Coastal Zone Management Plan for Shaws Bay, Ballina

Volume 1: CZMP

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Coastal Zone Management Plan for Shaws Bay, Ballina

Prepared on behalf of Ballina Shire Council by Hydrosphere Consulting.

Suite 6, 26-54 River Street
PO Box 7059, BALLINA NSW 2478
Telephone: 02 6686 0006
Facsimile: 02 6686 0078

Project Manager: Mick Howland
Project Team: Robyn Campbell, Katie Pratt, Uriah Makings, Matthew Miles

PROJECT 14-019 – COASTAL ZONE MANAGEMENT PLAN FOR SHAWS BAY, BALLINA					
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1. INTRODUCTION

1.1 Purpose of this Coastal Zone Management Plan

This Coastal Zone Management Plan (CZMP) consists of a scheduled sequence of actions that are recommended to achieve the objectives for management of Shaws Bay, East Ballina (Figure 1).

The main aim of a CZMP is to protect and enhance the key values of the area by increasing resilience of the coastal zone and addressing key threats through efficient, effective and timely management. This is achieved through the implementation of integrated, balanced, responsible strategies to restore and maintain the ecological health of Shaws Bay as well as the recreational and tourism activities associated with it.

The main considerations during the development of the Shaws Bay CZMP were to:

- Involve the community in the preparation of the CZMP including making information relating to the plan publicly available;
- Recognise and accommodate natural coastal processes and hazards;
- Maintain the condition of high value coastal ecosystems and rehabilitate priority degraded coastal ecosystems;
- Address the current and potential risks to estuary health;
- Protect amenity, maintain and improve public access arrangements to foreshores, support recreational uses and protect the cultural and heritage environment;
- Link Council's coastal zone management planning with other planning processes in the coastal zone to facilitate integrated coastal zone management; and
- Base decisions on the best available information and reasonable practice, including adopting an adaptive management approach.

The underlying philosophy of the overall goal from the original 2000 Shaws Bay Environmental Management Plan (EMP) is still considered to be relevant, but the considerations needed to be expanded to include the implications of climate change. Thus, the overall management goal for this CZMP is:

> *"to improve the recreational amenity of Shaws Bay and to ensure that the habitat and ecological values of the Bay are maintained within an acceptable range."*

Figure 1: Shaws Bay CZMP Study Area

1.2 Management Framework

Coastal councils are required to prepare CZMPs in accordance with the Minister's guidelines adopted in 2013 under section 55D of the *Coastal Protection Act, 1979.* This CZMP supports the goals and objectives of the *NSW Coastal Policy 1997* and assists in implementing integrated coastal zone management for Shaws Bay. This CZMP was prepared in accordance with Part 4A of the *Coastal Protection Act, 1979* and the CZMP guidelines (OEH, 2013a).

The CZMP guidelines specify the minimum requirements that are to be met when preparing a CZMP, in addition to the requirements in the Act. The minimum requirements in the guidelines relate to:

- Preparation of the CZMP;
- Coastal risk management;
- Coastal ecosystem health; and
- Community uses of the coastal zone.

Appendix 1 summarises the minimum requirements and how they have been met by this CZMP.

The management strategies contained in this CZMP will direct Council's future strategic planning, as well as other government agencies with responsibility for management of Shaws Bay. The plan will be referred to the Minister for certification under section 55g of the *Coastal Protection Act, 1979* once Council has considered submissions received as part of the public exhibition phase (refer Section 1.6).

At the time of preparation of this CZMP, the NSW Government was reforming its approach to coastal management in NSW. The legislative amendments associated with stage one of the NSW Government's coastal reforms commenced in January 2013. The main elements of the stage one coastal reforms related to amendments to the Coastal Protection Act, 1979 including the creation of a Code of Practice for 'Temporary Coastal Protection Works', Section 149 information and the consideration of coastal hazards in the context of local circumstances (the State Government will no longer recommend state-wide sea level rise benchmarks). Stage two of the reforms has a strategic focus and is closely linked to the current planning reforms and local government reviews. Future review of this CZMP will consider the policy context in place at that time.

Once certified, the Plan will be formally adopted by Council and published in the Government Gazette.

1.3 Development of the CZMP

To achieve the aims outlined above, the CZMP was prepared through a series of project phases. Each phase was an essential step in the development of the CZMP. The key phases were as follows:

- Collection and consolidation of background information from a range of sources including existing documentation, Council staff, external stakeholders and the community;
- Analysis of the information from existing studies on coastal hazards, estuary health and community uses (documented in Volume 2 – Supporting Information) to identify management issues (Section 4);
- Development and prioritisation of potential options to address the management issues (Appendix 3);
- Development of a strategic plan to address the priority management issues including an implementation framework with clearly defined and prioritised outcomes, actions, timeframes, funding, responsibilities and monitoring requirements (Section 5); and
- Consultation with stakeholders to obtain feedback on the proposed strategy.

The development of the CZMP has followed a risk-based and adaptive management approach to the assessment of issues, options and the overall implementation plan. Risks are assessed in terms of the risk to the environment, public safety and assets posed by identified threats, but also in terms of the risk that these

threats may pose to the likely success of any management option being considered as part of the CZMP. The hierarchy for risk management options starts at avoidance of risk, changing the likelihood or consequence of the risk through to sharing, or simply informed acceptance of the risks. All management options have been assessed considering social, environmental and economic implications.

Assets and properties at risk have been identified from the existing and/or derived information on erosion rates, ocean levels, etc. documented in Volume 2 to determine risks to property, infrastructure and estuary health within the study area. Risks to public safety and amenity have been considered in terms of usage patterns, environmental factors, access arrangements, infrastructure and any user conflict.

Adaptive management is facilitated by the inclusion of monitoring and verification actions in the CZMP but also in the general approach to assessing issues, options and the implementation schedule for actions. Interim actions have been proposed to manage high risks if these can only be mitigated over the longer term or the risks are likely to increase with time. A lack of detailed knowledge on issues does not preclude positive management action where such action is logical and can be modified with appropriate feedback obtained through monitoring. All proposed actions have nominated key performance indicators to facilitate on-going assessment which is fundamental to an effective adaptive management strategy.

1.4 Shaws Bay Estuary Management Plan

The Shaws Bay Estuary Management Plan (EMP, PBP, 2000a) was prepared to address the management needs of Shaws Bay and propose activities to address those needs. The issues addressed in the 2000 EMP were identified by the Shaws Bay Estuary Management Committee (which is no longer active) and through community consultation activities. The EMP included an Estuary Processes Study (PBP, 2000b) to provide an understanding of physical, chemical and biological processes within the Bay and enable prioritisation of the management issues based on their actual impact on the environmental and recreational values of the Bay.

A variety of options (structural and non-structural measures) were developed as part of the EMP to address the management objectives. Management tasks were then proposed to address the primary management issues of pollution, siltation, recreation and ecology. The status of these management tasks is discussed in Volume 2: Supporting Information and referenced as part of the discussion of existing management actions (Appendix 3).

1.5 Related Management Plans

This CZMP has links to many other natural resource management plans and strategies adopted or being developed by Ballina Shire Council (BSC) and government agencies. The roles and responsibilities of the various land managers are summarised in Appendix 2. Council, government agencies and statutory bodies are implementing management programs in parallel with the preparation of this CZMP and many of these initiatives are related to the management of Shaws Bay. This CZMP complements and defers to existing plans of management (refer Section 3.2, Volume 2) including:

- *CZMP for the Richmond River Estuary* (2010);
- *Ballina Urban Stormwater Management Plan* (2012);
- *CZMP for Ballina Shire Coastline* (draft, 2013) (which addresses coastal hazards of shoreline recession and coastal inundation);
- *Ballina Floodplain Risk Management Study* (2012) and *Draft Floodplain Management Plan* (draft, 2014);
- *Ballina Coastal Reserve Plan of Management* (2011);
- *Vegetation Management Plan for East Ballina Reserves* (2014);

- *Northern Rivers Regional Biodiversity Management Plan* (2010);
- *Shorebirds of Northern NSW* (2010);
- *Threatened Species (Pied Oystercatcher) Management Strategy* (2007)*;* and
- Crown Lands *Plan of Management for Shaws Bay Holiday Park* (draft, 2014).

When developing management strategies for the Shaws Bay CZMP, the intention is not to duplicate any of the actions already contained in other plans. The aim is to support the catchment and shire-wide initiatives contained in these plans, ensuring the detailed issues identified by the Shaws Bay CZMP are considered appropriately. Costs for the Shaws Bay CZMP have been estimated for actions to specifically address issues in this study area, however, in many cases, funding has already been identified as part of management actions in other plans. The related management plans will be referred to where appropriate, ensuring consistency between planning documents and avoiding duplication of costs. Where issues identified by this Plan are not addressed by other plans, local management strategies have been developed and costs estimated accordingly.

1.6 Community and Stakeholder Consultation

Community and stakeholder consultation has been undertaken to inform the development of the 2000 EMP as well as this CZMP. The 2000 EMP obtained information on community values, issues and concerns with regard to Shaws Bay. Consultation undertaken for this CZMP included a community survey, project webpage, community drop-in sessions, targeted consultation with key stakeholder groups, Council and agency consultation. The information collated during the consultation program has been used to develop management objectives, identify management issues and establish community desires for future management of Shaws Bay.

The Draft CZMP was placed on public exhibition for 21 days (as per legislative requirement) during September 2014. At the expiry of the exhibition period three public submissions were received by Council and have been considered in this final document.

Consultation activities have been documented in Section 4, Volume 2.

2. THE STUDY AREA, KEY FEATURES AND VALUES

The study area for the Shaws Bay CZMP is located near the mouth of the Richmond River in East Ballina on the NSW north coast within the BSC local government area. The boundary of the study area follows the topographical catchment for Shaws Bay as shown in Figure 1. For the purposes of this CZMP, the waterway has been divided into three distinct areas (as in the 2000 EMP) shown on Figure 1: Northern Section; Main Section; and East Arm.

This management plan focuses on issues with direct impact on Shaws Bay. Areas of the broader topographical catchment as indicated in Figure 1 are only considered where activities or processes occurring in the catchment have been shown to affect the health and/or function of Shaws Bay.

Figure 2 and Figure 3 provide an overview of the key features and values of Shaws Bay including recreational and community use, built amenities, estuarine and terrestrial vegetation. The land surrounding the Bay includes a mix of residential and tourist accommodation and recreational areas. The study area includes:

- Part of the Shaws Bay Caravan Park;
- The Shaws Bay Hotel and Fenwick House;
- Residential developments;
- The Ballina Lakeside Holiday Park;
- The off-leash dog exercise area along Compton Drive;
- Pop Denison Park;
- The Ballina Beach Resort;
- The reserve west of the Lighthouse Beach sand dunes and along Fenwick Drive;
- The Volunteer Marine Rescue Tower; and
- The northern training wall of the Richmond River.

Shaws Bay is a popular recreational area of great importance to the local community. Shaws Bay and the adjoining foreshore areas have a long association with the leisure time pursuits of the residents of Ballina and visitors to the area. The natural assets attract visitors to the area and a variety of man-made features and facilities have been developed in response to provide access and facilitate recreational use. Today popular community uses of Shaws Bay include swimming, snorkelling, use of a variety of passive watercraft (kayaks, canoes, paddle boards etc.), walking, cycling, bird-watching and nature appreciation, picnicking/BBQ and recreational fishing.

The foreshore features include sandy shorelines, a retaining wall supporting Compton Drive and the Shaws Bay Caravan Park, concrete steps providing access to the Bay adjacent to Shaws Bay Caravan Park, rock revetment along the Northern Section of the East Arm and the northern training wall of the Richmond River. Community infrastructure and amenities include public toilets, picnic shelters and tables, a playground and boules area, outdoor showers and benches (Figure 3).

The wider Richmond River estuary has spiritual and cultural significance for local communities. Both European and Aboriginal heritage sites and items exist in and around the estuary and their recognition and protection are important to the local community. Given the long period of Aboriginal use of the land there are numerous sites around the Richmond River estuary that are of Aboriginal heritage significance. The East Ballina Aboriginal Place (gazetted in 2012) extends from Richmond Park in the north of the study area (the rainforest escarpment below Suvla Street and the off-leash dog walking reserve) to Flat Rock and includes East Ballina Cemetery, Chickiba wetlands and Angels Beach. It is a place of special significance to Aboriginal culture and people. Management of Aboriginal Heritage matters in the shire is overseen by Jali Local Aboriginal Land Council and is supported by the *National Parks and Wildlife Act, 1974* and the *NSW Heritage Act, 1977* which provide legal protection for Aboriginal sites and relics in NSW. The protection of Aboriginal cultural heritage at Shaws Bay was not raised as an issue in stakeholder consultation undertaken for this CZMP, potentially due to the modified environment of Shaws Bay.

Shaws Bay has evolved into a diversity of habitats for a wide variety of flora and fauna. Important estuarine habitats include areas of seagrass, saltmarsh and mangroves (Figure 3). Terrestrial vegetation in the immediate vicinity of the Bay and surrounding catchment also provides habitat for a range of species and includes protected vegetation communities. A number of threatened fauna species are known to utilise Shaws Bay including shorebirds, raptors and fish species.

a

b

c

d

e

f

Figure 2: Key features of Shaws Bay

a – Shaws Bay Caravan Park, b – foreshore in front of Fenwick House and Shaws Bay Hotel, c – foreshore in front of Ballina Lakeside Holiday Park, d- Pop Denison Park, e - Northern training wall, f – East Arm (at high tide)

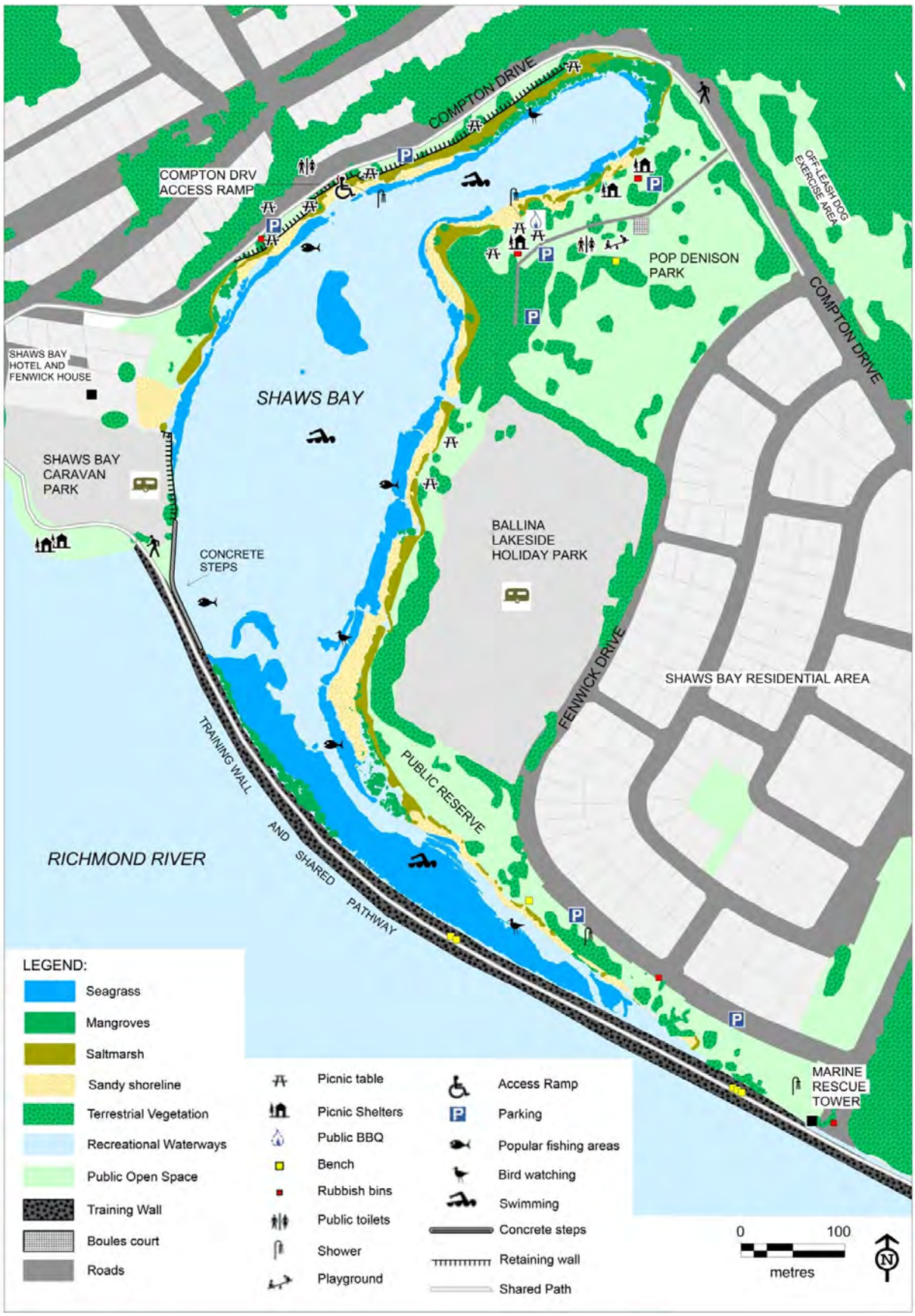

Figure 3: Shaws Bay Key Features and Values

3. MANAGEMENT OBJECTIVES

To ensure a balance between long term utilisation and conservation of Shaws Bay, management objectives have been applied to this CZMP. The original objectives of the 2000 EMP (refer Section 1.2) have been reviewed with consideration of current community values, Council and NSW Government policy and current and emerging management issues. The underlying philosophy of the overall goal from the 2000 EMP is still considered to be relevant, but the considerations need to be expanded to include the implications of climate change. Thus, the overall management goal for this CZMP is:

> *"to improve the recreational amenity of Shaws Bay and to ensure that the habitat and ecological values of the Bay are maintained within an acceptable range."*

This goal addresses the two most significant and sometimes conflicting values of the Bay – recreation and ecology. Management objectives have been developed to achieve this goal and address the range of current and future management issues identified for the Bay.

The management objectives for the CZMP for Shaws Bay are:

Objective 1: To protect and enhance ecological values in Shaws Bay

Objective 2: To protect cultural heritage values in Shaws Bay

Objective 3: To protect the visual amenity and character of the local area

Objective 4: To maintain and improve public access and use of Shaws Bay

Objective 5: To minimise and manage risk to public health and safety

Objective 6: To minimise and manage risks to community assets in Shaws Bay

Objective 7: To promote sustainable development

Objective 8: To adequately plan for management of known future risks

Objective 9: To provide efficient and effective management

Objective 10: To maximise the likelihood of success of management strategies

Objective 11: To minimise overall cost while achieving the goals of the CZMP

Objective 12: To ensure consistency with other strategic planning instruments and programs

The objectives are consistent with the nine goals of the *NSW Coastal Policy 1997* but have been expanded and adapted to be relevant to the local area values to be protected. Table 1 shows the relationship between management objectives and the goals of the Coastal Policy.

Table 1: CZMP management objectives and relationship to goals of the NSW Coastal Policy 1997

Objective	Detailed description of objective	Goals of the *NSW Coastal Policy 1997*
Objective 1: To protect and enhance ecological values in Shaws Bay	• Reduce pollution impacting the Bay • Maintain, rehabilitate and/or improve the riparian zone • Maintain, rehabilitate and/or improve the foreshore zone • Enhance habitat values of the Bay	1. To protect, rehabilitate and improve the natural environment 2. To recognise and accommodate natural processes and climate change
Objective 2: To protect cultural heritage values in Shaws Bay	• To identify significant cultural heritage values • To assess impacts on cultural heritage values • To minimise impacts on cultural heritage values	4. To protect and conserve cultural heritage
Objective 3: To protect the visual amenity and character of the local area	• Preserve the beauty and unique character of Shaws Bay • Preserve iconic elements such as Lakeside Caravan Park, Shaws Bay Holiday Park and Pop Denison Park • Protect flora and fauna species and habitat values to enhance nature-based activities around the Bay	3. To protect and enhance the aesthetic qualities of the coastal zone
Objective 4: To maintain and improve public access and use of Shaws Bay	• Ensure suitable access to foreshore and waterway is retained • Maintain/repair or relocate access that is impacted by coastal hazards	7. To provide for appropriate public access and use
Objective 5: To minimise and manage risk to public health and safety	• Identify appropriate setbacks for infrastructure, access points and buildings from the shoreline • Remove/rehabilitate hazardous areas and infrastructure • Provide information to the community about safety risks • Protect and improve water quality in the Bay	3. To protect and enhance the aesthetic qualities of the coastal zone 7. To provide for appropriate public access and use
Objective 6: To minimise and manage risks to community assets in Shaws Bay	• Implement management strategies to avoid or address risks to community assets • Allow for on-going use of community assets	3. To protect and enhance the aesthetic qualities of the coastal zone 5. To promote ecologically sustainable development and use of resources 7. To provide for appropriate public access and use

Objective	Detailed description of objective	Goals of the *NSW Coastal Policy 1997*
Objective 7: To promote sustainable development	• Enhance recreational amenity • Preserve community uses (fishing, swimming, boarding and foreshore use etc.) • Enhance social benefits (employment, sense of place, community) • Promote economic benefits for the community (tourism dollars, land value etc.)	5. To promote ecologically sustainable development and use of resources 6. To provide for ecologically sustainable human settlement
Objective 8: To adequately plan for management of known future risks	• Have a long term view when assessing the true costs and benefits of management responses (i.e. don't necessarily choose cheap options for quick fixes, if the cost is likely to be greater in the future).	2. To recognise and accommodate natural processes and climate change
Objective 9: To provide efficient and effective management	• Timely management and governance • Conduct monitoring of management strategies to measure success and improve practice • Identify equitable funding sources for implementation of management actions	8. To provide information to enable effective management 9. To provide for integrated planning and management
Objective 10: To maximise the likelihood of success of management strategies	• Foster community ownership of the management strategies and involvement in the implementation of the actions • Undertake community education about issues, the need for management and the options selection process • Enhance public awareness and support of adopted management strategies • Include community in decision making	8. To provide information to enable effective management 9. To provide for integrated planning and management
Objective 11: To minimise overall cost while achieving the goals of the CZMP	• Minimise costs where possible while achieving aims of management (get the best 'bang for buck') • Ensure true costs are reflected in assessment of options (quick fix may be cheap but costs may be more in the long run)	none
Objective 12: To ensure consistency with other strategic planning instruments and programs	• To provide a consistent management framework that logically facilitates efficient and effective management • To ensure management is not duplicated from other planning instruments or programs, but supports and refers to other programs where appropriate	9. To provide for integrated planning and management

4. SUMMARY OF MANAGEMENT ISSUES AND CAUSES

The coastal and estuarine processes currently affecting the health and amenity of Shaws Bay are discussed in detail in Volume 2 and summarised below. Many of the management issues and their causal factors are interlinked.

Shaws Bay is an artificial embayment that has long been regarded as an important community asset and tourism drawcard which is utilised for a variety of water and shore-based activities including swimming, paddling and angling. Despite being heavily modified from its original condition, Shaws Bay is a thriving part of the Richmond River estuary and is also a focus for nature-based recreation. Due to its popularity as a recreational asset, many of the issues raised during stakeholder consultation for this CZMP relate to the community's expectations regarding these recreational pursuits and changing circumstances that lead to reduced recreational experiences. Although not unique in this regard, Shaws Bay is an excellent demonstration of the conflict arising between stakeholder expectations and environmental processes in a modified environment.

The underlying cause of many of the issues cited by stakeholders is the changing nature of the Bay, particularly with respect to bathymetry. Figure 4 provides a summary of issue and causes relating to physical processes in the Bay. Shaws Bay was originally part of a series of shifting sand shoals at the mouth of the Richmond River until the construction of the river training walls isolated the Bay from the dynamics of the River. This, along with significant landscape modification associated with the development of what is now the Ballina Lakeside Holiday Park and the Shaws Bay residential area transformed Shaws Bay into a protected estuarine embayment. Since that time, the Shaws Bay environment has been responding to those changes, with the calmer waters of the Bay allowing sediment infilling without the balancing effect of scouring flood flows. To counter this, and to create beaches along the western margin that did not naturally have sandy beaches, dredging was regularly undertaken until the 1990s to deepen and enhance the recreational amenity of the Bay. Many of the community members reminiscing about the Bay favourably recall the Shaws Bay environment then and have expectations that the state of the Bay will continue to offer the same opportunities for younger generations.

Since the cessation of dredging in the Bay, gradual on-going infilling has been occurring and community concerns have been raised regarding the depth in key locations. The reduced bathymetry and bottom visibility influences swimmers' perceptions of the nature of the Bay, but also allows for increased growth of seagrass in areas that were previously open and/or deep water. Community members have expressed concern that seagrass is taking over the Bay. Although previously cleared in locations such as the East Arm, seagrass growth is no longer artificially controlled within Shaws Bay, but remains absent in heavily trafficked areas where sediment disturbance is enough to discourage growth. Despite may people's desire for the removal or control of seagrass, it is well recognised that marine vegetation communities provide vital aquatic habitat and provide ecosystem services such as improved water quality (e.g. through the settlement of turbid water). Shaws Bay hosts a significant area of the Richmond River estuary's seagrass communities.

