

Shaws Bay Coastal Management Program

Stage 1 Scoping Study



Final Report

December 2023

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Cover photos: Clockwise from top left – sandy shoreline at East Beach, rock groyne and fringing saltmarsh in the East Arm, ecological zone at the northern end of the bay, constructed saltmarsh basin at the northeast end of the bay.

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23-019 SHAWS BAY COASTAL MANAGEMENT PROGRAM: STAGE 1 SCOPING STUDY					
REV	DESCRIPTION	AUTHORS	REVIEW	APPROVAL	DATE
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1	Final Report	K. Pratt	M. Howland	M. Howland	13 Dec 2023

EXECUTIVE SUMMARY

Shaws Bay, located near the mouth of the Richmond River in East Ballina is within the Ballina Shire Council (BSC) local government area, on the NSW north coast. BSC, with assistance from the NSW Department of Planning and Environment (DPE), is preparing a Coastal Management Program (CMP) for Shaws Bay in accordance with the NSW Coastal Management Framework. Stage 1 of the CMP development is a Scoping Study (this document) which sets out the remainder of the coastal planning process for Shaws Bay:

- Stage 2 – determine risks, vulnerabilities and opportunities.
- Stage 3 – identify and evaluate options.
- Stage 4 – prepare, exhibit, finalise, certify and adopt the CMP.
- Stage 5 – implement, monitor, evaluate and report.

This Scoping Study draws on existing studies and information, review of past and ongoing management actions, community and stakeholder feedback, and site inspections. Collaboration with various stakeholders involved in Shaws Bay management has informed this study, which presents the CMP's scope, forward program, and costs for implementing Stages 2 to 4. The CMP for Shaws Bay will update and replace the *Coastal Zone Management Plan for Shaws Bay* (Shaws Bay CZMP, Hydrosphere Consulting, 2015).

Shaws Bay is a coastal embayment that was formed when the northern training wall of the Richmond River was constructed near the river entrance at Ballina over 100 years ago. The bay comprises part of the former river course and there is tidal exchange of water with the main river. The Shaws Bay CMP study area is defined by the hydrological catchment boundary of Shaws Bay and the boundary formed by the northern training wall of the Richmond River. It is a popular spot for leisure activities such as picnicking, swimming, snorkelling, canoeing and walking. The landforms within the study area vary from gently sloping sandy beaches with fringing coastal wetlands, to the rainforest-covered escarpment surrounding the bay in the west and north. Shaws Bay and the broader Richmond River estuary holds cultural significance for local First Nations people. The people of the Bundjalung nation are the traditional custodians of Shaws Bay. Their original occupation and custodianship of the lands and waters of the study area dates back many thousands of years.

The study area has been extensively modified from its natural state through construction of the Richmond River training wall and land raising and development of what is now the Ballina Holiday & Caravan Park (Discovery Parks Ballina) and the Shaws Bay residential area with associated infrastructure including roads, sewer and stormwater assets, open space areas and public recreation amenities. Despite these modifications, Shaws Bay is a unique coastal ecosystem with high biodiversity value supporting a range of flora and fauna species including threatened and endangered species of fish, birds and vegetation.

The Shaws Bay CZMP successfully addressed many high-priority threats through actions such as dredging, beach nourishment, and infrastructure improvements. Community feedback on CZMP implementation has been overwhelmingly positive, with stakeholders emphasising the importance of managing ecological health, water quality, wildlife, and biodiversity. Sandy beaches and access to water, walking and cycling opportunities and scenic beauty were also regarded as important aspects to be maintained and enhanced in the future.

