrecoverable environmental damage	Public Administration would fall into decay and cease to be effective
Major	Isolated instances of serious injuries loss of lives	Regional stagnation such that businesses unable to thrive and employment does not keep pace with population growth	Severe and widespread decline in services and quality of life wrthin the community	Severe loss of environmental amenity and danger of continuing environmental damage	Public administration would struggle to remain effective and be seen as in danger of failing completely
Moderate	Small numbers of injuries	Significant general reduction in economic performance relative to current forecasts	General appreciable decline in services	Isolated but significant instances of environmental damage that might be reversed with intensive efforts	Public administration would be under severe pressure on several fronts
Minor	Serious near misses or minor injuries	Individually significant but isolated areas of reduction in economic performance relative to current forecasts	Isolated but noticeable examples of decline in services	Minor instances of environmental damage that could be reversed	Isolated instances of public administration being under severe pressure
Insignificant	Appearance of a threat but no actual harm	Minor shortfall relative to current forecasts	There would be minor areas in which the region was unable to maintain its current services	No environmental damage	There would be minor instances of public administration being under more than usual stress but it could be managed

	CONSEQUENCE				
LIKELIHOOD	Insignificant	Minor	Moderate	Major	Catastrophic
ALMOST CERTAIN	Medium	High	High	Extreme	Extreme
LIKELY	Medium	Medium	High	High	Extreme
POSSIBLE	Low	Medium	High	High	High
UNLIKELY	Low	Low	Medium	Medium	High
RARE	Low	Low	Medium	Medium	High

# APPENDIX 3: HUNTER ESTUARY CMP COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

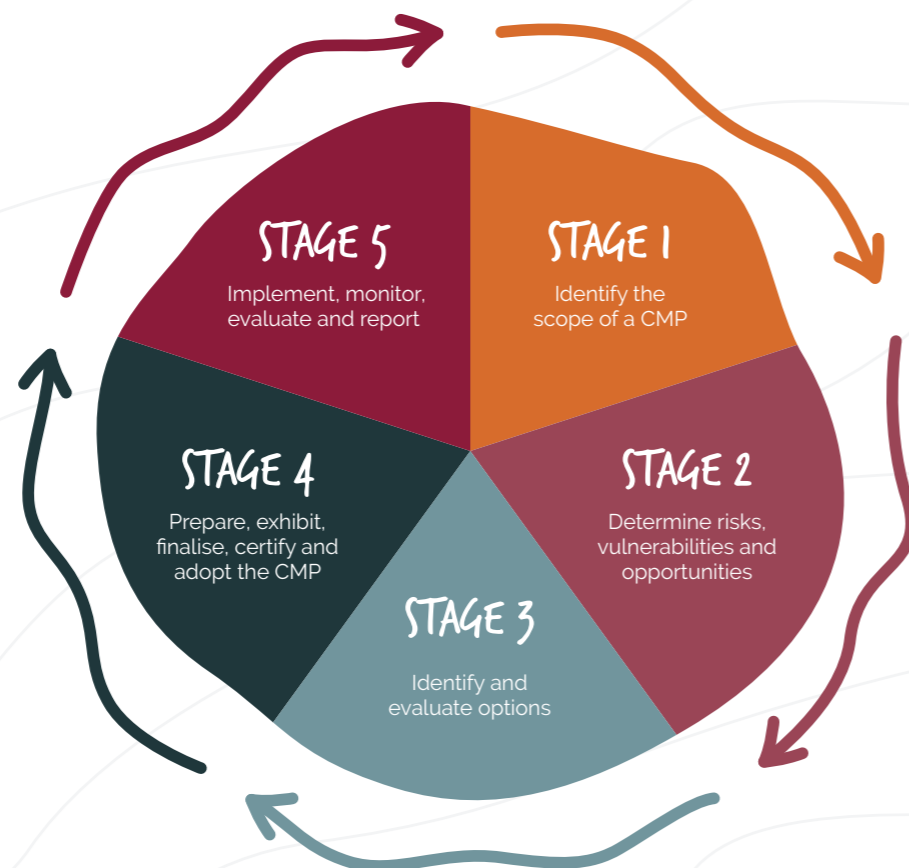
## 1.0 PROJECT BACKGROUND:

### 1.1 COASTAL MANAGEMENT PROGRAM

The purpose of a Coastal Management Program (CMP) is to set the long-term strategy for the coordinated management of the coastal zone with a focus on achieving the objectives of the Coastal Management Act 2016 (CM Act) in accordance with the NSW Coastal Management Manual 2018 (the Manual).

The Coastal Management Manual 2018 recommends that a five-stage risk management process for the preparation and implementation of a CMP be followed as shown in Figure 1.

Fig 1 (Right): Five stages of the coastal management program development



### 1.2 CMP ENGAGEMENT REQUIREMENTS.

The CM Act (Section 16) requires councils to engage with the community and other stakeholders before adopting a CMP. Part A of the coastal management manual includes statutory provisions and mandatory requirements relating to community and stakeholder engagement.

The NSW Government has provided guidance in how to prepare a CMP community and engagement strategy in its document: Guidelines for community and stakeholder engagement in coastal management (Guidelines). It is recommended that councils prepare

a community and stakeholder engagement strategy in Stage 1 to assist in identifying how the council will engage with the community and stakeholders during the preparation of the CMP. This strategy adheres to the guidance from the NSW Government.

### 1.3 STUDY AREA

The Hunter Estuary is one of the largest and most complex estuaries in NSW. It is subject to a range of pressures from mining, agriculture, industry and urbanisation while providing a home to internationally important shorebirds and wetlands.

The Estuary provides ecosystem services that support community economic, social, physical and spiritual wellbeing whilst also being sensitive to such risks as floods and sea level rise.

