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Hunter Estuary Coastal Zone Management Plan

Revised December 2017
Original Final Report September 2009
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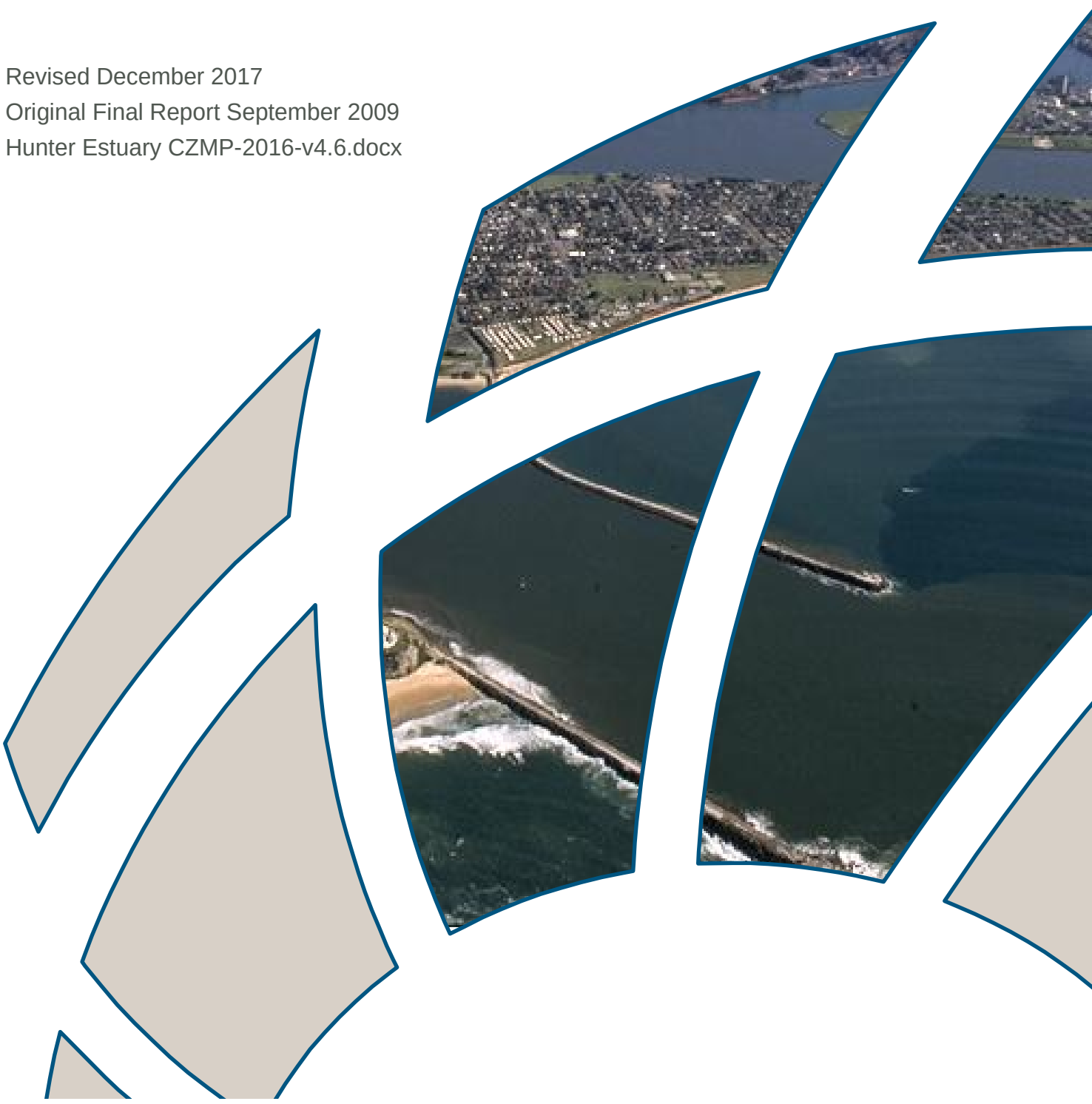

Hunter Estuary Coastal Zone Management Plan

Prepared For:	Newcastle City Council, Port Stephens Council, Maitland City Council and NSW Department of Environment and Climate Change
Prepared By:	BMT WBM Pty Ltd (Member of the BMT group of companies)
Revised by:	Newcastle City Council, Port Stephens Council, Maitland City Council, NSW Office of Environment and Heritage and Local Land Services

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Client Reference	

Title :	Hunter Estuary Coastal Zone Management Plan (Hunter Estuary Management Plan)
Author :	Michelle Fletcher and Dr Philip Haines
Synopsis :	This document is an Estuary Management Plan for the Hunter Estuary prepared under the NSW Government's Estuary Management Program. It outlines a series of management strategies aimed at maintaining the environmental values of the estuary and improving the condition of the estuary into the future.

REVISION/CHECKING HISTORY

REVISION NUMBER	DATE OF ISSUE	CHECKED BY		ISSUED BY	
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REVISED DOCUMENT CONTROL SHEET

Title :	Draft Hunter Estuary Coastal Zone Management Plan
Revised by :	Newcastle City Council, Port Stephens Council, Maitland City Council and Office of Environment & Heritage
Purpose of Revision :	This document has been revised from the original report prepared by BMT WBM to reflect the status of the management strategies, the current planning context, and to meet the updated requirements for the preparation of Coastal Zone Management Plans outlined in Part 4A of the *Coastal Protection Act 1979* and the supporting NSW Guidelines for Preparing Coastal Zone Management Plans (OEH, 2013).

REVISION/CHECKING HISTORY

REVISION NUMBER	DATE OF ISSUE	REVISION	CHANGES BY
4.1	28/09/2016	Workshop Updates	AC
4.2	29/08/2016	MCC & Bird Observers Comments	AC
4.2b	29/08/2016	Strategy 12, PON, LLS, PSC comments	AC
4.3	30/09/2016	HWC comments	AC
4.4	05/10/2016	MCC comments, finalise changes	AC
4.5	6/10/16	Added status report as Appendix 3	DNP
4.6	21/12/17	Added OEH and DoI-Lands & Forestry comments	DNP

HUNTER ESTUARY COASTAL ZONE MANAGEMENT PLAN: EXECUTIVE SUMMARY

Purpose	This Coastal Zone Management Plan is to guide future decision making regarding short and long term management of the Hunter Estuary, its foreshores and its broader catchment area.
Context	This Coastal Zone Management Plan was originally developed under the NSW Government's Estuary Management Program and adopted by the three councils in 2009. A 2016 review of the Plan was undertaken in preparation for submission to the Minister for Planning for certification. The 2016 review ensured that the Plan met the requirement of the Coastal Protection Act 1979 and the Guidelines for Preparing Coastal Zone Management Plans (2013) (demonstrated in Appendix B). The Plan is supported by an Estuary Processes Study (MHL, 2003), which describes the environmental processes of the estuary and their interactions, and an Estuary Management Study (BMT WBM, 2009), which outlines in detail a prioritised a range of potential management options for the estuary.
Status	This document was originally adopted by Newcastle City Council on 6/10/09, and by Port Stephens Council and Maitland City Council on 13/10/09. The revised document was endorsed to be progressed to the Minister for certification by Port Stephens Council and Maitland City Council on 13/12/16 and Newcastle City Council on 20 December 2016.
Relationship to other plans	This Plan is to be read in conjunction with other relevant strategic environmental management plans, including the LLS Strategic Plan, the regional Biodiversity Strategy, and the Plan of Management for Hunter Wetlands National Park. This Plan should also be consulted when reviewing and amending Councils' Local Environmental Plans (LEPs), Development Control Plans (DCPs), and other Council Management Plans.
Vision	"The community, industry and government working together towards a productive, economically viable and ecologically sustainable Hunter Estuary, recognising social, cultural and environmental values"
Principles	**A.** Natural Environment and Processes - To protect, enhance, maintain and restore the environment of the Hunter Estuary, its associated ecosystems, ecological processes and biological diversity, and its water quality **B.** Heritage - To protect and conserve the Aboriginal and European heritage of the Hunter Estuary **C.** ESD and Integrated Planning - To provide for integrated planning and management of the Hunter Estuary in accordance with the principles of ecologically sustainable development **D.** Aesthetics and Access – To ensure continuing public access and preservation of the amenity of the Hunter Estuary **E.** Community involvement - To recognise the role of the community, as a partner with the government, in resolving issues relating to the protection and effective management of the Hunter Estuary
Objective	1. To protect and enhance estuarine biodiversity, particularly Endangered Ecological Communities (as listed under the NSW Threatened Species Conservation Act 1995) and other key habitats 2. To increase appropriate native riparian vegetation along the Hunter Estuary 3. To prevent catchment and point source pollutants from compromising social, environmental and economic values of the Hunter Estuary 4. To optimise management of flood mitigation works and other flow control structures to enhance environmental values without compromising intended function 5. To minimise further bank erosion throughout the Hunter Estuary and remediate existing erosion sites, where appropriate

Objectives cont'd.	6. To provide opportunity for effective and inclusive stakeholder involvement in the management of the Hunter Estuary environment. 7. To acquire knowledge relevant to environmental management about the Hunter Estuary, on a priority basis 8. To achieve consistency and integration between the Hunter Coastal Zone Management Plan and other strategic environmental planning and natural resource management instruments and programs 9. To adopt catchment wide development assessment practices that consider and address cumulative impacts on the Hunter Estuary 10. To ascertain the impacts of past works and activities on the tidal hydraulics of the Hunter Estuary 11. To encourage development that maintains and enhances landscape values, opportunities for recreation, and ecological functions of the Hunter Estuary 12. To prevent mobilisation of contaminated sediment and groundwater contamination from impacting on environmental processes within the Hunter Estuary 13. To reduce the catchment sediment load to the Hunter Estuary 14. To fulfil all requirements of international environmental management treaties and relevant conservation legislation in regard to the Hunter Estuary 15. To prevent environmental weeds and pests from compromising the social, ecological and economic values of the Hunter Estuary 16. To facilitate the adaptation of estuarine communities to projected climate change 17. To adopt a consistent approach to foreshore land rehabilitation and conservation along the Hunter Estuary 18. To minimise environmental consequences of changes to flow and salinity regimes from upstream activities 19. To reduce the environmental impacts of the accumulation and migration of recent sediments within the Hunter Estuary 20. To prevent further exposure of Potential Acid Sulfate Soils and to reduce the extent of actual acid sulfate soils around the Hunter Estuary 21. To increase appropriate public access and amenity to the Hunter Estuary and wetlands, recognising sensitive habitats 22. To enhance the scenic quality of the Hunter Estuary 23. To facilitate appropriate reuse of sediment dredged from the Estuary 24. To minimise the environmental impacts of commercial sand and gravel extraction on the Hunter Estuary 25. To protect and conserve Aboriginal and European heritage objects, places and landscapes
Strategies	24 individual strategies have been developed to help to achieve stated objectives for the Hunter Estuary. A summary of the strategies is provided in Summary Table A. Strategies have been defined in terms of relative timeframe for implementation as: Immediate (start within 12 – 18 months); Short Term (start within 3 – 5 years); Medium Term (start within 5 – 10 years) and on-going. These timeframes are indicative only and are subject to available funding and resources held by the responsible authorities. The proposed order of implementation for the different strategies takes into consideration the priority of the strategy as well as the relative timeframe in which it should be undertaken.
Meeting the Objectives	The 25 objectives are to be addressed through a combination of works in undertaking the strategies, along with compliance to the guiding principles for all future development, initiatives and planning instruments throughout the Hunter Estuary and surrounding lands. The manner in which the management objectives are to be addressed by the strategies and the manner in which the objectives meet the principles, is presented in Summary Table B.
Implementation responsibilities	Responsibilities for implementation have been defined. Primary responsibility for the majority of strategies rests with **Newcastle City Council, Port Stephens Council and Maitland City Council**. Assistance to Council, and implementation of some ancillary strategies and tasks, is to be provided by key stakeholders and relevant government agencies including: Hunter Local Land Services (HLLS), Office of Environment and Heritage (OEH), DPI-Fisheries, NSW Roads and Maritime Service (RMS), and Dept. of Industry – Crown Lands & Water. Implementation is also to be facilitated through the assistance of landholders and local community groups / volunteer organisations.

Program of actions	Suggested actions for each strategy have been provided, and are detailed within individual implementation schedules (see Section 3).
Costs and funding	Indicative costs have been provided in the Implementation Tables. Costs to individual Councils and other stakeholders will depend on prioritised requirements for funding of individual strategies against significant existing stakeholder activities. Significant in-kind contributions are required by all responsible authorities. A range of external funding opportunities will also be available to support the implementation of this Plan. These are discussed in Section 3.5.
Indicators for success	The ultimate success of the CZMP is to be gauged by how well the Plan objectives have been met. Given that the objectives are broad and likely to be measurable over long timescales only, a series of Performance Measures have been incorporated into the Implementation Tables for each strategy to facilitate short term successes.
Consultation	Community and stakeholder consultation has underpinned the development of this Plan. The community have reviewed this Plan during a public exhibition period.
Review and amendment provisions	This Revised Plan has an indicative 5 year timeframe. Progress with implementation should be formally reviewed annually, with a thorough audit of implementation after 5 years. Contingency measures should be activated if progress is slow. A complete review and amendment of the Plan should be completed within 5 years, and should redress outstanding issues, new environmental management practices, new scientific data, and changed governance and administrative arrangements.

Summary Table A Proposed Management Strategies

Strategy #	Strategy Name	Timeframe
1	Establish and/or modify local planning guidelines and controls to allow appropriate assessment and consideration of estuarine habitats and biodiversity as a part of any future development within the estuary and its surrounds	Ongoing
2	Investigate opportunities to protect key habitats and significant existing vegetation stands through rezoning to a more appropriate conservation zone	Ongoing
3	Map estuarine and riparian vegetation to determine habitat potential, health and location, and extents of estuary-related Endangered Ecological Communities	Ongoing
4	Develop an integrated predictive numerical model of the Hunter Estuary, incorporating hydrodynamics, water quality and sediment transport processes, as necessary	Ongoing
5	Identify all structures within the estuary that are interfering with fish passage, and then replace and rehabilitate on a priority basis	Ongoing
6	Develop a Hunter Estuary Conservation and Rehabilitation Masterplan that provides clear priorities for implementation for future conservation and rehabilitation	Ongoing
7	Incorporate the objectives of the CZMP into the Plan of Management for the newly created Hunter Wetlands National Park (incorporating the former Hexham Swamp and Kooragang Nature Reserves) and assist with support to implementation	Ongoing
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, and implement strategies to redress erosion, on a priority basis	Ongoing
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.	Ongoing
10	Build on existing riparian vegetation guidelines to encourage consistency across the estuary landscape and differing land tenures	Ongoing
11	Introduce an environmental planning requirement for all new development to achieve no net increase in pollutant runoff loads, through best practice stormwater management	Ongoing
12	Through the Hunter Coast and Estuary Management Committee (or similar), host an on a needs basis inter-governmental panel / forum with senior administrators and agency staff to stream-line co-ordinated and integrated decision-making	Ongoing
13	Raise public awareness of the values of the Hunter Estuary and sustainable use of the estuary through targeted community education	Ongoing
14	Improve land use practices throughout the catchment to minimise soil erosion and improve water quality	Ongoing
15	Develop incentive mechanisms to promote and facilitate the adoption of sustainable agricultural practices that generate a commercial and environmental benefit	Ongoing
16	Conservation of key habitat and significant vegetation should be undertaken through the Biobanking scheme or through preparation and implementation of individual conservation agreements	Ongoing
17	Undertake estuarine and related habitat restoration through physical works, revegetation and or change management practices of assets and infrastructure	Ongoing
18	Develop a plan of all public access points along the Hunter Estuary, review those which coincide with sensitive habitats, and formalising those with highest recreational usage / value (where appropriate), to provide on-going and undiminished access to the river	Ongoing
19	Support and participate in research programs and run these programs in partnership with major stakeholders on a case by case basis	Ongoing
20	Investigate impacts arising from climate change and potential adaptations	Medium Term
21	Undertake a critical review of the salinity trading scheme, the Hunter River Water Sharing Plan and upstream activities in terms of environmental consequences of water discharges and offtakes	Medium Term
22	Undertake assessments for contaminated sediments in the Lower Hunter Estuary	Ongoing
23	Where appropriate, reuse sediment dredged from the Estuary	Ongoing
24	To identify and conserve heritage objects, places and landscapes in the Hunter Estuary	Ongoing

Summary Table B Manner in which Objectives meet Principles, and are satisfied by Strategies

Principles	*Objective*	*Strategies*
A	**1. Estuarine biodiversity**	1, 2, 3, 5, 6, 7, 8, 9, 10, 13, 16, 17, 18, 20
A	**2. Native vegetation**	1, 2, 3, 6, 7, 8, 9, 10, 14, 17
A	**3. Catchment pollutants**	11, 13, 15, 17
A	**4. Flood mitigation works**	4, 5, 8, 17, 19, 20
A	**5.Bank erosion**	8, 13, 14, 17, 18
E	**6. Stakeholder involvement**	6, 9, 10, 12, 14, 15, 16, 17
C	**7. Acquire knowledge**	3, 4, 19, 21, 22
C	**8. Planning consistency**	1, 2, 6, 7, 11, 12, 16, 17, 20
C	**9. Catchment-wide DA practices**	3, 11, 20
A	**10. Impacts of past works**	3, 4, 5, 17, 19
C	**11. Encourage eco-development**	1, 2, 11, 13, 16
A	**12. Contaminated sediments**	22
A	**13. Catchment sediment load**	6, 8, 11, 14, 15, 17
C	**14. International treaties**	3, 5, 6, 7, 16, 17, 20
A	**15. Weeds and pests**	3, 6, 7, 9, 10, 13, 15, 16, 17
C	**16. Climate change adaptation**	3, 4, 5, 6, 16, 17, 19, 20
A	**17. Consistent rehab. approach**	1, 2, 3, 6, 7, 9, 10, 13, 16, 17
A	**18. Flow and salinity regimes**	4, 18, 20, 21
A	**19. Recent sedimentation**	8
C	**20. Acid sulfate soils**	4, 5, 6, 13, 17
D	**21. Public access**	3, 9, 10, 15, 18
D	**22. Scenic quality**	2, 3, 5, 6, 13, 17
C	**23. Port sediments reuse**	23
A	**24. Sand/gravel extraction**	8
B	**25. Heritage conservation**	24

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ABBREVIATIONS (TERMS AND AGENCY NAMES)

Terms	
AG	Australian Government
APZ	Asset Protection Zone
BACI	Before, After, Control, Impact
CAMBA	China Australia Migratory Bird Agreement
CMA	(Hunter Central-Rivers) Catchment Management Authority
CRMHE	Conservation and Rehabilitation Masterplan for the Hunter Estuary
CSP	Council Strategic Plan
DCP	Development Control Plan
DG	Director General
DGR	Director General Requirements
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EMP	Estuary Management Plan
EMS	Estuary Management Strategy
EPI	Environmental Planning Instrument (includes LEP, REP and SEPP)
EPS	Estuary Processes Study
ESD	Ecologically Sustainable Development
GGBF	Green & Golden Bell Frog
HBOC	Hunter Bird Observers Club
HCEMC	Hunter Coast and Estuary Management Committee
Hunter Estuary CZMP	Hunter Estuary Coastal Zone Management Plan
HRRP	Hunter River Remediation Project
HWNP	Hunter Wetlands National Park
ISQG	Interim Sediment Quality Guidelines – see ANZECC
JAMBA	Japan Australia Migratory Bird

Agencies	
AQIS	Australian Quarantine & Inspection Service
DCC	((former) Commonwealth) Department of Climate Change
– DoI- Crown Lands & Water	Department of Industry - Crown Lands & Water
DoPE	Department of Planning & Environment
DPI	Department of Primary Industry
EPA	NSW Environmental Protection Authority
HRC	Healthy Rivers Commission
HWC	Hunter Water Corporation
HLLS	Hunter Local Land Services (formerly Hunter Central Rivers Catchment Management Authority (HCRCMA))
MCC	Maitland City Council
MHL	Manly Hydraulics Laboratory
NCC	Newcastle City Council
DPI- Water	Department of Primary Industries - Water
NPWS	National Parks and Wildlife Service
NRC	Natural Resources Commission
OEH	(NSW) Office of Environment & Heritage
PSC	Port Stephens Council
RMS	Roads & Maritime Services

	Agreement
LEP	Local Environmental Plan
LGA	Local Government Area
LHRS	Lower Hunter Regional Strategy
LHRBS	Lower Hunter Regional Biodiversity Strategy
LMPMC	Lake Macquarie Project Management Committee
LWA	Land and Water Australia
MoU	Memorandum of Understanding
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
NIMPCG	National Introduced Marine Pest Coordination Group
POM	Plan of Management
REP	Regional Environmental Plan
ROKAMBA	Republic of Korea Australia Migratory Bird Agreement
SEPP	State Environmental Planning Policy
SoE	State of Environment
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
TWG	Technical Working Group
WSUD	Water Sensitive Urban Design

1 ABOUT THE HUNTER ESTUARY COASTAL ZONE MANAGEMENT PLAN

1.1 Study Area

The Hunter Estuary is a barrier estuary, carved through Worimi, Wonnarua and Awabakal country, over millions of years. From the most inland tidal limit at Gostwyck, on the Paterson River, some 75km from the ocean, the estuary meanders through agricultural lands, some of the earliest developed townships in Australia and internationally important wetlands to the largest coal port in the southern hemisphere, the Port of Newcastle.