While many recognised threats have been mitigated, this Scoping Study identifies remaining challenges, categorising key issues and emerging threats which have been prioritised in this Scoping Study for consideration in the CMP. Key management issues (high risk threats within the current timeframe) are:

- Urban stormwater discharges
- Poor water quality episodes
- Catchment flooding (from Richmond River)
- Litter and microplastics
- Loss or degradation of estuarine vegetation (mangroves, saltmarsh, seagrass)
- Extreme weather events (e.g. prolonged dry periods and increased frequency and magnitude of storms/ flood events)
- Roads/traffic adjacent to pedestrian pathways and recreation areas
- High demand/ visitor numbers, particularly during peak holiday periods
- Lack of compliance with regulations (by users)

Emerging issues (high risk threats in 20 years in addition to the current threats above) are:

- Increasing tidal/ coastal inundation.
- Anthropogenic barriers (i.e. physical barriers, land use and planning constraints) to migration of vegetation communities with sea level rise.

This Scoping Study presents the details of ongoing management activities, investigations and results of recent stakeholder engagement activities for Shaws Bay. There is a high level of understanding of Shaws Bay risks, current processes and ecosystem trends and the remaining data gaps to be addressed have been identified for Stage 2 of the CMP including targeted water quality assessment, identification of stormwater improvements and updates to mapping of estuarine vegetation.

Through successful CZMP implementation, BSC has demonstrated commitment to best practices and sustainable funding strategies integrated with its planning processes. The CMP process offers an opportunity to address remaining risks, set a long-term strategy, and enhance Shaws Bay for current and future generations. BSC will coordinate the development of the CMP and will collaborate with First nations people, land managers, state government agencies and community representatives to provide effective coastal management outcomes. The CMP development will continue over the next two years with the estimated costs and timing to deliver stages 2 to 4 of the CMP development as follows:

- Stage 2: between \$80,000 and \$210,000 (12 months: July 2024 – June 2025).
- Stage 3: between \$65,000 and \$85,000 (6 months: July 2025 – December 2025).
- Stage 4: between \$40,000 and \$65,000 (6 months: January 2026 – June 2026).

BSC intends to secure funding from the DPE Coastal and Estuaries Grants Program and other external funding sources, with ongoing stakeholder liaison integral to CMP development.

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1. INTRODUCTION

The *Coastal Zone Management Plan for Shaws Bay, Ballina* (Shaws Bay CZMP, Hydrosphere Consulting, 2015) was certified in 2015 under the (former) *Coastal Protection Act 1979*. Ballina Shire Council (BSC) with assistance from the NSW Department of Planning and Environment (DPE), is preparing a Coastal Management Program (CMP) for Shaws Bay in accordance with the NSW Coastal Management Framework. Stage 1 of the CMP development (the Scoping Study, this document) sets the scene for the remainder of the coastal planning process for Shaws Bay.

This Scoping Study addresses the requirements of the Manual related to Stage 1 and includes the key components as listed in the Manual:

- A description of the strategic context for coastal management (Section 3: Strategic Context).
- The purpose, vision and objectives of the CMP (Section 11.1: Purpose, Section 11.2: Vision, Section 11.3: Objectives).
- The scope of the CMP, including management issues (Section: 7 Environmental Context, Section 8: Socio-Economic Context and Section 9: Future Context) and the spatial extent of management areas (Section 2: Study Area).
- A review of the effectiveness of current management practices and arrangements, including identification of changes required to manage the relevant coastal management area(s) effectively (Section 4: Shaws Bay CZMP Implementation and Section 11.5: First Pass Risk Assessment and Gap Analysis).
- Details of roles and responsibilities and how the council will be working with other councils or public authorities – particularly where coastal sediment compartments or an estuary catchment is shared between councils (Section 10.2: Management Roles and Responsibilities, 12.3: Forward Plan and 12.4: CMP Engagement Strategy).
- Results of a first-pass risk assessment and details of where action is required including any additional studies that are proposed to fill knowledge gaps (Section 11.5: First Pass Risk Assessment and Gap Analysis).
- A stakeholder and community engagement strategy (Section 12.4: CMP Engagement Strategy).
- A preliminary business case to prepare a CMP (Section 12: Preliminary Business Case and Forward Plan).
- A forward plan for subsequent stages of the CMP process – including any fast-track proposals and how the stages will align with council's IP&R framework (Section 12: Preliminary Business Case and Forward Plan).