The extent of the Hunter Estuary is mapped as 65 kilometres along the Hunter River to Oakhampton within close proximity to Melville Ford Bridge, 75 kilometres from the ocean along Paterson River to Gostwyck Bridge and 46 kilometres from the ocean along the Williams River to the Seaham Weir.

It should be noted that the study area is limited to the coastal zone along each waterway as defined by the State Environmental Planning Policy (Resilience and Hazards) 2021 (SEPP). The SEPP identifies four coastal management areas that when combined define the coastal zone:

1. Coastal rainforest and littoral rainforest area
2. Coastal Vulnerability Area
3. Coastal Environment Area
4. Coastal Use Area



Fig 2 (Above): Map of the study area

## APPENDIX 3: HUNTER ESTUARY CMP COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

### 2.0 CONTEXT:

#### 2.1 HUNTER ESTUARY CMP

**In Stage 1 it is recommended that councils develop a vision for the coast that is consistent with the objects of the CM Act and councils' broader vision, as set out in its CSP.**

##### The Vision of the Hunter Estuary CMP is:

The Hunter Estuary is celebrated for its cultural significance, important ecosystems and the diversity of activities it supports. The people of the Hunter connect with the Estuary and are united in their stewardship of the Estuary for future generations. The Hunter Estuary is flourishing, resilient to change and rich in natural beauty.

##### The Objectives of the Hunter Estuary CMP are to:

- » Protect and enhance natural estuary processes and environmental values through restoration and rehabilitation.
- » Facilitate social interaction with and understanding of the Hunter estuary by maintaining and enhancing public access amenity and safe and appropriate use and activities, recognising the benefits that nature brings to human health and wellbeing and the importance of protecting the Hunter estuary.
- » Acknowledge, respect and protect indigenous communities' spiritual, social and economic use
- » Support the strategic economic importance of the Hunter Estuary
- » Facilitate ecologically sustainable development
- » Mitigate current and future risks from coastal hazards and climate change to improve resilience of the estuary
- » Enhance community stewardship of the estuary through consultation and engagement.

#### 2.2 HUNTER ESTUARY ALLIANCE

**Preparing and implementing a CMP is a major long-term project, requiring consideration of multiple complex issues about which there will be differing perspectives across the project partners and the community. Engagement is therefore not a one-off event, rather it is a long-term dialogue.**

Maitland City Council is leading the development of the CMP supported by the Hunter Estuary Alliance (HEAL), a strategically designed initiative composed of influential government entities in the Hunter Region that are uniting efforts to "heal the estuary".

##### HEAL is directed by:

- » City of Newcastle
- » Port Stephens Council
- » Maitland City Council
- » Cessnock City Council
- » Dungog Shire Council
- » Hunter Local Land Services
- » Hunter Water
- » Department of Planning & Environment.

#### 2.3 INTEGRATED PLANNING AND REPORTING

**Many councils have comprehensive community engagement policies, strategies and capabilities in a range of engagement methods. The Integrated Planning and Reporting (IP&R) manual provides detailed guidance on how to develop a broad community engagement strategy to develop and review the Community Strategic Plan (CSP).**

That manual and strategy are both relevant to the CMP. In developing the CMP community and stakeholder engagement strategy, this Strategy has drawn on the following engagement policies and strategies.

- » Maitland City Council Communication and Engagement Strategy 2022 – 2026
- » City of Newcastle Community Participation Plan
- » Port Stephens Communication and Engagement Strategy 2021 to 2025
- » Cessnock City Council Community Engagement Strategy
- » Dungog Shire Community Participation Plan.

## APPENDIX 3: HUNTER ESTUARY (MP) COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

### 2.4 COMMUNITY VALUES, ISSUES AND RISKS

Much of the information needed to develop this community and stakeholder engagement strategy has been generated by the councils and other public authorities in previous stakeholder engagement processes or in developing the councils' engagement policy and strategy.

Other plans, such as an existing coastal zone management plan or flood risk management plan or community development plan, may document issues and priorities that have previously been identified by stakeholders and the community.

Recently, several projects have undertaken community and/or stakeholder engagement to understand the value of the river, estuary and environment. These values are summarised in Table 1.

Table 1: Ramsar Wetlands and Strategic Context

ESTUARY HEALTH	HEALTHY LIFESTYLE	PRODUCTIVITY
Water Quality	Liveability	Jobs and Growth
Connectivity	Resilience	Resilience
Biodiversity / Habitat / Shorebirds	Community knowledge & understanding	Heritage
Wetlands	Recreation	Fisheries /Aquaculture
Resilience	Community Access	Creative and beautiful cities- urban design and liveability
Ecological Health	Amenity / scenic quality	Economy activated
Protecting and increasing native vegetation	Nature/Green Spaces	Tourism
Flow	Community	Flood mitigation
Healthy Riverbanks	Flood planning & emergency response	Agriculture
Significant species	Indigenous Culture	Water extraction- drinking / Port and associated industry / Research base

Issues and risks identified through prior community and stakeholder engagement relate to the following:

- » Restoration of riparian zone
- » Restoration of wetlands
- » Effective land management
- » Community connection to waterways
- » Better understanding contributions to estuary sediment and nutrient loads
- » Improving water quality by understanding pollutant source
- » Engagement of local Aboriginal groups and Traditional Owners
- » Preserving local recreational uses
- » Adaptation to sea-level rise
- » Improving data sharing for more effective land management
- » Building confidence in the capacity to manage the estuary
- » Loss of knowledge without system / network for managing / retaining
- » Changed weather patterns and more extreme events
- » Impact of pest species such as carp
- » Loss of habitat
- » Flood mitigation infrastructure
- » Lack of governance in relation to estuary management
- » Socio economic impacts.