The term "Hunter Estuary" describes the waterway, bed and banks of the tidal section of the Hunter River and its tributaries (such as the Williams and Paterson Rivers, Wallis and Fishery Creeks, Ironbark Creek and Throsby, Styx and Cottage Creeks), and immediate riparian zones within approximately 1km of the waterways (refer Figure 1-1). The adopted tidal limit for the Hunter River is in the vicinity of Oakhampton, which is about 64km from the ocean. The study area is shown in Figure 1-1.

Strategies included in Section 3 of this report also relate to the wider catchment in the Newcastle City Council (NCC), Maitland City Council (MCC) and Port Stephens Council (PSC) LGA's. This is essential as the estuary is the receiving water for a range of catchment activities that ultimately impact upon it. This includes agricultural, industrial, urban stormwater and catchment runoff.

The Hunter Estuary is a functioning ecosystem that is valued for a wide variety of reasons. Uses of the estuary include habitat to an internationally significant selection of resident and migratory animals, as a water source for agriculture, a recreational waterway, and a commercial resource for a number of industries (coal, fishing, tourism etc). The physical diversity and complexity of the estuary is reflected in the many interest groups that are connected to the estuary. These groups include government agencies, Aboriginal Land Councils and Aboriginal Elders groups, conservation organisations, researchers, recreational groups and large industry bodies.

Two centuries of rapid change within the catchment and estuary have had major impacts on environmental processes, resulting in a change to the condition of the estuary. Yet, the Hunter Estuary continues to support a diverse ecosystem with many ecological, economic and social values. In order to preserve these values, and to address the identified problems with the estuary, pro-active management is required. This management is required without further delay to ensure that the condition of the estuary does not continue to decline.

1.2 Planning Context

This Estuary Coastal Zone Management Plan was originally prepared on behalf of Newcastle City Council, Port Stephens Council and Maitland City Council, in co-operation with the NSW Office of Environment & Heritage (OEH), under the NSW Government's Estuary Management Program. It complied with the requirements of the *Coastal Protection Act 1979*, NSW Estuary Management Manual (1992) and the NSW Estuary Management Policy 1992. The Plan was adopted by the three councils in 2009.

Since the original adoption of the Hunter Estuary Coastal Zone Management Plan, the NSW Government has introduced various reforms to coastal management, including the introduction of the Guidelines for Preparation of Coastal Zone Management Plans (OEH, 2013). In 2016, a review of the 2009 adopted Plan was undertaken to ensure that the Plan satisfies the intent and objectives of these new reforms (detailed in Appendix B), as well as the fundamental principles originally espoused in the Coastal Policy and the previous Estuary Management Policy.

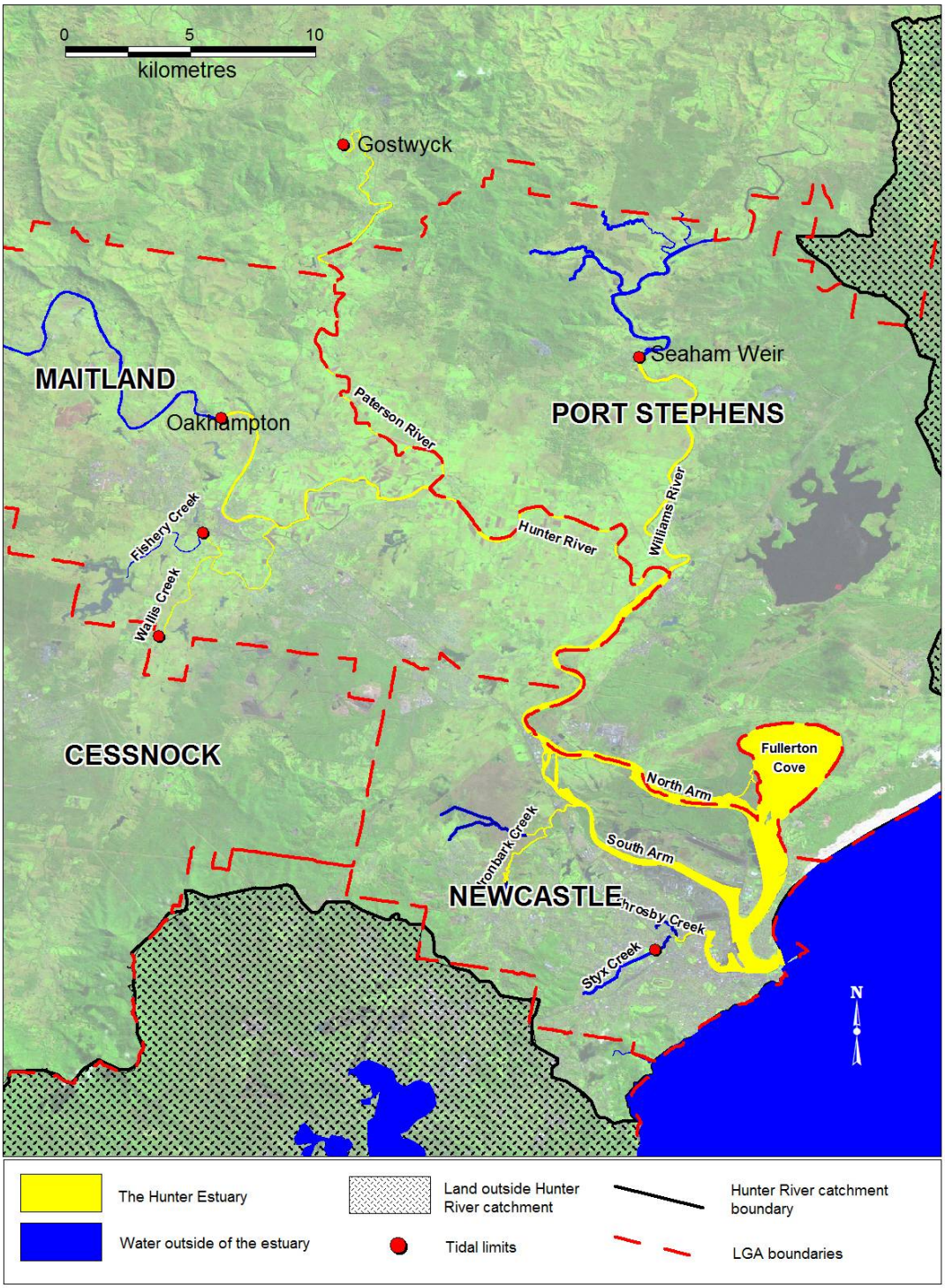


Figure 1-1 The Study Area

This Hunter Estuary Coastal Zone Management Plan is a strategic and long term plan developed through a specifically designed and legislated framework. It aims primarily to provide guidance for achieving a sustainable estuary in the future, giving balanced consideration to environmental, social and economic demands on the river system and its extensive catchment area.

The Plan is supported by an Estuary Processes Study (MHL, 2003), which describes the environmental processes of the estuary and their interactions, and an Estuary Management Study (BMT WBM, 2009), which outlines in detail and prioritised a range of potential management options for the estuary.

1.3 Coastal Zone Management Plans

The NSW Government's Guidelines for Preparing Coastal Zone Management Plans (2013) was released to assist local councils in developing balanced management plans for their estuaries. The guidelines outline the steps to be followed in preparing an Estuary Coastal Zone Management Plan. Community input is a key component of this process.

The process of managing the estuary was initiated by the establishment of an Estuary Management Committee. The Hunter Estuary Management Committee was convened in 1997 and amalgamated with the already established Hunter Coast Management Committee to form the Hunter Coast and Estuary Management Committee (HCEMC). The membership on the committee comprised representatives from the organisations listed in Table 1-1.

This Committee was responsible for the development of an Estuary Processes Study, which outlined all the hydraulic, sedimentation, water quality and ecological processes within the estuary, and the impacts of human activities on these processes. The Hunter Estuary Processes Study was completed by Manly Hydraulics Laboratory (MHL) in 2003.

The next step was to undertake an Estuary Management Study. The study developed management objectives and considered all feasible management options that address the identified issues of concern that are affecting the estuary. This step was completed for the Hunter Estuary by BMT WBM with the assistance of Parsons Brinckerhoff in 2009.

From the findings of the Management Study, an Estuary Coastal Zone Management Plan was prepared. The Plan described how the estuary would be managed, gave recommended solutions to identified problems, and detailed a schedule of activities for the implementation of the recommendations. The Plan can be certified by the Minister for Planning, and implemented through planning controls, works programs, monitoring programs, and education services. Once certified, the strategies recommended in an Estuary Coastal Zone Management Plan may be eligible for funding from the NSW Government.

The general Estuary Management process followed to develop this Plan is shown in Figure 1-2.

Table 1-1 Organisations on the Hunter Coast and Estuary Management Committee

State Government

- Office of Environnent & Heritage (OEH)
- Environmental Protection Authority (EPA)
- Dept. Primary Industries (DPI)
- Dept. of Industry – Crown Lands & Water
- Dept. of the Premier and Cabinet
- NSW Roads & Maritime (prev. Maritime Authority, Waterways Authority)
- Local Land Services Hunter (prev. Hunter-Central Rivers Catchment Management Authority)
- Dept. of Planning and Environment (DoPE)

Councils

- The City of Newcastle
- Port Stephens Council
- Maitland City Council

Industry Stakeholders

- Port of Newcastle
- Hunter Water Corporation (HWC)
- Port Waratah Coal Services (PWCS)
- Hunter Development Corporation (HDC)

Community Stakeholders / Representatives

- Commercial Fishermen's Co-operative Ltd
- Newcastle District Anglers Association (Sec)
- Hunter Surf Industry Cluster
- Oceanwatch
- Hunter Bird Observers Club (HBOC)
- Community representative (coastal management specialist)
- Community representative (Newcastle)
- Community representative (Stockton)
- University of Newcastle

Note: Definition of a support agency is one that will be consulted at the time of project management.

Figure 1-2 Estuary Management Process

1.3.1 Previous Reports

This report is the last in a series of documents that have been prepared in accordance with the provisions of the NSW Government's Guidelines for Preparing Coastal Zone Management Plans (refer to Section 1.3). Many other studies have been carried out on the Hunter River over the past 20 – 30 years and these have also been referred to where relevant, during the preparation of the present, and preceding reports. A reference list is provided in each of the reports, with the most detailed of these being the Estuary Processes Study (MHL, 2003).

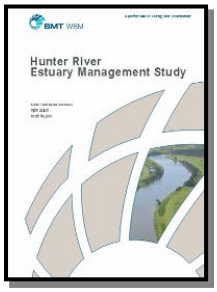
1.3.1.1 Hunter Estuary Processes Study

The Hunter Estuary Processes Study (MHL, 2003) outlines the hydraulic, sedimentation, water quality and ecological processes within the estuary, and the impact of human activities on these processes. An understanding of these processes is an important aspect of developing an effective Estuary Coastal Zone Management Plan. This includes an assessment of the;

- health status of the estuary
- pressures affecting estuary health
- projected climate change impacts on estuary health
- current access arrangements and associated environmental impacts.

1.3.1.2 Hunter Estuary Management Study

The Hunter Estuary Management Study brings together the current scientific understanding of how the estuary works and an understanding of the aspirations for future management of the estuary. This information is then used to recommend a shortlist of strategies for future management of the Hunter Estuary.



This document identifies and assesses a range of potential future management options that aim to protect the values of the estuary (i.e. those aspects of the estuary that are good), and address the issues facing the estuary (i.e. those aspects of the estuary that require attention). This information is presented in a manner readily accessible to the community, thereby enabling informed community participation in the selection of appropriate management options.

For a brief discussion of this consultation, refer to Section 1.9.

For completeness and consistency, the Hunter Estuary Management Study was finalised concurrently with the Hunter Estuary Coastal Zone Management Plan.

1.4 Coastal Zone Management Planning Requirements

The Estuary Management Process in NSW was guided by the Estuary Management Policy (1992) and Estuary Management Manual (1992) at the time of preparing the original CZMP. The NSW Government's Guidelines for Preparing Coastal Zone Management Plans (OEH, 2013) have now replaced the Estuary Management Manual and combines the former Coastal and Estuary Management processes. Appendix B outlines how this document meets the requirements of the new guidelines including the coastal management principles and the objects of the Coastal Protection Act 1979.

At the time of revising the Hunter Estuary CZMP the NSW Government is working to deliver further reforms with a new legislative and regulatory framework including the Coastal Management Act 2016, a coastal management manual and a Coastal Management State Environmental Planning Policy (SEPP). Future revisions of the Hunter Estuary CZMP will be made in accordance with these new requirements.

To be eligible for certification by the Minister for Planning, the Hunter Estuary CZMP must address the matters outlined in s55C of the Coastal Protection Act 1979, including:

a. protecting and preserving beach environments and beach amenity, and

b. emergency actions carried out during periods of beach erosion, including the carrying out of related works, such as works for the protection of property affected or likely to be affected by beach erosion, where beach erosion occurs through storm activity or an extreme or irregular event, and

c. ensuring continuing and undiminished public access to beaches, headlands and waterways, particularly where public access is threatened or affected by accretion, and

d. where the plan relates to a part of the coastline, the management of risks arising from coastal hazards, and

e. where the plan relates to an estuary, the management of estuary health and any risks to the estuary arising from coastal hazards, and

f. the impacts from climate change on risks arising from coastal hazards and on estuary health, as appropriate, and

g. where the plan proposes the construction of coastal protection works (other than temporary coastal protection works) that are to be funded by the council or a private landowner or both, the proposed arrangements for the adequate maintenance of the works and for managing associated impacts of such works (such as changed or increased beach erosion elsewhere or a restriction of public access to beaches or headlands).

The above points essentially relate to sections of the open coast, with the aim of ensuring public amenity of beaches and the coastline is maintained. For the open portion of the coast surrounding the mouth of the estuary the Newcastle Coastal Zone Management Plan will primarily provide guidelines on sustainable management and emergency response. Where considered relevant within the estuary, this Plan has also considered and addressed the abovementioned requirements. It is therefore proposed that this Hunter Estuary management plan be regarded as a Coastal Zone Management Plan (the Hunter Estuary Coastal Zone Management Plan).

In considering Approval, the Minister would consult with departments and stakeholders that are responsible for various aspects of this Plan.

1.5 Purpose of the Plan

The original Plan was developed to fulfil the requirements of the NSW Estuary Management Policy and the NSW *Coastal Protection Act 1979*. A 2016 review of the Plan was undertaken to ensure it also fulfils the requirements set out in the Guidelines for Preparing Coastal Zone Management Plans (OEH, 2013). The Plan links to other natural resource management strategies in the catchment and aims to protect and enhance the diverse range of values and assets associated with the Hunter Estuary. It contains a list of recommended strategies that have been designed and prioritised according to the 'Vision' and 'Objectives' for the future of the Hunter Estuary, as agreed by the Hunter Coast and Estuary Management Committee. The implementation process for these strategies is outlined in Section 3 and Section 4. Implementation tables include timeframes, responsibilities, measurables and other information related to each of the strategies.

1.6 Status of the Plan

This is an Estuary Coastal Zone Management Plan prepared in accordance with the Guidelines for Preparing Coastal Zone Management Plans (2013). This document is also considered a Coastal Zone Management Plan under the context of Part 4A of the *Coastal Protection Act 1979*.

The original Plan was adopted by Newcastle City Council on 6 October 2009.

The original Plan was adopted by Port Stephens Council on 13 October 2009.

The original Plan was adopted by Maitland City Council on 13 October 2009.

The revised Plan was endorsed to be progressed to the Minister for certification by Port Stephens and Maitland City Council on 13 December 2016. The revised Plan was endorsed to be progressed by Newcastle City Council on 20 December 2016.

The revised Plan was submitted for certification in December 2016.

1.7 Duration of the Plan

From a management perspective, it is envisaged that the strategies and actions outlined within the Plan would remain relevant for a period of at least five (5) years. During this period, however, the Plan shall be reviewed on an annual basis and will undergo an audit of implementation. Formal revision is required in 5 years. For more information on the review schedule, please refer to Section 5.4.

1.8 Relationship to other Plans

The Hunter Estuary is subject to a wide range of existing plans and policies that have been prepared by both State Government agencies and local government. These Plans frame the planning and policy context that has been incorporated into the development of this Hunter Estuary Coastal Zone Management Plan. To facilitate this, a detailed review of existing plans and policy documents was undertaken during the Estuary Management Study phase (BMT WBM, 2009).

At a regional level, there are policies and plans prepared by the various State Government agencies. The most significant of these is the Hunter LLS Strategic Plan (refer Section 1.8.1) and the Hunter Regional Plan 2036 (refer Section 1.8.2). Other relevant plans are discussed in detail in the Hunter Estuary Management Study (BMT WBM, 2009).

There are also local management plans prepared by each of the local councils (refer Section 1.8.3). Finally, there are management plans prepared by the owners of adjoining land, such as National Parks Plans of Management (refer Section 1.8.4).

The Hunter Estuary Coastal Zone Management Plan has been prepared giving extensive consideration to these existing strategic and management planning documents. The objectives of this Plan are considered to be consistent with the objectives of other relevant natural resource management plans and strategic policies, while the principles and strategies have been developed to maximise opportunities for integration between the documents.

1.8.1 Hunter Local Strategic Plan

The Hunter Local Strategic Plan 2016-2021 (HLLS, 2016) outlines the priority strategies to improve natural resources over the next 5 years. The strategic plan for HLLS region applies to the area from Taree in the north to Lake Macquarie in the south, and from the Merriwa Plateau and Great Dividing Range in the west to Newcastle in the east. It will build on the work of the Hunter-Central Rivers Catchment Action Plan. The Plan outlines how HLLS will work with communities to better manage our water, land, soil, vegetation,

1.8.2 Hunter Regional Plan 2036

A Hunter Regional Plan 2036 and associated Implementation Plan 2016-2018 has been prepared by the Department of Planning & Environment. At the time of writing, the Hunter Regional Plan 2036 is the principal regional environmental planning document for the Hunter area. The four key goals of the Plan are a strong economy, protecting the natural environment, creating thriving communities, and greater housing choice and jobs.

1.8.3 Council Strategic Plan

The Local Government Act 1993 (LG Act) defines the powers, duties and functions of all local councils in New South Wales. Under sections 402-406 LG Act, a council must prepare and adopt an overall ‘strategic plan’ (CSP).

Council Management Plans relevant to the Hunter Estuary are:

- NCC, 2013, "Newcastle 2030: Newcastle Community Strategic Plan",
- MCC, “Maitland +10 Community Strategic Plan”
- PSC, "Community Strategic Plan – 2013-2023"

Councils are required under section 404 of the Act to provide the following:

• A council must have a Delivery Program, detailing the principal activities it will undertake to achieve the objectives established in the Community Strategic Plan, within the resources available under the Resourcing Strategy.