The Shaws Bay CZMP and supporting documents provide detailed information on strategic, environmental, social, cultural and management context and have been updated with information available since the preparation of the CZMP. In particular, the studies and outcomes of the implementation of CZMP actions over the last eight years have been compiled in this Scoping Study.

2. STUDY AREA

2.1 Shaws Bay CMP

Section 13(2) of the *Coastal Management Act 2016* specifies that “a CMP may be made in relation to the whole, or any part of the area included within the coastal zone”. The study area for the Shaws Bay CMP is defined by the hydrological catchment boundary of Shaws Bay and the northern training wall of the Richmond River (Figure 1). The study area includes areas mapped in Chapter 2 (Coastal Management) of the *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP) as coastal environment area (CEA) and coastal use area (CUA) which make up the Shaws Bay coastal zone (Figure 2). Coastal management areas mapped within the study area are discussed further in Section 10.1.

Shaws Bay is a unique coastal embayment requiring targeted management to balance high demand for recreational use and environmental preservation. A dedicated Shaws Bay CMP will better address its unique character and specific recreational and environmental threats, which risk being overlooked if subsumed in the broader Coast and Estuary CMP being concurrently developed by BSC. The Shaws Bay CMP will focus on issues with direct impact on Shaws Bay. Areas of the broader topographical catchment as indicated in Figure 1 will be considered where activities or processes occurring in the catchment have been shown to affect the coastal hazards, ecosystem health, cultural heritage and/or community use of Shaws Bay.



Plate 1: Shaws Bay looking southeast to the training walls at the mouth of the Richmond River

Source: visitnsw.com (2023)

Shaws Bay was formerly part of the Richmond River entrance and is now a coastal embayment formed by the construction of the Richmond River training walls and the subsequent land raising and development of the Shaws Bay residential area to the west. The land surrounding the bay includes a mix of residential and tourist accommodation and recreational areas including:

- Part of the Shaws Bay Holiday Park (western foreshore).
- The Shaws Bay Hotel and Fenwick House (western foreshore).
- Residential developments (north, west and east of the bay).

- The Ballina Holiday & Caravan Park /Discovery Parks Ballina (eastern foreshore).
- The off-leash dog exercise area, north of Shaws Bay along Compton Drive.
- Pop Denison Park (northeast of the bay).
- The Ballina Beach Resort (east of the bay within Shaws Bay residential area).
- The open space reserve west of the Lighthouse Beach sand dunes and along Fenwick Drive.
- The Marine Rescue Tower (southeast corner of study area).
- Part of the northern training wall of the Richmond River.

Shaws Bay is a popular recreational area of great importance to the local community and this popularity is increasing with the recent ecological enhancements and recreational improvements. 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 features and facilities have been developed to provide access and facilitate recreational use. Popular community uses of Shaws Bay include a range of water-based activities (swimming, snorkelling, kayaks, canoes, paddle boards, recreational fishing etc.) and land-based activities (walking, cycling, birdwatching and nature appreciation, picnics/ BBQs, dog exercise and children's play).

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 Holiday and 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 pathways, car parking, public toilets, picnic shelters, BBQs and tables, a playground and pétanque area, outdoor showers and benches (Plate 2, also refer Figure 7 for key features and improvements undertaken as part of CZMP implementation).

Shaws Bay has evolved through time into a diversity of habitats for a wide variety of flora and fauna. Important estuarine habitats include areas of seagrass, saltmarsh and mangroves. 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 such as Coastal Cypress Pine Endangered Ecological Community (EEC) which has recently been enhanced and expanded in the northern section of the bay through plantings and weed control. A number of threatened fauna species are known to utilise Shaws Bay including shorebirds, raptors and fish species (e.g. the protected species Estuary cod *Epinephelus coioides*).