The growth of mangroves around the Bay is the topic of some debate. The proliferation of juvenile mangroves in many areas of the Bay is controlled by Council clearing of key access locations under a permit from Fisheries NSW. The stand of mangroves along the training wall is often blamed for the reduced tidal exchange of water between the Richmond River estuary and the Bay through the otherwise porous structure of the wall. However some records suggest that the affected section of wall may have always been impervious and the subsequent siltation and mangrove colonisation of this area is a natural result of relatively low tidal water velocities in this area.

Water quality is one of the most frequent concerns raised by stakeholders, despite the high levels of tidal exchange with the Richmond River (Figure 5). Tidal flushing of the East Arm occurs daily, with other parts of the Bay completely turned over typically in less than a week. This degree of free exchange with the Richmond River is a double-edged sword as the typically good quality of the marine water in the lower

reaches of the Richmond River helps to ensure that Shaws Bay remains clean and healthy. However, this open connection also means that poor water quality during catchment flood events also enters the Bay, bringing high suspended sediment loads (the main source of infilling sediment) and pathogens making its waters unsuitable for swimming for a number of days after such events. It is perceived that the stormwater system draining into Shaws Bay is responsible for poor water quality in the Bay however, in general Shaws Bay reflects the water quality of the Richmond River and occurrences of poor water quality are not generally attributable to drainage from the Shaws Bay local catchment.

The fact that high tides can freely penetrate the training wall and enter Shaws Bay exposes the surrounding area to inundation risks due to high ocean levels (Figure 6). Ocean levels can rise in response to storm events where reduced barometric pressure and onshore waves can combine with astronomical tides to create elevated risk. Such risks are compounded by the on-going phenomenon of sea level rise, with average sea levels projected to rise 40cm and 90cm by 2050 and 2100 respectively, relative to 1990 levels. The low-lying area of the Ballina Lakeside Holiday Park and surrounding residential area is particularly at risk from not only overland inundation, but also the intrusion of high water levels through the stormwater network as is the case in other areas of Ballina.

Sea level rise also leads to other issues for Shaws Bay and is likely to result in the shoreward migration of marine vegetation communities over time. Where opportunities for this migration is restricted, for instance by the presence of Compton Drive, or land use in the Holiday Park, marine vegetation can become 'squeezed' between the rising average water levels and the landward restriction. In the case of Shaws Bay, the existing topography is such that the narrow elevation band populated by mangroves will be the most restricted with sea level rise, whereas seagrass and saltmarsh may have more suitable areas than present.

Bank erosion is not a major issue for the majority of Shaws Bay, although the northern bank of the East Arm continues to erode due to strong tidal flows and pulsing nature of long period waves propagating from the Richmond River entrance through the training wall. The remnants of failed erosion control attempts are visual indicators of the extent of bank retreat in this area. This erosion reduces the amenity and public safety of the East Arm and also contributes to sedimentation within the Bay. Other locations have low erosion risk due to the sheltered nature of the Bay, however in the long term, modest shoreline retreat due to rising sea-levels is still likely in areas with low gradient shorelines such as near Pop Denison Park.

Shaws Bay is home to a variety of fish and is regarded as a safe, relaxing angling destination, particularly for young children. Despite the partial isolation from the main River, large fish live in Shaws Bay and have been the subject of some controversy. The protected Estuary cod are regularly seen along the edges of the training wall, whilst large trevally and mullet have the disconcerting habit of 'bumping' swimmers in the Bay (Figure 7). Illegal fishing for the cod as well as crab trapping still occurs in Shaws Bay and has led to calls by concerned individuals for a ban on fishing or establishment of a marine reserve which raised as many objectors as supporters within the community. The conflict of opinion regarding fishing in Shaws Bay is a demonstration of the high value and sense of ownership that much of the community has with the Bay. It is treasured as a fishing location but equally warrants protection from illegal fishing, whilst swimmers would rather remain unmolested by large fish while traversing the Bay's waters.

The management issues addressed in this CZMP are summarised below and illustrated in Figures 4 to 7.

Issue 1: Recreational amenity and ecosystem health may be compromised by poor water quality/circulation

The key issues relating to poor water quality are:

- Siltation/shoaling in the Bay results in poor flushing and tidal exchange in some parts of the Bay;
- Wet weather/flood flows from the Richmond River contribute significant sediment and nutrient loads to Shaws Bay. This may be exacerbated by increased storminess resulting from climate change;
- Lack of awareness of water quality risks; and

- Pollutants from urban stormwater runoff.

Issue 2: Community access to and use of the waterway is being affected by coastal processes

Key causes are:

- Siltation/shoaling in the Bay resulting in shallowing;
- Bank erosion resulting in safety risks and access limitations;
- The proliferation of seagrass and mangroves along the water's edge which limits clear access to the waterway and contributes to sedimentation;
- Bacterial and biological irritants which cause skin irritations; and
- Poor water quality as discussed in Issue 1.

Issue 3: There is a need to adequately manage the fishery resource of the Bay

This relates to:

- Poor water quality as discussed in Issue 1;
- The need to preserve fish populations;
- The popularity of recreational fishing in the Bay;
- Instances of illegal fishing/trapping; and
- Reported contact between large fish and swimmers.

Issue 4: The community has a desire for improved foreshore facilities

This desire has resulted from:

- The poor condition of some foreshore facilities; and
- Limited facilities in some areas around the Bay.

Issue 5: There is a need to adequately manage community use and ecosystem health conflicts

These conflicts relate to:

- The management of seagrass and the need to preserve marine habitat and water quality while providing suitable access to the waterway;
- The preservation of the natural amenity of the area and the community desire for enhanced recreational facilities;
- The impacts of coastal squeeze on habitat values; and
- Migration of fringing marine vegetation due to sea level rise.

Issue 6: There is a risk of inundation of developed land

The factors influencing this risk are:

- Low-lying land;
- Sea level rise;
- Catchment flooding;
- Ocean inundation; and
- Stormwater conveyance and flooding.

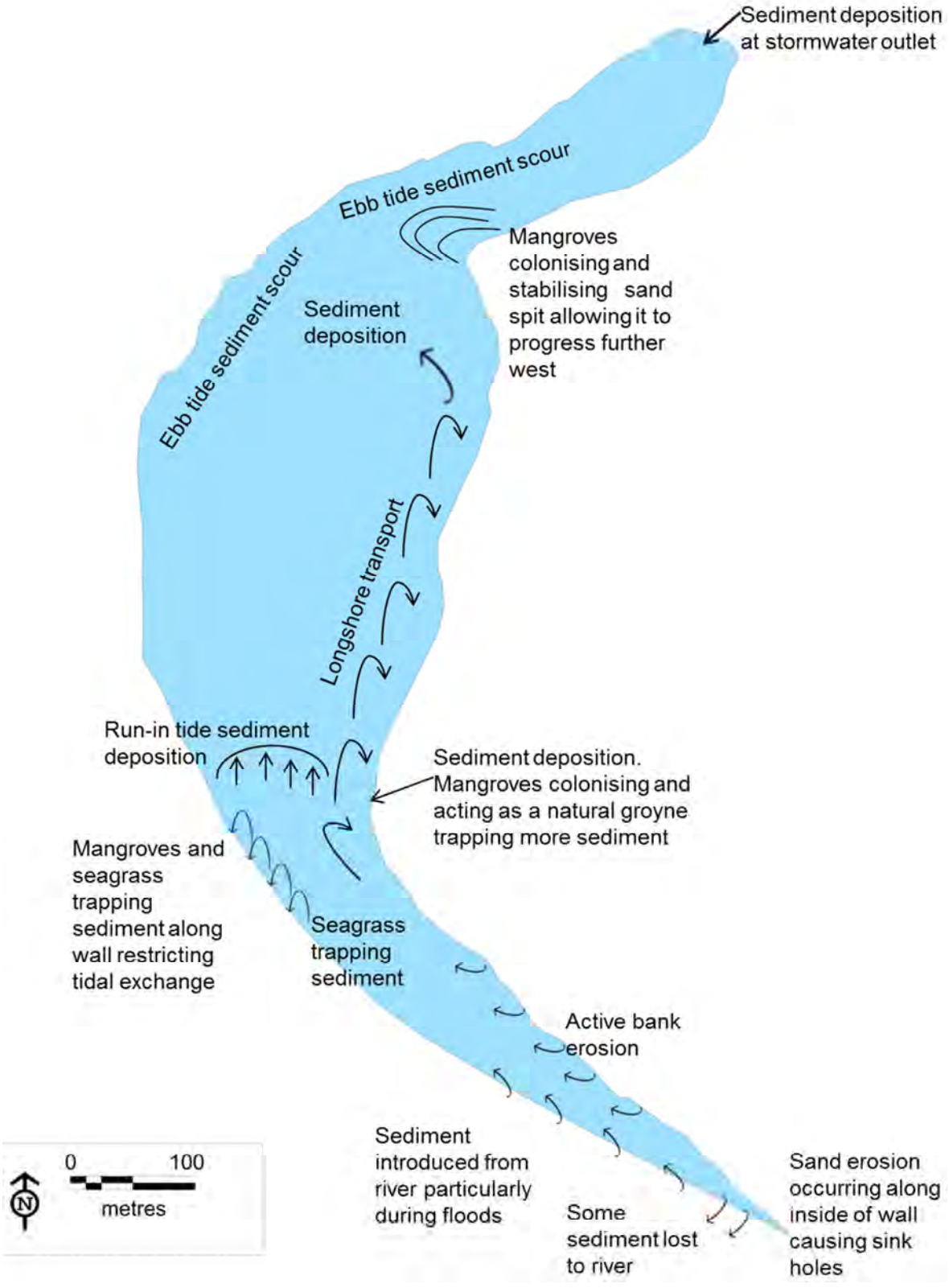

Figure 4: Siltation issues and processes

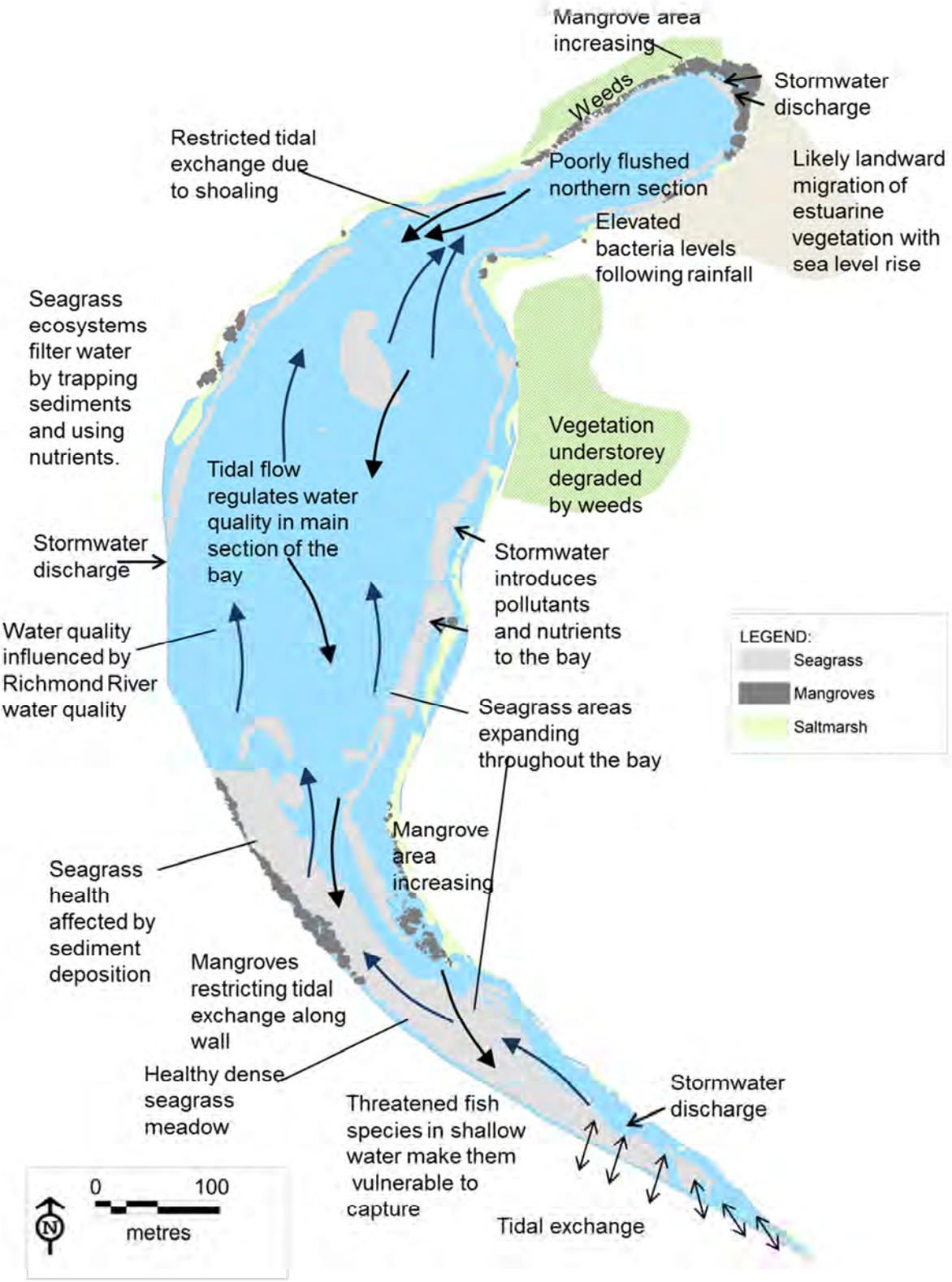

Figure 5: Water quality and ecosystem health issues and physical processes

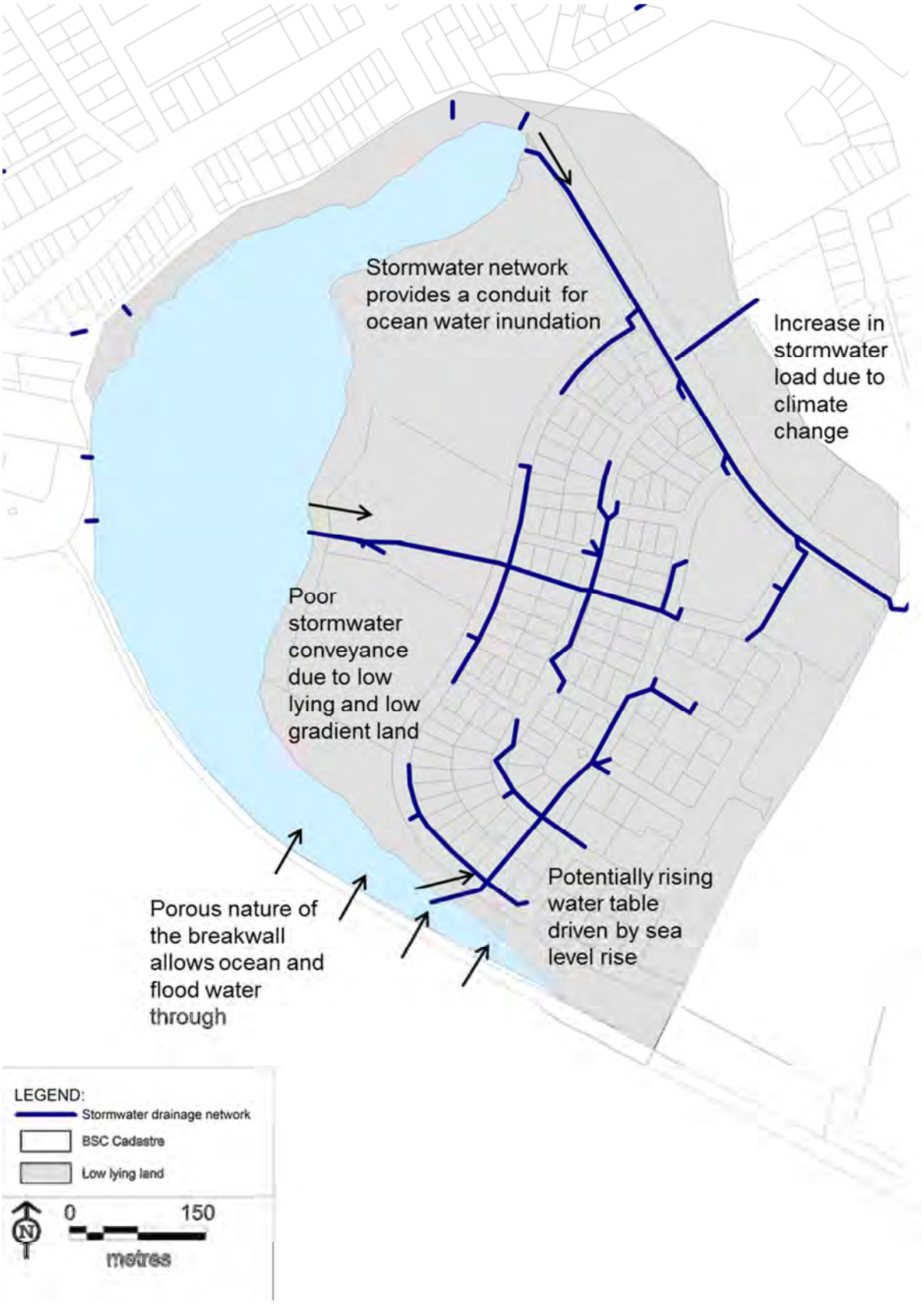

Figure 6: Inundation process

Figure 7: Community use issues

5. CZMP DEVELOPMENT

5.1 Recommended Options

The potential management options to address the management issues are discussed in Appendix 3. The potential options have been evaluated and prioritised by considering a number of factors including:

- Expected success in resolving the management issues;
- Cost of implementation;
- Effectiveness of each action in addressing the management objectives – refer Appendix 4;
- Expected level of community support and acceptance of the action; and
- Environmental impacts (both positive and negative).

Option 12: Dredging of Main Section is considered to be the optimal approach to controlling siltation and infilling in Shaws Bay. Additional technical investigation and environmental assessment is required to determine impacts on estuarine vegetation, applicable offsets and approval requirements. Dredging would be combined with Option 19: Creation of sandy shoreline as this would be the ideal source for clean sand for the beaches. It is acknowledged that dredging would need to be repeated at regular intervals to control infilling. Similarly the creation of the sandy shoreline would need to be repeated due to the reworking of sediments in the Bay. This will be reflected in the implementation plan.

Despite the recommendation to regularly dredge the Bay, not pursuing dredging (due to potential budget constraints or difficulty in obtaining approvals) is not considered to substantially alter the success of the remaining actions in the short term. Option 11: Allow infilling is the alternative in this case as discussed in Appendix 3.

Options relating to data collection, monitoring and studies to determine the preferred future direction are considered essential to achieve the risk-based and adaptive management approach adopted for this CZMP:

- Option 1: Modify Beachwatch program
- Option 2: Expand Richmond River Ecohealth monitoring program to include Shaws Bay
- Option 3: Regular hydrographic surveys
- Option 5: Review and upgrade of stormwater pollution controls
- Option 29: Development of strategy to address inundation risk in Shaws Bay

Options aimed at increasing public education and awareness are considered to be essential in achieving successful outcomes for other related actions:

- Option 8: Improve education and awareness of public health issues
- Option 14: Community education about the value and role of estuarine vegetation
- Option 16: Community education – recreational fishing
- Option 26: Community education and awareness of biological irritants

Options which are expected to be successful in directly addressing the overall goal of improving recreational amenity while protecting ecosystem health will form a key component of the implementation plan:

- Option 9: Implement East Arm erosion controls (modified)
- Option 13: Provide for enhancement of estuarine vegetation

- Option 15: Amend mangrove exclusion areas permitted under Fisheries NSW maintenance permit
- Option 20: Western foreshore improvements
- Option 21: Expansion of Pop Denison Park access and facilities
- Option 22: Eastern foreshore improvements
- Option 23: Development of Fenwick Drive recreational area and foreshore area improvements
- Option 24: Rehabilitation of training wall steps
- Option 25: Weed management along training wall

Some options will not be pursued on the basis of technical or cost-effectiveness:

- Option 4: Divert stormwater from Shaws Bay
- Option 6: Increase water exchange through wall
- Option 7: Improve circulation within the Bay
- Option 10: Clearing of mangroves along wall
- Option 17: Fishing ban
- Option 18: Removal of mature fish
- Option 27: Chemical insect control
- Option 28: Raking of shoreline

5.2 Management Actions

Actions have been developed from the options described in Appendix 3 and consist of a combination of studies, investigations and on-ground works. Some actions require additional research or assessment prior to implementation of on-ground works. This is to ensure the appropriate effort, funding and geographical focus of on-ground works is undertaken.

Management strategies and actions have been developed for a ten year period. This CZMP and the progress of the management actions should be reviewed to ensure the actions remain relevant and the implementation of the plan is being achieved.

The recommended management actions have been described in terms of:

- Related Options – as discussed in Appendix 3;
- Desired Outcome – the specific result to be achieved by implementation of each action;
- Responsibility – responsibilities for implementation of the management strategies have been assigned to Council or the relevant agency. In addition, support from various other local government and non-government organisations and groups including industry bodies, private landholders and community groups will be essential in the implementation of the plan. The actions identify the Lead Organisation as well as Support Organisations which may be required and/or requested to assist in implementation of the action, either through their regulatory role or land management function or as a potential funding or information source;
- Cost Estimate – a broad estimate of costs for implementation over the 10 year life of the plan is provided. Refer to Section 5.2.1 – Implementation Program for a breakdown of action costs. Cost estimates cover the tasks listed in the actions (including preliminary investigations, environmental assessments, approvals and implementation) unless otherwise stated. Cost estimates provided in the action descriptions are preliminary only and based on the best available information;

- Potential Funding – the CZMP strategies are expected to be funded through Council and State Government contributions, monetary grants and in-kind contributions. Identification of grants and successful application is an important component of this CZMP. A summary of potentially relevant and available grant schemes is given in Appendix 5. It is important to note that many grants and funding sources are only available up to a limited budget and as such, the available grants are changing from year to year. It will be necessary to keep abreast of current funding availability throughout the implementation of the CZMP. In most cases it is expected that in-kind contributions will be provided by Council. Collaboration with educational institutions may also provide opportunities for research projects.

  Where actions are implemented through a concurrent program, additional expenditure and funding have not been included. This is the case for some strategies being implemented as part of the Richmond River CZMP.

  Similarly, where a study/review is required to determine the appropriate level of expenditure, the cost of the review has been estimated in the action planning. Implementation costs should be confirmed by the results of the review;

- Timing – indicative timeframe for implementation. Based on the priorities developed in this CZMP, timeframes for management actions have been developed. The assumed start date for CZMP implementation is 1 July 2015, following Council adoption of the Plan. The CZMP has a planning timeframe of 10 years, therefore the duration of the Plan implementation period is from 1 July 2015 to 30 June 2025. Management actions have been scheduled according to the following timeframes:
  - Immediate (Year 1);
  - On-going: starting year 1 and implemented over the 10 year life of the CZMP with possible extension beyond that period;
  - Short term: year 1 – 3;
  - Medium term: year 4 – 6; and
  - Long term: year 7 – 10;
- Location – location of actions within Shaws Bay;
- Description of Tasks – an outline of the scope of works required; and
- KPIs (Key Performance Indicators) – target(s) for each action which can be used to measure the level of success.

The actions are described in the following sections.

5.2.1 Improvement Actions

Actions to improve recreational amenity or ecosystem heath are discussed below and shown on Figure 8.