• The Delivery Program must include a method of assessment to determine the effectiveness of each principal activity detailed in the Delivery Program in achieving the objectives at which the activity is directed.

• A council must prepare a new Delivery Program after each ordinary election of councillors to cover the principal activities of the council for the 4 year period commencing on 1 July following the election.

A draft delivery program must be placed on public exhibition for a period of at least 28 days and submissions received by the council must be considered by the council before the delivery program is adopted by the council.

• The General Manager must ensure that progress reports are provided to the council, with respect to the principal activities detailed in the Delivery Program, at least every 6 months.

- The council must review its Delivery Program each year when preparing the Operational Plan

The annual report in the year of the ordinary election must include a report (State of the Environment Report) as to the state of the environment in the local government area in relation to the objectives for the environment established by the Community Strategic Plan.

1.8.4 Hunter Wetlands National Park Plan of Management

The Hunter Wetlands National Park was created through the National Park Estate (Lower Hunter Region Reservations) Bill 2006. A Hunter Wetlands National Park: Draft Plan of Management has been completed and is in the final stage of the review process which includes information on important park values and provides directions for future management.

1.9 Community and Stakeholder Consultation

A draft of the Hunter Estuary CZMP will be publically exhibited by the councils for a minimum of 21 days with submissions reviewed before finalising and certifying the plan. In addition an extensive program of consultation has been undertaken in the development of this Hunter Estuary Coastal Zone Management Plan. This has been reported in detail in the Estuary Management Study (BMT WBM, 2009). A brief summary of the tasks undertaken is provided below.

- **Newspaper Advertisements** calling for participation in public workshops. Advertisements included Newcastle Herald (10/11/04; 13/11/04), Port Stephens Examiner (11/11/04) and Maitland Mercury (11/11/04).
- **Letters, brochures and fact sheets** mailed out to 182 organisations and individuals
- **Website –** A dedicated website was developed solely for the purposes of this study and for providing information directly to the community regarding the project (www.hunter-ems.com.au)
- **Community Workshops** held on four separate occasions, comprising Maitland Senior Citizens Centre (15/11/04); Port Stephens Council Administration Centre (17/11/04); Harbourview Function Centre, Newcastle (18/11/04); and Hexham Bowling Club (19/7/06).
- **Stakeholder Workshop with industry representatives** held at Hunter Business Chamber (22/9/05).
- **Individual workshops with Government Agencies** held on ten separate occasions, including:
  - NPWS (20/3/07)
  - RLMC (21/2/07)
  - DPI – Ag (27/2/07)
  - HCRCMA (16/2/07)
  - Hunter Water Corp. (16/2/07)
  - Newcastle Port Corporation (Now PON) / Maritime Authority (20/2/07)
  - DNR (15/3/07)
  - PSC (6/12/06)
  - MCC (7/12/06)
  - NCC (5/12/06)

- **Planners workshop with Councils' Strategic Planners and Department of Planning** held at Port Stephens Council Administration Centre (23/2/07).

The plan was re-exhibited across the three council areas in November 2016 for a minimum of 21 days. No community submissions were received. A number of government agencies provided comment and minor amendments were consequently made.

2 VISION, PRINCIPLES AND OBJECTIVES FOR THE ESTUARY

2.1 Vision for the Estuary

The Hunter Coast and Estuary Management Committee has prepared the following vision statement for the Hunter Estuary to represent the overall goal of the Hunter Estuary Coastal Zone Management Plan.

> *"The community, industry and government working together towards a productive, economically viable and ecologically sustainable Hunter Estuary, recognising social, cultural and environmental values"*

2.2 Management Principles

The Hunter Estuary Coastal Zone Management Plan is to maintain or improve the current environmental conditions of the Hunter Estuary. This is to be achieved firstly by remediating existing degrading influences within the estuary and the catchment, and secondly through limiting the potential for future environmental degradation. This approach is consistent the targets of the Natural Resources Commission (NRC) and the overall NSW State Plan.

A two part management framework has been developed for achieving the above aim, viz:

1. Recognising and protecting existing estuary values and functions (refer section below); and

2. Pro-active management strategies that redress existing issues and landuse conflicts (refer Section 3).

2.2.1 Estuary Values and Significance

The Hunter Estuary possesses a wide range of values and is considered locally, nationally and internationally significant for many reasons. The values are articulated within the Vision for the Estuary (refer Section 2.1), and are listed in greater detail below under the headings of Economic, Social, and Ecological.

2.2.1.1 Economic

- The deep water access and port-side activities of the Port of Newcastle act as a significant driver for local, regional and state economies.
- Agriculture around the Hunter Estuary contributes to local and regional economies.
- Fishing (commercial and recreational) and aquaculture within the Hunter Estuary contribute to the regional and local economies.

- The Hunter River Flood Mitigation Scheme has been developed to minimise damage, economic losses and risks to life during times of flood.
- The lower Hunter Estuary is considered a key attraction for tourists and recreational users to the area, with associated economic benefits.
- Wetlands within the Hunter Estuary provide habitat for prawns and fish, and thus are important to regional and local economics.
- Wetland rehabilitation works contribute to the local economy.

2.2.1.2 Social

- The Hunter River Estuary, wetlands and environs are of cultural significance to Aboriginal People.
- Newcastle and surrounds were one of the first sites of European settlement and the Hunter Estuary study area includes a unique variety of historical structures and sites of significance.
- The estuary is a significant landscape feature that determines the identity of regional communities and contributes to the amenity of the region.
- The Hunter Estuary is a focus for recreational activities in the region, including fishing, boating, water skiing, bird watching, swimming, cycling, sightseeing and walking.
- It is important to the local community that they continue to be consulted in management and protection of the Hunter Estuary.

2.2.1.3 Ecological

- The Hunter River Estuary and wetlands are of international significance, being listed under the Ramsar wetland convention, and utilised by 38 of the 66 species protected by the Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA), and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).
- The Hunter River Estuary and wetlands are also of state and national significance, being utilised by a range of species protected under the NSW *Threatened Species Conservation Act 1995* and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999.*
- The Hunter River Estuary encompasses a diversity of habitats, including several Endangered Ecological Communities listed under the NSW *Threatened Species Conservation Act 1995*, as well as habitats critical to migratory birds.
- Estuarine vegetation communities of the Hunter River Estuary play an important role in providing wildlife corridors of a landscape scale.
- Wetland rehabilitation works around the Hunter River Estuary (such as Kooragang, Shortland and Hexham Projects) are widely regarded and have produced notable positive results.

2.2.2 Guiding Principles for Estuary Conservation

The following guiding principles set out the context for future management of the estuary, taking into consideration the need to protect and conserve existing estuary values. This plan recommends all future developments, plans and actions within the estuary and associated study area consider these guiding principles.

A. Natural Environment and Processes - To protect, enhance, maintain and restore the environment of the Hunter Estuary, its associated ecosystems, ecological processes and biological diversity, and its water quality

B. Heritage - To protect and conserve the Aboriginal and European heritage of the Hunter Estuary

C. ESD and Integrated Planning - To provide for integrated planning and management of the Hunter Estuary in accordance with the principles of ecologically sustainable development

D. Aesthetics and Access – To ensure continuing public access and preservation of the amenity of the Hunter Estuary

E. Community involvement - To recognise the role of the community, as a partner with the government, in resolving issues relating to the protection and effective management of the Hunter Estuary

2.3 Key Estuary Issues

The key issues identified for the estuary are listed below. These issues were established through consultation with community and stakeholders, including government authorities, and a sound appreciation of the scientific processes occurring within the estuary.

- Habitat loss
- Bank erosion and sedimentation
- Impacts on native flora and fauna
- Lack of riparian vegetation
- Mangroves and noxious weeds invasion
- Estuary Management co-ordination
- Protecting estuary significance
- Development pressures and land management
- Estuary users and conflicts
- Heritage
- Scenic quality
- Changes to estuarine hydraulics
- Flood mitigation works
- Fishing
- Water quality
- Agricultural inputs
- Urban inputs
- Industrial inputs
- Water extraction
- Dredging and commercial sand and gravel extraction
- Need for foreshore reserves
- Port operations
- Climate change
- Condition of sea walls
- Coastal Inundation

The Processes Study identifies climate change as an information gap and outlines that further investigation into the local impact (including potential ecological, assets and access impacts) is required. This is reflected throughout the strategies within the plan.

All councils undertake flood assessments (Hunter River Floodplain Risk Management Study and Plan (MCC, 2015), the Williams River Flood Study (PSC, 2009) and the Newcastle Citywide Flood Risk Management Plan (NCC, 2012) which include climate change and coastal inundation and this will be an ongoing process. Flood assessment focus on impacts on infrastructure, however further investigation is required into the environmental impacts and this is reflected in the strategies.

2.4 Prioritised Management Objectives

The **objectives** define the specific focus of the Hunter Estuary Coastal Zone Management Plan, essentially defining the "goal posts" for which future management of the estuary should be targeted towards. The objectives provide a platform for actioning the Vision. With the exception of Objective 25, the objectives have been prioritised (ranked from most important to least important) by representatives of the Hunter Coast and Estuary Management Committee, as documented in the Hunter Estuary Management Study. Prioritisation of the objectives is used in the assessment of potential management options. The most important objectives are essentially the first to be addressed by management strategies included in the Hunter Estuary Coastal Zone Management Plan.

1. To protect and enhance estuarine biodiversity, particularly Endangered Ecological Communities (as listed under the *NSW Threatened Species and Conservation Act 1995, NSW Fisheries Management Act 1994*) and other key habitats
2. To increase appropriate native riparian vegetation along the Hunter Estuary
3. To prevent catchment and point source pollutants from compromising social, environmental and economic values of the Hunter Estuary
4. To optimise management of flood mitigation works and other flow control structures to enhance environmental values without compromising intended function
5. To minimise further bank erosion throughout the Hunter Estuary and remediate existing erosion sites, where appropriate
6. To provide opportunity for effective and inclusive stakeholder involvement in the management of the Hunter Estuary environment.
7. To acquire knowledge relevant to environmental management about the Hunter Estuary, on a priority basis
8. To achieve consistency and integration between the Hunter Estuary Coastal Zone Management Plan and other strategic environmental planning and Natural Resource Management instruments and programs

9. To adopt catchment wide development assessment practices that consider and address cumulative impacts on the Hunter Estuary

10. To ascertain the impacts of past works and activities on the tidal hydraulics of the Hunter Estuary

11. To encourage development that maintains and enhances landscape values, opportunities for recreation and ecological functions of the Hunter Estuary

12. To prevent mobilisation of contaminated sediment and groundwater contamination from impacting on environmental processes within the Hunter Estuary

13. To reduce the catchment sediment load to the Hunter Estuary

14. To fulfil all requirements of international environmental management treaties and relevant conservation legislation in regard to the Hunter Estuary

15. To prevent environmental weeds and pests from compromising the social, ecological and economic values of the Hunter Estuary

16. To facilitate the adaptation of estuarine communities to projected climate change

17. To adopt a consistent approach to foreshore land rehabilitation and conservation along the Hunter Estuary

18. To minimise environmental consequences of changes to flow and salinity regimes from upstream activities

19. To reduce the environmental impacts of the accumulation and migration of recent sediments within the Hunter Estuary

20. To prevent further exposure of Potential Acid Sulfate Soils and to reduce the extents of Actual Acid Sulfate Soils around the Hunter Estuary

21. To increase appropriate public access and amenity to the Hunter Estuary and wetlands, recognising sensitive habitats

22. To enhance the scenic quality of the Hunter Estuary

23. To facilitate appropriate reuse of sediment dredged from the Estuary

24. To minimise the environmental impacts of commercial sand and gravel extraction on the Hunter Estuary

25. [1]To protect and conserve Aboriginal and European heritage objects, places and landscapes

[1] This objective was added during the review process because heritage principles and strategies were included in the plan, however, there was not a corresponding objective. The objective has not been prioritised in relation to the other objectives and its number (25) does not reflect the relative importance given to this objective.

3 MANAGEMENT STRATEGIES

3.1 Summary of Strategies

A summary of the proposed management strategies is provided in Table 3-1, outlining a number of key characteristics, such as proposed priorities, implementation timeframes, applicable areas, costs and lead responsibilities. The inter-connection and relationship between these strategies is presented in Figure 3-1.

The strategies were prioritised and shortlisted by the study team according to the following criteria:

- The degree to which they address the agreed Estuary Management Plan objectives (represented by a "management objectives score").
- The benefit of the strategy (represented by a "benefit score").
- The implement costs (represented by a "cost score")

These three criteria and their associated scores are discussed further in 8.2 of the Hunter Estuary Management Study.

3.2 Management Zones

The management zones are geographic areas used to describe where each of the strategies apply. Two zones were defined by the Estuary Technical Subcommittee (TSC) of the HCEMC and the BMT WBM study team. Zone 1 covers the North Arm, Fullerton Cove and the South Arm including the Port and part of Throsby Creek (i.e. Lower Estuary) and Zone 2 covers all remaining upstream areas (i.e. Upper Estuary) within the NCC, MCC, and PSC LGA's. The management zones are shown in Figure 3-2. The various management strategies are applicable to Zone 1, Zone 2, or both Zones 1 and 2.

3.3 Addressing Management Objectives

The proposed management strategies are designed to address the 24 Management Objectives that have been identified and prioritised for the Hunter Estuary. The relationship between the management objectives, the proposed management strategies, and the guiding principles, is expressed in Table 3-2.

3.4 Implementation Details

Schedules providing details on implementation of the individual management strategies are provided in Section 3.6.

3.4.1 Suggested Actions

A list of suggested actions, or steps to achieve each of the strategies is given for each of the strategies within the implementation schedules. This list is designed to be used as a guide for

implementation, allowing a degree of flexibility in undertaking works and actions to achieve the overall intent of the strategies.

When implementing actions led by the strategies appropriate planning and approval processes will be undertaken as part of project management. For example, where works are proposed on Crown land, not under Council Trust or management, an appropriate authorisation from Department of Industry-Crown Lands and Water will be required prior to the works commencing. It should be noted that where actions are proposed on Crown land, consideration of Aboriginal Land Claims lodged under NSW Aboriginal Land Rights Act 1983 will need to be undertaken. Any works will need to be compliant with the Commonwealth Native Title Act 1993.

3.4.2 Agency Responsibilities

A number of agencies have been assigned responsibilities for the implementation of actions within this Hunter Estuary Coastal Zone Management Plan. Table 3-3 lists each of the management agencies that hold some degree of statutory or implementation responsibility for the Hunter Estuary Coastal Zone Management Plan. Former agency names are included to assist the reader. The agencies' wider role in the management of the Hunter Estuary is also noted.

Table 3-1 Summary of Strategies

Strategy #	Strategy Name	Relative Benefit / Cost [(1)]	Timeframe	Lead Responsibility	Costs	Zones	Impl. tbl pg ref.
1	Establish and/or modify local planning guidelines and controls to allow appropriate assessment and consideration of estuarine habitats and biodiversity as a part of any future development within the estuary and its surrounds	Medium	Immediate and Ongoing	Councils	min.	1 & 2	27
2	Investigate opportunities to protect key habitats and significant existing vegetation stands through rezoning to a more appropriate conservation zone	High	Ongoing	Councils	min.	1 & 2	28
3	Map estuarine and riparian vegetation to determine habitat potential, health and location, and extents of estuary-related Endangered Ecological Communities	Very High	Ongoing	Councils, HLLS, OEH	$100k	1 & 2	29
4	Develop an integrated predictive numerical model of the Hunter Estuary, incorporating hydrodynamics, water quality and sediment transport processes, as necessary	Medium	Ongoing	OEH, NOW, HWC	$1.3m	1 & 2	30
5	Identify all structures within the estuary that are interfering with fish passage, and then replace and rehabilitate on a priority basis	Very High	Ongoing	DPI - Fisheries	$100k +	1 & 2	31
6	Develop an estuary wide conservation Masterplan that provides clear priorities for implementation for future conservation and rehabilitation	Medium	Ongoing	HLLS, Councils	$100k	1 & 2	32
7	Incorporate the objectives of the CZMP into the Plan of Management for the newly created Hunter Wetlands National Park (incorporating the former Hexham Swamp and Kooragang Nature Reserves) and assist with support to implementation	High	Ongoing	OEH (NPWS)	min.	1 only	33
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, and implement strategies to redress erosion, on a priority basis	High	Ongoing	Councils, HLLS,OEH, RMS	$1m +	1 & 2	34
9	Support volunteers and environmental group participation, including Aboriginal Land Management, in revegetation of riparian zones-where appropriate include opportunities to improve public access.	High	Ongoing	HLLS, Councils	$100k	1 & 2	35
10	Build on existing riparian vegetation guidelines to encourage consistency across the estuary landscape and differing land tenures	Medium	Ongoing	HLLS	$20k	1 & 2	36
11	Introduce an environmental planning requirement for all new development to achieve no net increase in pollutant runoff loads, through best practice stormwater management	Very High	Ongoing	Councils, DoPE	min.	1 & 2	37
12	Through the Hunter Coast and Estuary Management Committee (or similar), host an on a needs basis inter-governmental panel / forum with senior administrators and agency staff to stream-line co-ordinated and integrated decision-making	Medium	Ongoing	Councils, OEH	min.	1 & 2	38

Strategy #	Strategy Name	Relative Benefit / Cost (1)	Timeframe	Lead Responsibility	Costs	Zones	Impl. tbl pg ref.
13	Raise public awareness of the values of the Hunter Estuary and sustainable use of the estuary through targeted community education	High	Ongoing	Councils	$50k & $10k/yr	1 & 2	39
14	Improve land use practices throughout the catchment to minimise soil erosion and improve water quality	Medium	Ongoing	HLLS, DPI-Ag, Councils	var.	2 only	40
15	Develop incentive mechanisms to promote and facilitate the adoption of sustainable agricultural practices that generate a commercial and environmental benefit	Medium	Ongoing	HLLS, DPI-Ag	var.	2 only	41
16	Conservation of key habitat and significant vegetation should be undertaken through the Biobanking scheme or through preparation and implementation of individual conservation agreements	Very High	Ongoing	HLLS, EPA	min.	1 & 2	42
17	Undertake estuarine and related habitat restoration through physical works, revegetation and or change management practices of assets and infrastructure	High	Ongoing	HLLS, EPA, OEH (NPWS), Councils	$10m +	1 & 2	43
18	Develop a plan of all public access points along the Hunter Estuary, review those which coincide with sensitive habitats, and formalising those with highest recreational usage / value (where appropriate), to provide on-going and undiminished access to the river	Medium	Ongoing	Councils	min.	1 & 2	44
19	Support and participate in research programs and run these programs in partnership with major stakeholders on a case by case basis	Medium	Ongoing	Councils, HLLS	$5k ea	1 & 2	45
20	Investigate impacts arising from climate change and potential adaptations	Medium	Medium Term	Councils, OEH	min.	1 & 2	46
21	Undertake a critical review of the salinity trading scheme, the Hunter River Water Sharing Plan and upstream activities in terms of environmental consequences of water discharges and offtakes	Medium	Medium Term	EPA, NOW	$50k	2 only	47
22	Undertake assessments for contaminated sediments in the Hunter Estuary	Medium	Ongoing	EPA, RMS	$50k	1 & 2	48
23	Where appropriate, reuse sediment dredged from the Hunter Estuary	Medium	Ongoing	NCC	Millions?	1 & 2	49
24	To identify and conserve heritage objects, places and landscapes in the Hunter Estuary	Medium	Ongoing	OEH	$50k	1 & 2	50