## APPENDIX 3: HUNTER ESTUARY CMP COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

### 2.5 IAP2 SPECTRUM

According to the Guidelines for community and stakeholder engagement in coastal management, 'community' refers to any individual or group of individuals who have something in common. They are members of the public who may be residents in the local government area or a local interest group.

'Stakeholders' refers to individuals or groups who have a stake or direct interest in the outcome of the process. This may include public authorities, community groups, directly affected landholders or business groups.

The IAP2 spectrum (Figure 3) provides a framework for defining the appropriate role of community and stakeholders in an engagement process. The spectrum identifies five levels of engagement, the goal of each level and the community's role in decision-making and implementation.


INCREASING IMPACT ON THE DECISION 					
	Inform	Consult	Involve	Collaborate	Empower
<b>Public participation goal (what we are trying to achieve)</b>	To provide the public with balanced and objective information to help them understand the problem, alternative and/or solutions	To obtain public feedback on alternatives and/or decisions	To work directly with the public throughout the process to ensure that public concerns and aspirations are consistently understood and considered	To partner with the public in each aspect of the decision including the development of alternatives and identification of the preferred solution	To place the final decision making in the hands of the public
<b>Promise to the public</b>	We will keep you informed	We will keep you informed, listen to and acknowledge concerns and provide feedback on how public input influenced the decision	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision	We will work with you to formulate solutions and incorporate your advice and recommendations into the decisions to the maximum extent	We will implement what you decide

Fig 3: IAP2 Public Participation Spectrum

According to the Guidelines, the identification of issues and the decisions made during the preparation of a CMP are generally of the same level of public impact as the decisions for the CSP, so tools and techniques

aligned with the 'involve' and 'collaborate' levels of engagement are strongly recommended. It is important to note that to operate at the 'involve' and 'collaborate' levels, the council will 'inform' throughout the process.

### 2.6 COMMUNITY PROFILE

The Guidelines for community and stakeholder engagement in coastal management recommend the development of a community profile for the CMP study area. This helps inform the engagement content and methods developed in the Strategy.

For the purposes of the Hunter Estuary CMP, the communities of Maitland LGA Newcastle LGA, Port Stephens LGA, Cessnock LGA and Dungog LGA have

been included in the community profile (Table 2). Data used in Table 2 has been obtained from the 2021 Census statistics.

Table 2: Community profile of the study area

	MAITLAND	NEWCASTLE	PORT STEPHENS	CESSNOCK	DUNGOG	NSW
<b>LGA Population (2021)</b>	90,553	169,317	75,276	64,082	9,525	
<b>Median age of persons (years)</b>	36	37	39	37	46	39
<b>Percentage &lt;15 years old</b>	21%	16%	17%	20%	19%	18%
<b>Percentage &gt;64 years old</b>	16%	17%	26%	17%	22%	17%
<b>Percentage Population Aboriginal and Torres Strait Islander</b>	8%	4%	7%	10%	7%	3%
<b>Birthplace: Australia</b>	87%	81%	83%	88%	89%	65%
<b>Language used at home: English only</b>	91%	85%	91%	90%	95%	68%
<b>Median total household income (\$/weekly)</b>	\$1,766	\$1,760	\$1,372	\$1,493	\$1,485	\$1,829
<b>Highest year of school completed: Year 12 or equivalent</b>	12%	14%	11%	11%	9%	15%
<b>Highest year of school completed: Bachelor's degree level and above</b>	15%	28%	14%	10%	15%	28%
<b>Employed population</b>	64%	64%	52%	57%	59%	59%
<b>% requiring assistance</b>	6.7%	6.4%	7.2%	7.8%	10.5%	5.8%

## APPENDIX 3: HUNTER ESTUARY CMP COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

### Features to note from the community profile include:

- » All LGAs had close to the NSW average percentage of population less than 15 years old (18%).
- » 26% of Port Stephens LGA and 22% of Dungog LGA are above the age of 64 years, higher than the NSW average of 17% of the population.
- » All LGAs had higher Aboriginal and Torres Strait Islander populations than the NSW average, with the highest percentage in Cessnock LGA (10%).
- » All LGAs had a higher percentage of people born in Australia and only speaking English at home compared to the NSW state average. The lowest percentages are in Newcastle LGA, where 81% of the population was born in Australia and 85% of the population only speaks English at home.
- » The LGAs generally have lower rates of year 12 and university schooling completed. Newcastle LGA had the highest rate of schooling completed, with 28% of the population having a bachelor's degree, compared to 10% in Cessnock LGA.
- » Port Stephens LGA has the lowest rate of employed population (52%) likely reflecting a higher rate of retirees. Maitland LGA and Newcastle LGA have 64% of the populations employed, higher than the state average of 59%.
- » The percentage of those requiring assistance is greatest in Dungog LGA (double the NSW average). This should be noted in the development of engagement activities for those people with disabilities and/or older people.

## 3.0 ENGAGEMENT OBJECTIVES: 3.1 PURPOSE OF ENGAGEMENT

### To work with communities and other stakeholders to:

- » understand stakeholder's issues, goals and aspirations for the Hunter Estuary and the social, economic and environmental services it provides.
- » identify and evaluate alternative management options to reduce impacts on the Hunter estuary.
- » identify preferred management actions to reduce impacts on the Hunter estuary.

The decision about the final management actions and priorities in the CMP remains with council, subject to advice from the NSW Coastal Council and certification by the Minister.

## 3.2 ENGAGEMENT OBJECTIVES

### According to the Guidelines, the general objectives (intent) for each stage of the CMP are to:

- » **STAGE 1** - bring all interested parties on board early to share information and ideas (before decisions are made).
- » **STAGE 2** - work with community and stakeholders with knowledge to contribute to decisions in subsequent stages. Share information equitably among stakeholders.