Figure 8: Summary of Shaws Bay Improvement Actions

Action 1: Control of East Arm bank erosion and creation of sandy beach

Desired Outcome	Improved public safety and amenity of Fenwick Drive foreshore and reduced sedimentation in the Bay
DESCRIPTION OF TASKS:	
1. Detailed design based on the GeoLINK (2009) concept plan but to include: • Fill sink holes along the wall utilising geofabric to prevent loss of fine material to the wall voids; • Increase the length of rock protection ensure the extent of protection of erodible bank is optimised; • Removal of loam capping material and re-profiling (and minor extension) of the East Arm beach; and • Clean up of remnant materials/infrastructure such as rock, concrete, failed stairs, logs, etc. 2. Liaison with regulatory authorities including Fisheries NSW; 3. Undertake environmental assessment and obtain approvals; 4. Seek funding approval; 5. Implement design; and 6. Monitor and report on effectiveness of works undertaken.	
Lead Organisation	BSC
Support Organisation	OEH, Fisheries NSW
Total Cost Estimate (10 year)	$200,000
Potential Funding Sources	BSC, NSW Estuary Management Program
Timing	Short term
Location	Fenwick Drive, East Arm
KPIs	• Design and approvals completed by June 2016 • Construction completed by June 2017
Related Options	Option 9: Implement East Arm erosion controls (modified) Option 23: Development of Fenwick Drive recreational area and foreshore area improvements

Action 2: Dredging of Main Section of Shaws Bay

Desired Outcome	Reduced infilling and improved water circulation
DESCRIPTION OF TASKS:	
1. Investigations: • Detailed assessment of impacts on marine vegetation; • Determination of the nature of sediments within the target dredge area; • Assessment of suitable dredging, dewatering and sediment placement methodology; • Conduct pre dredging hydrographic survey in order to gain an understanding of the change to bathymetry resulting from the dredging 2. Liaison with Fisheries NSW regarding impacts on marine vegetation and compensatory habitat requirements; 3. Undertake environmental assessment and obtain approvals; 4. Implementation; and 5. Conduct post-dredging hydrographic surveys in order to gain understanding of the change to bathymetry resulting from dredging, and infill rates.	
Lead Organisation	BSC
Support Organisation	Fisheries NSW, DPI – Crown Lands
Total Cost Estimate (10 year)	$400,000
Potential Funding Sources	BSC, Crown Lands
Timing	Medium term
Location	Main Section
KPIs	• Design and approvals completed by 30 November 2016 • Construction completed by June 2017
Related Options	Option 3: Regular hydrographic surveys Option 12: Dredging of Main Section Option 19: Creation of sandy shoreline Option 21: Expansion of Pop Denison Park access and facilities Option 22: Eastern foreshore improvements

Action 3: Review and upgrade stormwater treatment controls

Desired Outcome	Best-practice stormwater treatment systems are installed and maintained
DESCRIPTION OF TASKS:	
1. Review of effectiveness of stormwater treatment devices and best available technologies considering: • Water quality data; • Information on the material collected in the pits and traps; • Condition and performance of existing devices; • Best-available technology; • Flooding and sea-level rise impacts; • Occupational health and safety considerations e.g. for maintenance and rectification; • Amenity and public safety considerations; • Life cycle costs; and • Other Council asset management considerations. 2. On-going asset renewal/replacement based on the outcomes of the review – not included in additional funding.	
Lead Organisation	BSC
Support Organisation	-
Total Cost Estimate (10 year)	$25,000
Potential Funding Sources	BSC
Timing	Medium term
Location	Shaws Bay
KPIs	• Review completed by June 2019 • Asset renewal based on performance and condition assessments
Related Options	Option 1: Modify Beachwatch program Option 2: Expand Richmond River Ecohealth monitoring program to include Shaws Bay Option 5: Review and upgrade of stormwater pollution controls

Action 4: Western foreshore improvements

Desired Outcome	Enhanced safety and recreational amenity of Compton Drive foreshore
DESCRIPTION OF TASKS:	
1. Engineering design: Key considerations and priorities would include improved public safety, relocation of shared pathway to foreshore, provision of parking areas and traffic calming devices. All drainage should continue to be directed to the existing stormwater system and the opportunity for stormwater quality improvement devices should be investigated. Depending on available funding, additional recreational facilities may include exercise equipment and picnic facilities and extension of the foreshore redevelopment to Shaws Bay Hotel. 2. Approvals: Development consent (and environmental assessment). 3. Construction.	
Lead Organisation	BSC
Support Organisation	-
Total Cost Estimate (10 year)	$200,000
Potential Funding Sources	BSC
Timing	Short term
Location	Compton Drive, western foreshore
KPIs	• Engineering design and approvals completed by 1 December 2016 • Construction completed by 1 July 2018
Related Options	Option 20: Western foreshore improvements

Action 5: Expansion of Pop Denison Park and improvement of access to the eastern foreshore

Desired Outcome	Enhanced ecological value, foreshore access and recreational amenity at Pop Denison Park
DESCRIPTION OF TASKS:	
1. Engineering design: Key considerations and priorities would include: • Creation of sandy shoreline between existing beach at Pop Denison Park and southern boundary of Ballina Lakeside Holiday Park; • Establishment of ecological protection areas, educational facilities and weed management; • Formalisation of access tracks to Main Section beach/shoreline; • Vegetation management in accordance with the VMP; • Protection of saltmarsh areas in front of Lakeside Holiday Park; • Redevelopment of reserve between Fenwick Drive and the Lakeside Holiday Park to include access road, parking, pedestrian tracks and recreational facilities. 2. Approvals: Development consent, fisheries permits and environmental assessment. 3. Construction – to be staged based on established priorities and available funding.	
Lead Organisation	BSC
Support Organisation	Fisheries NSW, OEH
Total Cost Estimate (10 year)	$350,000
Potential Funding Sources	BSC, NSW Estuary Management Program (for habitat restoration)
Timing	Short-medium term
Location	Pop Denison Park, Northern Section and Main Section
KPIs	• Engineering design and approvals completed by 1 July 2017
Related Options	Option 12: Dredging of Main Section Option 13: Provide for enhancement of estuarine vegetation Option 14: Community education about the value and role of estuarine vegetation Option 16: Community education – recreational fishing Option 19: Creation of sandy shoreline Option 21: Expansion of Pop Denison Park access and facilities Option 22: Eastern foreshore improvements Option 25: Weed management along training wall

Action 6: Development of Fenwick Drive foreshore area

Desired Outcome	Enhanced foreshore access and recreational amenity at East Arm
DESCRIPTION OF TASKS:	
1. Engineering design: Key considerations and priorities would include redevelopment of reserve to include access road, parking, pedestrian tracks, open space areas and recreational facilities. 2. Approvals: Development consent and environmental assessment. 3. Construction – to be staged based on established priorities and available funding.	
Lead Organisation	BSC
Support Organisation	Fisheries NSW
Total Cost Estimate (10 year)	$120,000
Potential Funding Sources	BSC
Timing	Long term
Location	Fenwick Drive, East Arm
KPIs	• Engineering design and approvals completed by 1 July 2018
Related Options	Option 9: Implement East Arm erosion controls (modified) Option 23: Development of Fenwick Drive recreational area and foreshore area improvements Option 25: Weed management along training wall

Action 7: Refurbishment of training wall steps

Desired Outcome	Enhanced recreational amenity and access to Main Section
DESCRIPTION OF TASKS:	
1. Engineering investigation: Key considerations would include safety requirements, structural condition, rehabilitation options, approval requirements and funding constraints. 2. Approvals: Development consent, Fisheries NSW approval and environmental assessment. 3. Construction – to be staged based on established priorities and available funding.	
Lead Organisation	Crown Lands
Support Organisation	BSC, Fisheries NSW
Total Cost Estimate (10 year)	$150,000
Potential Funding Sources	BSC, Crown Lands
Timing	Medium – long term
Location	Training wall steps, southern section
KPIs	• Engineering design and approvals completed by 1 July 2019
Related Options	Option 16: Community education – recreational fishing Option 24: Rehabilitation of training wall steps

Action 8: Modify conditions of mangrove maintenance permit

Desired Outcome	Ensure that mangrove maintenance can be undertaken for priority areas around Shaws Bay.
DESCRIPTION OF TASKS:	
1. BSC to submit application to Fisheries NSW for the amendment of the current permit allowing clearing of mangroves in Shaws Bay in accordance with the amended areas proposed in this CZMP (Figure 14, Appendix 3). 2. Consideration and approval by Fisheries NSW	
Lead Organisation	BSC
Support Organisation	Fisheries NSW
Total Cost Estimate (10 year)	No additional cost
Potential Funding Sources	N/A
Timing	Short term
Location	Various locations around perimeter of Shaws Bay
KPIs	• Application for modified permit submitted by June 2015
Related Options	Option 9: Implement East Arm erosion controls (modified) Option 13: Provide for enhancement of estuarine vegetation Option 15: Amend mangrove exclusion areas permitted under Fisheries NSW maintenance permit Option 19: Creation of sandy shoreline Option 20: Western foreshore improvements Option 21: Expansion of Pop Denison Park access and facilities Option 22: Eastern foreshore improvements

Action 9: Weed management along northern side of the training wall

Desired Outcome	Improve amenity and environmental values along the training wall by removing weed species and restoring native vegetation.
DESCRIPTION OF TASKS:	
1. BSC to plan works considering the environmental impact of chemical use, revegetation requirements and safety considerations; 2. Carry out initial comprehensive weed control/ planting works as required; and 3. Follow up weed control and maintenance will be needed for at least 3-5 years. Depending on the success of works maintenance may be scaled back as native vegetation becomes established.	
Lead Organisation	BSC
Support Organisation	Fisheries NSW
Total Cost Estimate (10 year)	$22,000
Potential Funding Sources	BSC, Fisheries NSW
Timing	Short - medium term
Location	Northern side of the training wall along the southern perimeter of Shaws Bay
KPIs	• Initial works commenced by August 2015
Related Options	Option 25: Weed management along training wall

5.2.2 Education and Awareness Actions

Action 10: Education program – public health

Desired Outcome	Develop tools to improve awareness and notification of Beachwatch results and indicators of risk related to primary contact recreation
DESCRIPTION OF TASKS:	
1. The results of the Beachwatch water quality monitoring (Action 15) will continue to be made available on Council's website and published in local newspapers but with additional information on: • Background information on bacteria and pathogens, human interactions and high risk groups, including the potential for bacterial wound infections; • Water circulation processes in the Bay and recommended swimming locations; • Interpretation of the results and star ratings; and • Information of surrogate indicators of health risk including rainfall data and preventative measures. 2. Similar information and guidelines should be included in information boards at key swimming locations (refer Action 14: Foreshore signage) and distributed to tourist facilities.	
Lead Organisation	BSC
Support Organisation	NSW OEH
Total Cost Estimate (10 year)	$3,000
Potential Funding Sources	BSC
Timing	On-going
Location	Shaws Bay
KPIs	• Implemented by 1 July 2016
Related Options	Option 1: Modify Beachwatch program Option 8: Improve education and awareness of public health issues

Action 11: Education program – estuarine vegetation

Desired Outcome	The value and role of estuarine vegetation are communicated to the community and visitors
DESCRIPTION OF TASKS:	
Information on the value and role of estuarine vegetation will be communicated to the community and visitors via: • Local newspaper articles; • Community Connect articles; and • Included in educational signage/ information boards at key locations in close proximity (or with views of) estuarine vegetation (refer Action 14: Foreshore signage).	
Lead Organisation	BSC
Support Organisation	Fisheries NSW, OEH
Total Cost Estimate (10 year)	Included in current programs
Potential Funding Sources	BSC, Fisheries NSW, NSW Estuary Management Program
Timing	On-going
Location	Shaws Bay
KPIs	• Implementation started by June 2016 and information disseminated via information articles at annual intervals. • Refer Action 14: Foreshore signage for signage KPIs
Related Options	Option 2: Expand Richmond River Ecohealth monitoring program to include Shaws Bay Option 13: Provide for enhancement of estuarine vegetation Option 14: Community education about the value and role of estuarine vegetation Option 21: Expansion of Pop Denison Park access and facilities Option 25: Weed management along training wall

Action 12: Education program – recreational fishing

Desired Outcome	Increased public awareness of fishing regulations
DESCRIPTION OF TASKS:	
• Continue to distribute information to Shaws Bay caravan parks; • Similar information to be available on information boards, fishing tackle shops and tourist information centres. Content could include information on best practice fishing methods, legal sizes and bag limits, threatened species and regulations specific to Shaws Bay; • Organise a Fisheries NSW fishing workshop or other Fishcare program to be held at Shaws Bay during school holidays; and • Implement recreational fishing signage around Shaws Bay (See Action 14: Foreshore signage).	
Lead Organisation	Fisheries NSW
Support Organisation	BSC
Total Cost Estimate (10 year)	Included in existing programs and other actions
Potential Funding Sources	Fisheries NSW
Timing	On-going
Location	Shaws Bay
KPIs	• Refer Action 14: Foreshore signage for signage KPIs
Related Options	Option 2: Expand Richmond River Ecohealth monitoring program to include Shaws Bay Option 13: Provide for enhancement of estuarine vegetation Option 14: Community education about the value and role of estuarine vegetation Option 16: Community education – recreational fishing

Action 13: Education program – biological irritants

Desired Outcome	Improve public awareness of biological irritants
DESCRIPTION OF TASKS:	
• Develop public education material on biological irritants including information on potential irritant organisms, high risk times/locations, preventative and avoidance measures, symptoms and treatments. • Develop webpage on Council's website to present above information. • Distribute above information in local newspapers and Council publications during the swimming season. • Include relevant information on Shaws Bay information boards (See Action 14: Foreshore signage).	
Lead Organisation	BSC
Support Organisation	NSW Health
Total Cost Estimate (10 year)	$3,000
Potential Funding Sources	BSC
Timing	On-going
Location	Shaws Bay
KPIs	• Implemented by December 2016
Related Options	Option 26: Community education and awareness of biological irritants

Action 14: Foreshore signage

Desired Outcome	Information on key processes and human interactions with the Bay is provided on signs
DESCRIPTION OF TASKS:	
• Design and construct information board at Pop Denison Park including general information on Shaws Bay, estuarine vegetation including the importance to the health of Shaws Bay (refer Action 11: Education program – estuarine vegetation), ecological protection zones in the Bay (Action 5: Expansion of Pop Denison Park and improvement of access to the eastern foreshore), recreational fishing information (refer Action 12: Education program – recreational fishing); information on public health (refer Action 10: Education program – public health), water quality information and guidance on the most suitable areas in the Bay to swim. • Install recreational fishing information signage on the foreshore at popular fishing spots around the Bay including at Pop Denison Park, Lakeside Holiday Park, East Arm and at the concrete steps. • Rationalise and potentially remove existing signage in areas where it is proliferate.	
Lead Organisation	BSC
Support Organisation	Fisheries NSW
Total Cost Estimate (10 year)	$5,000
Potential Funding Sources	Fisheries NSW
Timing	Short term
Location	Shaws Bay
KPIs	• New signs erected by December 2016
Related Options	Option 8: Improve education and awareness of public health issues Option 14: Community education about the value and role of estuarine vegetation Option 16: Community education – recreational fishing

5.2.3 Monitoring and Data Collection Actions

Action 15: Beachwatch water quality monitoring (modified)

Desired Outcome	Improved knowledge and awareness of risks associated with primary contact recreation
DESCRIPTION OF TASKS:	
1. Review current sampling regime considering recommendations for program optimisation including additional sample site locations (discussed in Appendix 3). BSC to consult with OEH to determine appropriate changes. 2. Revise BSC Beachwatch manual to reflect changes. 3. Implement revised program. 4. Review data, methods and protocol on an annual basis. Community notification of Beachwatch results and indicators of risk related to primary contact recreation are included in Action 10: Education program – public health.	
Lead Organisation	BSC
Support Organisation	OEH, NSW Health
Total Cost Estimate (10 year)	$10,000 ($1,000 per year for water quality analysis at 1 additional site)
Potential Funding Sources	-
Timing	On-going
Location	Shaws Bay
KPIs	• BSC Beachwatch manual revised for Shaws Bay by September 2015, ready for summer sampling • Implement revised program in November 2015
Related Options	Option 1: Modify Beachwatch program Option 8: Improve education and awareness of public health issues

Action 16: Ecohealth - Monitoring, Evaluation and Reporting Program

Desired Outcome	Improved knowledge of ecosystem health and collection of data to enable identification of health changes over time
DESCRIPTION OF TASKS:	
1. Formalise request for Shaws Bay to be included in Richmond River Ecohealth monitoring. Initial discussions with the Ecohealth team indicate this is a feasible option, subject to approval by stakeholders. Richmond River County Council (RRCC) is administering the pilot program and BSC should discuss this further with RRCC. 2. Nominate sites for Ecohealth monitoring in Shaws Bay. The number and location of sampling sites within Shaws Bay will need to be determined in consultation with the Ecohealth team, however if possible, sampling at representative Beachwatch sites would allow for greater use of data across both programs. 3. Commence Ecohealth monitoring in Shaws Bay. The next round of Ecohealth sampling is planned for November 2016 – October 2017 following a three year repeat sampling regime. 4. Reporting of Ecohealth results including community Report Cards produced following sampling period. 5. Review data, methods, site suitability and sampling protocol after each reporting period.	
Lead Organisation	BSC
Support Organisation	OEH, North Coast LLS
Total Cost Estimate (10 year)	$18,000 based on one site in Shaws Bay. This estimate is based on the current approximate costs plus management of one Ecohealth site per year ($6,000) x 3 sample events in 10 years. Final costs will be dependent on the no. of sites included in Shaws Bay and methods to be employed.
Potential Funding Sources	BSC, NSW Estuary Management Program
Timing	One year of sampling repeated every three years commencing in November 2016
Location	Shaws Bay
KPIs	• Shaws Bay site(s) included in the next round of Richmond River Ecohealth program commencing in November 2016. • Report Card produced including summary of Shaws Bay ecosystem health assessment late 2017.
Related Options	Option 2: Expand Richmond River Ecohealth monitoring program to include Shaws Bay Option 14: Community education about the value and role of estuarine vegetation

Action 17: Hydrographic survey

Desired Outcome	Improved knowledge of sedimentation and infilling
DESCRIPTION OF TASKS:	
1. Repeat hydrographic survey at an interval of approximately every five years to assess infilling rates in Shaws Bay. The latest survey was completed in July 2013, and the next surveys should be conducted in 2018, 2023 etc. Should dredging be undertaken, hydrographic survey should follow dredging activities to determine the amount of infilling. 2. Survey methodology used in 2013 should be repeated to allow for accurate comparisons to be made between surveys. 3. Reporting of survey results including mapping and analysis of infilling rates to be completed as part of review of this CZMP (Action 20: 10 year review of CZMP).	
Lead Organisation	BSC
Support Organisation	NSW Crown Lands
Total Cost Estimate (10 year)	$10,000 (allowing $5,000 per survey)
Potential Funding Sources	BSC, NSW Estuary Management Program
Timing	Every five years commencing in 2018
Location	Shaws Bay
KPIs	• Repeat survey completed in 2018 and 2023. • Reporting of infilling rates undertaken as part of CZMP review in 2026.
Related Options	Option 3: Regular hydrographic surveys Option 9: Implement East Arm erosion controls (modified) Option 11: Allow infilling Option 12: Dredging of Main Section

Action 18: Development of strategy to address inundation risk

Desired Outcome	Improved knowledge of inundation frequency, duration and depth of inundation and development of feasible concepts for managing inundation within Shaws Bay

DESCRIPTION OF TASKS:

Tasks to be incorporated in Shire-wide investigations:

1. Improve understanding of likely inundation risk including:
   - Refine modelling undertaken for the Ballina floodplain risk management to more accurately determine water levels under key risk scenarios which include the influence of catchment floods, extreme ocean level events and the influence of wave setup at the entrance of the Richmond River estuary;
   - Inclusion of the effect of stormwater infrastructure;
   - Determine floor heights and levels of community assets;
   - Reporting on the magnitude versus frequency (i.e. various ARIs) of the range of anticipated inundation events; and
   - Estimates of damage relating to flooding.

2. Concept design for works and/or actions required to address the current inundation risk in the immediate and long term including:
   - Consideration of local planning controls and state government regulations;
   - An assessment of the feasibility of a levee and tide gates to prevent estuarine inundation in the short-medium term (0-20 years);
   - Consideration of stormwater drainage systems and potential inundation due to surcharge of the stormwater system during peak events;
   - Determination of volumes and works feasibility to raise affected land above 1 in 100 year ARI inundation levels in the short and long term;
   - Investigation of options to relocate the park; and
   - Community and stakeholder engagement.

3. Identification of risks to public safety and identification of appropriate emergency response and evacuation plans.

Lead Organisation	BSC
Support Organisation	OEH
Total Cost Estimate (10 year)	Included in shire-wide programs
Potential Funding Sources	NSW Floodplain Management Program, NSW Estuary Management Program
Timing	On-going
Location	Shire-wide (including Shaws Bay)
KPIs	• Study completed by June 2017
Related Options	Option 29: Development of strategy to address inundation risk in Shaws Bay

5.2.4 Monitoring and Review Actions

Action 19: Review of CZMP progress and monitoring of KPIs

Desired Outcome	Continuous improvement towards the CZMP objectives across the full range of issues
DESCRIPTION OF TASKS:	
Documentation of the effectiveness of the proposed actions will be reported as part of Council's annual State of the Environment Reporting including progress towards the KPIs included for each action.	
Lead Organisation	BSC
Support Organisation	OEH, Fisheries NSW, DPI-Crown Lands, North Coast LLS
Total Cost Estimate (10 year)	Included in existing Council reporting
Potential Funding Sources	n/a
Timing	Annual
Location	Shaws Bay
KPIs	• Annual SoE reporting

Action 20: 10 year review of CZMP

Desired Outcome	Management actions and approaches remain appropriate for the long term
DESCRIPTION OF TASKS:	
The CZMP and the specified management actions should be reviewed to ensure they are being achieved and are resulting in the desired outcomes. A ten year review (or earlier if warranted by legislative or management changes or improved scientific understanding) of the CZMP is required to consider: • Results of the annual KPI reviews (Action 19); • Any barriers identified to the effective implementation of actions or overall success of actions; • Any new or updated scientific knowledge; • Data provided by the data collection and monitoring actions (Action 15, Action 16, Action 17 and Action 18); and • Prevailing community attitudes, government policy, strategic planning and estuary management issues.	
Lead Organisation	BSC
Support Organisation	OEH, Fisheries NSW, DPI-Crown Lands, North Coast LLS
Total Cost Estimate (10 year)	$50,000
Potential Funding Sources	OEH Estuary Management Program, BSC
Timing	Long term (year 10)
Location	Shaws Bay
KPIs	• Review and reporting undertaken by year 10 • Adoption and gazettal of the amended CZMP as required

5.3 Measures of Success of the CZMP

Most of the management objectives defined in the CZMP (Section 3) are aspirational in that they are high level goals that may not be achievable within the life of this plan. However they remain as long term desires held by Council and the community. Continuous improvement towards these objectives across the full range of issues should be seen as the first measure of success.

Success of the CZMP will be indicated by the implementation of substantial measures to address the root cause of issues facing the estuary, as well as conclusive documentation of the effectiveness of such measures. Success of the CZMP will be gauged by:

- Stakeholder acceptance;
- Certification by the Minister for Planning;
- Adoption and gazettal of the plan by Council;
- Incorporation of the plan recommendations into business planning for the responsible agencies;
- Securing sufficient funds to implement the actions;
- Implementation of actions in an efficient and timely manner;
- Uptake of actions by stakeholders and others;
- Positive stakeholder feedback on improvements; and
- Measured improvements in ecosystem health such as improved water quality.

On-going community involvement will be required to ensure successful implementation of the CZMP. This will include:

- On-going consultation with interested and committed community groups;
- A high degree of engagement and collaboration with landholders;
- On-ground participation in management actions, particularly local community groups such as Coastcare and recreational groups;
- Consultation and collaboration with local Aboriginal representatives and groups; and
- Education programs.

Achievement of the management plan objectives is reliant on community understanding and effective involvement in the management process.

Key Performance Indicators (KPIs) have also been identified where appropriate for each management action to provide a target for achievement of the major steps in each action.

5.4 Implementation Program

The recommended management actions have been compiled into a ten year implementation schedule as shown in Table 2 with responsibilities and indicative costs estimated over the ten year implementation period. The total cost of the CZMP implementation is estimated to be approximately $1.66 million over ten years.

Table 2: CZMP Implementation Program

Action / Year	Lead Organisation	Ten year total	1	2	3	4	5	6	7	8	9	10
		$'000	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Action 1: Control of East Arm bank erosion and creation of sandy beach	BSC	**200**	25	175								
Action 2: Dredging of Main Section of Shaws Bay*	BSC	**400**	25	25	350							
Action 3: Review and upgrade stormwater treatment controls	BSC	**25**				25						
Action 4: Western foreshore improvements	BSC	**200**	20	100	80							
Action 5: Expansion of Pop Denison Park and improvement of access to the eastern foreshore	BSC	**350**		30	120	100	100					
Action 6: Development of Fenwick Drive foreshore area	BSC	**120**			20	50	50					
Action 7: Refurbishment of breakwall steps	Crown Lands	**150**					20	130				
Action 8: Modify conditions of mangrove maintenance permit	BSC	**-**	no additional cost									
Action 9: Weed management along northern side of the training wall	BSC	**22**	10	5	2	2	2	1				
Action 10: Education program – public health	BSC	**3**	3									
Action 11: Education program – estuarine vegetation	BSC	**-**	no additional cost									
Action 12: Education program – recreational fishing	Fisheries NSW	**-**	no additional cost									
Action 13: Education program – biological irritants	BSC	**3**	3									
Action 14: Foreshore signage	BSC	**5**	5									
Action 15: Beachwatch water quality monitoring (modified)	BSC	**10**	1	1	1	1	1	1	1	1	1	1
Action 16: Monitoring, Evaluation and Reporting Program	BSC	**18**		6			6			6		
Action 17: Hydrographic survey	BSC	**10**			5					5		
Action 18: Development of strategy to address inundation risk	BSC	**-**	no additional cost									
Action 19: Review of CZMP progress and monitoring of KPIs	BSC	**-**	no additional cost									
Action 20: 10 year review of CZMP	BSC	**50**										50
Total		**1,566**	**92**	**342**	**578**	**178**	**179**	**132**	**1**	**12**	**1**	**51**

Note: Years correspond to end of financial year i.e. 2016 is Year 1 (start 1st July 2015, end 30th June 2016) etc.