(1) refer BMT WBM (2009) for details of relative benefit/cost assessment

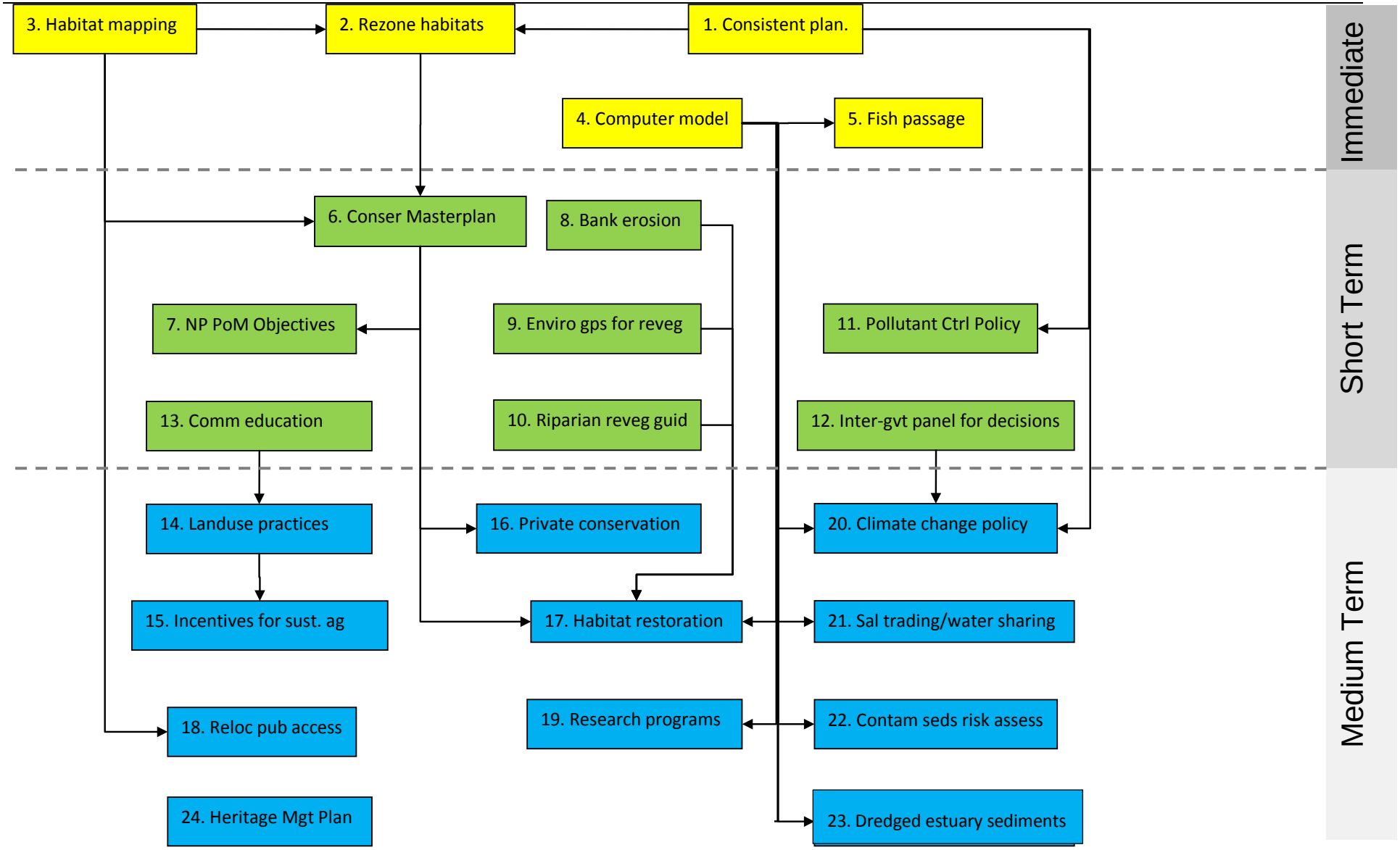
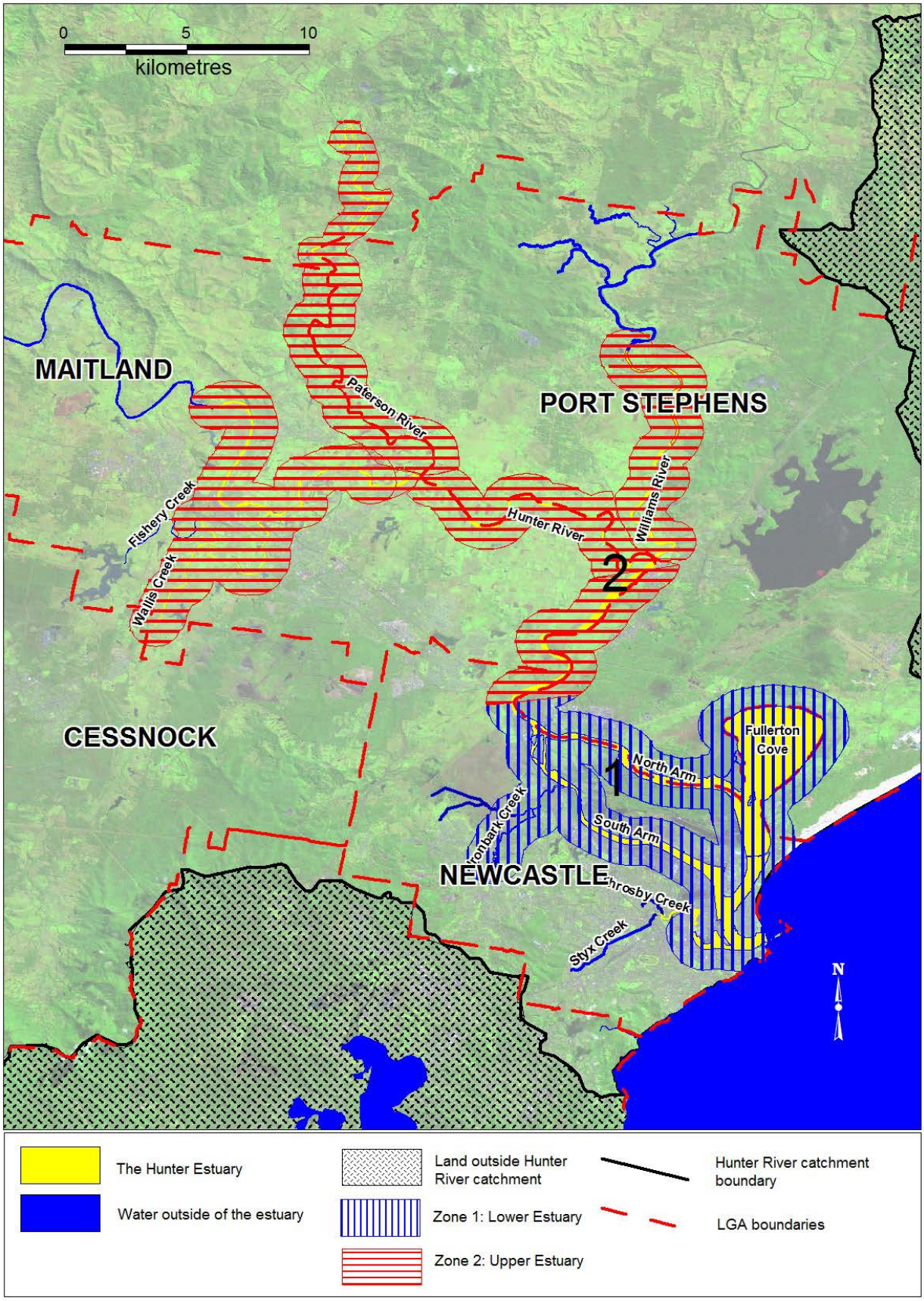


Figure 3-1 Relationship between strategies of this Hunter Estuary Coastal Zone Management Plan



Note: zones include an approximate 1km riparian buffer around estuarine waters

Figure 3-2 Management Zones for the Hunter Estuary

Table 3-2 Relationship between Objectives, Principles and Strategies

Principles	*Objective*	*Strategies*
A	**1. Estuarine biodiversity**	1, 2, 3, 5, 6, 7, 8, 9, 10, 13, 16, 17, 18, 20
A	**2. Native vegetation**	1, 2, 3, 6, 7, 8, 9, 10, 14, 17
A	**3. Catchment pollutants**	11, 13, 15, 17
A	**4. Flood mitigation works**	4, 5, 8, 17, 19, 20
A	**5.Bank erosion**	8, 13, 14, 17, 18
E	**6. Stakeholder involvement**	6, 9, 10, 12, 14, 15, 16, 17
C	**7. Acquire knowledge**	3, 4, 19, 21, 22
C	**8. Planning consistency**	1, 2, 6, 7, 11, 12, 16, 17, 20
C	**9. Catchment-wide DA practices**	3, 11, 20
A	**10. Impacts of past works**	3, 4, 5, 17, 19
C	**11. Encourage eco-development**	1, 2, 11, 13, 16
A	**12. Contaminated sediments**	22
A	**13. Catchment sediment load**	6, 8, 11, 14, 15, 17
C	**14. International treaties**	3, 5, 6, 7, 16, 17, 20
A	**15. Weeds and pests**	3, 6, 7, 9, 10, 13, 15, 16, 17
C	**16. Climate change adaptation**	3, 4, 5, 6, 16, 17, 19, 20
A	**17. Consistent rehab. approach**	1, 2, 3, 6, 7, 9, 10, 13, 16, 17
A	**18. Flow and salinity regimes**	4, 18, 20, 21
A	**19. Recent sedimentation**	8
C	**20. Acid sulfate soils**	4, 5, 6, 13, 17
D	**21. Public access**	3, 9, 10, 15, 18
D	**22. Scenic quality**	2, 3, 5, 6, 13, 17
C	**23. Estuary sediments reuse**	23
A	**24. Sand/gravel extraction**	8
B	**25. Heritage conservation**	24

Table 3-3 Agencies with Implementation Responsibilities

Agency	Previous names	Role
Newcastle City Council Port Stephens Council Maitland City Council	n/a	Prepare Local Environmental Plans under Part 3 of the EP&A Act, Development Control Plans and other Council policies. Councils are required to consult with their communities during the preparation of LEPs, DCPs and other policies and initiatives. Assess development under Part 4 of the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act) and provide essential local services including local infrastructure, rubbish removal, stormwater management and natural resource management.
NSW Department of Industry – Crown Lands & Water	Department of Lands	Manages certain Crown land and Crown reserves, and oversees the management of Crown land more generally in accordance with relevant legislation.
NSW Roads & Maritime	NSW Maritime, NSW Waterways Authority	Responsible for boating safety, licensing and mapping.
NSW Department of Primary Industries – Fisheries	NSW Fisheries	Fosters profitable and sustainable development of NSW fisheries including aquaculture.
NSW Department of Primary Industries - Agriculture	NSW Agriculture	Fosters profitable and sustainable development of agriculture in NSW, delivering a range of services to primary industries and rural communities, including horticulture, grazing, cropping, irrigation, and so on.
Hunter Local Land Services	Hunter Central Rivers Catchment Management Authority, Hunter Catchment Management Trust	Local Land Services bring together agricultural production advice, biosecurity, natural resource management and emergency management. It is responsible for involving regional communities in management of the NRM issues facing the region, and is the primary means for the delivery of funding from the NSW and Australian governments to help land managers improve and restore the natural resources of the state.
NSW Office of Environment & Heritage	DECC – Coastal and Floodplain, Department of Natural Resources, Department of Infrastructure, Planning and Natural Resources.	Water management, soil and vegetation management, and coastal and floodplain management.
NSW Office of Environment & Heritage – National Parks and Wildlife Services	DECC – Parks and Wildlife Group, NSW National Parks and Wildlife Service	Conserving the states biodiversity and aboriginal cultural heritage
NSW Environmental Protection Authority	DECC - Environment Protection & Regulations Group, NSW Environmental Protection Authority	Regulation of potentially polluting activities
Department of Primary Industries - Water	NSW Department of Water and Energy, Department of Natural	Implementation of the Water Management Act (2000) including preparation and implementation of Water Sharing Plans

Agency	Previous names	Role
	Resources, Department of Energy, Utilities and Sustainability, NSW Office of Water	
NSW Department of Planning and Environment	NSW Department of Planning, Department of Infrastructure, Planning and Natural Resources.	Assess development under Part 3A of the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act), including projects that involve State Significant Sites (note Newcastle in a proposed State Significant Site under SEPP (Major Projects) 2005). Approve new and amended statutory planning instruments, including Local Environmental Plans (LEPs).
Hunter Water Corporation	n/a	Reticulated water supply and wastewater management across the Lower Hunter region, as well as management of major trunk stormwater drainage channels within Newcastle. Responsible for sewage discharges to the Hunter Estuary at a number of locations, including Morpeth, Raymond Terrace and Shortland, as well as discharges into Fisheries Creek upstream and downstream of Wentworth Swamp.

In the Implementation Tables for the strategies (refer Section 3.6) “Lead agency” represents the group(s) which is (are) best placed to undertake the actions of the strategy or facilitate these actions. This does not reflect that the group(s) necessarily has current funding or resources to undertake the strategy. It is, however, a directional tool to focus future management plans or give impetus for seeking funding through grants.

3.5 Funding Opportunities

Implementation of the Hunter Estuary Coastal Zone Management Plan is expected to be funded through a variety of mechanisms, including government and non-government grant schemes, and in-kind contributions. The availability of funds for the Plan will depend on relevant government programs. The identification, application and success of grants will be an important component of the implementation of this Plan.

Given the timeframe of this Plan (ie up to ten years), it is likely that specific opportunities for funding various elements of the Plan will change. As such, specific funding programs have not been detailed here. Provided below is an overview of the types of funding that could be pursued to help with implementation of this Plan.

Estuary Management Program

The NSW Estuary Management Program provides 50/50 funding for most strategies included in an adopted Estuary Coastal Zone Management Plan prepared according to the Guidelines for Preparing Coastal Zone Management Plans (eg. this Plan). Councils are required to submit funding applications to OEH, who administer the Estuary Management Program. All applications for grants across the state are assessed and approved subject to their merit (including consistency with an adopted Plan) and available annual funding.

Department of Industry – Crown Lands & Water

Administers the Public Reserves Management Fund which provides financial support for the development, maintenance and improvement of public reserves.

HLLS

Funding may be available for some activities through the Hunter Local Land Services through its Hunter Estuary and incentive programs.

Local Government

Funding may be available through local government for environment-related projects, however, there is typically strong competition for the limited funds available. Councils have the ability to introduce levies for special funding under the provisions of the Local Government Act 1993. Historically, Councils have used this to collect monies for a range of purposes, including environmental works, sustainability works, stormwater management works and so on. These levies, however, are not perpetual, and therefore cannot be relied upon in the future for continued revenue.

Government Department and Organisation programs

A potential wide range of government and organisational funding programs are available from time to time that would cover some elements of the Hunter Estuary Coastal Zone Management Plan. Examples would include the Department of Primary Industries recreational fishing trusts, and the Department of Education, Employment and Workplace Relations initiatives in Indigenous placements.

Private Sector Grants

A number of private sector companies periodically offer environmental grants that could assist in implementing the Hunter Estuary Coastal Zone Management Plan. Opportunities should be explored now and in the future regarding potential private environmental/carbon offsetting programs. As government policies regarding carbon offsetting and trading become more established, there may be increased opportunity for implementation of targeted on-ground environmental restoration and conservation works, such as those captured within this Hunter Estuary Coastal Zone Management Plan.

Universities

Close collaboration with various universities may yield opportunities for further research, as outlined in this Plan, which could be covered by research grants through universities and other educational institutions.

3.6 Implementation Tables

The following pages contain the implementation tables for each of the strategies. A status report for the implementation of the plans strategies is contained within Appendix C

Strategy # 1 Consistent approach to planning along the estuary		Establish and/or modify local planning guidelines and controls to allow appropriate assessment and consideration of estuarine habitats and biodiversity as a part of any future development within the estuary and its surrounds	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	NCC, MCC, PSC	The actions in this strategy have essentially been undertaken, and will be reviewed on a needs basis. All LGAs have completed their new LEPs. On-going Development adjacent to the estuary is directed by the Environment Planning and Assessment Act 1979 and the Coastal Management Act 2016 and the State Environment Planning Policies. SEPP (Infrastructure) 2007 and other State Policies have the authority to override LEPs for certain types of development. Existing landuse and values of the estuary are to be considered in planning processes. Councils will continue to use the best available data and planning resources at the time of rezoning and development applications.	1.1 Investigate opportunities to develop compatible landuse zonings and/or LEP mapping overlays (particularly near LGA boundaries) along the foreshore for each of the Local Government Areas in consultation with the community and government authorities. 1.2 Investigate new LEP provisions relating to the protection of the estuary identified by LEP overlays. 1.3 Organise a series of workshops to be attended by planning departments from each of the Council's aimed at establishing a unified and consistent approach to environmental planning on lands surrounding the Hunter Estuary. 1.4 Investigate the creation of a "checklist of considerations" for all future development that allows assessing officers to identify and assess (via guidelines) potential impacts on estuarine processes (see Appendix A for example). In addition to statutory obligations, the checklist should make reference to scientific literature, as appropriate, to help with the assessment process. Seek DoP input during creation of the checklist and guidelines. 1.5 Continually update and improve the checklist and associated assessment guidelines following monitoring, benchmarking and ongoing research. 1.6 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. 1.7 Based on habitat mapping (Strategy 3) and the Conservation and Rehabilitation Masterplan (Strategy 6), along with other new information, update and/or prepare new DCPs (or similar) to introduce site specific, or estuary specific controls to restrict future development within the areas of the estuary and its surrounds. DCP documents should incorporate buffers, offsets and considerations, and numerical controls, such as boundary set-backs, which could minimise impacts on key habitats and biodiversity through development restrictions.
Support agencies	DoPE		
Cost estimate	Minimal- staff time only		
Funding opportunities			
Measurable	Compatible landuse zonings for estuarine environments and habitats across new LEPs		
Timing	Immediately and on-going		
Objectives addressed	1, 2, **8**, 9, 11, 17		
Related strategies	2		
Applicable Management Zones	1, 2		

Strategy # 2 Rezone key habitats		Investigate opportunities to protect key habitats and significant existing vegetation stands through rezoning to a more appropriate conservation zone	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	NCC, MCC, PSC	Zoning and ownership of key habitats are an important consideration in their protection. This strategy involves a review of ownership and zoning with the view to modifying these where they are considered inadequate for conservation and rehabilitation purposes. The new standard LEP template has a range of environmental management / conservation and waterway zonings that may be adopted giving a range of landuse permissibilities.	2.1 Overlay the mapping undertaken in Strategy 3 with current zoning and land ownership maps 2.2 Identify locations where current zonings are inadequate for conservation of existing vegetation and habitat areas. 2.3 Identify options for protection of key habitats and significant vegetation stands including voluntary conservation measures alongside zoning options 2.4 Coordinate among councils to establish a consistent approach. 2.5 As appropriate, recommend alternative conservation agreements for areas of key habitat and existing vegetation in consultation with the community and government authorities.
Support agencies	HLLS, OEH, DPI-Fisheries, DoPE		
Cost estimate	Minimal – staff time only		
Funding opportunities			
Measurable	Conservation of key habitats and significant existing vegetation		
Timing	Ongoing		
Objectives addressed	**1**, 2, 8, 11, 17, 22		
Related strategies	1, 3, 16		
Applicable Management Zones	1, 2		

Strategy # 3 Estuarine/riparian habitat and EEC mapping		Map estuarine / instream and riparian vegetation to determine habitat potential, health and location, and extents of estuary-related Endangered Ecological Communities	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	NCC, PSC, MSC, HLLS, OEH, DPI Fisheries	HLLS should work closely with MCC, PSC and NCC, as well as other Hunter Councils and OEH (NPWS) to maximise the benefit to all parties of the vegetation mapping being incorporated into the broader Lower Hunter Central Coast Regional Biodiversity Conservation Strategy. DPI Fisheries have undertaken extensive mapping of macrophytes within the Hunter Estuary.	3.1 Collated all available mapping of estuarine vegetation. Sources may include Councils, Wetland Care Australia, OEH, DPI Fisheries, HLLS. 3.2 Acquired the most recent available aerial photography (see sources above). Where appropriate photography was not available, arranged for new air photographs to be taken. 3.3 Mapped estuarine vegetation to community level based on air photo interpretation. Using accepted remote sensing and ground truthing techniques to categorise habitat potential and health. Identified all EECs. 3.4 Developed GIS maps for use by planners and others from Councils, DPI Fisheries, OEH etc 3.5 Identify gaps in mapping 3.6 Cross reference estuarine vegetation mapping with key recreation sites (eg fishing, boating) to identify areas of potential conflict or degradation. Appropriate mitigation measures should be implemented to minimise impacts on vegetation and EECs. 3.7 Cross reference estuarine vegetation mapping with key bank erosion sites (refer Strategy 8) to help with multi-objectives rehabilitation prioritisation.
Support agencies	Hunter Councils		
Cost estimate	$100,000		
Funding opportunities	Australian Government Grants, HLLS, NSW Estuary Program		
Measurable	GIS based ground-truthed maps of estuarine vegetation. Maps actively being used in Planning and management. Maps to include details of aspects such as habitat potential, community health and threats.		
Timing	Ongoing		
Objectives addressed	1, 2, **7**, 9, 10, 14, 15, 16, 17, 21, 22		
Related strategies	2, 6, 16, 17, 18		
Applicable Management Zones	1, 2		

<table>
<tr><th colspan="2">Strategy # 4
Predictive model of estuary</th><th colspan="2">Develop an integrated predictive numerical model of the Hunter Estuary, incorporating hydrodynamics, water quality and sediment transport processes, as necessary</th></tr>
<tr><th colspan="2">Implementation Details</th><th>Comments</th><th>Suggested Actions for Implementation</th></tr>
<tr><td>Lead agency</td><td>OEH, NOW, HWC</td><td rowspan="10">There are currently a number of computer models simulating the Hunter River; however, most of these are limited in their functionality, depending on the intent for their development. Broad scale ecological models of the region also exist, but these are likely to be limited in their application.