- » **STAGE 3** - share the decision-making process. Establish a process that will be used to choose between management options, incorporating community preferences and criteria.
- » **STAGE 4** - gain community confidence and support for decisions that are in the documented CMP.
- » **STAGE 5** - maintain community support for and commitment to the CMP, especially among those directly involved in, or impacted by the implementation.

## 4.0 STAKEHOLDERS: 4.1 STAKEHOLDER IDENTIFICATION

### The Guidelines recommend classifying stakeholder groups into four broad categories:

1. Community/business
2. Councils
3. Public authorities
4. Groups that require additional consideration.

Through discussion with the five councils directly involved in the Hunter Estuary CMP and review of previous stakeholder engagement, the following main stakeholder groups were identified (Table 3-Next page).



## APPENDIX 3: HUNTER ESTUARY CMP COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

Table 3: Main stakeholder groups for the Hunter Estuary CMP

COMMUNITY/BUSINESS	COUNCILS (FIVE)	PUBLIC AUTHORITIES	GROUPS THAT REQUIRE ADDITIONAL CONSIDERATION
Local Aboriginal Land Councils and traditional owner groups	Mayor and councillors	NSW Department of Planning and Environment	Indigenous peoples
Landholders: residents, non-residents, landholder groups	Senior leadership teams	Local Land Services	Children and youth
Visitors including tourists, non-resident workers	Relevant council advisory committees	Hunter Water	People with disabilities
Chambers of Commerce and other business groups	Council staff from land use planning	NSW Crown Lands	Older people
Tourist operators and organisations	Council staff from natural resource management	NSW Department of Primary Industries - Fishing	People from Culturally and linguistically diverse communities (focus on Newcastle LGA)
Aquaculture industry	Council staff from asset management	NSW Department of Primary Industries - Agriculture	Caravan park owners and dwellers
Farmers and agricultural groups e.g. NSW Farmers	Council staff from parks and recreation	Transport for NSW (Maritime)	
Environment groups including Landcare, Bushcare, birdwatcher groups, Hunter Wetlands Centre	Council staff from emergency services	NSW State Emergency Service	
Recreational groups including fishing clubs, rowing clubs	Council staff from communications	Port Authority NSW (Newcastle Port)	
Community groups including Lions, Rotary, Progress Associations	Neighbouring councils	WaterNSW (including Hunter Valley Flood Mitigation Scheme)	
Education institutions including pre-schools, schools, universities, TAFEs	Hunter Joint Organisation	Other public authorities e.g. NSW National Parks & Wildlife Service, EPA	

A detailed 'live' list of specific stakeholders related to each stakeholder group is provided as an addition to this Strategy.

## 4.2 STAKEHOLDER PROFILING

Identifying and establishing a profile of various stakeholders, the community and existing networks will enable the council to consider appropriate engagement techniques that encourage meaningful stakeholder and community involvement.

A profile of the main stakeholder groups identified in Table 3 is provided in Table 4.

Table 4: Stakeholder profile

STAKEHOLDER GROUP	LEVEL OF INTEREST/IMPACT	LEVEL OF INFLUENCE	WHAT IS IMPORTANT TO THE STAKEHOLDER	POTENTIAL VALUE OR THREAT TO ISSUE	STRATEGY FOR ENGAGING THE STAKEHOLDER
Local Aboriginal Land Councils and traditional owner groups	High	High	Tangible and intangible indigenous cultural heritage. Opportunities for indigenous peoples to be involved or lead CMP management actions.	It is valuable to understand the cultural significance of the Hunter estuary and the influence that estuarine processes, hazards and environmental change may have on the values of physical and non-physical elements of cultural heritage	Important to build trust throughout the CMP and meet regularly in a way that is appropriate to each indigenous group.
Landholders: residents, non-residents, landholder groups	Medium	High	Estuary health, healthy lifestyle, productivity	A threat is apathy and poor awareness of the need to maintain Hunter estuary health. Some people do value the estuary highly and these people should be strongly supported.	Online and in-person engagement with landholders throughout the process backed by communications to encourage involvement in the CMP stages.
Visitors including tourists, non-resident workers	Low	Low	Aesthetics and recreation (tourists), place to earn income (non-resident workers), environmental interests e.g. birdwatching	Generally not attuned to the Hunter estuary and not aware of issues.	Online engagement. Also link with tourist operators (tourists) and business groups e.g. Chambers of Commerce (non-resident workers)
Chambers of Commerce and other business groups	Low	Medium	Productivity	Opportunity for businesses to support CMP management actions. Also could have impacts on estuary health e.g. via stormwater pollution	Presentations and discussions at Chambers of Commerce meetings