Shaded cells = Denotes the occurrence of actions with no additional costs allocated as part of this CZMP.

* The monetary value to address compensatory habitat requirements is not included in this figure. Up to $250,000 may be required in addition to the cost of works if suitable proposals in lieu of this requirement cannot be identified.

GLOSSARY AND ABBREVIATIONS

Acid sulfate soils (ASS)	Acid sulfate soils are the common name given to soils containing iron sulfides. In Australia, the acid sulfate soils of most concern are those which formed within the past 10,000 years, after the last major sea level rise. When the iron sulfides are exposed to air and produce sulfuric acid, they are known as actual acid sulfate soils. The soil itself can neutralise some of the sulfuric acid. The remaining acid moves through the soil, acidifying soil water, groundwater and, eventually, surface waters.
Anaerobic	Living without air
Aquatic	Living or growing in water, not on land.
Amenity	A desirable or useful feature or facility of a building or place
Bacteriological	Related to bacteria (microorganisms involved with infectious diseases and nitrogen fixation)
Bathymetry	Measurement of water depth in lakes, oceans and seas. In other words, bathymetry is the underwater equivalent to topography.
Blackwater	A collective term used to describe low oxygen water emanating from backswamp areas, drains and floodplains. The term usually refers to low oxygen flood waters receding from floodplain after extended periods of backswamp flooding.
Causal factors	Contributing causes
Chlorophyll a	The green pigment in plants used to capture and use energy from sunlight to form organic matter (see photosynthesis). Concentrations of chlorophyll-a in the water column are used as an indicator for phytoplankton and benthic algae biomass. It provides a useful proxy indicator of the amount of nutrients incorporated into phytoplankton biomass, because phytoplankton have predictable nutrient-to-chlorophyll ratios
CZMP	Coastal Zone Management Plan
DECCW	Former (NSW) Department of Environment, Climate Change and Water (now OEH)
Dilapidated	In a state of disrepair or deterioration
Dissolved oxygen	Oxygen dissolved in the water (oxygen saturation). Often abbreviated to DO
DPI	(NSW) Department of Primary Industries
Ecology	The interactions between organisms and their environment
Ecosystem	Refers to all the biological and physical parts of a biological unit (e.g. an estuary, forest, or planet) and their interconnections.
Embayment	A shape resembling a bay
Estuarine	Part of the river channel with a mix of fresh water and salt (tidal) water
EMP	Estuary Management Plan
EPS	Shaws Bay Estuary Management Plan, Volume 1 - Estuary Processes Study
Foreshore	That part of the shore that lies between the mean high tide mark and the mean low tide mark
Hydrodynamics	The motion of a fluid and interactions with its boundaries
Hydrographic	Refers to topographic/bathymetric features of a water body (depth and morphology)
Hydrology	The study of water and its properties, including precipitation onto land and returning to oceans
LEP	Local Environmental Plan
LLS	Local Land Services
Long period waves	Surging of water levels in response to wave action at the estuary entrance
Macroinvertebrate	Animal lacking a backbone
MER	NSW Natural Resources Monitoring, Evaluation and Reporting Strategy
OEH	Office of Environment and Heritage

Pathogen	An agent that causes disease
Physico-chemical	Physical properties dependent on and influencing chemical structure, properties and reactions
POM	Plan of Management
Porosity	Measure of the void spaces in a material
Riparian	Of, on or relating to the banks of a watercourse
RRCC	Richmond River County Council
Salinity	The level of salt dissolved in the water
Sand shoal	A shallow sand bank or sand bar
Sedimentation	The deposition or accumulation of sediment
SEPP	State Environmental Planning Policy
SLSC	Surf Life Saving Club
SOE	State of Environment
SQIDs	Stormwater Quality Improvement Devices
Terrestrial	Living or growing on land (not aquatic)
Tidal prism	The difference between the mean high water volume and mean low water volume of an estuary
Turbid	Cloudy or dirty (not clear)
Turbidity	A measure of the amount of light-attenuating particles in a water body.
VMP	Vegetation Management Plan for East Ballina Reserves
Zooplankton	Animal plankton inhabiting the surface layer of water bodies that serve as food for fish and other animals

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Appendix 1: Minimum Requirements of the CZMP Guidelines (OEH, 2013a)

This Appendix discusses how the minimum requirements of the CZMP guidelines have been met.

Coastal councils are required to prepare draft plans in accordance with the CZMP guidelines adopted by the Minister for the Environment under section 55D of the *Coastal Protection Act 1979* (OEH, 2013a).

The CZMP preparation process as defined by OEH (2013a) is provided as Figure 9.

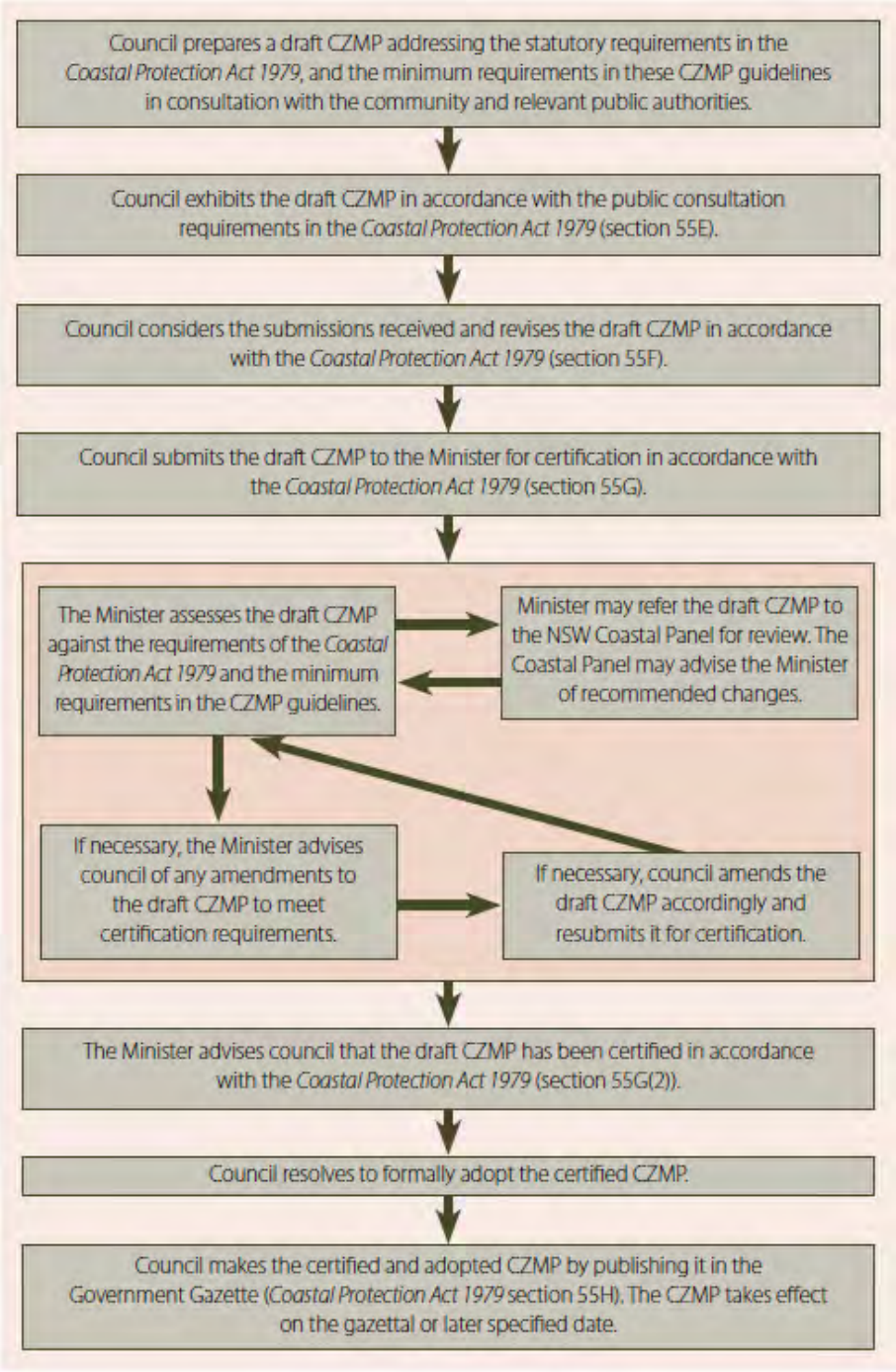

Figure 9: CZMP preparation and certification process for Shaws Bay

Source: OEH, 2013a

The Guidelines (OEH, 2013a) specify the minimum requirements that are to be met when preparing a draft CZMP, in addition to the requirements in the Act. The minimum requirements in the guidelines relate to:

- Preparation of the CZMP
- Coastal risk management
- Coastal ecosystem health and
- Community uses of the coastal zone.

The following tables summarise the minimum requirements and how they have been met in this CZMP and other related planning processes.

Table 3: Minimum Requirements: CZMP planning process content and outcomes

Minimum Requirement	Reference
CZMPs are to contain a description of:	
• how the relevant Coastal Management Principles have been considered in preparing the plan	Table 4, below.
• the community and stakeholder consultation process, the key issues raised and how they have been considered	Section 1.6 Section 4 and Appendix 1, Volume 2
• how the proposed management options were identified, the process followed to evaluate management options, and the outcomes of the process	Sections 1 and 5
CZMPs are to contain proposed management actions over the CZMP's implementation period in a prioritised implementation schedule which contains:	
• proposed funding arrangements for all actions, including any private sector funding	Section 5.2
• actions to be implemented through other statutory plans and processes	Appendix 3
• 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).	Relevant authorities have been involved in the preparation of the Draft CZMP. Letters of support have been submitted to Council from the public authorities with responsibilities under the CZMP that actions or activities to be carried out by any public authority relating to any land or other assets owned or managed by a public authority as required of S55C(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.	Section 5.2.4 - Action 19: Review of CZMP progress and monitoring of KPIs and Action 20: 10 year review of CZMP
CZMPs are to be prepared using a process that includes:	
• evaluating potential management options by considering social, economic and environmental factors, to identify realistic and affordable actions	Sections 1 and 5
• consulting with the local community and other relevant stakeholders. The minimum consultation requirement is to publicly exhibit a draft plan for not less than 21 days, with notice of the exhibition arrangements included in a local newspaper (section 55E of the Coastal Protection Act 1979)	Section 1.6 Section 4 and Appendix 1, Volume 2

Minimum Requirement	Reference
• 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).	Section 1.6 Section 4 and Appendix 1, Volume 2
CZMPs are to achieve a reasonable balance between any potentially conflicting uses of the coastal zone.	Volume 2

Coastal Management Principles have been developed to inform strategic considerations in coastal management, including the preparation of CZMPs. The Principles have been considered in the evaluation of the coastal management actions documented in this CZMP as discussed below.

Table 4: Coastal Management Principles addressed by the CZMP for Shaws Bay

Principle		Reference
1	Consider the objects of the Coastal Protection Act 1979 and the goals, objectives and principles of the NSW Coastal Policy 1997	Sections 1.2 and 3
2	Optimise links between plans relating to the management of the coastal zone	Section 1.5
3	Involve the community in decision-making and make coastal information publicly available	Stakeholder consultation activities are discussed in Section 1.6 and Section 4 and Appendix 1, Volume 2
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	Volume 2
5	The priority for public expenditure is public benefit. Public expenditure should cost-effectively achieve the best practical long term outcomes	Sections 3 and 1
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	Section 1.2 and 1
7	Adopt an adaptive risk management approach if risks are expected to increase over time, or to accommodate uncertainty in risk predictions	Appendix 3
8	Maintain the condition of high value coastal ecosystems, rehabilitate priority degraded coastal ecosystems	Appendix 3 Section 6, Volume 2
9	Maintain and improve safe public access to beaches and headlands consistent with the goals of the NSW Coastal Policy	Appendix 3 Section 7, Volume 2
10	Support recreational activities consistent with the goals of the NSW Coastal Policy	Appendix 3 Section 7, Volume 2

Table 5: Minimum Requirements for Coastal Risks (OEH, 2013a)

Minimum Requirement	Reference
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*) based on council's adopted sea level rise projections or range of projections. Councils should consider adopting projections that are widely accepted by competent scientific opinion • 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	Section 5, Volume 2 Lighthouse Beach is expected to remain stable into the future, with some beach rotation, and is likely to be subject to sea level rise induced shoreline recession. The CZMP for the Ballina Coastline (GeoLINK, 2013) has documented the limit of coastal erosion and shoreline recession at Lighthouse Beach. The limit of coastal hazard at Lighthouse Beach addressed by the CZMP for the Ballina Coastline does not extend into the Shaws Bay CZMP study 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*)	Action 2: Dredging of Main Section of Shaws Bay Action 18: Development of strategy to address inundation risk
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*)	N/A
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 the State Emergency and Rescue Management Act 1989 relating to emergency response (sections 55C(b) and (g) of the Coastal Protection Act 1979) • any site-specific requirements for landowner emergency coastal protection works, and • the consultation carried out with the owners of land affected by a subplan.	N/A

Table 6: Minimum Requirements for Coastal Ecosystems (OEH, 2013a)

Minimum Requirement	Reference
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*), based on council's adopted sea level rise projections or range of projections.	Section 6, Volume 2

Minimum Requirement	Reference
Proposed actions in the implementation schedule to respond to estuary health pressures (section 55C(e) of the *Coastal Protection Act 1979*)	Action 5: Expansion of Pop Denison Park and improvement of access Action 11: Education program – estuarine vegetation Action 14: Foreshore signage Action 16: Ecohealth - Monitoring, Evaluation and Reporting Program
An entrance management policy for intermittently closed and open lakes and lagoons (ICOLLs)	No ICOLLS in Shaws Bay
An estuarine monitoring program, consistent with the NSW Natural Resources Monitoring, Evaluation and Reporting (MER) Strategy.	Action 16: Ecohealth - Monitoring, Evaluation and Reporting Program

Table 7: Minimum Requirements for Community Uses (OEH, 2013a)

Minimum Requirement	Reference
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*)	Action 1: Control of East Arm bank erosion and creation of sandy beach Action 2: Dredging of Main Section of Shaws Bay Action 4: Western foreshore improvements Action 5: Expansion of Pop Denison Park and improvement of access Action 6: Development of Fenwick Drive foreshore area Action 15: Beachwatch water quality monitoring (modified)
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.	Section 7, Volume 2
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	Action 1: Control of East Arm bank erosion and creation of sandy beach Action 4: Western foreshore improvements Action 15: Beachwatch water quality monitoring (modified)

Appendix 2: Roles and Responsibilities

This Appendix provides detailed information on the local, state and federal government roles and responsibilities for the management of Shaws Bay.

Organisation	Key Roles and Responsibilities in relation to Shaws Bay
Ballina Shire Council	Council functions are conferred or imposed by the *Local Government Act, 1993*. Depending on the individual council's structure, some of these functions are shared with County Councils and state government agencies. Relevant functions include: • Planning functions and consent authority for land development • Environmental planning • Pollution control • Roads • Community services and facilities • Cultural, educational and information services and facilities • Sporting, recreational and entertainment services and facilities • Environment conservation, protection and improvement services and facilities • Waste removal, treatment and disposal services and facilities • Pest eradication and control services and facilities • Public transport services and facilities • Water, sewerage and drainage works and facilities • Stormwater drainage and flood prevention, protection and mitigation services and facilities • Use and management of community land including community land categorised as foreshore and watercourse • Fire prevention, protection and mitigation services and facilities • Land and property development • Industry development and assistance and • Tourism development and assistance.
Office of Environment and Heritage (OEH)	• The Office of Environment and Heritage (OEH) is a separate agency within the Planning and Environment cluster. OEH was formed on 4 April 2011 and works to protect and conserve the NSW environment, including the natural environment, Aboriginal country, culture and heritage and our built heritage, and manages NSW national parks and reserves. The Environment Protection Authority (EPA) became a separate statutory authority on 29 February 2012.
Department of Planning (DoP)	• Sustainable land management and population growth • Effective management of natural, environmental and cultural resources and values through protection from inappropriate development • Diversity and adequacy of housing and • Integrated delivery of regional infrastructure and government activities.
Department of Primary Industries, DPI – Agriculture, Fisheries and Aquaculture	Partnership with industry and other public sector organisations to foster profitable and sustainable development of primary industries in New South Wales. Management of marine protected areas (Marine Estate Management Authority)
DPI – Crown Lands Division	• Land and property information; • Management of state-owned (Crown) Lands and Crown Reserves; and • Commercial environmental consultancy services.
Richmond River County Council	Delegated with responsibility for flood mitigation activities including management of flood control infrastructure and related natural resource management activities.

Organisation	Key Roles and Responsibilities in relation to Shaws Bay
North Coast Local Land Services (LLS)	During 2013/14, the Northern Rivers Catchment Management Authority (CMA) transitioned to the South East Local Land Services (LLS) Board. From January 2014, Local Land Services will deliver functions currently provided by CMAs, Livestock Health & Pest Authorities (LHPAs) and advisory services of Agriculture NSW (part of the Department of Primary Industries).
Far North Coast Weeds (FNCW)	Local Control Authority responsible for administering the *Noxious Weeds Act, 1993* in the Northern Rivers region of NSW. Responsibilities include: • Controlling noxious weeds on public land including roadside weed management and aquatic noxious weeds on rivers and public lagoons • Conducting inspections of private property for presence of noxious weeds • Enforcement of control of noxious weeds through requests and fines as necessary and • Provide advice on weed management issues.
Department of Sustainability, Environment, Water, Population and Communities (DSEWPC)	• Environment protection and conservation of biodiversity • Land contamination • Natural, built and cultural heritage • Environmental research • Water policy and resources • Coordination of sustainable communities policy • Population policy • Built environment innovation Environment, water and heritage issues are also managed by other levels of government.
NSW Health	• Improving health through measures that prevent disease and injury • Create social and physical environments that promote health and provide people with accessible information to encourage healthier choices • Responds to the public health aspects of major incidents or disasters in NSW

Appendix 3: Management Options

MANAGEMENT OPTIONS

A range of management options are available to address the coastal and estuary issues identified in Section 4. Potential management options have been developed, where possible, to address the causal factors of each issue with consideration of the extent of the problem, any related management issues, cumulative impacts and consideration of the work that has already been undertaken to address the issue.

Overall Approach

The discussions in previous sections of this CZMP and in Volume 2 highlight the need to protect the social and ecological values associated with the Bay and to manage the often conflicting desire for protection of ecological values as well as optimising recreational opportunities at Shaws Bay. One of the key aspects of the management approach for this CZMP is to accept that some issues cannot be resolved cost-effectively or without compromise. This CZMP has been developed with consideration of the key opportunities and constraints as shown on Figure 10.

Water based recreation is one of the main uses for Shaws Bay, with water quality being recognised as a key factor contributing to this activity. Whilst improving water quality generally and providing easy access for swimming in all areas of the Bay is desirable, this may not be practical, affordable or in keeping with other goals for management. The approach for this CZMP, for example, is to encourage swimmers to areas that are best suited for swimming (better water quality, suitable water depths, ease of access) by providing facilities near those locations and concentrating management actions that improve this use in the areas that will most benefit in the long term. In taking this approach, other areas are set aside to achieve other management goals where the focus may be, for instance, ecological protection and provision for estuarine vegetation growth with future climate change.

The management approach therefore attempts to delineate management focus areas around the Bay in order to efficiently achieve the objectives of this plan. This approach recognises the key processes influencing the ecological health and recreational amenity of the Bay as well as key pressures to be faced in the future. Management options have been developed and prioritised on this basis with the key aims of recognising these constraints and optimising future management expenditure.

Figure 10 shows the main goals for each area of the Bay as follows:

- Ecological protection – provides for enhancement of ecological values with minimal disturbance. Opportunities for nature appreciation and education would be promoted here;
- Sandy shoreline – provides for improved access to the waterway at key swimming locations, free of juvenile mangroves;
- Additional foreshore facilities – the existing focus of recreational activities would be enhanced by improved and additional facilities in these areas; and
- Integrated use – providing for a combination of ecological protection and additional passive recreational opportunities.

Figure 10: Management focus areas around Shaws Bay

Information Requirements for Management

Management Issues:

Issue 1: Recreational amenity and ecosystem health may be compromised by poor water quality

Issue 2: Community access to and use of the waterway is being affected by coastal processes

Issue 3: There is a need to adequately manage the fishery resource of the Bay

Issue 5: There is a need to adequately manage community use and ecosystem health conflicts

Issue 6: There is a risk of inundation of developed land

The development of this CZMP has been based on the available information as documented in Volume 2. While the available data are sufficient to identify key issues and develop the main management approaches, improved knowledge of the hydrodynamic, sediment and water quality processes would assist with future prioritisation of management actions as well as monitoring of the success of actions implemented as part of this CZMP.

Existing Management Approach

The 2000 EMP included a recommendation (Task F) to expand the bacteriological sampling program to include other water quality parameters which are important to the overall health of the Bay. Shaws Bay is monitored throughout the swimming season through the Beachwatch program implemented by Council in conjunction with the Office of Environment and Heritage (OEH). This includes bacterial indicators and physico-chemical parameters. The program is focussed on bathing water quality.

The current water quality monitoring program was reviewed as part of this CZMP (refer Section 6.1, Volume 2) and there were a number of areas identified with opportunities to optimise the current program:

- The current sample sites are all located in the Northern Section of Shaws Bay and do not represent all of the areas used for primary contact recreation. The East Arm of the Bay and areas adjacent to the Shaws Bay Caravan Park and Ballina Lakeside Holiday Park are not currently sampled. Due to poor flushing in the northern reach it is anticipated that the results from the current sites are likely to reflect the worst case scenario for water quality in Shaws Bay. Sampling at these sites is considered to be appropriate as they are currently popular swimming areas, however sampling at other swimming locations will allow for a more comprehensive assessment of swimming risk, particularly as swimming is encouraged at other locations with better water quality as part of this CZMP;
- Physico-chemical parameters (conductivity, pH, dissolved oxygen (DO) and turbidity) have been collected at one site near Pop Denison Park. Collecting physico-chemical parameters at only one site does not provide a good indication of the overall health of Shaws Bay. PBP (2000b) found that the East Arm, the Main Section of the Bay and the Northern Sections differ hydrologically from each other due to morphology, flushing times and external inputs. Sampling should aim to represent each of these discrete locations in order to properly characterise the on-going health of the system;
- It is difficult to draw conclusions about the overall health of Shaws Bay without measurement of trophic status (i.e. nutrients and/or chlorophyll a). Elevated concentrations of chlorophyll a can reflect an increase in nutrient loads and increasing trends can indicate eutrophication of aquatic ecosystems. Annual median chlorophyll a concentrations in a waterway are an important indicator for ecosystem health; and
- Generally, single measurements of DO are not considered to be a very useful indicator of overall ecosystem health due to the natural daily variation in DO within aquatic ecosystems. DO is usually highest in the middle of the day when aquatic plants are photosynthesising and releasing oxygen to the water and lowest around dawn after aquatic plants have been respiring through the night and

consuming oxygen from the water. As a minimum, measurements should ideally be taken at dawn and midday to approximate the diurnal range, and the median value to compare against the guidelines assessed using this data. However, dawn sampling may be impractical for a number of reasons. As a minimum, samples should continue to be taken at approximately the same time of day to allow for trend tracking over time. Current sampling is generally completed in the morning, and this will be important to maintain whenever possible.

The Richmond Estuary CZMP (Hydrosphere Consulting, 2011) included a recommendation to implement a coordinated catchment-wide monitoring program to monitor estuary health, measure the success of management actions and inform decision making in accordance with the NSW Natural Resources Monitoring, Evaluation and Reporting (MER) Strategy.

A pilot study monitoring the health of waterways across the Richmond River catchment is currently underway. The Ecohealth program is jointly funded by OEH, Local Landholder Services (LLS), Ballina, Kyogle, Lismore and Richmond Valley Councils and Richmond River County Council, with in-kind assistance from Rous Water. The design of the Ecohealth freshwater/estuarine monitoring program is based on the NSW MER protocols for Rivers and Estuaries (OEH, 2013b) and aligned for reporting outcomes used in the South-East Queensland Ecosystem Health Monitoring program (EHMP) methodologies, as well as previous ecosystem health assessments undertaken within the local region (Ryder, 2012). The pilot program began in December 2013 and is due to be completed in December 2014. Waterway health data are being collected from 39 sites during the year. The program aims to repeat sampling every three years to determine trends and provide a source of data for State of Environment (SOE) reporting (RRCC, 2014).