This strategy involves the development of a detailed model of the estuary that is capable of simulating flood and tidal conditions. The model should be used in a predictive manner to ascertain the likely changes to estuarine hydrodynamics associated with
• Potential management strategies (e.g. opening of floodgates and removing other barriers to fish passage)
• Past structural works
• Future climate change scenarios

The results of the hydrodynamic model should be integrated with a predictive water quality, sediment transport and ecological models / modules to determine impacts on structure and function of ecological communities.</td><td rowspan="10">4.1 Investigate existing data and models and consider engaging consultant for establishing/integrating a model (complete)
4.2 Oversee the model development, ensuring that it is calibrated to an appropriate standard
4.3 Determine a range of scenarios that need to be assessed by the model
4.4 Use the model to assess options / scenarios
4.5 Link outputs from the model to a conceptual or more detailed water quality, sediment transport and ecological model to evaluate consequences on the broader estuarine processes, including algal dynamics and more holistic ecological responses.
4.6 Maintain the model, updating as appropriate when new information and data becomes available.
4.7 Investigation, development, and implementation of water quality monitoring of the estuary and incorporating it into the model.
4.8 Develop Centralised database and open access website.</td></tr>
<tr><td>Support agencies</td><td>NCC, PSC, MCC</td></tr>
<tr><td>Cost estimate</td><td>$1,300,000</td></tr>
<tr><td>Funding opportunities</td><td>Hunter Water to fund the initial model build</td></tr>
<tr><td>Measurable</td><td>Numerical model that is capable of simulating and assessing a range of scenarios for rehabilitation, works, and climate change</td></tr>
<tr><td>Timing</td><td>Ongoing
Model to be completed by late 2018</td></tr>
<tr><td>Objectives addressed</td><td>4, 7, 10, 16, 18, 20</td></tr>
<tr><td>Related strategies</td><td>5, 11, 17, 19, 21, 22, 23</td></tr>
<tr><td>Applicable Management Zones</td><td>1,2</td></tr>
</table>

<table>
<tr><th colspan="2">Strategy # 5
Remove barriers to fish passage</th><th colspan="2">Identify all structures within the estuary that are interfering with fish passage, and then replace and rehabilitate on a priority basis</th></tr>
<tr><th colspan="2">Implementation Details</th><th>Comments</th><th>Suggested Actions for Implementation</th></tr>
<tr><td>Lead agency</td><td>DPI Fisheries</td><td rowspan="10">Barriers to fish passage in the Hunter Estuary include the extensive flood mitigation works, reclamation, stormwater gross pollutant traps and numerous low level road crossings and culverts.

The NSW Department of Primary Industries, with funding from the Hunter LLS, did undertake a project aimed at restoring stream connectivity through the removal / modification of in-stream barriers. The project was known as “Bring Back the Fish” and spans the entire NSW Coast. An audit of floodgate structures has been undertaken for the Hunter River, and these have been prioritised for remediation. Funding to be sourced for high priority remediation structures. The present strategy will use the available prioritisation to inform further remediation works.

A revised priority list of structures is soon to be released by DPI.</td><td rowspan="10">5.1 Conduct an audit of all estuarine waterways within the Hunter, and establish which barriers continue to impede fish passage. On priority works as part of project management identify relevant land managers/asset owners. (Refer to previous audits on barriers to fish passage conducted by DPI-Fisheries.)

5.2 In consultation with relevant agencies, establish a prioritisation for removal of barriers in the Hunter Estuary based on i) the potential value of rehabilitation (eg the extent of habitat restored), ii) the expected costs of removal / modification of the barrier, and iii) other consequences of the works (eg inundation of private lands etc).

5.3 Implement remediation measures at barriers on the basis of the priorities developed at Step 5.2, and through consideration of DPI-Fisheries’ NSW-wide audit and funding opportunities</td></tr>
<tr><td>Support agencies</td><td>Dept of Industry- Crown Lands & Water, HLLS, NCC, PSC, MCC, OEH</td></tr>
<tr><td>Cost estimate</td><td>Potentially hundreds of thousands of dollars</td></tr>
<tr><td>Funding opportunities</td><td>NSW Estuary Program, Australian Government Grants, HLLS</td></tr>
<tr><td>Measurable</td><td>Number of structures within the estuary rehabilitated</td></tr>
<tr><td>Timing</td><td>Ongoing</td></tr>
<tr><td>Objectives addressed</td><td>1, 4, 10, 14, 16, 20, 22</td></tr>
<tr><td>Related strategies</td><td>4, 6, 17, 19</td></tr>
<tr><td>Applicable Management Zones</td><td>1, 2</td></tr>
</table>

Strategy # 6 Conservation Masterplan for Estuary		Develop a Hunter Estuary Conservation and Rehabilitation Masterplan that provides clear priorities for implementation for future conservation and rehabilitation.	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	HLLS	At present, conservation and rehabilitation of the estuary and adjacent lands is somewhat fragmented between different land owners, management agencies and initiatives. Efforts under this current arrangement do not recognise and preserve the holistic and inter-related nature of ecological processes. Disparate management and unintegrated initiatives run the risk of concealing cumulative environmental degradation. The Masterplan would provide direction for conservation and rehabilitation efforts undertaken around the estuary. It should be based on existing values, as mapped by Strategy 3, as well as existing knowledge, incorporating for example: • Management Plan for the Green and Golden Bell Frog Key Populations in the Lower Hunter (DECC, 2007) • Compiled data from the Hunter Bird Observers Club (HBOC, 2007) • Lower Hunter Regional Biodiversity Strategy • Mt Sugarloaf to Stockton Green Corridor • HLLS Strategic Plan	6.1 Compiled, reviewed and collated conservation plans and initiatives (eg GGBF, LHRBS), along with current habitat and EEC mapping - convert to GIS format where required 6.2 Summarised ecological values, conservation status and existing policy / legislation for the areas mapped 6.3 Prepared a practical map based Masterplan showing current on-ground works and identifying priority areas for future works including areas that require further consultation with stakeholders. For priority projects identify the relevant land owners/ managers / administration arrangements at the time of project management. 6.4 Use the agreed Masterplan to direct future conservation works (through HLLS initiatives and other avenues) as well as rehabilitation works. This would include specific habitat areas, as well as connections (green corridors) between habitats.
Support agencies	OEH, Dept of Industry – Crown Lands & Water, DPI Fisheries, NCC, MSC, PSC		
Cost estimate	$100,000		
Funding opportunities	NSW Estuary Program, Australian Government Grants, HLLS		
Measurable	Adopted Masterplan used to direct conservation and rehabilitation actions and planning decisions		
Timing	Complete. Ongoing review		
Objectives addressed	**1**, 2, 6, 8, 13, 14, 15, 16, 17, 20, 22		
Related strategies	2, 3, 5, 7, 16, 17		
Applicable Management Zones	1, 2		

<table>
<tr><th colspan="2">Strategy # 7
CZMP objectives into new NP PoM</th><th colspan="2">Incorporate the objectives of the CZMP into the Plan of Management for the newly created Hunter Wetlands National Park (incorporating the former Hexham Swamp and Kooragang Nature Reserves) and assist with support to implementation.</th></tr>
<tr><th colspan="2">Implementation Details</th><th>Comments</th><th>Suggested Actions for Implementation</th></tr>
<tr><td>Lead agency</td><td>OEH (NPWS)</td><td rowspan="10">OEH (National Parks and Wildlife Service) manage a large area of land in the Hunter Estuary. The HWNP includes the land previously included in Kooragang and Hexham Swamp Nature Reserves, as well as additional land now dedicated to National Park.

The National Parks and Wildlife Act (1974) requires that a Plan of Management (POM) be prepared for each National Park. A POM is a legal document, which outlines how a National Park will be managed in the years ahead. Once a POM has been adopted by the Minister, operations undertaken within the National Park must be consistent with the POM.</td><td rowspan="10">7.1 Stakeholders kept informed of progress in the development of a HWNP POM.

7.2 Encouraged relevant staff to review the draft Hunter Estuary Coastal Zone Management Plan and be familiar with the final document

7.3 Supplied relevant staff with a copy of the Hunter Estuary Coastal Zone Management Study and Plan once finalised

7.4 Ensured OEH staff were involved in development of the Conservation and Rehabilitation Masterplan for the hunter Estuary (Strategy 6) so that the HWNP can be included as appropriate.

7.5 Support the implementation of the HWNP POM.</td></tr>
<tr><td>Support agencies</td><td>HLLS, NCC, PSC, MCC, DPI-Fisheries</td></tr>
<tr><td>Cost estimate</td><td>Minimal – Staff time only</td></tr>
<tr><td>Funding opportunities</td><td></td></tr>
<tr><td>Measurable</td><td>References to Hunter Estuary Coastal Zone Management Plan in the new HWNP POM and consistency between the documents</td></tr>
<tr><td>Timing</td><td>Ongoing</td></tr>
<tr><td>Objectives addressed</td><td>1, 2, 8, 14, 15, 17</td></tr>
<tr><td>Related strategies</td><td>5, 6, 12</td></tr>
<tr><td>Applicable Management Zones</td><td>1</td></tr>
</table>

Strategy # 8 Bank erosion remediation		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, and implement strategies to redress erosion, on a priority basis	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	NCC, MCC, PSC, (on council lands) OEH , HLLS, RMS	This strategy would apply a similar approach to that applied in the Williams Estuary using bank survey techniques in specific reaches to identify erosion hotspots (GHD, 2006). Previous mapping undertaken by MHL will be used to identify any additional mapping requirements. For sites on private land, consideration needs to be given to the extent of private assets at risk. Landholder involvement and financial investment would generally be required for government projects to include bank stabilisation of private lands. This strategy is not intended to impact on specific emergency works that may be required following significant flood events. Whilst emergency stabilisation during a flood is generally not feasible, post-flood stabilisation may be required in order to protect critical assets and infrastructure that may have become threatened during the course of the event. Similar to the circumstances following the June 2007 Hunter River flood, such post-flood restoration and stabilisation work would continue to be the responsibility of OEH, DPI- Water, HLLS and others, as appropriate.	8.1 Collate all available mapping of erosion hotspots for the Hunter Estuary - sources will include mapping by MHL 2003 and GHD (2006). The MHL 2015/16 River bank condition assessment has been revised. 8.2 Undertake ground-truthing, survey, historical air photo review and aerial reconnaissance / surveillance to update/ confirm mapping 8.3 Identify built and environmental assets at risk from erosion at all individual hotspot locations and consideration of impacts on instream habitats. Identify relevant land managers/asset owners for priority projects at the time of project management. 8.4 Work with RMS to establish signage and other mechanisms to manage and restrict 'slow tow' activities that cause excessive boat wash. 8.5 Establish monitoring program to determine recession rates at hotspots, and calculate timeframes for expected compromise of asset. 8.6 In partnership with relevant land managers / asset owners prioritise sites for rehabilitation works based on assets at risk, timeframe for expected asset compromise, costs of works, availability of alternative asset management options and land tenure. As part of project management investigate
Support agencies	Dept. of Industry – Crown Lands & Water, DPI - Water, DPI Fisheries		
Cost estimate	More than $1 million		
Funding opportunities	NSW Estuary Program, Australian Government Grants, HLLS		
Measurable	Reduced erosion rates, reduction in dollar value of assets at risk		
Timing	Ongoing		
Objectives addressed	1, 2, 4, **5**, 13		
Related strategies	6, 10, 17		
Applicable Management Zones	1, 2		

Strategy # 8 Bank erosion remediation		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, and implement strategies to redress erosion, on a priority basis	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
		RMS is currently in the process of developing erosion management plan for the Lower and Upper Williams River.	authorisation of the structure and whether management protocols are in place. 8.7 Undertake works on a prioritised basis with consideration to environmentally friendly design, subject to funding availability 8.8 Monitor the impact of the migration of sediment slugs within the hunter estuary as it pertains to bank erosion and hydrology.

Strategy # 9 Support Regeneration Teams		**Support volunteers and environmental group participation, including Aboriginal Land Management Teams, in revegetation of riparian zones-where appropriate include opportunities to improve public access.**	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	HLLS, NCC, MCC, PSC (on council land)	A list of volunteer organisations known to be contributing to rehabilitation in and around the estuary is included in the EMS. In addition, a number of Aboriginal Land Management Teams, have now become established within the Hunter Region, and are skilled in a range of rehabilitation and environmental on-ground works. Rehabilitation works should be guided by the Conservation Masterplan, to ensure that initiatives are integrated and consistent.	9.1 Maintain databases of volunteer groups working on Hunter Estuary 9.2 Establish regular communication with group leaders 9.3 Distribute Conservation and Rehabilitation Masterplan to the groups 9.4 Hold an annual workshop for estuary related groups, use this opportunity to outline priorities and resources 9.5 Continue to provide financial assistance and resources to volunteer organisations working within the estuary and immediate catchment that are seeking additional project resources 9.6 Acknowledge the contributions of volunteers in publications and with certificates of appreciation, printed sun proof clothing etc.
Support agencies	OEH (NPWS), DPI-Fisheries, Dept of Industry – Crown Lands & Water , Hunter Wetlands Centre		
Cost estimate	$100,000 for works & co-ordination		
Funding opportunities	NSW Estuary Program, Australian Government Grants, HLLS		
Measurable	Improved level of understanding of estuary by community		
Timing	Ongoing		
Objectives addressed	1, 2, **6**, 14, 15,17, 21		
Related strategies	6, 18		
Applicable Management Zones	1, 2		

Strategy # 10 Riparian revegetation guidelines		Build on existing riparian vegetation guidelines to encourage consistency across the estuary landscape and differing land tenures	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	HLLS	Two relevant guideline documents have recently been released. These are *Principles for riparian lands management* (LWA 2007), and *Where Land Meets Water - Resource Kit* (HCRCMA 2007). A challenge of riparian rehabilitation is the diversity of morphological, physiological and life history adaptations which enable plant species to persist in these variable and dynamic habitats. This highlights the need for a considered approach to rehabilitation across the estuary. The dynamic nature of vegetation communities in riparian habitats as a result of fluvial disturbance also needs to be considered. An overall strategy will better consider more holistic aspects, for example, the degree of shade created by riparian vegetation can influence the growth and development of aquatic plants and animals, implications for flood velocities (due to possible increases in roughness and flow resistance)	10.1 Prepare riparian revegetation guidelines and fact sheets specific to the Hunter Estuary to promote optimum habitat, ecological corridor, erosion control and scenic amenity benefits through rehabilitation of riparian areas. Environmental weeds and pests should be considered as part of the guidelines. 10.2 Implement revegetation programs using the riparian revegetation guidelines. Programs can be implemented through volunteer groups/ green teams and/or direct landholder involvement schemes 10.3 Monitor and evaluate rehabilitation works implemented under the plans, and update / modify the guidelines as necessary based on practical outcomes of its application.
Support agencies	DPI Fisheries, OEH, NCC, MCC, PSC		
Cost estimate	$20,000		
Funding opportunities	HLLS		
Measurable	Riparian vegetation rehabilitation undertaken consistently across all LGAs in accordance with the guidelines		
Timing	Ongoing		
Objectives addressed	1, 2, 6, 15, **17**, 21		
Related strategies	8, 9, 17		
Applicable Management Zones	1, 2		

<table>
<tr><th colspan="2">Strategy # 11
Pollutant control policy / requirements</th><th colspan="2">Introduce an environmental planning requirement for all new development to achieve no net increase in pollutant runoff loads, through best practice stormwater management</th></tr>
<tr><th colspan="2">Implementation Details</th><th>Comments</th><th>Suggested Actions for Implementation</th></tr>
<tr><td>Lead agency</td><td>NCC, MCC, PSC,</td><td rowspan="10">The guiding principles for a Pollutant Control Policy or DCP could be:
To facilitate the installation and use of best management practices to improve water quality discharging from development sites of varying densities and scale within the City.
To retain nutrients on site and/or to filter stormwater flows to remove nutrients prior to discharging of stormwater from development sites into any constructed drains or local waterways.
The maintenance and use of vegetation on development sites be used to its best advantage in minimising pollutant generation and managing nutrients on site.
A marine debris program has been implemented to keep plastics and other floating debris out of waterways and the ocean.</td><td rowspan="10">11.1 Organise a meeting/workshop for Council planners from each of the three Councils to determine the best way of introducing a consistent policy / development controls across all three LGAs aimed at controlling pollution from future development.
11.2 Assess existing Council stormwater runoff / WSUD guidelines, plans and policies. Modify guidelines (or prepare new as required) that requires new development to achieve either no net increase in pollutant loads, or a reduction in TSS / TP / TN of 80% / 60% / 45%, whichever is the more stringent, compared to existing development conditions (excluding exempt and complying development).
11.3 The Policies should use MUSIC or similar modelling by developers to demonstrate compliance. Councils should become familiar with MUSIC to help assess the development applications, or should outsource this review.
11.4 Planning and implementation of water sensitive urban design (WSUD).</td></tr>
<tr><td>Support agencies</td><td>EPA, HLLS, DoPE</td></tr>
<tr><td>Cost estimate</td><td>Minimal – staff time only</td></tr>
<tr><td>Funding opportunities</td><td></td></tr>
<tr><td>Measurable</td><td>Percentage of new developments complying with no net increase (target 100%)</td></tr>
<tr><td>Timing</td><td>Ongoing</td></tr>
<tr><td>Objectives addressed</td><td>3, 8, 9, 11, 13</td></tr>
<tr><td>Related strategies</td><td>10</td></tr>
<tr><td>Applicable Management Zones</td><td>1, 2</td></tr>
</table>

Strategy # 12 Inter-gvt forum for decision-making		**Through the Hunter Coast and Estuary Management Committee (or similar), host an on a needs basis inter-governmental panel / forum with senior administrators and agency staff to stream-line co-ordinated and integrated decision-making**	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	NCC, MCC, PSC, OEH	This strategy involves encouraging improved attendance of the existing Hunter Coast and Estuary Management Committee, and the establishment of a working sub-group or sub-committee that has representatives at higher levels within agencies. A local example of high level state government departments actively participating in Estuary Management is the Lake Macquarie Project Management Committee. The Lake Macquarie Project Management Committee consists of community representatives, Regional Directors of the relevant State Government Departments and one councillor from both Wyong Shire Council and Lake Macquarie City Council. The committee oversees the work of the Lake and Catchment Coordinator in the implementation of action plans for the improvement of Lake Macquarie. The LMPMC was a successful avenue for obtaining funds for environmental works and initiative in Lake Macquarie.	12.1 Identify relevant high level government department representatives 12.2 Arrange an inaugural meeting and establish meeting schedules, terms of reference etc. 12.3 Organise regular meetings to guide decisions related to the estuary. 12.4 Keep minutes and publish an annual report.
Support agencies	DPI Fisheries, NPWS HLLS, Dept of Industry – Crown Lands & Water, HWC, NOW, Dept of Premier and Cabinet		
Cost estimate	Minimal - Staff Time Only		
Funding opportunities			
Measurable	Regular attendance and decision making by regional directors		
Timing	Short Term To Commence in 2011		
Objectives addressed	6, 8		
Related strategies	All strategies that require inter-governmental decision making		
Applicable Management Zones	1, 2		

<table>
<tr><th colspan="2">Strategy # 13
Community education program</th><th colspan="2">Raise public awareness of the values of the Hunter Estuary including its international significance and sustainable use of the estuary through targeted community education</th></tr>
<tr><td colspan="2"></td><td></td><td></td></tr>
<tr><td>Lead agency</td><td>NCC, MCC, PSC</td><td rowspan="10">There are a number of existing educational programs that should be further supported. This includes initiatives of Councils, Hunter Wetland Centre, and the LLS.