## APPENDIX 3: HUNTER ESTUARY CMP COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

STAKEHOLDER GROUP	LEVEL OF INTEREST/IMPACT	LEVEL OF INFLUENCE	WHAT IS IMPORTANT TO THE STAKEHOLDER	POTENTIAL VALUE OR THREAT TO ISSUE	STRATEGY FOR ENGAGING THE STAKEHOLDER
Tourist operators and organisations	Medium	Medium	Estuary health, healthy lifestyle	Could promote good estuarine health behaviours to visitors.	Meetings with tourist operators/ organisations
Aquaculture industry	High	Medium	Estuary health, Productivity	Estuary health is critical to this industry and could be involved in some management actions	Meetings with aqua culture industry reps. Possible use of Oceanwatch and other resources
Farmers and agricultural groups e.g. NSW Farmers	Medium	High	Estuary health, Productivity	Directly involved in catchment WQ and shoreline erosion	Target farmers especially in the coastal zone of the estuary
Environment groups including Landcare, Bushcare, birdwatcher groups, Hunter Wetlands Centre	High	High	Estuary health, healthy lifestyle,	Conduits into the community to promote CMP and its management actions	Meetings with environment groups, online engagement
Recreational groups including fishing clubs, rowing clubs	Medium	High	Estuary health, healthy lifestyle	River users and can influence others to participate in the CMP and its management actions	Meetings with recreational groups, online engagement
Community groups including Lions, Rotary, Progress Associations	Low	Medium	Healthy lifestyle, estuary health	Conduits into the community and can promote CMP and its management actions	Meetings with recreational groups, online engagement
Education institutions including pre-schools, schools, universities, TAFEs	Medium	High	Curriculum-based studies relating to local environment. Environmental education activities (non-curriculum)	Opportunities to promote CMP and possible management actions using local Environmental Education Centres, Hunter Wetlands Centre	Meetings with Environmental Education Centres, Hunter Wetlands Centre, online engagement. Promotion via online engagement

STAKEHOLDER GROUP	LEVEL OF INTEREST/IMPACT	LEVEL OF INFLUENCE	WHAT IS IMPORTANT TO THE STAKEHOLDER	POTENTIAL VALUE OR THREAT TO ISSUE	STRATEGY FOR ENGAGING THE STAKEHOLDER
Mayor and councillors	Medium	Medium	Interest in local issues and Council activities	Conduits into the community and can promote CMP and its management actions	Regular briefings to Mayor and councillors of the five Councils
Council staff	High	High	Estuary health, healthy lifestyle, productivity	Have responsibility to develop and promote the CMP	Council workshops via HEAL throughout all Stages of the CMP, promotion of the CMP to stakeholders
Neighbouring councils	Medium	Medium	Estuary health, healthy lifestyle, productivity	Part of Hunter River catchment and thus influence Hunter estuary. Possible learnings from other CMPs	Meetings to brief and include neighbouring councils in the development of the CMP
Public authorities	High	High	Estuary health, healthy lifestyle, productivity	Have major legislated and policy influence on the Hunter estuary	Stakeholder workshops and interviews throughout the development of the CMP
Groups that require additional consideration	Low	Medium	Estuary health, healthy lifestyle	Some of these groups appear vulnerable to natural events (e.g. floods) and possibly not engaged, however may be important for the future of the CMP	Youth forums, school excursions, field trips for specific groups, online engagement

## APPENDIX 3: HUNTER ESTUARY CMP COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

### 5.0 KEY MILESTONES

Table 5 outlines the key milestones for the completion of each stage in the Hunter Estuary CMP.

Table 5: Hunter Estuary CMP milestones

ACTIVITY	DATE
Stage 1	March 2023
Stage 2	June 2023
Stage 3	October 2023
Stage 4	December 2023 (dependent on certification by the Minister)
Stage 5	2033 (ongoing for 10 years)

### 6.0 IMPLEMENTATION PLAN

The following implementation plan provides an indication of the engagement content and methods for stakeholders in each stage of the CMP. The various engagement activities are linked to the engagement outcomes for each CMP stage as outlined in the Guidelines for community and stakeholder engagement in coastal management.

It should be noted that a more detailed engagement and communications action plan is required for each stage particularly to relate engagement actions to timeframes and responsibilities.

#### Stage 1

In Stage 1 councils set the scene for the coastal planning process. They will consider the status of coastal management for the council area and decide on the focus of the CMP.

#### The engagement outcomes for Stage 1 are:

- » stakeholders and the community understand how they can be involved in the preparation of a CMP
- » increase community and stakeholder understanding of the new legislative and planning framework – CM Act, State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP) and manual
- » establish strong working relationships with community networks and stakeholders which are built on mutual trust and respect
- » be clear about the coastal management roles and responsibilities of the council and public authorities
- » understand community goals and aspirations for the coastal zone and community views on values, opportunities and priorities
- » understand community motivations for participation and preferred approaches and processes, to encourage increased community interest and willingness to actively participate in coastal management
- » increase community and stakeholder understanding of the dynamic nature of coastal processes, risks and opportunities and the need to set long-term objectives
- » determine the engagement activities that are required during the preparation of subsequent stages of the CMP.

Considerable community and stakeholder engagement has been undertaken over the past years to identify values, issues and risks. The outcomes of this engagement are summarised in Section 2.4 of this Strategy.

#### In addition, the following engagement activities were conducted in Stage 1 of the Hunter Estuary CMP:

- » Participants at seminar on the Hunter Estuary hosted by Hunter Environmental Institute. The 66 attendees included a mix of council, public authority, consultant, academic and community representatives – June 2021

- » Senior Managers briefing of Maitland City Council by council's environmental staff to assist with broader planning development reflecting on the value of the estuary to their community. – June 2021
- » Workshop which included 35 participants from multiple stakeholder groups to support analysis of governance development – July 2021
- » Briefing of Hunter Local Land Services – December 2021
- » Briefing Newcastle Coastal Management Program Working Group December 2021
- » Briefing Port of Newcastle – January 2022
- » Briefing Hunter Water – February 2022
- » Briefing Hunter Joint Organisations group- May 2022
- » Briefing General Managers Advisory Committee – May 2022
- » Briefing Cessnock City Council – May 2022
- » Briefing Mindaribba Local Aboriginal Land Council CEO – June 2022
- » Stakeholder tour of estuary and workshop – August 2022
- » Cessnock area values identification – September 2022
- » Dungog area values identification - September 2022
- » Port Stephens Council Aboriginal Strategic Committee – Oct 2022
- » Cessnock City Council Aboriginal and Torres Strait Islander Advisory Committee - Dec 2022
- » Mindaribba Local Aboriginal Land Council – Dec 2022.