The pilot Ecohealth program uses physical, chemical and biological indicators to determine the health of the Richmond River. Waterway health indicators which identify short term (water chemistry), intermediate-term (zooplankton, macroinvertebrates), and long term responses (estuarine vegetation mapping) provide a means of quantifying waterway health and prioritising management actions. Water chemistry identifies trends in nutrients (nitrogen and phosphorus), chlorophyll a and suspended solids and static variables such as pH, salinity, dissolved oxygen and temperature. Macroinvertebrate assemblages, collected from freshwater sites in Autumn and Spring, are used to assess long term condition of water quality and in-channel habitats. Zooplankton assemblages are used as biological indicators in estuary reaches and coastal lagoons (RRCC, 2014). Assessment of seagrass, saltmarsh and mangrove mapping is also completed for Richmond River estuarine areas. Currently there are no Ecohealth sites located in Shaws Bay. The nearest site is located near the mouth of the Richmond River (pers. comm. D. Ryder, 2014). Future water quality monitoring aimed at assessing ecosystem health in Shaws Bay should consider inclusion in the broader Richmond River Ecohealth program.

In addition to the Ecohealth program, OEH conducts monitoring of water quality in the Richmond River as part of the state-wide MER program. Currently there is no monitoring undertaken within Shaws Bay itself. Sampling is conducted over a few weeks with a frequency of approximately every 2 years and results are reported in State of Catchment (SoC) reports. The first of these reports is available for the Northern Rivers catchment including a summary of ecosystem health for the Richmond River (DECCW, 2010). The MER program is appropriate for assessing relative waterway health within the Northern Rivers Catchment and for comparison on a state-wide scale. It is not intended to provide enough local data for effective evaluation of river health, identification of discrete problem areas and tracking of health trends in response to management at a local scale.

Hydrographic surveys were undertaken in 1999 and more recently in 2013 (Task I from 2000 EMP). The rate of infilling has been assessed in Section 3.6 of Volume 2. It is recommended that regular hydrographic surveys continue to be undertaken.

Information on the distribution of estuarine vegetation communities (mangroves, saltmarsh and seagrass) in Shaws Bay has come from a variety of sources. Fisheries NSW conducted historical mapping of mangroves, seagrass and saltmarsh in Shaws Bay in 1986 and 1991. PBP (2000a) produced maps of seagrass habitat

based on aerial photography for a number of years between 1947 and 1999. Mangrove, saltmarsh and seagrass mapping was completed as part of this CZMP based on the available aerial photography since 2000 (refer Section 6.2, Volume 2). The latest mapping using 2013 aerial photography was ground-truthed to verify vegetation extents and provide a relative assessment of vegetation health. It is recommended that repeat mapping of estuarine vegetation is undertaken to assess trends over time and changes resulting from management actions likely to impact on estuarine vegetation communities such as dredging. This is currently completed as part of the Richmond River Ecohealth program and this could be extended to include Shaws Bay.

Potential Future Management Options

The options described below are aimed at improving knowledge of the public and ecosystem health issues, developing data to inform public education programs and enabling assessment of the success of other management measures.

Potential Future Options:

Option 1: Modify Beachwatch program

Option 2: Expand Richmond River Ecohealth monitoring program to include Shaws Bay

Option 3: Regular hydrographic surveys

Option 1: Modify Beachwatch program

The current Beachwatch program provides the community with accurate information on the cleanliness of the water at three sites in the Northern Section of the Bay. Routine assessment can also be used to assess general trends in water quality over time and help to identify and assess risk factors. It is recommended that the current Beachwatch program be continued in Shaws Bay to assess recreational water quality risk. The discussion of the current program above highlights a number of opportunities for optimisation as follows:

- Water quality sample site locations:
    - Continue sampling at Shaws Bay West, Shaws Bay East and Shaws Bay North sites. Recreational use of the Shaws Bay North site is expected to decrease through time, as elements of this CZMP are implemented to encourage swimming further south into better water quality areas, and areas maintained free of mangroves and seagrass. As this occurs, it would be logical to phase out Beachwatch sampling at Shaws Bay North site; and
    - BSC to consider the introduction of sample site(s) in the East Arm and/or Main Section of Shaws Bay in consultation with OEH. As a minimum it is recommended that at least one East Arm site is introduced about halfway along the East Arm near the entry point to the water. Further sites should be considered as recreational use patterns change over time (refer to future considerations below).

  Figure 11 shows the approximate locations of the recommended sample sites.
- Optimise collection of ecosystem health indicators (physico-chemical parameters) collected as part of the Beachwatch sampling. The following measures are recommended for continued Beachwatch monitoring in addition to the expansion of the Richmond River Ecohealth monitoring program (refer Option 2: Expand Richmond River Ecohealth monitoring program to include Shaws Bay):
    - Collect physico-chemical parameters from all sites located in different areas of the Bay to better characterise the waterbody;

- Carry out sampling at approximately the same time of day to allow for effective tracking of trends (e.g. DO). Continue to note observations at time of sampling and include: tide state; climatic conditions (e.g. sunny/overcast/rain etc.); significant events such as Richmond River flooding and any site factors of note (e.g. presence of algae, surface scums, froth, vegetation removal, changes to bed conditions etc.) to assist in interpretation of results; and
- Regular updating of a central water quality database with results as they are collected. Results should be routinely checked for errors and analysed to detect any declining trends in water quality.

The above measures are expected to add minimal additional time and cost to the current program, and the modifications will allow for a more robust assessment of water quality and will assist in the interpretation of Beachwatch results.

Future considerations for the Beachwatch program should include the introduction of additional sites depending on the redevelopment plans and potential changes in the location of primary contact recreation. Potential sites to consider in the future are:

- The foreshore area between Pop Denison Park and Ballina Lakeside Holiday Park which may become more utilised as a swimming area as Pop Denison Park is extended towards the south (refer Option 21: Expansion of Pop Denison Park access and facilities);
- The foreshore to the south of the Ballina Lakeside Holiday Park where there is an entry point through seagrass; and
- Adjacent to the Shaws Bay Caravan Park – either near the concrete steps area or the beach in front of the Shaws Bay Hotel.

Recommendations relating to improved communication and public awareness of water quality risks are listed in options for Water Quality and Public Health.

Figure 11: Recommended Beachwatch sampling site locations in Shaws Bay

Option 2: Expand Richmond River Ecohealth monitoring program to include Shaws Bay

The most efficient and robust assessment of ecosystem health in Shaws Bay would be achieved by expanding the Richmond River Ecohealth monitoring program to include Shaws Bay sites. The program would provide a comprehensive assessment of ecosystem health which is consistent with the NSW MER program and covers a broad range of indicators including water chemistry, zooplankton, macroinvertebrates, fish and an assessment of seagrass, saltmarsh and mangrove mapping. Repeated monitoring every three years would provide key information to track trends in ecosystem health over time and measure response to management actions such as catchment development, dredging or stormwater management and natural events such as Richmond River flooding.

Shaws Bay is of high ecological value in the lower Richmond estuary containing a high proportion of the estuarine seagrass area, providing valuable fish nursery areas and shorebird habitat. It is also highly valued for its natural amenity and recreational opportunities. These are all valid reasons to support Shaws Bay being included in the Richmond River Ecohealth program. Inclusion of Shaws Bay into the existing program presents an opportunity to coordinate with existing programs and provide cost-effective monitoring and reporting. BSC is one of the partners involved in funding the existing Ecohealth program.

Option 3: Regular hydrographic surveys

Repeat hydrographic surveys will enable comparison of Shaws Bay bathymetry and water depth. The infilling of Shaws Bay is a key concern for the local community and survey data will provide accurate information about the rate of infilling and need for management action (e.g. dredging) to maintain existing uses. Survey information will also provide information to assist in assessing the need for and planning the location and magnitude of any future dredging works. Based on the existing information and estimated rates of infilling (refer Volume 2, Section 3.6), repeat hydrographic surveys conducted at an interval of approximately five years is considered appropriate.

Urban Stormwater Quality Management

Management Issues:

Issue 1: Recreational amenity and ecosystem health may be compromised by poor water quality

Issue 2: Community access to and use of the waterway is being affected by coastal processes

Issue 3: There is a need to adequately manage the fishery resource of the Bay

Issue 4: The community has a desire for improved foreshore facilities

Issue 5: There is a need to adequately manage community use and ecosystem health conflicts

Appropriate stormwater assets and public education regarding stormwater function and pollution control are required to minimise pollutant discharges to Shaws Bay. The management of stormwater runoff and the risk of localised flooding is discussed in options for Inundation Risk.

Existing Management Approach

Urban Stormwater Management Plan

The Ballina Urban Stormwater Management Plan (USMP, refer Section 3, Volume 2) includes shire-wide actions to:

- Improve Council administration and management of stormwater functions;
- Increase funding to implement stormwater management initiatives;
- Improve direction and guidance for Council staff and developers regarding stormwater management considerations.
- Increase community education and understanding of urban stormwater functions and impacts; and
- Implementation of a monitoring, evaluation and reporting program.

These shire-wide actions will contribute to improved stormwater management outcomes for the Bay over the long term.

Existing stormwater treatment devices

Following an assessment of various stormwater quality management devices (Gilbert & Sutherland, 2001), stormwater pollution baskets ("Enviropod" baskets) and gross pollution traps were installed within the Shaws Bay Residential Estate (Task A from 2000 EMP). The Shaws Bay stormwater system now includes 87 filter bag pit inserts, 2 gross pollution traps and 2 standard stormwater pits (Hydrosphere Consulting, 2012). There are more stormwater control devices in Shaws Bay than anywhere else in the Shire, and these now treat the majority of stormwater entering the Bay from the surrounding urban area with minor outlets from Compton Drive and some draining private land that remain untreated.

The 2001 study recommended monitoring of the performance of the litter baskets to assess the amount and types of contaminants collected. Monitoring of water quality in the Bay was also recommended to assess the level of water quality improvement. BSC has recently implemented a procedure to record the general composition of material removed from stormwater pits during scheduled maintenance activities. This may assist in identifying improved stormwater catchment controls in future. Improvements in water quality cannot be determined from the water quality monitoring data available from the Beachwatch program (which was not designed with this purpose), however the collection of sediments and litter indicate the systems have been successful in minimising pollution of the Bay. The level of success depends on regular maintenance and cleaning of the devices and continued maintenance should be a priority for Council.

Gully and scour erosion controls

Gully erosion was previously occurring in locations where a stormwater overland flow path leading to the Bay was channelising surface flows and developing into a deep canal, causing sediment to wash into the Bay. Council implemented some erosion controls works in 2010/11 as part of implementation of the 2000 EMP (Tasks D and L). Scour protection devices were installed around the openings of stormwater discharge pipes to prevent scour of sandy beaches and reduce the likelihood of establishing anaerobic pools of water and sediment. The works included importation of clean fill and rock rubble at the following sites:

- Gully erosion controls:
    - Stormwater outlet located adjacent to the northern boundary of Ballina Lakeside Holiday Park (as part of scour control works);
    - Pop Denison Park – three sites along the foreshore; and
    - Stormwater outlet south of Compton Drive.
- Scour controls:
    - Stormwater outlet located adjacent to the northern boundary of Ballina Lakeside Holiday Park; and
    - Along Compton Drive rock wall (six sites).

Council has recently placed turf along the drainage line following the northern boundary of the Ballina Lakeside Holiday Park to filter overland flow and reduce erosion. Some minor erosion caused by scour of natural drainage channels is still present. These should be addressed as part of general maintenance activities at the Bay.

Community education

Community education (Task E from the 2000 EMP) is a continuing process shire-wide with publications such as the *Sustainable Urban Business Program* and regular messages from all levels of government. Council rangers or environmental health officers regulate offences when evidence is available.

The USMP identified a general lack of knowledge within the community of how urban stormwater systems work, what they should look like and how to assist their function. This lack of knowledge can lead to complaints about performance of the systems as well as pollution from inappropriate discharges. In addition, some site-specific issues, the complexity of the issues and high costs of the solutions are not well understood by local residents, which lead to expectations of quick and easy solutions. Actions to improve understanding of the function of stormwater systems and how the community can assist were recommended focusing on erosion and sediment control, stormwater pollution, local flooding, function of stormwater systems and private maintenance requirements. It is considered appropriate that community education continues to be undertaken on a shire-wide basis with implementation of the actions from the USMP.

The 2012 Urban Stormwater Management Plan (Hydrosphere Consulting, 2012) found that the “showcase” pollution control device at the Lighthouse Beach lookout (implemented as part of the 2000 EMP) does not function as designed and is poorly maintained. Modification of the site was suggested as a focal point for education on stormwater pollution. While this device is outside the stormwater drainage catchment for Shaws Bay, there is the potential to include an upgrade of this facility as a future education tool.

Potential Future Management Options

There has been significant investment in stormwater pollution controls at Shaws Bay. Potential future management approaches relate to collection of data on stormwater pollution and the success of stormwater treatment devices and ensuring best-practice technologies are installed. The option of diverting stormwater

discharge to the Richmond River has been suggested by some members of the community and this is also discussed below.

Potential Future Options:

Option 2: Expand Richmond River Ecohealth monitoring program to include Shaws Bay – refer Section 5.2.2

Option 4: Divert stormwater from Shaws Bay

Option 5: Review and upgrade of stormwater pollution controls

Option 4: Divert stormwater from Shaws Bay

The 2000 EMP discussed the option of redirecting stormwater to the Richmond River to minimise the discharge of nutrients and sediments to Shaws Bay. During the preparation of the 2000 EMP there was strong support for this option and this was raised again during community consultation undertaken for this CZMP. The EMP concluded that this option was not warranted as the stormwater discharge was not having a significant detrimental impact on the Bay.

Based on discussions in Volume 2 of this CZMP, this conclusion is still considered valid as:

- The available data suggest water quality in the Bay is generally considered to be typical of a healthy estuarine environment;
- Catchment pollutant loads to Shaws Bay are considered small in comparison to the oceanic flushing potential;
- Modelling undertaken for the Estuary Processes Study (PBP, 2000b) indicates that pollutants are likely to be diluted and dispersed relatively quickly and any impacts are expected to be short-lived;
- The Main Section of the Bay has a large dilution capacity and pollutants discharged to this section of the Bay have a relatively minor effect on overall water quality; and
- The water quality in the East Arm generally reflects the water quality of the adjacent river as water in this section is completely exchanged with the river each tide.

In addition, the pollution control devices installed within the Shaws Bay catchment are expected to improve the quality of stormwater discharges through the reduction of sediments and litter. Hence any major expenditure on stormwater modifications is not considered to be warranted.

Option 5: Review and upgrade of stormwater pollution controls

It would be appropriate to conduct a review of the effectiveness of the existing stormwater treatment devices once some data on collected sediments/pollutants and/or water quality is available or if any concerns regarding system performance or safety are raised.

Key considerations would include:

- Information gathered by Council staff on the material collected in the pits and traps;
- Pollutant retention requirements (e.g. focusing on sediments, nutrients or litter or a combination of pollutants);
- Amy relevant results of water quality monitoring (refer Option 1: Modify Beachwatch program and Option 2: Expand Richmond River Ecohealth monitoring program to include Shaws Bay);
- Current technologies suited to the sites and pollution retention requirements;
- The risk of flooding and inundation and the impacts of sea level rise;
- Occupational health and safety considerations e.g. for maintenance and rectification;

- Amenity and public safety considerations;
- Life cycle costs; and
- Other asset management considerations and best-practice approaches documented in Council's urban stormwater management procedures (a key action arising from the USMP).

Water Quality and Public Health Management

Management Issues:

Issue 1: Recreational amenity and ecosystem health may be compromised by poor water quality

Issue 2: Community access to and use of the waterway is being affected by coastal processes

Shaws Bay is a popular area for primary contact recreational activities such as swimming and board paddling. While water quality is generally suitable for primary contact recreation, Beachwatch data suggest a link between high rainfall and increased risk of illness to bathers. Reduced water circulation and tidal flushing due to infilling may affect water quality at some locations.

Existing Management Approach

Water quality monitoring currently undertaken in Shaws Bay (Beachwatch) is discussed in options for Information Requirements and Management.

Richmond River CZMP actions

The Richmond River CZMP includes strategies that are aimed at improving water quality. Many of the strategies concern management of floodplain infrastructure, farming practices and large-scale erosion and riparian vegetation improvements and are not directly applicable to Shaws Bay. However, as Shaws Bay is hydrologically connected to the Richmond River, implementation of these actions across the catchment will have a large bearing on improvement water quality in the Richmond River which will also influence Shaws Bay water quality, particularly during major flooding events. Priority Richmond River CZMP strategies for improvement of water quality include:

- Floodplain Infrastructure Management: There is now recognition of the significant negative impacts of floodplain modification on the overall health of the estuary and specifically associated with acid sulfate soil impacts, blackwater events following flooding, contribution to general decline in water quality, increasing the frequency and severity of fish kills and loss of biodiversity on the floodplain. The strategy aims to address the environmental impacts of floodplain infrastructure (constructed drains, modified canals, artificial levee banks and floodgates), while maintaining adequate protection against flooding.
- Farm Management Planning: Management of agricultural lands in the Richmond River catchment has a major influence on water quality and riparian vegetation condition within the estuary. This strategy aims to minimise the environmental impact of farming practices while preserving the economic and social benefits of agriculture to the community. Key actions include: scientific investigations to fill gaps in understanding; develop farm management plans for high priority farms to address specific environmental issues to facilitate changes to more estuary-friendly land uses in the catchment; and liaison with agriculture industry bodies to improve education and ensure estuary friendly practices are incorporated into industry guidelines.
- Riparian Zone Management and Erosion: The riparian zone bordering the Richmond River Estuary and tributaries is degraded for much of the study area, with limited coverage and poor condition. This issue has been identified as one of the key issues affecting overall estuary health. The establishment of suitable vegetation for riparian biodiversity corridors and natural vegetation for stabilisation of

denuded banks is the key aim of this strategy and would result in a significant reduction in bank erosion and sediment displacement while enhancing ecosystem values and improving water quality for the estuary as a whole.

Potential Future Management Options

There are opportunities to improve knowledge of water quality risks, increase tidal exchange with the river and circulation in the Bay and increase community understanding and awareness of health risks.

Potential Future Options:

Option 1: Modify Beachwatch program – refer Section 5.2.2

Option 4: Divert stormwater from Shaws Bay – refer Section 5.3.2

Option 5: Review and upgrade of stormwater pollution controls – refer Section 5.3.2

Option 6: Increase water exchange through wall

Option 7: Improve circulation within the Bay

Option 8: Improve education and awareness of public health issues

Option 6: Increase water exchange through wall

Numerous stakeholders consider that increasing tidal exchange through the training wall will improve water quality and have suggested potential options to achieve this. Tidal exchange is presently concentrated through the wall within the East Arm. Some tidal exchange may occur through other parts of the wall but is likely to be minor in relation to the East Arm flow. Exchange though the central section of wall is blocked, particularly at low tide, by the build-up of sediments and mangroves half way along the wall. Removal of mangroves along the training wall is discussed below. One uncertainty regarding this option is the extent to which these mangroves limit tidal exchange as the EPS (PBP, 2000a) notes that the wall itself may be impervious at the lower tidal levels in this central section.

The current low tide limit within the Bay is limited by the porosity of the lower elevations of the training wall. Modification of the wall to lower this ponding effect would increase the tidal prism of the Bay and therefore promote increased water exchange, however this would have significant unwanted consequences such as reduced swimmer access at low tide and significant ecosystem disturbance due to alteration of marine fringing vegetation distribution. No alteration of the present low tide limitation is recommended for these reasons.

Another option raised by stakeholders is the provision of a dedicated conduit through the wall. Such a conduit would be located and sufficiently sized to provide a significant contribution to water exchange within the Bay. The EPS found that the training wall presently allows transmission of virtually all of a high tide (within 0.1m) with little time lag (<45 minutes). To provide an increased benefit to circulation and exchange within the Bay, the conduit location would need to be complementary to the tidal exchange through the East Arm. Some stakeholders have suggested that a conduit near the steps at the south-western end of the Bay would provide benefits to circulation within the Bay. This would consist of a pipe through the wall, which could if desired, be fitted with gates to control the tidal conditions under which exchange occurs. Such a conduit may provide additional circulation within the main body of the Bay, and may be improved if an opening/closing mechanism is provided to coordinate exchange at the optimal levels in relation to natural flow through the East Arm. No hydraulic studies of this concept have been undertaken at this stage and the potential effectiveness of a conduit of this nature has not been fully evaluated.

As this concept would be costly and may have structural implications for the training wall, the benefits to water quality would need to be significant to justify development of this approach. The present understanding

of the hydrodynamics of Shaws Bay indicates that the south-western end of Shaws Bay already receives significant tidal exchange and therefore the level of improvement likely to result from an additional conduit in this location is expected to be minimal.

Given the uncertainty about the efficacy of this concept and the significant costs associated with assessment and implementation of this option, it is not recommended for inclusion in this CZMP.

Option 7: Improve circulation within the Bay

A concept related to Option 6 is to direct good quality water during the incoming tide directly to the northern end of Shaws Bay. Variants on this option were raised by several stakeholders and would comprise the following:

- An intake at the East Arm, at the appropriate elevation, which would be overtopped during the incoming tide. This intake may either be located within the East Arm (collecting water which has already flowed through the training wall), or provided in conjunction with a conduit through the wall at this location, thereby accepting water directly from the Richmond River; and
- A pipeline northwards, approximately following Cedar Crescent and then linking westwards following Compton Drive to discharge into the Northern Section of Shaws Bay.

This concept is envisaged to improve water quality in the Northern Section of Shaws Bay through passive operation, which may be improved by the use of flow control gates to promote one-way circulation. A key consideration with this option is the size of the pipeline that would be required to transfer beneficial volumes of water to the Northern Section. The approximate distance of the pipeline route is 1.2 km. The water level difference between the Northern Section of the Bay and the East Arm is around 0.1 m during inflowing tides and there is up to a 0.1 m difference between the Richmond River and the water level within the East Arm (PBP, 2000a). The maximum head available to drive water circulation is therefore 0.1 m (East Arm intake) or 0.2 m (Richmond River intake), with hydraulic gradients through the 1.2 km pipeline of 1 in 12,000 or 1 in 6,000 respectively. Although no hydraulic modelling has been undertaken, it is considered that the size of pipeline (or channel) needed to convey useful volumes of water at these gradients is likely to be prohibitive. This option is not recommended for inclusion in the CZMP.

Option 8: Improve education and awareness of public health issues

The community consultation undertaken for this CZMP highlighted a general lack of knowledge of public health risks at Shaws Bay. Key concerns related to the appropriateness of the water quality for primary contact recreation, particularly following rainfall, as well as the potential for skin infections. Much of the concern arises from the visual appearance of the water (clarity, the presence of algae and seagrass and film/slicks on the surface), anecdotal evidence of skin irritations as well as information provided to newspapers by members of the public.

The Beachwatch program is designed to provide the community with accurate information on the cleanliness of swimming locations. Modifications to this monitoring program have been recommended.

The BSC website contains general information about the Beachwatch program, downloads of latest reports and a link to the OEH website of weekly star ratings for the summer months of sampling. The linked OEH page contains star ratings for Shaws Bay, but limited information on what each rating means. Better organisation of information is required to allow for easy interpretation of these results by the public.

The NHMRC guidelines advocate a preventive approach to the management of recreational water, focusing on assessing and managing hazards and hazardous events within a risk-management framework (NHMRC, 2008). The approach relies on identifying surrogate indicators of increased risk and taking action to manage those risks. For example, rainfall causing increased runoff into a water body and consequently influencing pathogen contamination could be used as a surrogate indicator of increased risk. An appropriate action to reduce this risk might be to advise the public not to use the water body for a particular time. Applying

surrogate indicators in this way allows for 'real-time' management of faecally-derived pathogens in recreational water. From the existing water quality data and previous study it is known that rainfall events of >10mm in a 24hr period present a risk of increased levels of bacterial contamination and that swimming in Shaws Bay should be avoided during and for up to three days following rainfall. Therefore, adopting a more preventative approach could utilise this information and include this general guideline on the BSC website and possibly links to rainfall data allowing the public to make informed decisions. This guideline could also be included on any information boards put up around the Bay. It is noted that this guideline is based on water quality data from the Northern Section of the Bay and while there is no data to confirm, the East Arm and Main Section are likely to have better water quality following rainfall due to better flushing and tidal exchange with the Richmond River (providing the river is not in flood). Sampling in these locations would provide more information on conditions and level of risk.

The key components of an education and awareness program would include (similar to the program conducted by BSC for Lake Ainsworth in relation to blue-green algae):

- Background information on bacteria and pathogens, human interactions and high risk groups, including the potential for bacterial wound infections;
- Data on the monitoring results, interpretation and clear indicator of risk published regularly on Council's website and in local newspapers;
- Distribution of general information to tourist facilities and on signage at key swimming access points (Pop Denison Park, Compton Drive and Fenwick Drive). This would include recommended swimming locations and relationship to rainfall. Signage is currently being planned for key sites by BSC; and
- Recommendations regarding preventative measures such as avoiding contact with water, particularly if skin lesions are present and following rainfall.