Community education should cover a wide range of topics, including:
• Heritage and cultural values
• Environmental values and significance
• Recreational values and opportunities
• Management of potential acid sulphate soils
• Economic importance of the estuary and the region
• Preservation of existing values in a sustainable manner.

Values and significance of the estuary are discussed in Section 2.2.1 of this Plan.

Separate education programs should be developed for different users of the estuary (eg, urban residents, rural landholders, recreationists, conservationists).</td><td rowspan="10">13.1 Consider developing a logo for the Hunter Estuary education program
13.2 Consider undertaking a survey to establish level of reference etc.
13.3 Compile existing resources for community consultation regarding the estuary. Sources will include DPI Fisheries, each council, RMS, OEH and HLLS.
13.4 Identify the target audience and key messages including international significance (Ramsar listing and Kushiro affiliation) and issue of marine debris
13.5 Develop a broad education program for the estuary and its catchments including a variety of communication mediums such as brochures, DVDs, guided tours and an interactive web site.
13.6 Deliver the education program
13.7 Monitor the success of the education program through follow-up surveys
13.8 Modify / update the program as necessary
13. 9 Produce Hunter Estuary Report Card based on data from monitoring, modelling and research</td></tr>
<tr><td>Support agencies</td><td>HLLS, OEH, DPI, HWC</td></tr>
<tr><td>Cost estimate</td><td>$50,000 for program initiation. $10,000 per year continuing</td></tr>
<tr><td>Funding opportunities</td><td>NSW Estuary Program, Australian Government Grants, HLLS</td></tr>
<tr><td>Measurable</td><td>Improved level of understanding of estuary by community</td></tr>
<tr><td>Timing</td><td>Ongoing</td></tr>
<tr><td>Objectives addressed</td><td>1, 3, 6, 11, 13, 15, 17, 20, 22</td></tr>
<tr><td>Related strategies</td><td>9, 14, 15</td></tr>
<tr><td>Applicable Management Zones</td><td>1, 2</td></tr>
</table>

Strategy # 14 Improve catchment landuse practices		Improve land use practices throughout the catchment to minimise soil erosion and improve water quality.	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	HLLS, DPI (Ag), NCC, MCC, PSC, DPI Fisheries	The Estuary Processes Study (MHL, 2003) reports that the agricultural practices of the early settlers were unsustainable. RMS routinely support this strategy via education/signage/enforcement.	14.1 Implement quick win erosion control strategies such as improved stock management practices and revegetation through existing initiatives and programs 14.2 Address creek and gully erosion within the catchments, through rehabilitation works 14.3 Research best practice sustainable farming practices and identify pilot farms for trials of more sustainable approaches 14.4 Where pilot study sites show success in sustainable farming trials, provide incentives to encourage this approach on a wider scale. 14.5 Prevent and remediate soil erosion in areas that are affected by on-going recreational activities, particularly along riverbanks (e.g. boating) 14.6 Prioritise compliance activities such as audits and corrective actions for development sites 14.7 Undertake works to improve water quality
Support agencies	OEH, RMS		
Cost estimate	Variable. Potentially hundreds of thousands of dollars for catchment-wide programs and remediation		
Funding opportunities	NSW Estuary Program, Australian Government Grants, HLLS		
Measurable	Reductions in catchment based sediment supply		
Timing	Ongoing		
Objectives addressed	2, 5, 6, **13**		
Related strategies	15		
Applicable Management Zones	2		

Strategy #15 Incentives for sustainable agriculture		Develop incentive mechanisms to promote and facilitate the adoption of sustainable agricultural practices that generate a commercial and environmental benefit.	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	HLLS, DPI (Ag)	HLLS and DPI (Ag) runs a range of programs to encourage uptake of sustainable agriculture practices including education and a small project funding program.	15.1 Continue to support the vegetation conservation 15.2 Liaise with DPI (Agriculture) to initiate pilot sustainable farming trial sites 15.3 Promote sites that are shown to be working to encourage uptake at other sites.
Support agencies	NCC, MCC, PSC		
Cost estimate	Variable. Potentially hundreds of thousands of dollars for catchment-wide programs and incentives		
Funding opportunities	HLLS, Australian Government Grants		
Measurable	Number of properties accredited under Property Planning Accreditation Program		
Timing	Ongoing		
Objectives addressed	**3**, 6, 13, 15, 20		
Related strategies	13, 14		
Applicable Management Zones	2		

Strategy # 16 Biobanking & PVPs for private conservation		Conservation of key habitat and significant vegetation should be undertaken through the Biobanking scheme or through preparation and implementation of individual conservation agreements	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	HLLS, OEH	Biobanking enables 'biodiversity credits' to be generated by landowners who commit to enhance and protect biodiversity values on their land through a Biobanking agreement. These credits can then be sold, generating funds for the management of the site. Credits can be used to counterbalance (or offset) the impacts on biodiversity values that are likely to occur as a result of development. The credits can also be sold to those seeking to invest in conservation outcomes, including philanthropic organisations and government.	16.1 Identify key habitats and significant vegetation stands under private ownership that would be suitable for conservation through Biobanking and conservation agreements. 16.2 Undertake an education program specifically targeting owners of identified lands promoting participation in the Biobanking scheme and preparation of voluntary conservation agreements. 16.3 Consult with potential support agencies and work towards developing a list of other possible incentive mechanisms as offsets for conservation of private lands, including rate exemptions, HLLS grants (for fencing etc), voluntary conservation agreements with HLLS and OEH, and Environmental Stewardship schemes. 16.4 Implement agreements and incentives on a priority basis, subject to agreement by landholders.
Support agencies	NCC, MCC, PSC, DPI-Fisheries, Dept of Industry – Crown Lands & Water		
Cost estimate	Essentially market-based trading, but may require additional funding of potentially hundreds of thousands of dollars		
Funding opportunities	Australian Government Grants, HLLS, NSW Estuary Program		
Measurable	Area of land protected under agreement		
Timing	Medium Term		
Objectives addressed	**1**, 6, 8, 11, 14, 15, 16, 17		
Related strategies	3, 8, 9		
Applicable Management Zones	1, 2		

Strategy # 17 Habitat restoration		Undertake estuarine and related habitat restoration through physical works, revegetation and or change management practices of assets and infrastructure	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	HLLS, EPA, OEH, NCC, MCC, PSC, DPI Fisheries	Specific and measurable ecological objectives should be developed for each area of potential rehabilitation. These objectives will determine the approach taken, expenditure and ultimately how the results of rehabilitation are measured. In choosing potential rehabilitation sites, it is essential to consider recurrent funding demands. The best sites will be those that do not require long term active management. The rehabilitation potential for estuarine foreshores is indicatively mapped in the EPS. Economic incentives may be required for rehabilitation of private lands, such as Transferable Development Rights, Purchase of Development Rights, Density Bonuses. Outright property acquisition may be required to protect and enhance estuarine biodiversity and EECs. Restoration works would be guided by the conservation Masterplan (refer Strategy 6). Some of these works have been completed see status report.	17.1 Develop a data base of relevant information for potential sites, such as ownership, fauna species, vegetation communities etc 17.2 Ensure local, regional, national and international values are considered when undertaking estuarine rehabilitation. 17.3 In consultation with key stakeholders undertake a multi criteria assessment for prioritising rehabilitation sites utilising existing tools, and establish an agreed forward restoration works program. 17.4 Work withNSW and Commonwealth Governments for funding of works, especially urgent restoration works. 17.5 Implement rehabilitation / restoration works on a priority basis, subject to funding availability, using volunteer groups / indigenous green teams, where appropriate. 17.6 Establish agreements (eg, under the NPW Act 1974 or Nature Conservation Trust Act 2001) over rehabilitated lands, as appropriate, to ensure long-term conservation of rehabilitation sites 17.7 Manage Ramsar sites in accordance with their international significance.
Support agencies	, HWC, NOW, OEH, Dept of Industry – Crown Lands & Water		
Cost estimate	Potentially tens of millions		
Funding opportunities	NSW Estuary Program, Australian Government, Grants, HLLS		
Measurable	Areas of rehabilitated lands with ongoing management in place		
Timing	Ongoing		
Objectives addressed	1, **2**, 3, 4, 5, 6, 8, 10 ,13, 14 ,15, 16, 17, 20, 22		
Related strategies	3, 4, 5, 6, 8, 9, 10		
Applicable Management Zones	1, 2		

Strategy # 18 Relocate/formalise public access		**Develop a plan of all public access points along the Hunter Estuary, review those which coincide with sensitive habitats, and formalising those with highest recreational usage / value (where appropriate), to provide on-going and undiminished access to the river**	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	NCC, MCC, PSC	Sensitive habitats in the Hunter Estuary include, for example: • mangroves adjacent to Fullerton Cove which provide roosting and breeding sites for red fruit bats and grey headed fruit bats, and • the Kooragang Dykes and Stockton Sandspit which provide roosting and feeding sites for a variety of birds. The Hunter Estuary Processes Study reports that recreational activities may be disturbing birds from their roosts in some key habitat areas. Studies conducted within the Estuary have also identified that wave action from boats are a major contributing factor in bank erosion. This must be taken into consideration when planning future boating infrastructure.	18.1 Refer to available existing habitat mapping (eg HBOC Avian Study) and mapping to be completed in Strategy 3 to identify important areas. 18.2 Undertake a field-based audit of existing formal and informal access to the water throughout the estuary, on both public and private lands. Characterise the usage of each access location (ie volume, purpose, management agency etc). 18.3 Assess the vulnerability of access arrangements to sea level rise impacts and consider options for long term adaptation. 18.4 Overlay access mapping with habitat mapping to determine critical points of conflict. 18.5 Prepare and implement a plan in consultation with relevant land managers that aims to relocate existing access points within important habitat areas to alternative sites, and formalises existing high usage locations that are not already formalised, providing that any environmental and social issues can be addressed. Ensure appropriate authorisations are in place for the access points.
Support agencies	Dept of Industry – Crown Lands & Water, RMS, OEH		
Cost estimate	Minimal – Staff time only for plan preparation. Potentially tens of thousands for on-ground access works.		
Funding opportunities	NSW Estuary Program, Councils. Boating Now Program (RMS)		
Measurable	Reduction in access routes through sensitive habitats, and formalised access to the waterway		
Timing	Ongoing		
Objectives addressed	1, 5, **21**		
Related strategies	3, 6		
Applicable Management Zones	1, 2		

Strategy # 19 Research projects & programs		Support and participate in research programs and run these programs in partnership with major stakeholders on a case by case basis	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	NCC, MCC, PSC, HLLS	Funding research programs (for example through universities) is a useful way of increasing the understanding of how the estuary works, getting future professionals interested in the estuary and increasing community interest. Relevant projects could involve climate change (particularly if complemented with the numerical model: Strategy 4), cultural aspects (eg impacts of climate change on preservation of sites), extent of potential acid sulphate soils, and biodiversity / rehabilitation.	19.1 Meet with academics to discuss opportunities for university students 19.2 Prepare research plans and funding applications for proposed research projects and submit to relevant approval authority (ie. Within council or HLLS) 19.3 Advertise through normal university research project mechanisms 19.4 Select students for research projects and implement 19.5 Follow up research by using results to inform future management
Support agencies	OEH, Universities, HWC		
Cost estimate	Up to $5000 per project		
Funding opportunities	Local Government Grants, HLSS, Australian Research Council, and private industry		
Measurable	Results of research programs available to inform future management		
Timing	Medium Term To commence by 2013		
Objectives addressed	4, **7**, 10, 16, 18, 20		
Related strategies	4		
Applicable Management Zones	1, 2		

Strategy # 20 Climate change policy		Investigate impacts arising from climate change and potential adaptations.	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	NCC, MCC, PSC, OEH, DPI Fisheries	Although the impacts of climate change are uncertain, new data and projections are being published frequently. Projected variables for sea level rise and changes to storm and drought intensity and frequency are available. Planning mechanisms to adapt to the environmental impacts of climate change will generally focus on ensuring migration space for estuarine habitat (e.g. saltmarsh in response to rising sea levels). The Hunter Estuary was included within a Case Study for the federal Dept of Climate Change, which determined the likely impacts on estuarine processes of climate change scenarios (Hadwen et al, 2011). In addition to this Case Study, the proposed predictive numerical model (Strategy 4) is ideally suited to determine the potential impacts of climate change on the estuary. The Department of Environment and Climate Change released a Draft Sea Level Rise Policy statement. The adoption of this Policy and subsequent preparation of planning guidelines will be considered by the relevant stakeholders for the Hunter Estuary. Also, Port Stephens Council is undertaking a risk-based assessment of the potential impacts of climate change on their assets and operations.	20.1 Review government policy, guidelines and legislation regarding climate change adaptation and appropriate strategic planning responses. 20.2 Based on the outcomes of existing research (eg federal Case Study) and further investigations (eg Strategy 4) into the impacts of climate change on the estuary and surrounding lands, investigate opportunities to cater for expected impacts through strategic planning and asset management initiative, including for example: • land title restrictions • restrictive and positive covenants • establishing larger riparian setbacks (e.g. to ensure that saltmarsh can respond to sea level rise) • Changes to infrastructure design to ensure that the ecological response to climate change can be accommodated (eg. culverts under roads to allow saltmarsh to migrate and re-colonise elsewhere). 20.3 Organise a meeting/workshop for Council planners from each of the three Councils to determine a consistent approach incorporating climate change provisions into Council planning frameworks. It is recognised that while the approach should be consistent, individual responses by each Council may differ, given the differing expected impacts of climate change across the three LGAs.
Support agencies	HLLS, HWC, DoPE		
Cost estimate	Minimal – Staff Time Only for planning review and changes. Potentially tens of thousands to clarify potential impacts of climate change on the three LGAs		
Funding opportunities	NSW Estuary Program, NSW Flood grants, Australian Government Grants, HLLS		
Measurable	Review of current policy and research undertaken and consistent climate change provisions incorporated into the three Councils planning frameworks		
Timing	Medium Term To commence by 2013		
Objectives addressed	1, 4, 8, 9, 14, **16**, 18		
Related strategies	4, 1, 12		
Applicable Management Zones	1, 2		

Strategy #21 Review salinity trading / water sharing		Undertake a critical review of the salinity trading scheme, the Hunter River Water Sharing Plan and upstream activities in terms of environmental consequences of water discharges and offtakes	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	a) EPA (review of Salinity Trading Scheme) b) DPI - Water(review of Water Sharing Plan)	a) The Salinity Trading Scheme was introduced to mitigate the impacts of electricity production and mining on agriculture and the environment. The scheme involves a program of continuous monitoring to allow scheduling of saline discharges for periods of high river flow rates and low background salinity levels. During times of very low salinity levels, licensees are allowed to discharge into the river. There was some concern amongst the community that this is impacting on the environment. b) The Hunter Water Sharing Plan will be implemented by the DPI - Water. The purpose of the Plan is: • to protect the fundamental environmental health of the water source • to ensure that the water source is sustainable in the long-term • to provide water users with a clear picture of when and how water will be available for extraction.	21.1 Undertake a review of the salinity trading scheme in line with legislative review schedule. 21.2 Undertake a review of the Hunter River Water Sharing Plan in line with legislative review schedule. 21.3 Implement improvements to the existing salinity trading scheme and Water Sharing Plan based on the reviews
Support agencies	DPI Ag		
Cost estimate	$50,000		
Funding opportunities	Estuary Management Program, Australian Government Grants		
Measurable	List of recommended improvements to existing schemes		
Timing	Ongoing		
Objectives addressed	7, **18**		
Related strategies	4		
Applicable Management Zones	2		

Strategy #22 Contaminated sediments assessment		Undertake assessments for contaminated sediments in the Hunter Estuary	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	EPA, RMS	RMS owns the seabed in Newcastle Harbour and issues a Port Safety Operating Licence to the Port of Newcastle (PoN). This assessment does not include recognized shipping channels in the Port of Newcastle as these are managed under state and federal approvals that are assessed and monitored in accordance with the National Assessment Guidelines for Dredging (NAGD) 2009. Maintenance dredging in the Port of Newcastle removes sediment loading from upstream sources to maintain depth and ensure safe navigation of the shipping channel and berth pockets. Works identified in Strategies 4, 8, 11, 14 and 17 to address sediment and erosion upstream will minimize the volume of material required to be dredged further downstream. Whilst capital dredging works in the Port area are separate to maintenance dredging they are still required to undergo rigorous testing under the NAGD to ensure that the material being removed is managed appropriately. Areas to be targeted should be those where there is limited or no data available. The computer model (Strategy 4) should be used to help ascertain the potential dispersion of contaminated sediments from specific sources, and also the potential zone of influence on water quality resulting from desorption of contaminants from the sediment.	22.1 Compile available sediment sampling results from sources including: • EIS Study by URS for BHP site on the south arm • Lower Throsby Creek Honors Study 22.2 Identify data gaps 22.3 Design monitoring and risk assessment program or call for proposals for suitable consultant 22.4 Undertake monitoring and include in the Hunter estuary model developed under strategy 4 22.5 Undertake risk assessment 22.6 Recommend risk treatment options 22.7 Consider for inclusion in the estuary report card
Support agencies	Dept of Industry – Crown Lands & Water, OEH, DPI (Fisheries), Industry groups		
Cost estimate	$50,000		
Funding opportunities	NSW Estuary Program, DPI Fisheries		
Measurable	Prioritised list of treatment options		
Timing	Ongoing		
Objectives addressed	7, **12**		
Related strategies	4		
Applicable Management Zones	1 & 2		

Strategy #23 Reuse of dredged sediments		Where appropriate, reuse sediment dredged from the Estuary	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	OEH, NCC	Dredging of the Newcastle Port commenced in 1859. The Port of Newcastle (PON) undertakes regular maintenance dredging to maintain shipping channel and berth pocket depths for safe navigation of commercial vessels. The Port Safety Operating Licence issued to PoN details conditions for the disposal of dredge spoil. PON support an initiative driven by NCC to place suitable dredged material from the Port entrance onto Stockton Beach. On occasion dredged material from capital dredging projects may not to be reused for the development itself. In this instance the material will be considered for environmental beneficial reuse. Protection of the Environment Operations Act requires licencing by the EPA if extraction exceeds 30,000 cubic metres.	23.1 Organisations that undertake capital and maintenance dredging (and related activities) within the Hunter Estuary and surrounds are required to liaise with the relevant government agencies to determine possible options for reuse of dredged material, including the reuse of clean sand for nourishment of Stockton Beach. 23.2 In issuing licences and approvals for dredging and related activities, the relevant government agencies shall consider the potential impacts on the Hunter Estuary and surrounding beaches.
Support agencies	Dept of Industry – Crown Lands & Water, RMS		
Cost estimate	Potentially millions		
Funding opportunities	Commercial need		
Measurable	Options for reuse investigated and implemented where practicable		
Timing	Ongoing		
Objectives addressed	**23**		
Related strategies	4, 22		
Applicable Management Zones	1		

Strategy #24 Heritage Management Plan		To identify and conserve heritage objects, places and landscapes in the Hunter Estuary.	
Implementation Details		**Comments**	**Suggested Actions for Implementation**
Lead agency	OEH	a) The Hunter Estuary has a long history of Aboriginal occupation, with tribal groups believed to be living in the area for at least 30,000 years. Approximately 2000 Aboriginal sites have been recorded throughout the study area, including sites along the valley floors of the major tributaries, rock shelter sites in the sandstone areas and shell middens around the estuary. However due to large scale river works, land reclamation and urbanisation, many of the remnants of Aboriginal occupation in the Hunter Estuary may have been destroyed. b) The Newcastle region was one of the first areas settled by Europeans and the study area contains many structures, buildings and towns that are considered historically significant. The Hunter Regional Environmental Plan 1989 (Heritage) has identified approximately 800 items of heritage significance to be conserved for future generations.	24.1 Compile and review previous Aboriginal and European heritage studies within the Hunter Estuary and undertake searches of the relevant databases to identify site locations within the Hunter Estuary. 24.2 Carry out a gap analysis of information from the previous studies and database searches and undertake additional studies if required to develop the predictive model (refer Action 24.3). 24.3 Develop a predictive model of Aboriginal site locations for the Hunter Estuary. 24.4 Supported the development of the Hexham and Kooragang Cultural Heritage Management Plan 24.5 Based on the findings of the literature review and predictive model, develop an overarching strategic Heritage Management Plan for the Hunter Estuary. The management plan should identify areas of high heritage value and outline appropriate management measures to protect and conserve heritage values. Consultation will be undertaken with the Aboriginal community during the preparation of the plan. 24.6 Implement the management measures outlined in the plan and review the plan at the interval specified within the plan.
Support agencies	HLLS, MCC, NCC, PSC		
Cost estimate			
Funding opportunities	OEH		
Measurable	Heritage Management Plan developed and management measures being implemented		
Timing	Ongoing		
Objectives addressed	**25**		
Related strategies	2, 4, 6, 7, 13		
Applicable Management Zones	1,2		

Note: Strategy 25 was removed from the document and encapsulated in strategy 8.