The previous engagement activities in the study area and those conducted for Stage 1 help to achieve the recommended engagement outcomes. This Strategy fulfills the final engagement outcome for Stage 1: determine the engagement activities that are required during the preparation of subsequent stages of the CMP.

## APPENDIX 3: HUNTER ESTUARY (MP) COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

### Stage 2

Stage 2 involves detailed scientific, engineering, economic and social studies to fill knowledge gaps and help understand relevant to coastal management issues. Stage 2 may also include a detailed coastal risk assessment.

**It is anticipated that there will be five detailed study areas in Stage 2:**

1. Climate Change / Biodiversity / Resilience
2. Water quality / catchment management
3. Governance
4. Streambank erosion / riparian corridor creation
5. Socio economic analysis.

Each study will require its own community and stakeholder engagement plan. However, there is some general engagement that can be conducted in Stage 2 to build awareness in the community of the risks, vulnerabilities and opportunities and prepare it for informed consideration of management options and actions in Stage 3. This general engagement for Stage 2 is covered in Table 6 (Right).

**Table 6: General engagement activities for Stage 2**

ENGAGEMENT OUTCOMES	STAKEHOLDERS	IAP2 SPECTRUM	CONTENT & MESSAGES	METHODS
2.1 A shared understanding of risks and opportunities over different timeframes, and the range of actions that could address different risks	Community/ business, council, public authorities, other groups	Inform	Further identification of risks (e.g. flood, water quality, habitat) and opportunities on a community basis. The identification of possible risk management actions	Establish HEAL website to provide information about CMP stages
		Involve		Use promotional communications, meetings with indigenous groups and other community groups/ business
2.2 A shared understanding of the varied perspectives about coastal management within the community	Community/ business, other groups	Inform	Information on perspectives of estuary management. Various views on management of the Hunter estuary	Establish HEAL website and use promotional communications.
		Involve		Use social pins or equivalent program to encourage community members provide photographs and observations regarding management of the Hunter estuary
2.3 Council understands community's 'attitude to risk'	Community/ business	Consult	The range of attitudes to risk in communities across the study area	Use previous social research and engagement conducted by Councils, HEAL and other organisations e.g. Hunter Water
2.4 Community and stakeholders understand vulnerabilities, risk and opportunity studies, including technical aspects such as scenarios for sea level rise, hazards and impacts	Community/ business, council, public authorities, other groups	Inform	Findings from detailed studies e.g. water quality	Refer to stakeholder and engagement actions for each of the detailed studies in Stage 2.
		Involve		HEAL website covers and promotes the detailed studies
2.5 Increased community trust of technical information based on their involvement and understanding of assumptions and limitations	Community/ business, other groups	Inform	Understanding trade-offs e.g. if you focus on one risk and management option others may not be possible	Use of technical details (including Stage 1 report) in the HEAL website.
		Involve		Use Waterwatch and other citizen science programs to encourage community participation



## APPENDIX 3: HUNTER ESTUARY CMP COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

### Stage 3

In Stage 3 councils identify and evaluate management options to address the coastal risks and opportunities identified in Stages 1 and 2. The engagement process aims to facilitate stakeholder and community

involvement in identifying and evaluating the local and regional scale management options so that preferred actions are consistent with the objects of the CM Act.

The proposed community and stakeholder engagement for Stage 3 is covered in Table 7.

**Table 7: Engagement activities for Stage 3**

ENGAGEMENT OUTCOMES	STAKEHOLDERS	IAP2 SPECTRUM	CONTENT & MESSAGES	METHODS
3.1 Strong working partnerships	Community/business, council, public authorities, other groups	Involve	We do better together	Use and promote existing working partnerships e.g. HEAL, Council-community networks e.g. resident associations, chambers of commerce, indigenous and other groups
3.2 Managers within council aware of coastal hazards, threats, risks and vulnerabilities, opportunities and actions relevant to their responsibilities and potential conflict with other council priorities	Council staff	Consult	Awareness of intrinsic linkages across council related to CMP risk analysis findings. Need to tie CMP strategic planning across divisions of each council.	Workshop with council managers to review CMP risk analysis, what it means for council and implications of possible CMP actions
3.3 Public authorities contribute to identification and evaluation of management options, are aware of responsibilities and accept the adaptive nature of the CMP	Public authorities	Consult	Section 16 of the CM Act requires that councils consult with public authorities if the CMP proposes actions or activities to be carried out by that public authority or if the CMP relates to, affects or impacts on any land or assets owned or managed by that public authority.	Meetings with relevant public authorities to identify and evaluate management options and their responsibilities
3.4 Robust options, understood by all stakeholders in terms of risks, cost and benefits	Community/business, council, public authorities, other groups	Inform	Findings from detailed studies e.g. water quality	Refer to stakeholder and engagement actions for each of the detailed studies in Stage 2.  HEAL website covers and promotes the detailed studies
3.5 Council understands stakeholder views about cost-benefit distribution, willingness to pay and potential trade-offs	Councils	Consult	Council understands stakeholder views and implications for the choice of management options	Use HEAL to review stakeholder views and implications for management options. Communicate this to upper management and councillors via briefings

**In Stage 4, Councils must prepare a draft CMP. Section 16 of the CM Act requires that before adopting a draft CMP, a council must consult with the community. It also requires the council to consult with other public authorities if the draft CMP:**

- » proposes actions or activities to be carried out by that public authority

- » proposes specific emergency actions or activities to be carried out by a public authority under the coastal zone emergency action subplan
- » relates to, affects or impacts on any land or assets owned or managed by that public authority.

The proposed community and stakeholder engagement for Stage 4 is covered in Table 8.