Erosion Management

Management Issues:

Issue 1: Recreational amenity and ecosystem health may be compromised by poor water quality

Issue 2: Community access to and use of the waterway is being affected by coastal processes

Erosion of banks can impact on safe and enjoyable access to waterways as well as contributing to sedimentation in the Bay.

Existing Management Approach

The 2000 EMP included an action to create a stable sandy beach in the East Arm (Task K). In 2001 Council commissioned a study to investigate options to address erosion of the East Arm shoreline (WBM, 2001). Methods considered involved dissipation of the wave energy and interruption of sand transport. The study recommended a combined beach reshaping and single primary groyne constructed from sand bags. The option was then developed in consultation with Fisheries NSW and an environmental assessment was prepared in 2009 (GeoLINK, 2009). The proposed stabilisation works in the eastern-most section included areas of backfill with 150-200 mm nominal diameter boulders, coarse gravel, geotextile and top dressing. A bund of geotextile bags was proposed for the western end of this section to limit transport of sediment. The existing rock armour in the middle section of the East Arm was to be augmented (with rocks obtained from the failed rock armouring in the western section) and a geotextile installed behind the rock armouring. West of the stormwater drain, the proposal includes re-profiling of the shoreline and revegetation of the bank. At the western end of the shoreline, it is proposed to install a small groyne of geotextile bags to assist in reducing the movement of sediment from the East Arm into the main body of Shaws Bay. Active revegetation

of mangroves would also be undertaken to assist formation of a natural groyne and potentially allow removal of the geotextile bags once the mangroves were established. An application was made under the NSW Estuary Management Program for implementation funding but was unsuccessful.

A more cost-effective approach is supported in this CZMP as there is a need to improve foreshore and waterway access at this location (refer Figure 10).

Potential Future Management Options

It is considered that control of bank erosion in the East Arm remains a priority in addressing siltation and shoaling as well as improving foreshore access. While the availability of funding was a key constraint in the past, this concept should be pursued with modifications to improve technical and cost-effectiveness.

Potential Future Options:

Option 9: Implement East Arm erosion controls (modified)

Option 9: Implement East Arm erosion controls (modified)

The East Arm is continuing to erode under current conditions and this may be exacerbated by increased tidal flows associated with sea level rise. Although the volume of sediment and contribution to infilling of the Bay is relatively minor, erosion of this reach is reducing recreational amenity and causes public safety and access issues to this part of the waterway.

This issue has been on-going and it was recommended (Task K) in the previous EMP that a stable sandy beach be established at the East Arm. Following preliminary advice from WBM (2001), Council engaged GeoLINK in 2009 to prepare a detailed design however this has not been implemented to date.

A variant on this design is recommended for inclusion in this CZMP which consists of the following:

- Filling of sink holes immediately to the east of the East Arm, utilising geofabric to avoid fill loss through the wall. Loam material gained through the tasks below may provide some fill for this purpose;
- Construction of a rock retaining wall along the eastern half of the eroding bank, utilising geofabric to retain fine material to prevent failure as has occurred in previous attempts. The rock for this structure will be a combination of imported material as well as re-using rock from previous structures scattered in this reach. The extent of this rock wall should be considered in further detailed design, but is likely to be required to a point approximately 80m west of the stormwater outlet; and
- Stripping of the top loam layer and re-profiling of the sandy beach between the rock retaining wall and the stand of mangroves at the western end of the East Arm. This beach should be at a slope of 1 in 10 or less and may require imported clean sand to achieve the desired profile and beach condition. Some areas of stable bank and existing vegetation in this zone may be retained in the existing condition as appropriate.

The GeoLINK (2009) concept included the installation of a geotextile groyne at the western end of the sandy beach, however this is not likely to be necessary as the existing mangrove stand functions as a groyne and reduces the probability of bank erosion behind this point.

It is recommended that a general clean-up of the remains of previous infrastructure such as failed brick walls, concrete stairs and rockwork is conducted during these works.

The stabilisation of this reach and re-profiling of the beach will:

- Reduce sediment input to the rest of the Bay, reducing infilling and fine sediment accumulation;
- Increase the amenity of the East Arm beach and provide for greater usage;

- Reduce safety risks associated with steep/failing banks and sink holes to the east along the training wall; and
- Reduce the widening of the East Arm, which will limit the rate of shallowing by concentrating tidal flows within the sandy channel, hence maintain scoured clean sand and sufficient depth for high tide swimming.

Siltation and Infilling Management

Management Issues:

Issue 1: Recreational amenity and ecosystem health may be compromised by poor water quality

Issue 2: Community access to and use of the waterway is being affected by coastal processes

Issue 5: There is a need to adequately manage community use and ecosystem health conflicts

The sources of sediment and rate of infilling is discussed in Section 3.6, Volume 2. Since the cessation of dredging in the 1990s, Shaws Bay has gradually infilled with sediment from silt-laden floodwaters from Richmond River; scour of the East Arm channel and subsequent bed transport and deposition and to a lesser extent due to local catchment runoff (due to the installation of stormwater quality improvement devices). Sediment is redistributed within the Bay with key areas of infill being on the eastern margin of the Bay adjacent to the Ballina Lakeside Holiday Park and the northern half of the main waterbody.

Existing Management Approach

Management measures related to siltation and infilling include:

- Actions from the Richmond River CZMP aimed at improving the water quality in the Richmond River will assist with a reduction in sediment-laden floodwaters;
- Collection of bathymetric data;
- Erosion control measures; and
- Dredging of the Bay was undertaken in the mid-1970s, early 1980s, mid to late 1980s and 1990s. The 2000 EMP included an option of potential removal of accumulated sediment (Task J) based on hydrographic survey data and triggers such as water quality indicators suggesting sustained stratification of water in the northern Bay or infilling to a minimum water depth. Dredging has not been undertaken in the Bay since the 1990s.

Potential Future Management Options

Opportunities to control sedimentation and infilling relating to increasing tidal exchange and circulation, controlling bank erosion and collection of bathymetric data have been discussed in previous sections. Additional options relate to removal of sediment from the Bay and clearing of mangroves.

Potential Future Options:

Option 3: Regular hydrographic surveys – refer Section 5.2.2

Option 6: Increase water exchange through wall

Option 7: Improve circulation within the Bay – refer Section 5.4.2

Option 6: Increase water exchange through wall – refer Section 5.4.2

Option 9: Implement East Arm erosion controls (modified) – refer Section 5.5.2

Option 10: Clearing of mangroves along wall

Option 11: Allow infilling

Option 12: Dredging of Main Section

Option 10: Clearing of mangroves along wall

There is an established stand of mature mangroves along the training wall adjacent to the steps. The combination of the mangroves, trapped sediment and infilling of the wall itself means that there is limited tidal exchange through this section of the wall. Increased tidal flushing of the Bay would be advantageous for water quality at most times of the year (i.e. outside of floods). The removal of the mangroves could potentially increase tidal exchange through the wall with the Richmond River, promoting increased water circulation in the Bay.

Council has a permit which allows removal of mangroves along the wall (refer previous section). However, the intention of the mangrove clearing permit was for the clearance of immature trees, lopping of branches at access points and to prevent the uncontrolled spread of mangroves in key areas. The permit does not cover dredging and reclamation, which would now be a key requirement of any effective mangrove removal along the wall. A separate approval for dredging of the sediments and any damage to seagrass would also be required. It should also be noted that the correspondence accompanying the issue of the permit states that 'Mangroves are to be removed using hand held tools only' which provides some indication of the extent of work/degree of impact envisaged by Fisheries NSW when issuing the permit.

The EPS suggests this section of the wall may have always been relatively impervious and therefore the likely effectiveness of this measure is unknown. Although there is limited information available on the porosity of the wall, the EPS findings are supported as:

- Mangroves colonise areas where sedimentation is occurring within a narrow elevation profile. The colonisation of mangroves at this location, and not further to the east suggests that there was some difference in tidal flow through the wall and sediment build up at this location prior to mangrove establishment. There is a significant probability that simply removing the mangroves and excess sediment at this location will not change the reasons that sediment accumulation and mangrove establishment occurred in this location in the first place; and
- It is highly likely that there are variations in wall porosity along its length as a result of the relatively coarse construction process and it follows that some areas are likely to be more porous than others.

Figure 12: Mangroves along the training wall

It should also be noted that porosity of the wall is likely to continue to reduce, as natural processes contribute to infilling of the wall matrix including:

- Biofouling, where oysters, mussels, barnacles, sponges etc. continue to colonise crevices where any flow occurs;
- Items such as driftwood, seagrass wrack and litter continue to get trapped in the wall; and
- Flood and wave-borne sediments continue to settle in areas where flow is reduced due to these obstructions.

Any increase in wall porosity at low levels would have the effect of increased flow on the outgoing tide and therefore reduced depth for swimming at low tide. The ecology of the Bay would respond in accordance with the reduced levels and it is anticipated that the upper range of seagrass would retract and the lower range of mangroves would increase.

Removal of mature mangroves at this location will be a significant undertaking due to a number of factors including:

- The large size of this mangrove area (approximately 1,480 m^2);
- Access restrictions due to the location in close proximity to the training wall and surrounded by water;
- The need for disturbance of the training wall structure to extract mangrove roots and accumulated sediments from the wall matrix;
- The potential for damage to adjacent seagrass either directly or through sediment disturbance and water quality degradation. Even though Council has a permit for removal of mangroves, approval from Fisheries NSW for damage to seagrass areas is required. The potential damage to seagrass is a key consideration as compensatory measures would be required which in turn increases the cost of the action, even if considered a reasonable action; and
- Mangrove regrowth would occur and any sediment/mangrove removal actions would need to be ongoing.

An assessment of removal methods is required prior to works being undertaken and environmental impact assessment will be necessary to adequately assess potential impacts and support approval applications.

The mature mangroves along the wall have been noted by members of the community as contributing to the ecological and scenic value of the Bay and the need for removal is not supported by all of the community.

Due to the difficulties expected to be encountered and the lack of certainty regarding the effectiveness of this measure, removal of these mangroves is not recommended.

Option 11: Allow infilling

If infilling was allowed to continue unabated or without removal of sediments (refer Option 12), the current geomorphic trends associated with scour and infilling (refer Section 3.6, Volume 2) are expected to continue as follows:

- Continued deposition of fine sediment will encourage expansion of marine vegetation (seagrass and mangroves) along the edge of the training wall in areas not directly scoured by tidal flows through the wall. Expansion may also occur in the Northern Section and Main Section of the Bay which in turn will reduce flows and allow greater deposition;
- The delta at the confluence of the East Arm and the main body of Shaws Bay will expand with seagrass colonising the shallow areas previously scoured by the tidal flow; and
- North-moving sand from the East Arm will continue to deposit in front of Ballina Lakeside Holiday Park and the eastern shore of Pop Denison Park due to the prevailing southerly winds.

Comparison of the 1999 and 2013 bathymetric surveys indicates that, on average, the Bay has infilled by 876 m^3/year, which is equivalent to 5.6 mm/year if all deposition occurred evenly across the bottom of the Bay. This rate is similar to the predicted rate of sea level rise (6.7 mm/year between 1990 and 2050), which could be interpreted to mean that there may be no predicted net change in depth over the long term considering the two opposing factors. However, it is important to recognise that deposition is not occurring evenly across the Bay and parts of the Main Section of the Bay are accreting at a rate of over 100 mm/year and in these areas the long term shallowing will be appreciable.

Sediment deposition, shallowing and seagrass colonisation are significant areas of concern for the community. As discussed below, dredging of the sediments requires approvals, significant expenditure and the likely need for compensatory estuarine habitat. While dredging is recommended to achieve the goals and objectives for Shaws Bay, the continued infilling that will occur until dredging can take place will not significantly alter the current amenity of the Bay. Long term infilling will result in significant shallowing of the Main Section of the Bay which is not consistent with the overall goal of this CZMP to enhance recreational amenity. Despite this, allowing infilling to occur is a significantly cheaper option than dredging and will result in positive ecological outcomes through the expansion of seagrass as well as avoiding the impacts of dredging such as sediment disturbance and water quality deterioration.

Option 12: Dredging of Main Section

As discussed above, the rate of infilling of the Main Section of Shaws Bay is approximately an order of magnitude greater than the rate of expected sea level rise. Additionally, the areas of infilling are concentrated in areas highly valued by users of Shaws Bay and have the potential to alter the character and usage patterns of the Bay.

The continued accumulation of sediment at the connecting channel between the Northern Section and Main Section of Shaws Bay is likely to further restrict tidal exchange with the northern reach and is reaching a depth where expansive seagrass growth is likely. Numerous community stakeholders have expressed concerns about the reducing depths in this area and consider that the amenity of Shaws Bay for swimming (depth and water quality) will continue to degrade with on-going siltation and seagrass growth.

Historically, the Bay was regularly dredged to maintain the desired condition and to maintain sandy beaches utilising the dredged material. Dredging is favoured for Shaws Bay in order to maintain recreational values and to promote better tidal exchange with the Northern Section. A suite of investigations is required in order to confirm the appropriateness of this strategy. It is recommended that:

- An area encompassing the northern half of the Main Section of the Bay, as well as the channel to the Northern Section of Shaws Bay is defined as the target dredging area for further investigation with a target depth of ~3m at low tide. Expansion of this area to include the south-western portion of the Bay may also be appropriate;
- The nature of the sediments in this area is assessed to determine whether this material remains suitable for placement on sandy shorelines and to identify measures required for dewatering and placement;
- An environmental assessment is prepared for the project, including detailed assessment of impacts on marine vegetation and environmental protection measure required during works; and
- Liaison with Fisheries NSW is undertaken to determine the nature and extent of any offsets for destruction of marine vegetation.

Estuarine Vegetation Management

Management Issues:

Issue 2: Community access to and use of the waterway is being affected by coastal processes

Issue 4: The community has a desire for improved foreshore facilities

Issue 5: There is a need to adequately manage community use and ecosystem health conflicts

Estuarine vegetation refers to seagrass, mangroves and saltmarsh plant communities which occur in distinct zones at different elevations along the foreshore, subject to different levels of tidal inundation (refer Section 6.2, Volume 2). Estuarine vegetation performs a number of important ecosystem functions including providing nursery habitat and erosion control, sediment trapping and sediment filtration functions. Estuarine vegetation can also affect access to the waterway which is a key community concern. The protection of estuarine vegetation, while supporting recreational values, is a key goal of this CZMP.

Existing Management Approach

NSW Department of Primary Industries (DPI) administers the *Fisheries Management Act 1994* (FM Act) and associated Regulations. The department has jurisdiction over all fish and marine vegetation in state waters and these powers also extend to Commonwealth waters for some species and fishing methods. To meet the primary objectives, Part 7 of the FM Act deals with the protection of aquatic habitats and Part 7A deals with threatened species conservation.

Under Part 4 of the *Environmental Planning and Assessment Act, 1979*, NSW DPI is a 'determining authority' for local development that requires one or more of the following permits under the FM Act:

- Section 144 - aquaculture permit (i.e. cultivating fish or marine vegetation for sale/commercial purposes);
- Section 201 - permit to carry out works of dredging or reclamation (i.e. any excavation within, or filling or draining of, water land or the removal of woody debris, snags, rocks or freshwater native aquatic vegetation or the removal of any other material from water land that disturbs, moves or harms these in-stream habitats);
- Section 205 - permit to harm (cut, remove, injure, destroy, shade etc.) marine vegetation (saltmarshes, mangroves, seagrass and seaweeds); and
- Section 219 – permit to obstruct the free passage of fish.

The 2000 EMP included an action to maintain seagrass-free access into the water (Task M). Council sought a permit from Fisheries NSW in 2004 to undertake dredge and reclamation works in the Bay (to remove

seagrass). At that time, areas in the eastern side of the Bay and two middle access points on the western side were found to be clear of seagrass. The northern and southern most access points had a minor amount of seagrass recovery in the "seagrass-free zones". Due to the recreational values relying on seagrass (fishing, snorkelling etc.) and the water quality benefits provided by the seagrass beds, Fisheries NSW did not support the harming and removing of marine vegetation to maintain infrequently used access points and Council was unable to secure an approval to undertake this work.

Selective removal of mangroves was recommended in the 2000 EMP (Task U) to minimise sedimentation (and improve waterway access). BSC has obtained a permit under the FM Act to maintain certain waterways in the Shire affected by mangroves. The permit allows maintenance activities which harm mangroves at waterway access points and stormwater outlets along the training wall and banks of Shaws Bay as shown in Figure 14. Conditions relating to notification and consultation, work methods, sediment and erosion control, work in waters, timing of works and protection of other estuarine vegetation are included in the permit. Maintenance activities are subject to funding priorities and many of the locations affected by mangrove growth and approved for maintenance under the permit have not been maintained. As a result, juvenile and mature mangroves have established in many areas around the Bay. Removal of mangroves along the training wall would be costly due to the maturity and extent of the mangroves as well as access difficulties. The historical and current distribution of mangroves is discussed in Section 6.2 of Volume 2.

Potential Future Management Options

The overall approach to this CZMP includes the provision of ecological reserves which promote growth and protection of estuarine vegetation while at the same time concentrating recreational activities in other areas of the Bay. Potential options discussed below support this approach as well as increased community awareness and opportunities for education.

Potential Future Options:

Option 13: Provide for enhancement of estuarine vegetation

Option 14: Community education about the value and role of estuarine vegetation

Option 15: Amend mangrove exclusion areas permitted under Fisheries NSW maintenance permit

Option 13: Provide for enhancement of estuarine vegetation

This option provides for designated areas to be set aside for the protection of estuarine vegetation in Shaws Bay. Feedback received from the community as part of this CZMP was mixed with regard to estuarine vegetation. There was concern among many stakeholders regarding a perceived decline in amenity resulting from seagrasses and mangroves at waterway access points. Many members of the community also identified the values of estuarine vegetation and the need for on-going protection. The designation of ecological protection areas aims to address these conflicting opinions by providing safe and suitable access points to the waterway with enhancement of public facilities in certain areas while protecting ecological values in other locations.

Figure 10 provides an overview of the ecological protection areas set aside for this purpose. The aim of these zones is to allow for the continued growth (and migration where possible) of estuarine vegetation and to minimise disturbance as much as possible. Mechanisms of disturbance are discussed in Section 6.2 of Volume 2 and include human actions such as construction of infrastructure (e.g. roads, walkways, buildings etc.), actions that exacerbate bank erosion, poor water quality and direct disturbance from vehicles, watercraft and humans.

A major factor that will impact on estuarine vegetation in the future is the presence of barriers to upslope migration of mangroves and saltmarsh which would naturally occur with sea level rise (refer Section 6.2.4, Volume 2 and Figure 13).

Figure 13: Examples of barriers along Compton drive preventing migration of estuarine vegetation

The bathymetric analysis completed as part of this CZMP (Section 3.4, Volume 2) identified low-lying areas east of the northern tip of Shaws Bay (Pop Denison Park) suitable for the natural migration of estuarine vegetation communities. There are limited barriers such as retaining walls or roads in this location (up to the access road in Pop Denison Park) and migration of vegetation communities can occur unimpeded for a number of years. Currently, some of this area is used for recreation and it contains existing public facilities (car park, picnic tables etc.) which would provide access for nature appreciation and education activities.

The ecological zones also present an opportunity to provide compensatory habitat should they be required in order to compensate for potential adverse environmental impacts associated with proposed activities in this CZMP such as dredging and formalisation and enhancement of beach areas (which may exclude areas of seagrass). Details of the nature and suitability of compensatory habitat will need to be assessed in consultation with Fisheries NSW. General considerations for any works involving the removal or harming of marine vegetation have been provided by Fisheries NSW for this CZMP as follows:

- As a general principle Fisheries NSW aims for no net loss of key fish habitats;
- Tidal waters are considered key fish habitats and seagrass beds >5m are identified as *highly sensitive* (Type 1) key fish habitats;
- As a first priority, Fisheries NSW aims to avoid impacts upon key fish habitats (which includes tidal waters such as Shaws Bay), rather these areas should be maintained or improved;
- Where avoidance of impacts on key fish habitats is impossible or impractical, proponents should then aim to minimise impacts;
- Any remaining impacts should then be offset with compensatory works; and
- The Fisheries NSW policy and guidelines for rehabilitation and compensatory measures makes specific reference to a compensatory ratio of 2:1 (outside of SEPP14 wetland areas) and a $\$102/m^2$ monetary payment (subject to CPI inflation) for impacts on marine vegetation including seagrass.

Community education will be important for the successful implementation of ecological protection areas. Regular users of the Bay will need to know the reasons why facilities in certain areas are changing, if zones are to be successful. The exclusion of people from ecological zones (e.g. signage/ fencing) is the most important factor in protecting these ecosystems. The timeframes for vegetation community migration are long and the transition to ecological protection areas is expected to take place over a number of years.

Option 14: Community education about the value and role of estuarine vegetation

Providing effective communication to the public about ecological protection areas, designated access points and the rationale behind this approach will be important to the success of this management approach. Communication media including local newspaper articles, Community Connect articles, and educational signage at key locations around the Bay will be required. Part of this communication will include information about the value and ecosystem benefits of estuarine vegetation (refer Section 6.2, Volume 2). Information should also link ecological values to recreational benefits such as:

- Improved habitat areas improving fish stocks and enhancement of recreational fishing; and
- Enhanced seagrass areas improving water quality including water clarity which in turn enhances amenity and primary contact recreation.

Option 15: Amend mangrove exclusion areas permitted under Fisheries NSW maintenance permit

The current mangrove exclusion areas allow maintenance activities which harm mangroves at waterway access points and stormwater outlets along the training wall and banks of Shaws Bay. Consistent with the overall approach developed as part of this CZMP and to support increased community access to the foreshore, it will be necessary to modify the current exclusion areas in consultation with Fisheries NSW. Figure 14 shows the proposed modifications.

Figure 14: Current and proposed altered mangrove clearing areas

Fishery Management

Management Issues:

Issue 3: There is a need to adequately manage the fishery resource of the Bay

Issue 5: There is a need to adequately manage community use and ecosystem health conflicts

A wide range of fish species inhabit the Bay including the protected estuary cod. Recreational fishing is a popular pastime.

Existing Management Approach

The State's fisheries are a community-owned resource managed by Fisheries NSW. Comprehensive laws are in place to ensure fishing activities remain sustainable and that biological diversity is protected. There are a number of rules and regulations for recreational fishers addressing bag and size limits, protected species and prohibited methods. Commercial fishing, spear-fishing and the use of traps (other than bait traps) or nets (other than dip or scoop nets) are prohibited in the Bay.

Fisheries NSW actively encourages anglers to fish responsibly and adhere to the responsible fishing guidelines (published on the Primary Industries website). The guidelines include important messages such as catch and release techniques and reporting of suspected illegal fishing activity and are promoted through various channels including the DPI Saltwater Fishing Guides, newsletters, face to face public advice through the DPI Fishcare volunteer program (a recreational fishing education program where volunteers talk to anglers about fishing rules, responsible fishing practices and run a range of activities such as fishing workshops, surveys, school excursions and community fishing events), Fisheries Compliance officers (based at Ballina) and Fishcare Education officer (based at Wollongbar).

Protected fish species are discussed in the DPI *Saltwater Recreational Fishing Guide* along with information promoting responsible fishing practices. Fisheries NSW has forwarded copies of this guide to the Ballina Lakeside Holiday Park and Shaws Bay Caravan Park. The local Fisheries Compliance officers, Fishcare Education officer and Fishcare volunteers will continue to promote responsible fishing in the local area.

Currently, there are several signs at Shaws Bay displaying a 'no spearfishing' icon together with a number of general warnings (Figure 15). There is no other signage at Shaws Bay notifying the public of the other applicable fishing rules and restrictions or providing information on protected fish species and species size and bag limits.

Figure 15: Example of signage at Shaws Bay

Potential Future Management Options

There are opportunities to reduce the impact of recreational fishing including increasing community awareness and education about regulations and the types of fish in the Bay. Some community members have suggested there is a need to provide stricter controls on fishing and others have suggested reducing fish numbers in the Bay, particularly mature fish. These options are discussed below.

Potential Future Options:

Option 2: Expand Richmond River Ecohealth monitoring program to include Shaws Bay – refer Section 5.2.2

Option 16: Community education – recreational fishing

Option 17: Fishing ban

Option 18: Removal of mature fish

Option 16: Community education – recreational fishing

Community awareness and education is a tool used by Fisheries NSW to inform the public about recreational fishing in NSW. Fisheries implement a range of programs including signage at major boat ramps and popular fishing spots, provision of pamphlets, webpages and fact sheets on species size and bag limits and community engagement programs such as the Fishcare program.

The popularity of recreational fishing and the concerns raised around it in Shaws Bay presents an opportunity for additional community education about recreational fishing best practice, regulations, bag limits, size restrictions and threatened species. The information distributed by Fisheries NSW to the caravan parks is an example which should be supported by:

- Information on relevant signs and information boards around Shaws Bay;
- Fishcare activities at a Shaws Bay park during summer school holidays to engage and educate both children and adults; and
- Continued presence of Fisheries NSW officers during peak fishing periods (summer) to engage and educate the public and deter potential offenders.