4 IMPLEMENTATION MECHANISMS

4.1 Collaborative Agreements

A Memorandum of Understanding (MoU) may be used to demonstrate agreement / endorsement on the management objectives and strategies and commitment to implementation of the CZMP. The signatories of this MoU would agree in principle to implement the CZMP according to the implementation tables contained within the document, to the best of their abilities (and funding availabilities).

The MoU would not be intended to create legally binding financial and resource commitments, nor would it intend to be inconsistent with, or limit the powers of, the legislation that the signatory parties operate under.

Example terms of a MoU may include:

- The parties agree with the process for the development of the Estuary Management Plan;
- The parties agree with the management issues identified for the estuary, and concur with prioritisation of the defined objectives, which is used to help direct future management works actions;
- The parties agree with the guiding principles that would potentially direct and limit future development and activities within and around the estuary;
- The parties accept the outcomes of the options assessment process, which have been used to develop a short-list of preferred strategic management actions;
- The parties accept the responsibilities for implementation of the strategic management actions, as outlined in the Implementation Tables;
- The parties agree to actively implement the strategies, to the best of their financial and resource capabilities, in accordance with assigned responsibilities within the Estuary Management Plan; and
- The parties agree to review the Estuary Management Plan on a periodic basis, as nominated in the Plan, and adopt specified contingency actions if implementation of the Plan is delayed or ineffective.

Memoranda of Understanding have been used successfully in the past to gain buy-in from agencies and other stakeholders for a range natural resource management plans and initiatives, including Coastal Action Plans in Victoria (through the various Coastal Boards), and waterway usage and bank rehabilitation in the Wallamba River (Wallis Lake).

4.2 Co-ordination

It is recommended that the Councils collaborate during the implementation of the Hunter Estuary Coastal Zone Management Plan, recognising their role in co-ordination for both coastal works (based on the Newcastle Coastal Zone Management Plan) and estuary works (based on this Plan).

It is recommended that a Technical Sub-Committee (TSC) of the Hunter Coast and Estuary Management Committee be used to oversee implementation and completion of projects and reviews in accordance with this Hunter Estuary Coastal Zone Management Plan. Membership on the TSC may change from time to time depending on the nature of the works that are being undertaken, or are proposed. The TSC should report back to represented organisations to provide a periodic update on implementation progress.

4.3 Community Involvement

On-going community involvement is crucial to the success of the Plan. Opportunities for community input will include contributions through the Hunter Coast and Estuary Management Committee and on-ground participation in rehabilitation works and education programs (facilitated through Environmental Educators from the Councils and various agencies). Changes to behaviours of the wider community are an essential ingredient to improve estuary condition. It is hoped that through periodic reporting of Plan progress, community understanding and commitment to the estuary will be improved.

4.4 Reporting

The Hunter Estuary Coastal Zone Management Plan will be subject to on-going review to ensure continuing validity and relevance. This review process will include annual performance reviews and a detailed review after five years.

The condition, scientific knowledge, planning frameworks and public aspirations specific to the Hunter Estuary are all expected to change with time. It is therefore essential that as these elements change, management decisions are adjusted or modified within an adaptive framework.

To gain a better appreciation for the relative success of the Plan, a series of performance measures can be assessed on a periodic basis. Different types of performance measures are discussed in Section 5.

5 MONITORING, EVALUATION AND REVIEW OF MEASURES

The success of the Hunter Estuary Coastal Zone Management Plan should be gauged through its ability to achieve the designated objectives and vision. Extensive environmental monitoring and specific performance measures have been identified to help determine how well the Plan has achieved its objectives.

5.1 Environmental Monitoring

A program of co-ordinated environmental monitoring should be implemented to complement this Hunter Estuary Coastal Zone Management Plan. There are numerous existing programs that are currently underway that investigate various aspects of the biophysical environment in one or more areas around the estuary. These are carried out by a range of organisations, including HLLS, Hunter Water, government departments, Councils and Universities. As an example, an extensive monitoring program is being undertaken by the HLLS as part of the Hexham Swamp Rehabilitation Project, in order to observe changes in environmental condition as a result of opening floodgates at the end of Ironbark Creek. Meanwhile, HWC measures water quality in the estuary in the vicinity of its treatment plants, while the DPI- Water monitor flows and salinity at various locations within the upper non-tidal reaches of the Hunter River and some of its tributaries. Information should also be available regarding water extraction, as well as licenced discharges to the river (including salinity discharges in the upstream reaches of the Hunter, and industrial effluent discharges in the lower reaches).

It is recommended that a co-ordinated approach to future monitoring be instigated to ensure that all relevant monitoring programs are complementary and not repetitious. Monitoring should be used as a platform for gauging the future success of the Plan, and for drawing focus on particular issues or areas of concern, as appropriate.

Whilst not intended to impede existing initiatives in monitoring, it is recommended that the Hunter Coast and Estuary Management Technical Working Group be charged with co-ordinating monitoring efforts within the estuary, and that all monitoring data be reported back to represented organisations and the community so that current programs and outcomes can be utilised from a management perspective.

Ideally, environmental monitoring specifications should include at least:

- Flow: Tidal levels within the estuary and freshwater inflows to the estuary;
- Water quality: full range of physical, chemical and biological (including algae) parameters;
- Sediment quality: nutrients, pesticides and industrial pollutants;
- Ecology: vegetation, aquatic fauna (fish, invertebrates), birds, mosquitoes, amphibians;
- Bank condition: particularly after flood events;
- Groundwater: levels and quality;
- Waterway and foreshore usage: access locations, facility demands;
- Bathymetry: particularly after flood events to identify shoals and overall sediment slug movement

Frequency of monitoring should be sufficient to characterise the natural variations in the environmental parameters. This includes, for example, capturing flow and water quality data that typifies both low flow conditions and high flow conditions. It also includes capturing seasonality in environmental parameters (particularly ecological parameters).

The spatial distribution of monitoring also needs to be sufficient to capture variability within the river (eg the salinity gradient from upstream to downstream and all associated follow-on environmental effects) and needs to target locations of known problems or issues. Consideration also needs to be given to sufficient data capture in order to draw scientific conclusions from the data (eg designed using BACI or beyond BACI techniques). As well as sites within the estuary, data also needs to be collected from the catchment in order to characterise and quantify inputs to the estuary.

As part of the co-ordination process, the Hunter Estuary Technical Working Group (HETWG) should ensure that the minimum environmental monitoring requirements are met by at least one of the current monitoring programs. Where there are gaps in the overall monitoring of the estuary, the HETWG should make recommendations to the most appropriate authority for expanding existing programs to fill the gaps. If necessary, a new and supplementary environmental monitoring program should be established. Responsibilities for any additional monitoring would be established through discussions and negotiations with the relevant authorities.

5.2 Performance Evaluation

The Hunter Estuary Coastal Zone Management Plan has been developed with the provisions for evaluating its performance. Where performance is sub-optimal, contingencies should be implemented to remedy the situation. A series of performance measures applicable to the Plan outcomes are discussed below.

5.2.1 Primary Performance Measures

The first set of performance measures should ascertain whether the strategies are actually being implemented or not within the timeframe designated in the Plan. As such, the primary performance measures are simply a *measure of project initiation*.

Organisations responsible for implementation will need to review the Plan carefully and ensure that adequate resources are allocated to the various strategies to ensure that the timeframe for implementation of ten years is achieved.

Clearly, a high degree of co-ordination will be required to manage the successful implementation of all the strategies within the designated timeframe, particularly given the different jurisdictional boundaries that this Plan crosses. Co-ordination for implementation of the plan is to be facilitated by the Hunter Coast and Estuary Management Committee.

Specific questions to be answered are:

- What strategies have actually been implemented (regardless of outcome – see Secondary performance measure)?
- What strategies are outstanding, and should have been implemented within this nominated timeframe?

If it is determined that the strategies are not being implemented to the nominated timeframe then one or both of the following *contingencies* should be adopted:

- Determine the cause for the delay in implementation. If delays are funding based, then seek alternative sources of funding. If delays are resource-based, seek additional assistance from stakeholder agencies and/or consider using an external consultancy to coordinate implementation of the Plan; and
- Modify and update the Hunter Estuary Coastal Zone Management Plan to reflect a timeframe for implementation that is more achievable. The revised Plan would need to be endorsed by all relevant stakeholders and agencies responsible for implementation.

5.2.2 Secondary Performance Measures

Once a strategy has actually been implemented, the second set of performance measures relate to *measuring specific outputs* from the individual strategies, as appropriate. These "measurables" define what the specific outcome from each action should be. If these outputs are delivered as defined, then the action (or strategy) is considered to have been successful.

Outputs will vary according to the individual strategy and are identified as the "measurable" with the Implementation Tables.

The specific question to be asked here is:

- Of the strategies that have been implemented, has the nominated "measurable" been achieved?

If specific outputs, as defined by the "measurables", are not generated from implementation of the Plan then the following *contingencies* need to be adopted:

- Determine the reason for not producing the specified output. If the reason involves a lack of funding or resources, then similar contingency measures to those described for the primary performance measures should be adopted. If the reason is of a technical nature, then expertise in the area should be consulted to overcome the technical problem. OEH and other government agencies should have the necessary in-house expertise to assist in most cases; and
- Review the appropriateness of the specific output of the management strategy, and if necessary, modify the output described in the Plan to define a more achievable product.

5.2.3 Tertiary Performance Measures

The third set of performance measures are aimed at *measuring the overall outcomes of the Plan*, and as such relate to the specific management objectives of the Plan (refer Section 2.4), and how implementation of the Plan has made a difference to the biophysical and social environments of Hunter Estuary (eg reduction in pollutant loads, increase in biodiversity etc). The main mechanism for gauging whether these objectives have been achieved, or not, is environmental monitoring (refer Section 5.1). Therefore, **monitoring of various elements of the physical, biological and social environment is an essential component of assessing the overall success of the Hunter Estuary Coastal Zone Management Plan**.

The specific question to be asked here is:

- Have the objectives been satisfied?

If, after a reasonable period of time, the specific objectives of the Plan are not being achieved by the strategies being implemented, then the following contingencies should be adopted:

- Carry out a formal review of the implemented management strategies, identifying possible avenues for increasing the effectiveness of the strategy in meeting the Plan objectives;
- Commence implementation of additional management strategies that may assist in meeting Plan objectives (possibly 'fast-track' some longer term strategies as necessary);
- Reconsider the objectives of the Plan to determine if they set impossible targets for future estuary conditions, and adjust the Plan, as necessary. Any such changes to the Plan would need to be endorsed by the stakeholders and relevant government agencies, as well as the public.

5.3 Factors for Success

The success of the Hunter Estuary Coastal Zone Management Plan can be improved by the following factors:

- Approval and certification by the Minister
- Agreement on the objectives, principles and strategies
- Agreement on implementation by all state and local government agencies, stakeholders and the general community;
- Understanding and acceptance of responsibilities for the implementation of the various aspects of the Plan;
- Commitment by those involved to dedicate appropriate time and resources to achieve the objectives and timeframe of the Plan; and
- Sourcing of appropriate funds, through grants, user contributions, and in-kind commitments from community.

An important aspect is the acceptance and agreement by the local community. Without significant support by the local community, Councils and the other agencies will not receive the pressure to ensure that the long-term sustainable management of Hunter Estuary remains a high priority.

The three Councils (Newcastle, Port Stephens and Maitland) are not responsible for all activities that occur within the estuary. Whilst the CZMP examines numerous areas and issues, implementation of the recommended strategies contained in the Plan relies heavily on an integrated approach by the relevant key stakeholder agencies, which have been, and will continue to be, involved in the development of the Plan.

Whilst some of the recommendations may identify other agencies as responsible for implementation, each Council will be responsible for encouraging and facilitating the Plan's implementation and will champion its on-going implementation.

5.4 Plan Review

To facilitate review of the Hunter Estuary Coastal Zone Management Plan, it is recommended that a rolling four (4) year Estuary Action Plan (or Implementation Plan) be developed and reviewed/amended annually. A thorough audit of implementation of the Hunter Estuary Coastal Zone Management Plan should be carried out after 5 years, if considered necessary.

Development of an Estuary Action Plan will enable modifications/alterations to the management of the estuaries, on an as-needed basis, within the context of an adaptive management framework. The Development and maintenance of the Estuary Action Plan should be facilitated through the HETWG, taking into account rolling budget allocations for responsible agencies, anticipated grants, and in-kind contributions.

The periodic reviews of the Estuary Action Plan and Hunter Estuary Coastal Zone Management Plan should cover the topics described generally in Table 5-1. This table also outlines who is responsible for conducting the periodic reviews.

It is recommended that the review of the Plan be co-ordinated through the HETWG, as this Group has the representation of all authorities and agencies responsible for implementation. The Committee should reach agreement to any modifications to the Plan before formally amending the document. Whilst modifications to the Estuary Action Plan would be relatively straightforward (providing it remains consistent with the overall objectives and principles of the Hunter Estuary Coastal Zone Management Plan), changes to the Hunter Estuary Coastal Zone Management Plan, if gazetted, can only be effected by another gazetted document. Therefore, any required amendments to the Plan would also need to be gazetted by the Councils, following Approval and certification by the relevant Minister.

Table 5-1 Framework for future review of the Hunter Estuary Coastal Zone Management Plan

Review Period	Review tasks	Responsibility
Annual – Estuary Action Plan	• Assess primary, secondary and tertiary performance measures, and determine appropriate contingencies if performance measures do not meet targets • Review funding arrangements and allocations for current and future management strategies • Review resourcing and staffing allocations for current and future management strategies • Provide report on progress of the Hunter Estuary Coastal Zone Management Plan implementation, results of annual review, and any modifications required to the Plan coming out of the review • Present and where possible, interpret any environmental monitoring / research undertaken as part of the CZMP • Provide newsletter for posting on Council web sites, disseminated via email and other avenues to community and stakeholder contacts	Estuary Management Committee To be coordinated through Council Officers and reported to Councils, relevant stakeholders and government agencies via the committee
5 Yearly - Hunter Estuary Coastal Zone Management Plan	• Consider appointing an external consultant to undertake review • Review latest information to determine potential changes to the condition or understanding of the Estuary Processes; • Determine changes to community values, issues and aspirations; • Assess the consistency of the plan with contemporary government policies and plans; • Assess the continuing relevance of the objectives; • Determine the appropriateness of the implementation plan to meet these objectives; • For strategies requiring on-going commitment, assess the value in maintaining implementation of those strategies; • Assess the overall effectiveness of each management strategy implemented to date • Reconsider the management options that were not short-listed and included in the original Plan • Update the Hunter Estuary Coastal Zone Management Plan document to reflect proposed strategies for implementation over the next 5 year period, and seek endorsement by stakeholders, government agencies and the community. • Consider either completely revising the document or simply updating some aspects of the existing CZMP	Estuary Management Committee To be coordinated through Council Officers and reported to Councils, relevant stakeholders, government agencies and the general community

6 REFERENCES

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APPENDIX A: CHECKLIST OF CONSIDERATIONS FOR FUTURE DEVELOPMENT

Ref.	Consideration	Yes / No / NA
a)	Is the proposed development compassionate to existing economic, social and environmental values of the estuary, and does not diminish the significance of any of these values unless equivalent compensatory provisions have been made?	
b)	Does the proposed development improve or maintain the environmental condition of the Hunter River estuary and its tributaries compared to existing (2008) conditions, irrespective of social, recreational, tourism, industry or economic gains? *Note that future development may incorporate compensatory environmental offsets within the Hunter estuary and its catchment in order to improve or maintain the environmental conditions of the estuary, as per the Lower Hunter Regional Conservation Plan.*	
c)	Does the proposed development impact on Aboriginal or early European cultural values or degrade known sites of cultural significance?	
d)	Does the proposed development duly consider existing and future risk of flooding and inundation from the Hunter River and its tributaries, catering for future climate change (to a timescale that is commensurate with the proposed development)?	
e)	Does the proposed development diminish fish and prawn stocks within the estuary?	
f)	Does the proposed development diminish scenic values of the estuary and its catchment area?	
g)	Does the proposed development compromise any existing functionality of the Hunter Valley Flood Mitigation Scheme that is still considered important to the viability of the Scheme?	
h)	Does the proposed development increase pollutant loads to the estuary or its tributaries through catchment runoff or through direct discharges compared to existing (2008) conditions?	
i)	Does the proposed development exacerbate conflicts between the different user groups of the estuary or between the waterway and foreshore users?	
j)	Does the proposed development disturb recognised shorebird roosting and breeding areas?	
k)	Does the proposed development potentially impact on any existing Endangered Ecological Communities (EECs), estuarine and floodplain wetlands, or other significant habitats (including areas utilised by birds protected under international migratory treaties, areas utilised as wildlife corridors across the landscape, and fish and prawn nursery areas)?	
l)	Does the proposed development require significant clearing of vegetation, including clearing within an Asset Protection Zone (APZ)? *Note that any significant vegetation clearing on private lands must be in accordance with an Approved Property Vegetation Plan (PVP), and is subject to the provision of revegetation and biodiversity offsets of local equivalent habitats, consistent with the Environmental Outcomes Methodology as per the Native Vegetation Conservation Act 2003 and as per the Lower Hunter Regional Conservation Plan.*	
m)	Does the proposed development involve bank stabilisation, excavation or river engineering works? *'Soft engineering' bank stabilisation works, using natural products, revegetation, etc, should be used in preference to hardened (eg rock) structures, where possible*	

Ref.	Consideration	Yes / No / NA
n)	Does the proposed development increase low flow extraction from the Hunter estuary or its tributaries	
o)	Does the proposed development involve extraction of sediment? *Where feasible, sediments extracted from dredging operations in the Lower Estuary be considered for reuse as general fill or similar, while sediments extracted from the upper estuary should target contemporary sediment deposits in order to counteract potential detrimental impacts on the river system associated with the deposition.*	

If “Yes” is answered to any of the above questions, then further investigations should be carried out to establish the degree of impact on existing estuary values, with preference for modification to the development to avoid or offset any apparent impacts.