ENGAGEMENT OUTCOMES	STAKEHOLDERS	IAP2 SPECTRUM	CONTENT & MESSAGES	METHODS
4.1 Community and stakeholder support for actions and priorities in the CMP	Community/business, council, public authorities, other groups	Inform	It is a mandatory requirement that a draft CMP must be exhibited for public inspection at the main offices of the council of all local government areas within the area to which the CMP community and stakeholder engagement guidelines applies, during the ordinary hours of those offices, for a period of not less than 28 calendar days, before it is adopted.	Exhibition at main offices of each council  Draft CMP available on HEAL website with online feedback form
		Consult		Hold drop-in session in study area to brief community on draft CMP and obtain feedback  Continue dialogue with indigenous and other groups
		Involve		Brief councillors re draft CMP  Meet with public authorities re draft CMP and their responsibilities.
4.2 Increased awareness about funding options and how CMP implementation will be integrated with council's Resourcing Strategy and Delivery Program under IP&R	Council	Inform	Recognition of multiple funding sources for the coastal zone. Identification of integration into council IP&R planning and operations. Recognition of funding and resourcing limitations.	Use internal council working groups to facilitate and raise awareness of funding options and integration of the CMP within council's IP&R framework
4.3 Public authorities accept roles and responsibilities in the CMP	State government and other public authorities	Involve, Collaborate	Determination of cost apportionment across responsible public authorities	Link with state government agency meetings in Strategy 4.1

## APPENDIX 3: HUNTER ESTUARY CMP COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

### Stage 5

The engagement activities in Stage 5 continue to build on the relationships and opportunities that have been fostered in the earlier stages of preparing the CMP.

#### During Stage 5, councils may take the opportunity to:

- » provide project-based updates on implementation of specific coastal management actions that detail actions, costs and results

- » report to the community on progress in achieving coastal management outcomes
- » establish project-specific working groups to oversee the implementation of large-scale works (i.e. involving landowners, council, DPE and other relevant public authorities)
- » continue to work with the coastal management advisory working group (e.g. HEAL), where it exists.

The proposed community and stakeholder engagement for Stage 5 is covered in Table 9.

Table 9: Engagement activities for Stage 5

ENGAGEMENT OUTCOMES	STAKEHOLDERS	IAP2 SPECTRUM	CONTENT & MESSAGES	METHODS
5.1 Community understanding of how CMP will be implemented through the IP&R framework and land use planning system; and by other public authorities	Community, indigenous and other groups	Inform	Outline integration with council IP&R framework and roles and responsibilities for council and public authorities. Stress shared responsibility and that all are involved e.g. behaviour change	Project bulletin on HEAL website
		Involve		Use Council community networks and newsletters
5.2 Community informed about progress on actions	Community, indigenous and other groups	Inform	Community initiative – the need to continue to work together on actions	Continued dialogue with indigenous and other groups where appropriate
5.2 Community informed about progress on actions	Community, indigenous and other groups	Inform	Community initiative – the need to continue to work together on actions	Media releases and social media on progress. Letters to community groups re progress on actions
5.3 Community is aware of the effectiveness of actions in terms of changes to coastal risk profile, coastal condition and community satisfaction	Community, indigenous and other groups	Involve	Reporting measured improvements	Involve communities in implementation and monitoring actions e.g. via citizen science
				Prepare and disseminate 'report cards' on the effectiveness of actions

ENGAGEMENT OUTCOMES	STAKEHOLDERS	IAP2 SPECTRUM	CONTENT & MESSAGES	METHODS
5.4 Continue partnership with community by creating opportunities for community involvement in implementing, monitoring, evaluating and reporting CMP effectiveness	Community, indigenous and other groups	Involve	Communities can be involved in implementing and monitoring and evaluation	Involve communities in monitoring actions e.g. via citizen science. Continue dialogue with indigenous and other groups on their involvement Use community reference groups for large projects
5.5 Maintain and enhance partnerships across public authorities and also to seek opportunities to leverage off other programs (e.g. MEMA)	Council, public authorities	Collaborate	Importance of maintaining and enhancing partnerships	Use CMP governance structure including HEAL to regularly meet with public authorities Partner with public authorities on implementation projects

## 7.0 MONITORING AND EVALUATION

The participating partners via HEAL should use formative and summative evaluation to review this Strategy.

Formative evaluation is used during the implementation of the Strategy and related communication/engagement action plans. It can include evaluation methods such as feedback sheets, peer review, reflection and satisfaction surveys. The future Strategy content and methods may be amended as a result of this evaluation.

Summative evaluation occurs at the end of each Stage and generally involves the review of all evaluation data culminating in an engagement report in the report for the Stage.

#### Metrics could include:

- » number of responses to community surveys
- » quality of responses to community surveys
- » compliments/complaints received
- » level of interest in activities
- » positive feedback from workshop and drop-in sessions.

## 8.0 ACTION PLANS

Engagement action plans for Stages 2-4 related to the Strategy are provided below. The action plans provide a general sequence of engagement and associated communication activities for each Stage.

As noted previously, there are five specific projects required in Stage 2 with each requiring its specific action plan. However, there is general engagement required

in Stage 2 with it being an information gathering activity and the requirement to continue to keep community/stakeholders aware that the CMP is being written.