Option 17: Fishing ban

Prior to the preparation of this CZMP anecdotal reports of people spearfishing, keeping protected species and setting crab pots within Shaws Bay received a large amount of media attention and subsequently raised concern about fishing in Shaws Bay among some community members. Consequently, some members of the community made calls for Shaws Bay to be gazetted as a ‘marine park’ or ‘no fishing zone’. Following these calls Council made enquiries to Fisheries NSW regarding the matter. The preferred approach of Fisheries NSW is based on the existing regulations and guidelines.

Option 18: Removal of mature fish

During the community consultation phase, community members cited the perceived proliferation of fish (particularly mullet) and the ‘bumping’ of swimmers by larger fish (e.g. trevally) as issues affecting the amenity of swimming in Shaws bay. Community members also suggested that to manage this issue commercial fishers should be able to target and net mullet in Shaws Bay as they do in the main Richmond River adjacent to Missingham Bridge from April to July. It was also suggested that large fish responsible for ‘bumping’ swimmers should be captured from the Bay.

Currently, commercial fishing is prohibited in Shaws Bay and any netting of mullet would require relaxation of these laws. Additionally, the relatively small numbers of mullet in the Bay are likely to hinder the commercial viability of commercial netting of the mullet. Alternatively, both the mullet and ‘bumping’ fish could be

captured by other means (such as line fishing or netted under an appropriate permit) and released over the training wall into the main Richmond River.

Removal of a large quantity of these fish from Shaws Bay is likely to face considerable community opposition as these species are important to the health of the Shaws Bay ecosystem and both species, in particular Trevally, provide a popular recreational fishing resource attracting anglers to the Bay. The identified removal options are likely to encounter considerable constraints and issues including:

- Cost;
- Commercial viability (for commercial netting);
- Legislative constraints;
- Practicality; and
- Community opposition.

Due to these constraints and relatively low consequence and public risk of the issue it is recommended that this option is not pursued further.

Foreshore Facilities and Access Management

Management Issues:

Issue 4: The community has a desire for improved foreshore facilities

Issue 5: There is a need to adequately manage community use and ecosystem health conflicts

Issue 6: There is a risk of inundation of developed land

Shaws Bay provides a range of water-based and land-based recreational opportunities and natural experiences. The maintenance and enhancement of the amenity of Shaws Bay is important to promote community enjoyment and tourism in Ballina.

Existing Management Approach

Maintenance of existing community facilities and open space areas (mowing, cleaning and waste collection) is undertaken by Council on an on-going basis. Recommendations from the 2000 EMP have been implemented including:

- A disabled access ramp to the waterway (Task O) and shower (Task R) were installed along Compton Drive foreshore (a);
- Bench seating has been installed along the training wall (Task S);
- Broken stormwater pipes and mangrove debris have been removed from the western foreshore (Task H);
- Existing facilities at Pop Denison Park have been enhanced and maintained (Task P from the 2000 EMP, b, c).
- Additional rubbish bins have been installed around the Shaws Bay foreshore (Task G from 2000 EMP); and
- Council has introduced a 3-bin urban waste system for recyclable materials, food organics and garden waste and garbage (Task C from the 2000 EMP). This system should discourage residents from discarding green waste into drains, vacant lots and reserves. Education promoting public awareness of correct disposal of garden waste, lawn clippings and other organic materials is also a key Council initiative for minimising oxygen demanding pollutants in urban waterways.

Construction of a new BBQ and picnic shelter at Pop Denison Park commenced in June 2014. Funding for rebuilding of existing amenities into a modular amenities block has also been approved ($100,000 has been allocated for 2016/17).

While illegal dumping of waste is not considered to be a serious issue in Shaws Bay compared to other parts of the Shire and the green waste collection system is expected to reduce the amount of green waste being dumped around Shaws Bay, there have been recent occurrences (e.g. dumping of garden waste in the reserve off Fenwick Drive and the placement of palm fronds to fill the sink holes in the East Arm of the Bay). shire-wide regulation of illegal dumping and resident education programs should be continued.

Council has received several grants that have allowed significant progress on the removal of weeds from the rainforest areas (Task Y). This work is continuing under a current grant in association with Coastcare.

Vegetation management in the study area is addressed by the *Vegetation Management Plan for East Ballina Reserves* (VMP, Blackwood Ecological Services, 2014). The areas of application include the Shaws Bay escarpment, Pop Denison Park and the foreshore areas of Shaws Bay. The weed infestation along the northern side of the training wall is not addressed in the VMP and will be addressed as part of this CZMP.

a

b

c

d

Figure 16: Upgraded foreshore facilities

a – disabled access ramp and shower on Compton Drive, b – Boules court, c – Playground equipment and amenities, d – New barbecue under construction (June 2014)

Potential Future Management Options

There are many opportunities to enhance the amenity of Shaws Bay by improving access to the foreshore and waterway and providing a wider range of recreational and nature appreciation experiences. The potential options discussed below follow the overall approach of this CZMP which is based on development

of particular outcomes for the main areas of the Bay foreshore. These options are consistent with the Precinct Plan documented in the *Ballina Coastal Reserves Plan of Management* (refer Section 3, Volume 2).

Potential Future Options:

Option 19: Creation of sandy shoreline

Option 20: Western foreshore improvements

Option 21: Expansion of Pop Denison Park access and facilities

Option 22: Eastern foreshore improvements

Option 23: Development of Fenwick Drive recreational area and foreshore area improvements

Option 24: Rehabilitation of training wall steps

Option 25: Weed management along training wall

Option 19: Creation of sandy shoreline

The community consultation phase of this CZMP highlighted the desire for clean sandy beaches along the Shaws Bay foreshore. There was a general concern that over time, clean sand had been lost from the shoreline of Shaws Bay resulting in a decrease in amenity and access. Potential areas for creation of a sandy shoreline are shown on Figure 10 and include the foreshore from Pop Denison Park to Ballina Lakeside Holiday Park and the East Arm.

PBP (2000b) reported that past dredging of the Bay involved the placement of dredged sand onto beach areas, thus building up clean sandy beaches in certain areas. In the late 1990s, a long reach excavator was used to pull sand up onto the beach areas from deeper sections of the Bay. PBP (2000b) reported that sand is reworked by wind and waves along the shoreline to a point near the narrow section of the Bay, where it is then deposited in the middle of the Bay. It is anticipated that any actions involving the placement of sand along the shoreline will result in the same reworking of sediment to the middle of the Bay. Therefore, in order to maintain clean sandy shorelines, placement of sand on the shore

line will need to be repeated at regular intervals.

There are two main potential sources of sand:

1. Sand dredged from Shaws Bay; and
2. Sand sourced from elsewhere (e.g. North Creek) and trucked into the Bay.

Sourcing sand from another location will incur additional costs of transport and handling and may be cost-prohibitive. Also, given that sand will be eventually reworked from beaches and deposited in the middle of the Bay, the import of sand to the system will increase the net rate of infilling which is a key concern for continued community access.

Dredging activities and associated environmental impacts are discussed in Option 12: Dredging of Main Section. Of key concern are the impacts associated with seagrass disturbance and water quality impacts. Approval is required from Fisheries NSW to undertake dredging and reclamation work. If dredging is undertaken in Shaws Bay, this would be the most cost-effective source of sand for shoreline nourishment, providing the dredged material is of suitable quality.

The creation of the sandy shoreline would be coupled with removal of juvenile mangroves in these areas as discussed in Option 15: Amend mangrove exclusion areas permitted under Fisheries NSW maintenance permit. Areas of Coastal Saltmarsh EEC that occur behind the sandy shoreline will be retained and protected within the ecological protection zones (refer Figure 8). Access will be encouraged via the existing disturbed tracks with saltmarsh areas delineated by log fencing or similar.

Option 20: Western foreshore improvements

The Compton Drive foreshore area (Figure 17) is a popular access point for swimming and board paddling in the Bay. The area includes informal parking, shared pathway, picnic tables, shade trees and a shower. Across Compton Drive is an amenities block and steps leading to Hill Street which are a popular fitness/exercise activity. Waterway access is via a disabled access ramp. The foreshore area includes mangroves and seagrass. The community has expressed a desire for additional and improved recreational facilities in this area. Actions to upgrade amenities in this area were documented in the Locality Plan (Coastal Reserves Plan of Management, BSC, 2003) including replenishment of sand on beaches, development of a landscape plan, upgrading car parking facilities and provision of shared pathway to Shaws Bay Caravan Park.

Figure 17: Compton Drive foreshore

The key issues and opportunities for this area are:

- This part of the Bay provides access to generally good water quality and therefore should be encouraged as a waterway access point;
- Vegetation management implemented as part of the VMP (Subzone 2A). This includes management of patches of Coastal Cypress Pine EEC along the western foreshore;
- The location of the shared path between Compton Drive and the foreshore parking area requires cars to cross the pathway when entering or leaving the parking area. This parking area is often used by large cars and trailers to unload kayaks and boards as well as parking of caravans. Relocation of the shared pathway to the foreshore would improve safety for path users as well as the attractiveness of the pathway. This may be combined with foreshore seating or other separation between the pathway and retaining wall;
- Provision of formalised parking areas with designated areas for cars and trailers utilising the existing gravel surface and drainage. Wheel barriers or bollards may be required in areas adjacent to the shared path. While detailed engineering investigations have not been undertaken, a preliminary assessment suggests that relocation of the shared pathway to the foreshore and parking for 30-40 cars could be accommodated at the site;
- The amenities block is considered to be in good condition although users are required to cross Compton Drive for access. The steps to Hill Street are popular with walkers and fitness groups.

Road treatments (such as traffic calming measures that create a low speed environment) would provide increased safety for pedestrians accessing the steps and amenities block;

- Additional facilities may include fitness equipment and picnic tables; and
- Depending on future use of the area and the need for additional parking, the foreshore to the south (between Compton Drive and the Shaws Bay Hotel) may also be redeveloped. This area is currently infrequently used due to a lack of access and poor condition of the foreshore vegetation but provides opportunities for extension of the foreshore to access areas of good water quality.

Compton Drive foreshore improvements are considered to be a high priority due to the potential to improve safety and recreational amenity in this area at relatively low cost. Engineering designs should be developed based on available funding and the priorities listed above. An overall concept is shown in Figure 18. There is also the opportunity to consider the extension of the shared pathway along the foreshore in front of the Shaws Bay Hotel and Fenwick House to join up with the North Wall pathway, although issues such as land ownership and public safety would need to be resolved.

Figure 18: Proposed concept for Compton Drive foreshore area improvements

Option 21: Expansion of Pop Denison Park access and facilities

The Pop Denison Park area includes large open space areas, vehicular access, parking, amenities, picnic shelters, a new gas barbecue and clear access to the waterway. The area includes stands of significant vegetation including patches of Coastal Cypress Pine Forest EEC (refer Section 6.3, Volume 2). Foreshore vegetation consists of mangroves and saltmarsh (marine vegetation protected under the FM Act).

Redevelopment of the Pop Denison Park area provides opportunities for achievement of the main goal of this CZMP (to enhance recreational opportunities while protecting ecological health) as follows:

- The Northern Section of the waterway has the poorest water quality with the least flushing and circulation. This area is also at risk of inundation and is a key area for potential migration of fringing vegetation due to sea level rise (refer Option 13: Provide for enhancement of estuarine vegetation). This provides an opportunity to enhance the ecological value of this area while redirecting people to other more suitable areas of the Bay for primary contact activities;
- There is an opportunity to establish an educational focus in this area with educational and interpretive signage (e.g. types and role of estuarine vegetation, habitat, human influences etc.) centred around the existing picnic shelters and parking area (refer Option 14: Community education about the value and role of estuarine vegetation);
- The western area of the Park with stands of mature trees (including Coastal Cypress Pine EEC) should be rehabilitated including weed removal and native vegetation planting and regeneration as detailed in the VMP (Subzone 2C). Figure 19 shows this area as an integrated use zone with patches of Coastal Cypress Pine Forest EEC delineated as ecological protection zones. The actions for this area combine the rehabilitation of native vegetation with improved access to the foreshore and passive recreational facilities such as seating and showers. Existing tracks through the area will be maintained and improved with no new tracks created;
- The existing access road, open space area and boules court should be retained and regularly maintained (mowing and weed removal);
- Dredging of the main waterway section (refer Option 12: Dredging of Main Section) is expected to improve water quality in this area. Dredged sand could be placed on existing and new beach areas to improve access to the waterway (refer Option 19: Creation of sandy shoreline discussed above) and would be combined with removal of juvenile mangroves in these areas as discussed in Option 15: Amend mangrove exclusion areas permitted under Fisheries NSW maintenance permit;
- Due to the significant investment in recreational facilities, the existing main beach area near the shower should be retained but with additional waterway access encouraged towards the Lakeside Holiday Park as this provides access to better water quality areas and would improve the amenity for park users. Access tracks from the parking areas would be maintained to the sandy beach in this location; and
- The southern section of the reserve between Fenwick Drive and the Lakeside Holiday Park could be redeveloped with an access road and parking areas with pathways to the existing facilities and beach areas. This area could become a focus of recreational activities including new amenities and picnic, playground and barbecue facilities. Other playground or fitness equipment may be provided depending on budget constraints and priorities.

Given the high value placed on Pop Denison Park, the existing facilities and high level of existing use, the redevelopment of Pop Denison Park is considered to be a priority. Engineering designs should be developed based on available funding and the priorities listed above. An overall concept is shown in Figure 19.

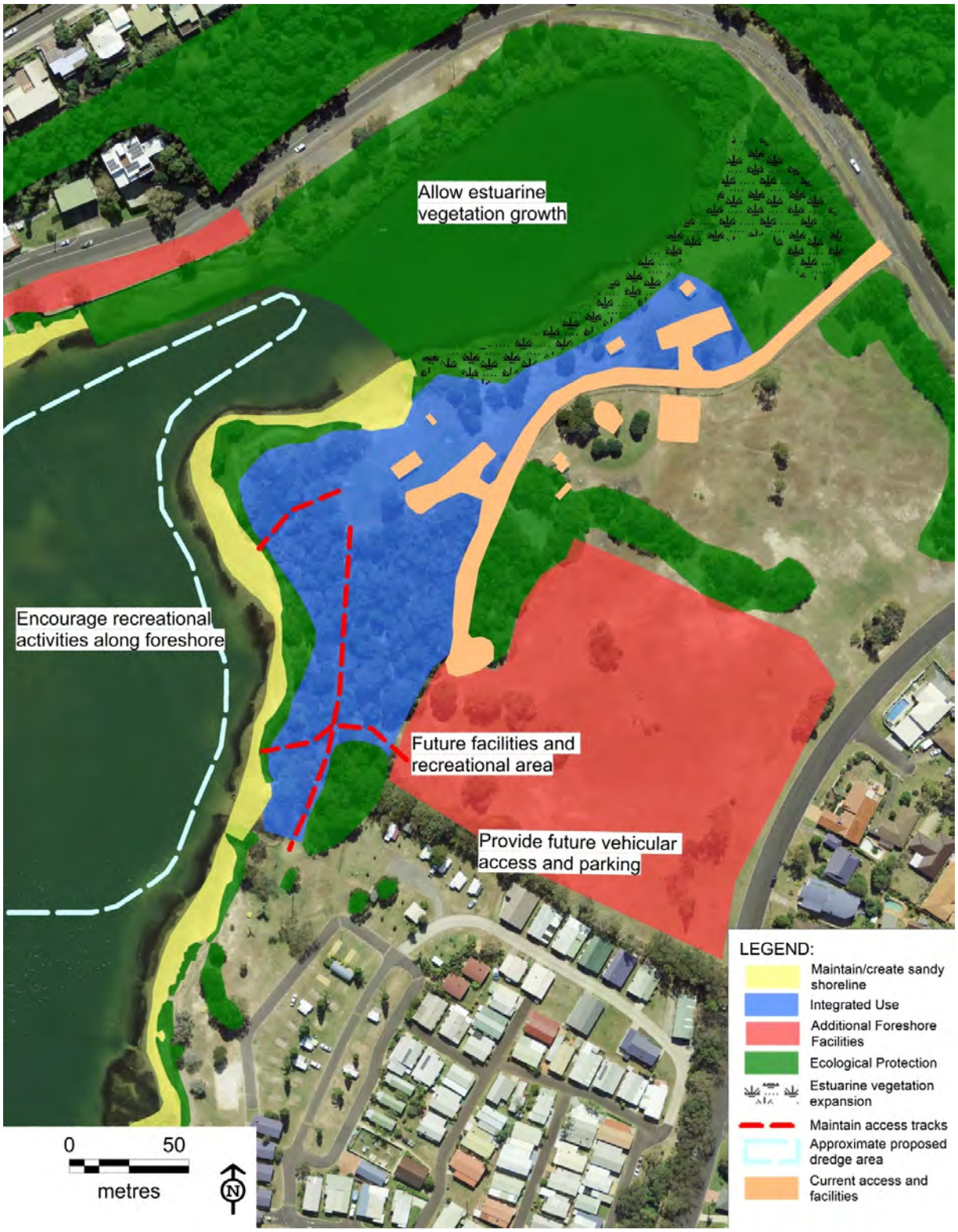

Figure 19: Proposed concept for expansion of Pop Denison Park

Option 22: Eastern foreshore improvements

A similar approach to the foreshore in front of Ballina Lakeside Holiday Park would see the clean sandy beaches extend to the southern boundary of the holiday park combined with removal of juvenile mangroves. Upslope of these beaches, saltmarsh will continue to colonise with waterway access encouraged via the existing disturbed tracks and saltmarsh areas delineated by log fencing or similar. Mowing of open space areas would be maintained to areas upslope of saltmarsh. Waterway access through seagrass beds at low tide is expected to be maintained by the continued trampling of these areas. Management of terrestrial vegetation will be implemented as part of the VMP (Subzone 2C).

Option 23: Development of Fenwick Drive recreational area and foreshore area improvements

Fenwick Drive is a popular access point for swimming, boarding and snorkelling in the East Arm of Shaws Bay but with limited facilities in the area. This area provides access to the best water quality of the Bay and therefore swimming and other passive recreational pursuits should be encouraged. This would be combined with control of the East Arm bank erosion and creation of a stable sandy foreshore. There is a large public reserve which could be used for parking, shade trees, seating and picnic facilities and also providing access to the beach and sand spit between the main waterway section and the East Arm. Engineering designs should be developed based on available funding. Management of terrestrial vegetation will be implemented as part of the VMP (Subzone 2C).

Option 24: Rehabilitation of training wall steps

The steps along the training wall near Shaws Bay Holiday Park provide access to the waterway and are a popular site for fishing. The steps have been constructed from a base of concrete aggregate with a surface screed and are steep with narrow tread. The treads that are permanently or periodically inundated are covered by algae and some oyster shells. The surface of the steps appears to have been degraded through expansion between the exposed aggregate and surface screed potentially caused by temperature changes and water effects. There are also many areas of cracked concrete although there are no signs of corrosion or evidence of exposed reinforcing steel (Figure 20).


a


b


c

Figure 20: Training wall concrete steps

a – Concrete steps, b and c – surface damage (June 2014)

This area of the Bay has good water quality and therefore swimming would be encouraged in this area although the steps do not provide safe water entry due to their condition, steepness, narrow tread and slippery surface of the wet areas. There are potential opportunities to provide improved access in this area for swimming, board paddling and fishing as well as improving the aesthetic appearance of the steps including:

- Resurfacing of the steps with durable, non-slip finishes. Marine grade, UV resistant products made from recycled materials have been used in other coastal developments in the Shire such as Lennox Head walkway and may be appropriate here;
- Reconstruction of the steps to provide safe waterway access, potentially including wider stairs and decking to the water level. The existing concrete base appears to be durable but structural testing would confirm its integrity for use as footings; and
- Incorporation of a floating pontoon to provide access to deeper water. The pontoon would need to be large enough to accommodate all users of the area; and
- Consideration of a linking pathway along the foreshore to Compton Drive (refer Option 20 above).

The cost of these options increases with the complexity and size of the solution. Any refurbishment options would require consideration of safety requirements, structural condition, rehabilitation options, approval requirements, land ownership and funding constraints.

Option 25: Weed management along training wall

The northern side of the training wall, bordering the southern extremity of Shaws Bay is an area subject to weed infestation which impacts on the amenity and environmental values of Shaws Bay. While this area is not included in the VMP, weed management is necessary to improve these values, particularly in the vicinity of the large stand of mangroves along the wall. A number of weed species are present including Lantana, Bitou Bush, Prickly Pear (Figure 21), Umbrella tree, Siratro, Coastal morning glory, and a number of herbaceous weeds and exotic grasses. In some sections these weeds restrict the view of Shaws Bay from the shared pathway and the area is highly visible from the East Arm and the Ballina Lakeside Holiday Park.

There are a number of factors to be considered in planning for and carrying out restoration works in this area including:

- The environmental impact of chemical use in weed spraying in close proximity to waterways and protected communities such as mangroves and seagrass;
- Maintaining suitable habitat for species of birds and other animals that utilise current areas of exotic shrubs such as Lantana and Bitou Bush along the wall. Due to the disturbed nature of the site, native regeneration in these areas is unlikely to occur and therefore it will be necessary to consider replacing exotic species with suitable native shrubs wherever possible; and
- Safety considerations associated with working on steep slopes and in proximity to water especially where machinery is required.

a

b

Figure 21: a - Prickly pear and b - a variety of other environmental weeds growing along the northern side of the training wall in vicinity of mangroves (June 2014)

Biological Irritants Management

Management Issues:

Issue 1: Recreational amenity and ecosystem health may be compromised by poor water quality

Issue 2: Community access to and use of the waterway is being affected by coastal processes

Issue 5: There is a need to adequately manage community use and ecosystem health conflicts

The main biological irritants of concern at Shaws Bay include biting midges (sand flies), sea lice and swimmers itch, a type of non-infectious dermatitis contracted from within the marine environment, most likely caused by schistosome dermatitis (refer Section 7, Volume 2). These irritants are not specific to Shaws Bay but are associated with most coastal habitats.

Existing Management Approach

While studies have been undertaken on the causes and abundance of biological irritants, including at Shaws Bay, no management actions have been undertaken at Shaws Bay.

Potential Future Management Options

Potential management approaches include increased community awareness of the irritants as well as chemical and physical controls.

Potential Future Options:

Option 26: Community education and awareness of biological irritants

Option 27: Chemical insect control

Option 28: Raking of shoreline

Option 26: Community education and awareness of biological irritants

Community awareness and education of the causes and processes behind biological irritants is a key measure to address the nuisance of biological irritants in the Bay. An awareness program would address all potential irritants and information to be conveyed to the public could include;

- Prevalence and occurrence of such organisms in coastal waters;
- Life-cycle and habitat of irritant organisms;
- High risk occurrence time and location of irritant organisms within Shaws Bay;
- Any preventative actions that individuals can undertake; and
- Treatment of symptoms.

The information could be conveyed to the public via a number of methods including pamphlets/posters at Shaws Bay caravan parks and relevant information boards, reminders/alerts in Council newsletters at the start of each 'swimming season' and information on Council website similar to the mosquito factsheet and biting midge information available on Byron and Tweed Shire Council websites. Programs should be undertaken in conjunction with NSW Public Health.

While community education does not remove the problem, it creates awareness and enables the public to make informed decisions and when and where to swim and potential treatments for dermatitis thus reduce the risk and consequence of swimmers itch.

Option 27: Chemical insect control

Historically, populations of the host snail of the schistosome (that causes swimmers itch) have been controlled by molluscicides to disrupt the life cycle of the schistosome and reduce their population. However, the effectiveness is minimal with the host populations developing resistance to the molluscicide. Additionally, mollucicides are toxic to other marine biota and do not break down in the environment. Stace (2008) highlighted that the use of molluscicides in an environment like Shaws Bay would have adverse effects on flora and fauna in the Bay and also the adjacent Richmond River entrance.

Chemical control of midges has been found to be an effective method of reducing midge larval numbers in other regions of the Northern Rivers (Easton, 1999). Such a method is likely to require the application of an insecticide spray 2 to 3 times per year every year (over spring/summer period) for it be effective. However, as with chemical controls in general, there are number of potential problems with using insecticides for midge control including toxicity to non-target fauna and flora and the potential for the midges to become resistant to the chemical.

Council does not undertake any chemical spraying to control mosquitoes and sand flies at any other locations within the Shire, although options were investigated for mosquito and sand fly control options around 10 years ago. Chemical control was determined to be too expensive and considered to have limited long-term effectiveness. As such, Council's preferred strategy is to control development (through Council's DCP) instead. Any chemical measures to control biological irritant populations are likely to be extensive and on-going, have a high risk of negative ecological effects and be potentially expensive. Therefore, no further investigation into the use of such control at Shaws Bay is recommended.