APPENDIX B: REQUIREMENTS OF THE CZMP

The current requirements for the preparation of Coastal Zone Management Plans are outlined in Part 4A of the Coastal Protection Act 1979 and the supporting Guidelines for Preparing Coastal Zone Management Plans (OEH, 2013).

The minimum requirements for preparation of coastal zone management plans have been satisfied by this Hunter Estuary Coastal Zone Management Plan as outlined in Table B-1.

Table B-1 CZMP Minimum Requirements

Minimum Requirement	Addressed by this CZMP
A description of how the relevant Coastal Management Principles have been considered in preparing the plan	Table B-2 details how the Coastal Management Principles have been considered in the plan.
A description of the community and stakeholder consultation process, the key issues raised and how they have been considered	Refer to Section 1.9. Additional detail around the consultation process and how it informed the formation of the CZMP can be found in the Hunter Estuary Coastal Zone Management Study (BMT WBM, 2009). The key issues are documented in Section 2.3.
A description of how the proposed management options were identified, the process followed to evaluate management options, and the outcomes of the process	Refer to Section 8 of the Hunter Estuary Coastal Zone Management Study (BMT-WBM, 2009) for details of the process used to evaluate over 100 potential management options identified through community and stakeholder engagement, and the criteria used to prioritise the strategies. The outcome of this process is the 24 management strategies in Section 3.6 of the CZMP.
Proposed management actions over the CZMP's implementation period in a prioritised implementation schedule which contains details of: • proposed funding arrangements for all actions, including any private sector funding • actions to be implemented through other statutory plans and processes • actions to be carried out by a public authority or relating to land or other assets it owns or manages, where the authority has agreed to these actions (section 55C(2) (b) of the Coastal Protection Act 1979) • proposed actions to monitor and report to the community on the plan's implementation, and a review timetable	Refer to Section 3.6 for the implementation tables for the 24 strategies. Refer to Section 5 for details of the monitoring, evaluation and review process. Letters of support from public authorities have been sought where an authority is involved in an action.
Plan to be prepared using a process that includes: • evaluating potential management options by considering social, economic and environmental factors, to identify realistic and affordable actions • consulting with the local community and other relevant stakeholders. The minimum consultation requirement is to publicly	Refer to Section 8 of the Hunter Estuary Coastal Zone Management Study (BMT WBM, 2009) for details of the process used to evaluate the management strategies. A draft of this CZMP will be publically exhibited by Councils with all submissions considered in accordance with section 55E of the Coastal Protection Act 1979.

Minimum Requirement	Addressed by this CZMP
exhibit a draft plan for not less than 21 days, with notice of the exhibition arrangements included in a local newspaper (section 55E of the Coastal Protection Act 1979) • considering all submissions made during the consultation period. The draft plan may be amended as a result of these submissions (section 55F of the Coastal Protection Act 1979)	
CZMPs are to achieve a reasonable balance between any potentially conflicting uses of the coastal zone.	The extensive community and stakeholder consultation has led to the development of objectives and strategies that seek to balance the environmental, social and commercial interests in the Hunter Estuary.
Clause 3.1 Minimum requirements: Coastal Risk A CZMP which addresses coastal risks should include	
A description of: • coastal processes within the plan's area, to a level of detail sufficient to inform decision-making. • the nature and extent of risks to public safety and built assets from coastal hazards. • projected climate change impacts on risks from coastal hazards (section 55C (f) of the Coastal Protection Act 1979). • suitable locations where landowners could construct coastal protection works (provided they pay for the maintenance of the works and manage any offsite impacts), subject to the requirements of the Environmental Planning and Assessment Act 1979, and • property risk and response categories for all properties located in coastal hazard areas.	Coastal inundation is the primary coastal risk identified with the Hunter Estuary. Section 2.3 outlines the previous flood assessment work that has been undertaken in this area.
Proposed actions in the implementation schedule to manage current and projected future risks from coastal hazards, including risks in an estuary from coastal hazards. Actions are to focus on managing the highest risks (section 55C (d) and (e) of the Coastal Protection Act 1979).	The prioritisation of strategies is provided in section 3, this in associated with funding availability will dictate implementation.
Where the plan proposes the construction of coastal protection works (other than emergency coastal protection works) that are to be funded by the council or a private landowner or both, the proposed arrangements for the adequate maintenance of the works and for managing associated impacts of such works (section 55C(g) of the Coastal Protection Act 1979), and	Not applicable
an emergency action subplan, which is to describe: • intended emergency actions to be carried out during periods of beach erosion such as coastal protection works for property or asset protection, other than matters dealt with in any plan made under State Emergency and Rescue Management Act 1989 relating to	Not applicable

Minimum Requirement	Addressed by this CZMP
emergency response (sections 55C(b) and (g) of the Coastal Protection Act 1979), • any site-specific requirements for landowner emergency coastal protection works, and • consultation carried out with owners of land affected by a subplan.	
Clause 4.1 Minimum requirements for coastal ecosystems A CZMP which addresses coastal ecosystem management is to include;	
A description of: • the health status of estuaries within the plan's area. • the pressures affecting estuary health status and their relative magnitude. • projected climate change impacts on estuary health (section 55C(f) of the Coastal Protection Act 1979).	Section 1.3.1.1 makes reference to this information and further information is contained within the Refer to The Hunter Estuary Processes Study (MHL, 2003). It includes a detailed investigation of the estuary characteristics and processes along with the issues affecting the health of the estuary (including climate change). Management strategies 4 & 20 include actions to further understand pressures affecting estuary health including climate change.
Proposed actions in the implementation schedule to respond to estuary health pressures (section 55C(e) of the Coastal Protection Act 1979)	Refer to Section 3.6. The management strategies have been developed to manage the key issues (pressures) affecting the estuary.
An entrance management policy for intermittently closed and open lakes and lagoons (ICOLLs).	Not applicable
An estuarine monitoring program, consistent with the NSW Natural Resources Monitoring, Evaluation and Reporting (MER) Strategy.	Refer to Section 5. In addition significant monitoring is being undertaken through actions in management strategy 4.
Clause 5.1 Minimum requirements for community uses CZMPS are to contain:	
Proposed actions in the implementation schedule that protect and preserve beach environments and beach amenity, and ensure continuing and undiminished public access to beaches, headlands and waterways, particularly where public access is threatened or affected by accretion (section 55C(c) of the Coastal Protection Act 1979). With a description of: • the current access arrangements to beaches, headlands and waterways in the plan's area, their adequacy and any associated environmental impacts. • any potential impacts (e.g. erosion, accretion or inundation) on these access arrangements, and • the cultural and heritage significance of the plan's area.	Current access and associated impacts are recognized within 1.3.1.1 with further detail provided within The Hunter Estuary Processes Study. Refer to implementation tables in Section 3.8. Management strategies 3, 9, 10, 15 and 18 contribute to objective 21: to increase appropriate public access and amenity to the Hunter Estuary and wetlands. Strategy 24 contains actions to identify and conserve heritage objects, places and landscapes in the Hunter Estuary.
Proposed actions in the implementation schedule to manage any environmental or safety impacts from current access arrangements, and to protect or promote the culture and heritage environment.	Refer to management strategies 3, 9, 10, 15, 18 and 24.

This Hunter Estuary Coastal Zone Management Plan addresses the coastal management principles, as espoused in the CZMP guidelines, as outlined in Table B-2.

Table B-2 Coastal Management Principles

Coastal Management Principles	Addressed by the CZMP
Principle 1: Consider the objects of the Coastal Protection Act 1979 and the goals, objectives and principles of the NSW Coastal Policy 1997.	The guiding principles for the development of this CZMP are shown in Section 2.2 which include consideration of the Coastal Protection Act 1979 and the NSW Coastal Policy 1997. Table A-3 demonstrates how this CZMP meets the objects of the NSW Coastal Policy 1997.
Principle 2: Optimise links between plans relating to the management of the coastal zone.	This plan has been developed with due consideration of other management plans including the Newcastle Coastline Management Plan 2003, and numerous local flood studies.
Principle 3: Involve the community in decision making and make coastal information publically available	Refer to Section 4.3. An extensive community consultation process was undertaken throughout the development of this plan. The CZMP will be available on council websites. Actions in the plan include a public access website so that monitoring and modelling undertaken will be publically available.
Principle 4: Base decisions on the best available information and reasonable practice; acknowledge the interrelationship between catchment, estuarine and coastal processes; adopt a continuous improvement management approach.	An Estuary Process Study (MHL, 2003) and an Estuary Management Study (BMT WBM, 2009) were undertaken to form the basis for the CZMP.
Principle 5: The priority for public expenditure is public benefit; public expenditure should cost-effectively achieve the best practical long-term outcomes.	The management strategy prioritization process included a benefit/cost analysis of each option. Refer to the Hunter Estuary Management Study (BMT WBM, 2009).
Principle 6: Adopt a risk management approach to managing risks to public safety and assets; adopt a risk management hierarchy involving avoiding risks where feasible and mitigation where risks cannot be reasonably avoided; adopt interim actions to manage high risks while long-term options are implemented	Risks to public safety and assets are addressed by local flood studies, including the Hunter River Floodplain Risk Management Study and Plan (MCC, 2015) and the Williams river Flood Study (2009). The Newcastle Coastline Management Plan (2003) looks further at risks to public safety and assets related to the coast.
Principle 7: Adopt an adaptive risk management approach if risks are expected to increase over time, or to accommodate uncertainty in risk predictions	The adaptability of management options to future circumstances was considered in the selection of management strategies and actions. A triggered based approach has been applied to respond to risks that may increase over time.
Principle 8: Maintain the condition of high value coastal ecosystems; rehabilitate priority degraded coastal ecosystems	Actions in the implementation schedule to identify and protect high value ecosystems Eg Ramsar and for rehabilitation/restoration on a priority basis.
Principle 9 : Maintain and improve safe public access to beaches and headlands consistent with the goals of the NSW Coastal Policy	Management strategies 3, 9, 10, 14 and 17 contribute to objective 21; to increase appropriate public access and amenity to the Hunter Estuary and wetlands.
Principle 10: Support recreational activities consistent with the goals of the NSW Coastal Policy	As above.

The objects of the Coastal Protection Act 1979 are broadly to provide for the protection of the coastal environment of the State for the benefit of both present and future generations. The specific objects of the Act and how the Hunter Estuary CZMP addresses them are shown in Table B-3.

Table B-3 Objects of the Coastal Protection Act 1979

Object	Addressed by the CZMP
(a) to protect, enhance, maintain and restore the environment of the coastal region, its associated ecosystems, ecological processes and biological diversity, and its water quality	The first prioritized objective of this plan is to protect and enhance estuarine biodiversity, particularly EEC's, and other key habitats. Numerous management strategies have been developed to meet this objective.
(b) to encourage, promote and secure the orderly and balanced utilisation and conservation of the coastal region and its natural and man-made resources, having regard to the principles of ecologically sustainable development	The extensive community and stakeholder consultation has led to the development of objectives and strategies that seek to balance the environmental, social and commercial interests in the Hunter Estuary.
(c) to recognise and foster the significant social and economic benefits to the State that result from a sustainable coastal environment, including: (i) benefits to the environment, and (ii) benefits to urban communities, fisheries, industry and recreation, and (iii) benefits to culture and heritage, and (iv) benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water	Environmental, social and economic values for the Hunter Estuary have been considered. These values informed the management objectives which in turn informed the management strategies and actions to protect and enhance the values of the estuary.
(d) to promote public pedestrian access to the coastal region and recognise the public's right to access	Objectives and supporting actions in the CZMP aim to increase appropriate public access and amenity to the Hunter Estuary and wetlands.
(e) to provide for the acquisition of land in the coastal region to promote the protection, enhancement, maintenance and restoration of the environment of the coastal region	Not applicable
(f) to recognise the role of the community, as a partner with government, in resolving issues relating to the protection of the coastal environment	Extensive consultation was undertaken in the development of this plan. Many of the actions provide for the continued engagement and involvement of the community.
(g) to ensure co-ordination of the policies and activities of the Government and public authorities relating to the coastal region and to facilitate the proper integration of their management activities	An objective of the CZMP is to achieve consistency and integration between the CZMP and strategic planning and natural resource management instruments. Strategies 1, 2, 6, 7, 11,17, 18,and 21 have actions towards meeting this objective.
(h) to encourage and promote plans and strategies for adaptation in response to coastal climate change impacts, including projected sea level rise	Climate change adaptation has been considered in the management actions.
(i) to promote beach amenity.	The study area does not include open coastal beaches. Amenity of beaches within the bounds of the estuary is preserved under the CZMP.

APPENDIX C: STATUS REPORT OF THE ESTUARY PLAN AT REVISION STAGE, 2016.

Strategy 1: Consistent approach to planning along the estuary

1.1, 1.2, 1.3 and 1.4 – Local Environmental Plans developed for all three Councils using the standard instrument supplied by Department of Planning and Environment. Planning meeting held to discuss intention of zoning along estuary, appropriate zones applied as per decisions by each Council, guidelines/checklists developed as required for heads of consideration.

1.5, 1.6, 1.7 – Ongoing.

Strategy 2: Rezone key habitats

2.1 – Mapping of estuarine habitat undertaken in Newcastle City Council area, yet to be undertaken for whole of estuary.

2.2 – Zonings of estuarine area addressed as required when Local Environmental Plans developed by each Council.

2.3 – On-going as projects arise.

2.4 - Planning meeting held to discuss intention of zoning along estuary prior to development of Council's Local Environmental Plans.

2.5 - On-going process as land becomes available for environmental project work or provided to National Parks and Wildlife to conserve. National park estate in the estuary was expanded in 2010 with gazettal of HWNP that included the Ash Island restoration site of the Kooragang Wetland Rehabilitation Project (KWRP).

Strategy 3: Estuarine/riparian habitat and EEC mapping

3.1 – 3.7 - Mapping undertaken for Newcastle City Council area, yet to be undertaken for whole of estuary, grant funding dependent. Vegetation mapping for Hunter Wetlands National Park and Hunter Wetlands Centre Australia covering Hunter Estuary Wetlands Ramsar site was completed with funding from HLLS.

Strategy 4: Predictive model of estuary

4.1-4.2 – Model being prepared by Hunter Water with direction from the technical sub-committee.

4.3 – 4.6 – Yet to be determined.

4.7 Lower Hunter River Health Monitoring Program which was carried out by OEH in 2014-15 and is pending release at the end of 2016

Strategy 5: Remove barriers to fish passage

5.1-5.3 –Structures/barriers to fish passages are all identified and replacement will be forthcoming as grant finances become available. .

Strategy 6: Conservation Masterplan for Estuary

6.1 – 6.3 – Conservation and Rehabilitation Masterplan for the estuary was created by Hunter Local Land Services to compile relevant data layers and map works undertaken to date.

6.4 – 6.5 – Meetings held by Hunter Local Land Services with key estuary organisations. Masterplan being developed to serve as basis for prioritising future conservation works.

Strategy 7: HECZMP objectives into new National Park Plan of Management

7.1 – 7.4 – A Hunter Wetlands National Park: Draft Plan of Management has been completed and is in the final stage of the review process which includes information on important park values and provides direction for future management.

Strategy 8: Bank erosion remediation

8.1, 8.2 – Boating erosion targeted through a number of years of surveys in the Williams and a year in the Morpeth to Raymond Terrace reach of the Hunter. Works and improvements suggested for the Williams. Any future review of these sites or the rest of the estuary is grant funding dependent. RMS is currently in the process of developing an erosion management plan for the Lower & Upper Williams River. HLLS updated bank condition survey.

8.3 – OEH maintains flood mitigation works to protect built assets.

8.4 – 8.7 – Responsibility of these actions needs to be established. Works to be undertaken on a needs basis and in the main is grant funding dependent. Bank stabilisation works completed on Ash Island by KWRP with HLLS and OEH funded projects.

Strategy 9: Support Regeneration Teams

9.1 – HLLS documented groups working in estuary during the development of the Masterplan

9.2- 9.6 – HLLS established a landcare network which includes groups working in the estuary, distributed masterplan, held workshops, provided funding for restoration projects and incentives for volunteers. Support for volunteers is undertaken as part of projects, grant funding dependent.

Strategy 10: Riparian revegetation guidelines

10.1- 10.3 – State government best practice guidelines followed when undertaking works in riparian areas. Works are grant funding dependent. Volunteers and regeneration groups revegetated riparian zones on Ash Island and access to Stockton Sandspit planting over 200,000 local native plants following restoration guidelines; photographic record and vegetation database is maintained to document results.

Strategy 11: Pollutant control policy / requirements

11.1 – Meeting yet to be undertaken

11.2 – 11.3 – Each Council have requirements either under their manual of engineering standards or development control plans that require stormwater to meet this strategies guidelines. Councils require modelling either through MUSIC or similar to demonstrate compliance for development in discussion with Council engineers.

Strategy 12: Inter-governmental forum for decision-making.

The Local Land Services – Hunter undertook an inter-governmental forum to discuss the progression of the Masterplan. Future meetings will be undertaken in accordance with this strategy on a needs basis as issues arise.

Strategy 13: Community education program

Education and community engagement program undertaken through HLLS KWRP and Newcastle program; activities include annual estuary family festival and shorebird events to raise awareness; schools program and community service days; Kooragang Wetlands website; supporting wetland affiliation with Kushiro Wetlands in Japan through exchanges and events; marine debris program. Further development of this strategy is to be undertaken and is grant funding dependent. Various education programs are currently undertaken through Councils including topics of stormwater quality, stream management, erosion, litter management and marine debris.

Strategy 14: Improve catchment landuse practices

14.1 – 14.5 – Projects undertaken in association with landholders by Local Land Services and advice from the Department of Primary Industries – Agriculture. Actions are dependent on grant funding.

14.6 – Discussions for assistance in management of boat erosion on going with Roads and Maritime Service.

14.7 – Action undertaken on needs basis particularly in relation to customer requests.

Strategy 15: Incentives for sustainable agriculture

This strategy is on-going.

Strategy 16: Biobanking and conservation agreements

To be undertaken following completion of the Masterplan.

Strategy 17: Habitat restoration

17.1 – 17.4 - Activities include data layers in masterplan of on ground works; vegetation database and species lists developed and maintained for KWRP restoration sites; species lists used for HWNP POM;

17.5 – Various projects are being undertaken subject to grant funding throughout the estuary, strategy 17.2 is considered when rehabilitation works are undertaken. Major projects include Hexham Swamp Rehabilitation Project (HSRP), Tomago Wetlands Restoration project, KWRP (three sites), restoration at Stockton Sandspit and Tomago Wetlands for shorebird habitat restoration by OEH NWPS and HBOC; modification of Kooragang Dykes for shorebird habitat (stages 1-4 completed) and *Juncus acutus* control in saltmarsh by OEH NPWS with HLLS and other funding; and monthly shorebird monitoring by HBOC.

17.6 – Considered as appropriate on a case by case basis.

Strategy 18: Relocate / formalise public access

Yet to be undertaken.

Strategy 19: Research projects and programs

19.1 – 19.5 – undertaken on an opportunistic basis. Current projects applicable include the model, bank erosion and estuary status report card.

Strategy 20: Climate change policy

20.1 – Council policy and plans guided by government legislation.

20.2 – Hunter Councils have undertaken climate change risk and adaptation reports for the region in 2009-10.

20.3 – Workshop essentially undertaken through Hunter Councils climate change risk and adaptation project. Further will be undertaken on a needs basis.

Strategy 21: Review salinity trading / water sharing

EPA is currently finalising the 10 year review of the Hunter salinity trading scheme, further information on this review is provided on the EPA website.

Strategy 22: Contaminated sediments assessment

Yet to be undertaken in a formal process, however some individual projects have been completed.

Strategy 23: Reuse of dredged sediments

On-going on a needs basis

Strategy 24: Heritage Management Plan

24.1 - OEH maintains the Aboriginal Heritage Information Management System, system can be accessed prior to undertaking works.

24.2 – 24.6 – *Aboriginal Cultural Heritage Management Plan for the Burralinban Estuary Wetlands (incorporating KWRP and HSRP)* produced by Awabakal LALC, 2010 for HLLS.

Features of European heritage significance on Ash Island were restored and estuary historical information compiled by KWRP.

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