## APPENDIX 3: HUNTER ESTUARY CMP COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

Table 10: General engagement action plan for Stage 2

ACTION	STAKEHOLDERS	COMMUNICATION TOOLS	RESPONSIBILITY	RESOURCING NEEDS
Brief each Council's communication/engagement staff re actions for Stage 2	Council	Hold virtual briefing session	HEAL	Briefing notes
Inform about Stage 2 specific studies as part of progress with CMP	Community/business/special interest groups	HEAL website Media releases Posts through Council social media Email to stakeholders (use Stakeholder Contact List)	HEAL	Update HEAL website with CMP progress infographic Develop media release, precanned social media posts
Inform about Stage 2 specific studies as part of progress with CMP	Indigenous groups	Direct organisation of meetings with each indigenous group	HEAL	Meetings with indigenous groups
Inform about Stage 2 specific studies as part of progress with CMP	Council staff, Councillors	Organise Council internal meetings Organise councillor briefing at Council meetings	Each Council	Briefing notes, PP presentation for relevant Council staff, Councillors
Inform about Stage 2 specific studies as part of progress with CMP	Public authorities	Use Stakeholder Contact List to organise briefing meeting with public authorities	HEAL	Briefing notes, PP presentation
Continue to engage interest in CMP as prelude to identifying management options	Community/special interest groups	As part of media release and social media posts encourage people to pin their thoughts on Hunter estuary management and possible management options	HEAL	Develop social pins or equivalent program on map on HEAL website to encourage community members provide photographs and observations regarding management of the Hunter estuary
Inform stakeholders of findings from detailed Stage 2 CMP studies e.g. water quality	Community/business/special interest groups, indigenous groups	Email to Stakeholder Contact List with link to HEAL website Media release re summary of findings	HEAL	Summary of findings of the five specific studies on HEAL website
Inform stakeholders of findings from detailed Stage 2 CMP studies e.g. water quality	Council staff	Organise Council internal meetings	All Councils	Briefing notes, PP presentation for relevant Council staff

Table 11: General engagement action plan for Stage 3

ACTION	STAKEHOLDERS	COMMUNICATION TOOLS	RESPONSIBILITY	RESOURCING NEEDS
Brief each Council's communication/engagement staff re actions for Stage 3	Council	Hold virtual briefing session	HEAL	Briefing notes
Hold workshops with council managers to review CMP risk analysis, what it means for council and implications of possible CMP actions	Council	Organise manager workshops in each Council	HEAL	Briefing notes, PP presentation for relevant Council staff
Facilitate workshop with relevant public authorities to identify management options and their responsibilities	Public authorities	Organise virtual workshop with public authorities	HEAL	Briefing notes, PP presentation, facilitator
Meet with indigenous groups to identify possible management options	Indigenous groups	Organise meetings with indigenous groups	HEAL	One-on-one meetings at venues preferred by indigenous groups
Engage with community stakeholders re their preferred CMP management options	Community/business/special interest groups	Update HEAL website with community survey, information about Stage 3	HEAL	Provide list of possible management actions Project bulletins and HEAL website
		Brief councillors of each Council on evaluation of possible management options	Each Council	Briefing notes for Councillors Community online survey on possible management options
		Advertise drop-in sessions and online survey via media releases, social media posts Send email to stakeholders re online survey and drop-in sessions using Stakeholder Contact List	HEAL	Community drop-in sessions in each LGA to review and choose management options
Hold workshop with relevant public authorities to evaluate management options	Public authorities	Organise virtual workshop with public authorities	HEAL	Briefing notes, PP presentation, facilitator
Hold workshop with Council staff to evaluate management options	Council	Organise virtual workshop with reps from each Council	HEAL	Briefing notes, PP presentation, facilitator
Meet with indigenous groups to evaluate management options	Indigenous groups	Organise meetings with indigenous groups	HEAL	One-on-one meetings at venues preferred by indigenous groups
Inform stakeholders of findings of the preferred management options	Community/business/special interest groups	Email to Stakeholder Contact List with link to HEAL website Media release re summary of findings	HEAL	Summary of outcomes of Stage 3 including preferred management options

## APPENDIX 3: HUNTER ESTUARY CMP COMMUNITY STAKEHOLDER ENGAGEMENT STRATEGY

Table 12: General engagement action plan for Stage 4

ACTION	STAKEHOLDERS	COMMUNICATION TOOLS	RESPONSIBILITY	RESOURCING NEEDS
Brief each Council's communication/engagement staff re actions for Stage 4	Council	Hold virtual briefing session	HEAL	Briefing notes
Exhibit draft CMP online and at Council offices	All stakeholders	Draft CMP available as a hard copy in each Council office and selected libraries	Each Council	Draft CMP must be exhibited for public inspection at the main offices of the council, during the ordinary hours of those offices, for a period of not less than 28 calendar days
		Draft CMP available online	HEAL	Provide draft CMP and a summary infographic online at HEAL website  Provide feedback sheets (digital and hard copy) for comments on draft CMP
Involve community in the review of the draft CMP	Community, business, special interest groups	Provide media releases and social media posts to advertise the exhibition of the draft CMP and how people can be involved	Each Council	Media release, precanned social media posts at beginning and during exhibition period
		Organise and advertise drop-in session in each LGA to brief participants on the draft CMP	HEAL	Hold drop-in sessions at beginning of exhibition period
		Email to stakeholders on Stakeholder Contact List encouraging them to provide comments on the draft CMP	HEAL	Provide details of exhibition of draft CMP and how people can be involved
Meet with indigenous groups re their comments on draft CMP	Indigenous groups	Organise meeting with each indigenous group	HEAL	Hold meetings with indigenous groups to discuss draft CMP and obtain their comments
Advise public authorities and Councils of opportunity to provide comments on draft CMP	Public authorities, Council	Email public authorities re the draft CMP exhibition and encouraging their comments	HEAL	Provide draft CMP and deadline for comments
		Email relevant Council staff re the draft CMP exhibition and encouraging their comments	Each Council	Provide draft CMP and deadline for comments





HEAL

HUNTER ESTUARY ALLIANCE

BRINGING LIFE TO THE ESTUARY.

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