Option 28: Raking of shoreline

Easton (1999) suggested beach raking as a potential biting midge option in the Shaws Bay Estuary Processes Study (PBP, 2000b). Preliminary results from trials in the Tweed Shire at the time indicated that weekly beach raking of suitable biting midge habitat (in particular *Culcoides molestus*) could reduce numbers over time by killing eggs and small larvae. However, this method is likely to be labour intensive (although

could be mechanised), have negative impacts on other biota (such as crabs, estuarine worms and yabbies) and the effectiveness is currently relatively poorly understood.

With regards to swimmers itch, as highlighted by Stace (2008) the raking and removal of populations of the schistosomes intermediate host (a marine snail - *Batillaria australis*) within Shaws Bay has the potential to interrupt the breeding cycle and subsequently reduce numbers of the schistosome. This method is also likely to be labour intensive and could potentially negatively impact seagrass and the broader Shaws Bay ecosystem.

Due to the potential negative impacts and unconfirmed effectiveness of both beach raking for control of biting midges and *Batillaria australis* raking and removal for the control of swimmers itch, they are not recommended as suitable control options in Shaws Bay.

Inundation Risk Management

Management Issues:

Issue 4: The community has a desire for improved foreshore facilities

Issue 5: There is a need to adequately manage community use and ecosystem health conflicts

Issue 6: There is a risk of inundation of developed land

The low-lying flat land of Shaws Bay, proximity to the ocean and susceptibility to flooding of the Richmond River contribute to the risk of localised flooding and inundation which will be exacerbated by sea-level rise and increased storminess due to climate change.

Existing Management Approach

Inundation of low-lying land is caused by a range of factors. Such factors can act either individually or in combination and can have differing effects in terms of the frequency and extent of inundation, event duration, predictability and type of impact. The key causes of inundation of urban land within Shaws Bay are:

- Richmond River catchment flooding;
- Localised flooding (Shaws Bay catchment);
- Tidal/storm surge inundation; and
- Poor site drainage.

Inundation due to these issues is likely to increase with continued climate change with increased storminess contributing to demands on stormwater infrastructure and sea level rise continuing to exacerbate issues associated with tidal intrusion and inundation.

The Ballina Floodplain Risk Management Plan (BFRMP, BMT WBM, 2013) draws together the results of flood studies and data collection to provide a strategic assessment of management options including emergency management, structural solutions and planning measures. The BFRMP is currently in draft format for public exhibition. Proposed flood mitigation measures relevant to Shaws Bay CZMP study area are:

- Update of development controls - Council has prepared a draft floodplain management development control plan (DCP) which is expected to be adopted in 2014/15. The DCP defines controls for future development of flood prone land based on the flood risk precincts developed from the flood risk planning process (refer Section 3.2, Volume 2);
- Shire-wide flood warning and evacuation planning and management; and
- Shire-wide community engagement strategy.

Potential Future Management Options

While the management of the inundation risk in Shaws Bay will require localised solutions, many parts of Ballina and the NSW coastline face similar issues. A Shire-wide approach is considered to be appropriate to ensure consistency with planning and development controls.

Potential Future Options:

Option 29: Development of strategy to address inundation risk in Shaws Bay

Option 29: Development of strategy to address inundation risk in Shaws Bay

Current planning documents do not address the risk of inundation within the Shaws Bay study area. Particularly susceptible areas include the Ballina Lakeside Holiday Park which is threatened by extreme water level conditions in the Richmond River estuary (refer to Volume 2). The inundation assessment is not definitive but it is considered that there is a clear risk of estuarine inundation of this land and that future sea-level rise will continue to exacerbate this risk. Further work is required to fully understand the inundation risk for this area and there is a need to determine factors such as the frequency, duration and depth of flooding.

There are two broad strategies to address this inundation risk:

- Separate the low lying area from the estuary such that estuarine inundation does not propagate into the area; and/or
- Raise the land to be protected above the projected inundation levels (or to minimise the depth of inundation).

To limit propagation of high water levels into the park it would be necessary to create a raised levee such that overland flow was contained within the estuary basin. However, this would also need to consider stormwater flow paths and the need for tide gates. Raising of the low-lying land through filling of the site could be implemented progressively over a number of decades to achieve the target land levels. Any dredging of the Bay (Option 12: Dredging of Main Section) could potentially gain fill material for this use, thereby achieving multiple community benefits, however the practicality of this approach is to be determined.

Given that Shaws Bay is not unique with respect to exposure to sea level rise and tidal inundation risk, the most appropriate approach for addressing these issues is through continued inclusion of the Shaws Bay area within the Shire-wide floodplain risk management planning process.

It is recommended that, as part of Ballina Shire Council's FPRMS:

- Shaws Bay is specifically considered in the Shire-wide study to improve understanding of likely inundation frequency, duration and depth of inundation in this area. This study should include an assessment of the risk of ocean water intrusion via the stormwater system and consider the implications of catchment flooding, extreme ocean level events and the influence of wave setup at the entrance to the Richmond River estuary;
- Feasible concepts for managing inundation are developed including identification of the extent of potential property damage; and
- The risk to public safety, and appropriate emergency response/evacuation actions are identified.

Appendix 4: Matrix of Options and Management Objectives

Option / Objective	Objective 1: To protect and enhance ecological values in Shaws Bay	Objective 2: To protect cultural heritage values in Shaws Bay	Objective 3: To protect the visual amenity and character of the local area	Objective 4: To maintain and improve public access and use of Shaws Bay	Objective 5: To minimise and manage risk to public health and safety	Objective 6: To minimise and manage risks to community assets in Shaws Bay	Objective 7: To promote sustainable development	Objective 8: To adequately plan for management of known future risks	Objective 9: To provide efficient and effective management	Objective 10: To maximise the likelihood of success of management strategies	Objective 11: To minimise overall cost while achieving the goals of the CZMP	Objective 12: To ensure consistency with other strategic planning instruments and programs
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Option / Objective	Objective 1: To protect and enhance ecological values in Shaws Bay	Objective 2: To protect cultural heritage values in Shaws Bay	Objective 3: To protect the visual amenity and character of the local area	Objective 4: To maintain and improve public access and use of Shaws Bay	Objective 5: To minimise and manage risk to public health and safety	Objective 6: To minimise and manage risks to community assets in Shaws Bay	Objective 7: To promote sustainable development	Objective 8: To adequately plan for management of known future risks	Objective 9: To provide efficient and effective management	Objective 10: To maximise the likelihood of success of management strategies	Objective 11: To minimise overall cost while achieving the goals of the CZMP	Objective 12: To ensure consistency with other strategic planning instruments and programs
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Appendix 5: Potential Grant Funding

This Appendix provides a summary of potential grant funding available to implement this CZMP.

Agency	Program Name	Description	Criteria/Objectives
State Government			

Agency	Program Name	Description	Criteria/Objectives
OEH	NSW Estuary Management Program and Coastal Management Program	The NSW Government's Coastal Management Program's primary objective is to provide support to local councils to manage the risks from coastal hazards such as coastal erosion. A secondary objective of the program is to restore degraded coastal habitats. The NSW Government's Estuary Management Program provides support to councils to improve the health of NSW estuaries and understand the potential risks from climate change. The support provided to councils under these programs includes financial assistance to: • preparing (or updating) coastal zone management plans and associated technical studies (including estuary health and coastal hazard assessments) • taking actions to manage the risks from coastal hazards • taking actions to implement environmental repairs, including habitat restoration and conservation projects • undertaking pre-construction activities for projects that are eligible and are likely to proceed to construction and • developing management tools (e.g. education projects).	There are two grant categories: • Coastal management grants and • Estuary Management Grants Projects which can be funded under the programs include: • preparing (or updating) coastal zone management plans and associated technical studies (including estuary health and coastal hazard assessments and incorporating hazard information into Development Control Plans (DCPs) or Local Environment Plans (LEPs) beyond core council business) • taking actions to manage the risks from coastal hazards (noting that for identified hotspot* locations, these actions must be listed as a priority in a Coastal Zone Management Plan certified by the Minister) • taking actions to implement environmental repairs, including habitat restoration and conservation projects • undertaking pre-construction activities for projects that are eligible and are likely to proceed to construction • developing management tools (e.g. education projects) Under this funding round applications will be separated into the following categories with prioritisation as shown. **Coastal zone management planning** 1. Preparing (or updating) coastal zone management plans 2. Preparing technical studies which contribute to a coastal zone management plan or revision (including estuary health or coastal hazard assessments). **Implementing actions** 1. Implementing actions arising out of the coastal/estuary management planning process, including actions to manage coastal hazard risks, environmental restoration/conservation activities or developing management tools (e.g. education projects) (noting that for identified hotspot* locations, these actions must be listed as a priority in a Coastal Zone Management Plan certified by the Minister) 2. Evaluating and reporting on the outcomes of implementing coastal/estuary management plans 3. Actions that will manage coastal hazard risks, environmental restoration/conservation activities or developing management tools that have not been identified through the coastal/estuary management planning process (noting that for identified hotspot locations that any actions funded must be identified as a priority action in a certified Coastal Zone Management Plan). **Note:** Higher priority will also be given within each category to applications that: address public safety risks; protect valuable publicly-owned assets; and/or protect, maintain or improve high conservation value environments.
Hydrosphere Consulting			Under the 2012-2013 funding round, applications will be separated into the following categories for prioritising with the highest priority being awarded to number 1 in each category. Coastal zone management planning 1. For preparing (or updating) coastal zone management plans, with highest priority

Agency	Program Name	Description	Criteria/Objectives
OEH	NSW Floodplain Management Program	The Floodplain Management Program supports the implementation of the NSW Government's Flood Prone Land Policy as outlined in the NSW Government's Floodplain development manual. The primary objective of the policy is to reduce the impacts of flooding and flood liability on communities and to reduce private and public losses resulting from floods, utilising ecologically positive methods wherever possible. The Floodplain Management Program provides financial support to councils and eligible public land managers to: • make informed decisions on managing flood risk by preparing floodplain risk management plans (and associated background studies) under the floodplain risk management process. • implement floodplain risk management plans to reduce flood risk to both existing and future development, and reduce losses through a range of property, flood and response modification measures as outlined in the manual. • provide essential information to the State Emergency Service to enable the effective preparation and implementation of local flood plans to deal with flood emergency response.	Continuing staged projects and new projects that may be funded include: • floodplain risk management plans and other associated background studies, including flood studies and floodplain risk management studies • a review of floodplain risk management plans and associated background studies • projects which implement floodplain risk management plan actions, which include but are not limited to: – investigation, design and environmental assessment for works projects – structural works projects such as levees, detention basins, flood gates and flow conveyance improvements – investigation and implementation of flood warning systems – permanent works to support emergency management – voluntary house raising – voluntary purchase – projects for the rehabilitation of public levees protecting urban areas. Assistance under the program is normally offered by the State Government providing $2 for every $1 provided by the council.
DPI (Fisheries and Aquaculture)	Habitat Action Program	Supports the improvement of recreationally important fish populations, engages recreational anglers in fish habitat actions through the Fishers for Fish Habitat project, provides devolved habitat action grants to enhance fisheries in NSW. The Habitat Action Program is funded by the revenue raised by the NSW recreational fishing fee. Habitat Action Grants - Angling clubs, individuals, community groups, local councils and organisations interested in rehabilitating fish habitats in freshwater and saltwater areas throughout NSW can apply for grants.	Habitat rehabilitation projects which may be funded include: • removal or modification of barriers to fish passage • rehabilitation of riparian lands (river banks, wetlands, mangrove forests, saltmarsh) • re-snagging waterways with timber structure • removal of exotic vegetation from waterways • bank stabilisation works • reinstatement of natural flow regimes Habitat Action Grants are available in August each year and require the completion of a habitat-specific Funding Application form. Funding applications must relate to the enhancement of recreational fishing through the improvement of fish habitat. Successful projects are usually funded for one year, however funding may be sought for multi-stage projects that take place over a number of years (e.g. two or three year projects).

Agency	Program Name	Description	Criteria/Objectives
NSW Government	Natural Disaster Resilience Grants Scheme (NDRGS)	The NSW Government in partnership with the Commonwealth Government under the Natural Disaster Resilience Program is offering the Natural Disaster Resilience Grants Scheme (NDRGS). The NDRGS replaces the Natural Disaster Mitigation Programme and makes grants available to local governments and agencies to undertake a wide range of natural disaster risk assessments and risk reduction works which contribute to safer, sustainable communities which are more resilient to the effects of natural disasters. Generally, the Australian and New South Wales Governments contribute up to one third each of approved project costs. Local agencies and in some cases private sector contributors make up the balance.	A wide range of natural disaster risk reduction works which contribute to safer, sustainable communities which are more resilient to the effects of natural disasters, qualify for funding under the NDRGS. They may include: • natural disaster risk management studies • disaster mitigation strategies • investment in disaster resilient public infrastructure • structural works to protect against damage (e.g. disaster proofing of existing buildings at risk, levees, retarding basins and channel improvements, permanent fire breaks, other engineered works that offer protection from natural disasters) • disaster warning systems • community awareness and readiness measures • audits of levees and warning systems • research to improve knowledge of natural disaster risk and mitigation • Geographic Information Systems (GIS) based hazard and flood data for disaster mitigation purposes • land and building purchase schemes in high-risk areas.
OEH	Environmental Education Grants	The aim of the Environmental Education program is to support educational projects or programs that develop or widen the community's knowledge of, skills in, and commitment to protecting the environment and promoting sustainable behaviour.	The Objectives of the Environmental Education Program are: • to help attain one or more of the outcomes in the NSW Government's Environmental Education Plan, Learning for Sustainability • to facilitate changes in behaviour of individuals and groups which affect specific environmental problems • to develop and promote education projects which improve the environment.
OEH	Urban Sustainability Program	The Urban Sustainability Program aims to facilitate projects of significant environmental benefit to NSW, delivered by local government organisations in partnership with other government agencies, local businesses, community organisations and householders. Through these projects, the Program also aims to improve the capacity of communities and organisations to protect, restore and enhance the sustainability of our urban environment.	The objectives of the Program are to: • improve urban water management with particular focus on stormwater and urban runoff to achieve sustainable water quality and conservation outcomes • improve resource conservation through effective waste management, avoidance, reuse, recycling and support for sustainable products and services • improve and protect urban bushland and creeks, urban wildlife and habitats of rare and endangered flora and fauna • improve the quality of the local urban environment, through integrated approaches that address a combination of the following examples: air quality, noise, odour, chemical use, biodiversity, litter and dumping • improve the sustainability performance of local councils, small businesses and community organisations and householders in urban areas.

Agency	Program Name	Description	Criteria/Objectives
NSW Office of Water (DPI)	Country Towns Program	Through the Country Towns Water Supply and Sewerage Program the Office of Water provides technical support and financial assistance to local water utilities throughout New South Wales so they can better plan and manage their water supply and sewerage businesses.	To be eligible for financial assistance under this program, all local water utilities must comply with the Best-Practice Management of Water Supply and Sewerage Guidelines, August 2007. The Country Towns Water Supply and Sewerage Program goal is to provide appropriate, affordable, cost effective and well managed water supply and sewerage services in urban areas of country NSW. The water supply and sewerage services should meet community needs, protect public health and achieve sustainable environmental outcomes, while making best use of regional resources. Financial assistance is available to local water utilities towards the capital cost of the backlog component of approved water supply and sewerage infrastructure.
NSW Maritime	Partnerships	A 'Partnership' would apply to any funding or value in kind (VIK) made available to individuals or organisations to support specific programs or events deemed mutually beneficial.	Programs or events that help deliver, align with, or raise awareness of key objectives outlined in the Results and Services Plan are eligible and cover: • ports to support a growing economy • safe and sustainable waterways and • improved infrastructure and access to waterways. Any application for a Partnership with NSW Maritime would be considered against the backdrop of financial responsibility of public money and resources. This reinforces the need for all partnerships to demonstrate a clear and direct benefit to the boating, maritime and/or maritime property community aligned with appropriate objectives.
NSW Trade and Investment – Crown Lands	Public Reserves Management Fund	Funding is available to develop, maintain and improve land and facilities, including for recovery from natural disasters and the protection of heritage and the environment.	The Public Reserves Management Fund Program (PRMFP) provides financial support for the development, maintenance and improvement of public reserves. Round 2 of the 2014-15 PRMFP is currently expected to commence in August 2014. Applications will be accepted at that time from the managers of caravan parks, state parks, showgrounds and local parks and reserves.

Agency	Program Name	Description	Criteria/Objectives
Federal Government			
Australian Government	Caring for Our Country	Caring for our Country is the Government's natural resource management initiative. It integrates delivery of the Commonwealth's previous natural resource management programs, the Natural Heritage Trust, the National Landcare Program, the Environmental Stewardship Program and the Working on Country Indigenous land and environmental program.	Caring for our Country focuses on achieving strategic results in six national priorities: • the National Reserve System • biodiversity and natural icons • coastal environments and critical aquatic habitats • sustainable farm practices • natural resource management in northern and remote Australia, and • community skills, knowledge and engagement. The Australian Government calls for investment proposals for projects through annual Caring for our Country business plans. Community Action Grants are the small grants component of the Australian Government's Caring for our Country initiative that aims to help community groups take action to conserve and protect their natural environment. The grants are targeted towards established community-based organisations which have sustainable farming and/or protecting and enhancing the natural environment as their principal objective.
Australian Research Council (ARC)	ARC Centre of Excellence	The ARC Centres of Excellence scheme aims to enhance and develop Australia's research excellence through highly innovative and collaborative research, as well as build Australia's human capacity in a range of research areas. The objectives of the ARC Centres of Excellence scheme are summarised as: • undertake highly innovative and potentially transformational research • link existing Australian research strengths and build critical mass with new capacity for interdisciplinary, collaborative approaches • develop relationships and build new networks with major national and international centres and research programs • build Australia's human capacity in a range of research areas • provide high-quality postgraduate and postdoctoral training environments • offer Australian researchers opportunities to work on large-scale problems over longer periods of time and • establish Centres of such repute in the wider community.	The National Research Priorities are: • An Environmentally Sustainable Australia • Promoting and Maintaining Good Health • Frontier Technologies for Building and Transforming Australian Industries and • Safeguarding Australia.

Agency	Program Name	Description	Criteria/Objectives
National Water Commission	Raising National Water Standards Program	To guide investment in high priority activities to improve water management and advance national water reform, the Commission developed two investment pathways for the Raising National Water Standards Program: a strategic commissioning pathway and a competitive call pathway. In 2007, a National Groundwater Action Plan was initiated by the Commission under the Raising National Water Standards Program to fund projects to progress the groundwater reforms agreed to under the National Water Initiative. More than 175 Raising National Water Standards projects have been funded under the following themes: • Water accounting • Emerging water markets • Water planning and management • Knowledge and capacity building • Irrigation and other rural water • Water-dependent ecosystems • Integrated urban water management	This $250 million program offers support for projects that are improving Australia's national capacity to measure, monitor and manage our water resources. Funds from the Raising National Water Standards Program are directed at activities across three strategic investment areas: • advancing the implementation of the National Water Initiative • improving integrated water management across Australia • improving knowledge and understanding of our water resources. • Groundwater • Northern rivers • National assessment of water resources • Northern Australia water futures assessment
DSEWPC	Indigenous Heritage Program	The Indigenous Heritage Program (IHP) is an Australian Government initiative that supports the identification, conservation, and promotion (where appropriate) of Indigenous heritage.	Individual project funding for organisations will in general be available up to a maximum of $100,000 (GST exclusive). Individual applicants will generally be eligible for funding up to $5000. Applications for more than these amounts may be considered where the applicant demonstrates special circumstances or a genuine requirement for additional funds. The IHP may also help identify places likely to have outstanding Indigenous heritage value to Australia suitable for inclusion on the National Heritage List.

Agency	Program Name	Description	Criteria/Objectives
NSW Heritage Office	Aboriginal Heritage Projects	Provides funding for projects that conserve, promote and increase understanding of Aboriginal heritage in NSW. Grants up to $75,000 are available for Aboriginal heritage projects. $ for $ grants are available to local government for Aboriginal heritage projects.	Eligible projects are project that: • Provide or assist in the interpretation of culturally significant Aboriginal places, including physical site interpretation such as walkways, signs, trails, mapping of tracks or places • Record or document significant Aboriginal community events, including contemporary community events • Focus on mission housing and reserves • Focus on grave sites and cemeteries conservation and restoration • Focus on travelling stock routes and trading routes • Focus on industries including pastoralism, fishing and forestry • Shared history projects and social themes including showgrounds, race courses, world wars etc • Contribute to Aboriginal tourism • Encourage communities to record oral histories and collections to increase understanding between generations and communities • Research of a place, an area or event/s • Educate communities on their cultural heritage through media such as brochures, DVDs and publications • Undertake physical conservation works arising from site planning and history projects
DSEWPC	Working on Country	In recognising Indigenous people's relationship to and aspirations for country, and that protecting the environment is a shared responsibility, the Australian Government established Working on Country. This program builds on Indigenous knowledge of protecting and managing land and sea country, and provides funding for the employment for Indigenous people to deliver environmental outcomes.	Working on Country aims to: • support Indigenous aspirations in caring for country • protect, conserve and manage Australia's environment and heritage values contribute to Closing the Gap targets by providing a career pathway and opportunity for Indigenous people to enter into real jobs in the land and sea management sector • provide nationally accredited training for Indigenous people in land and sea management, in partnership with industry and others.

Agency	Program Name	Description	Criteria/Objectives
DSEWPC	Maintaining Australia's Biodiversity Hotspots	The Maintaining Australia's Biodiversity Hotspots (MABH) programme is about taking a cost-effective, proactive approach to managing threats in high conservation value areas that are still relatively intact and maintaining their biodiversity values. Managing the threats effectively requires taking a whole of landscape approach, across all tenures, to promote active, on-going conservation management. The MABH programme aims to improve the conservation of biodiversity hotspots on private and leasehold land by enhancing active conservation management and protection of existing terrestrial and freshwater ecosystems as habitat for native plants and animals.	The programme supports two activities in hotspot areas stewardship payments for on-ground biodiversity improvements and voluntary acquisitions. The stewardship payments offer direct financial support to land-holders to help them protect existing natural habitats with high conservation values. The payments will provide support to those land mangers that have already made a commitment to maintaining the biodiversity values of their properties. Investments will be determined on the basis of a competitive tender process, where the 'best value for money' conservation services to deliver the specified biodiversity outcomes will be purchased. Large properties with outstanding biodiversity values are those most likely to be targeted for voluntary acquisitions. Funding will be provided to registered charitable organisations on condition they manage the properties for conservation in perpetuity and can demonstrate organisational capacity and prior extensive property acquisition and management experience.
Other			
Terrestrial Ecosystem Research Network (TERN)	Australian Centre for Ecological Analysis and Synthesis (ACEAS)	ACEAS is a virtual and physical Facility within the Terrestrial Ecosystem Research Network for both disciplinary and inter-disciplinary integration, synthesis and modelling of ecosystem data to aid in the development of evidenced-based environmental management strategies and policy at regional, state and continental scales.	Up to $50,000 funding to coordinate diverse working groups to solve identified problems and get tangible outcomes
Landcare Australia	Junior Landcare grants program	Junior Landcare is about encouraging young people to play an active role in ensuring the safe future of their environment.	Through the Junior Landcare Grants Program, any school or organisation that would like to involve their students in landcare projects, in conjunction with local landcare groups, can apply for grants to assist them with the cost of their projects.

Agency	Program Name	Description	Criteria/Objectives
NRCMA	Caring for Our Coast	This suite of large-scale projects will engage coastal community organisations in the delivery of coastal and marine rehabilitation, restoration and conservation on-ground works and capacity building activities within the Northern Rivers CMA region. The Northern Rivers CMA will devolve funds either directly through community organisations, or else through land managers, land owners and other organisations that actively engage coastal community organisations in the delivery of projects.	Activities that large-scale projects should focus on include one or more of the following as defined in the Caring for our Country Business Plan: • on-ground actions that protect the conservation values of coastal and marine ecosystems and environments • protection, rehabilitation and enhancement of coastal and marine habitats, waterways and wetlands to stabilise dunes, prevent coastal erosion, establish wildlife corridors and enhance remnant coastal vegetation • implementation of actions in recovery plans of threatened coastal and marine species and threat abatement plans, such as removing marine debris • minimising disturbance to and protecting sensitive coastal and marine areas, including working with Indigenous communities to protect Indigenous cultural landscapes and culturally sensitive sites • implementation of best-practice sustainable near-shore coastal land and resource use (e.g. fishing pressure), including Indigenous traditional use • reduction of local stressors (e.g. poor water quality) on near-shore coastal ecosystems such as inshore reefs and seagrass meadows • preventing the decline of water quality in coastal and marine habitats through management of point-source pollution, establishment of buffer zones and off-stream stock watering points • increasing participation of individuals and communities in coastal and marine conservation projects, including enhancing skills, knowledge and raising community awareness • enhancing the skills and knowledge of Indigenous Australians, volunteers and communities in the delivery of on-ground actions in Saltwater Country through the use of traditional ecological knowledge, existing Land and Sea Country Management Plans, local knowledge and the best available science.