The Shaws Bay and the broader 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. The East Ballina Aboriginal Place (gazetted in 2012) extends from Richmond Park in the north of the Shaws Bay study area to Flat Rock Beach. It is a place of special significance to Aboriginal culture and people.



Figure 1: Study area for the Shaws Bay CMP



Figure 2: Shaws Bay Resilience and Hazards SEPP Mapping a) coastal use area b) coastal environment area

Source: State Government of NSW and DPE (2023)



a



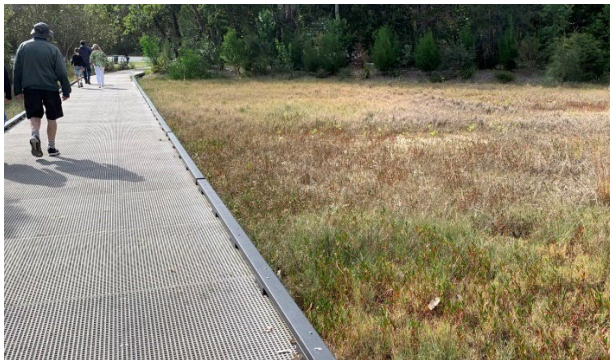
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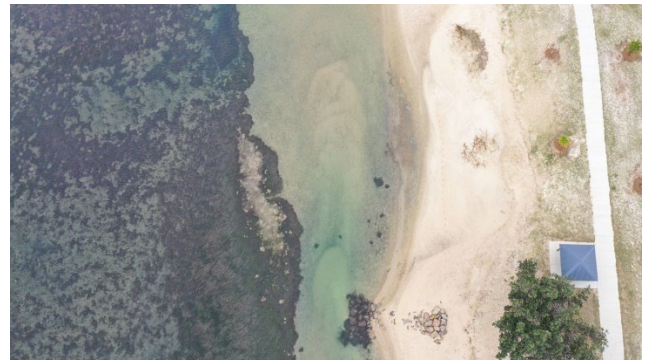
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d



e



f

Plate 2: Key features of Shaws Bay

a – Pop Denison Park Beach, b – Western foreshore picnic shelter, c – Ecological protection zone in northern section of the bay, d - East Beach, e – Saltmarsh basin and boardwalk, f – East Arm aerial image showing rock groyne

2.2 Coastal Management Strategy within Ballina Shire

BSC has developed or is developing coastal management planning documents (in accordance with the *Coastal Management Act 2016*) for the other estuaries and coastline areas within the Ballina LGA including the Richmond River, North Creek, Lake Ainsworth and the Ballina Coast and Estuary. The *Stage 1 Scoping Study for the Ballina Shire Coastline Coastal Management Program* (Water Technology, 2022) includes the urban areas of Ballina within the lower Richmond River. The Ballina Coast and Estuary CMP will replace the *Coastal Zone Management Plan for the Ballina Shire Coastline* (GeoLink, 2016). BSC and the other local councils within the Richmond River catchment have prepared a Stage 1 Scoping Study for the remainder of the Richmond River estuary (Hydrosphere Consulting, 2023a) as part of the development of a separate CMP for the Richmond River which will replace the *Coastal Zone Management Plan for the Richmond River Estuary* (Hydrosphere Consulting, 2011).

3. STRATEGIC CONTEXT

3.1 The Coastal Management Framework in NSW

The *Coastal Management Act 2016* establishes the framework and overarching objectives for coastal management in NSW and supports the aims of the *Marine Estate Management Act 2014* to provide for strategic and integrated management of the whole marine estate – marine waters, coasts and estuaries. The *Coastal Management Act 2016* communicates the NSW Government’s vision for coastal management and reflects the vital natural, social, cultural and economic values of our coastal areas and promotes the principles of ecologically sustainable development in managing these values. The legislative and policy framework recognises natural coastal processes and the local and regional character of the coast and promotes land use planning decisions that accommodate them. The framework promotes coordinated planning and management of the coast and supports public participation in these activities (Figure 1).

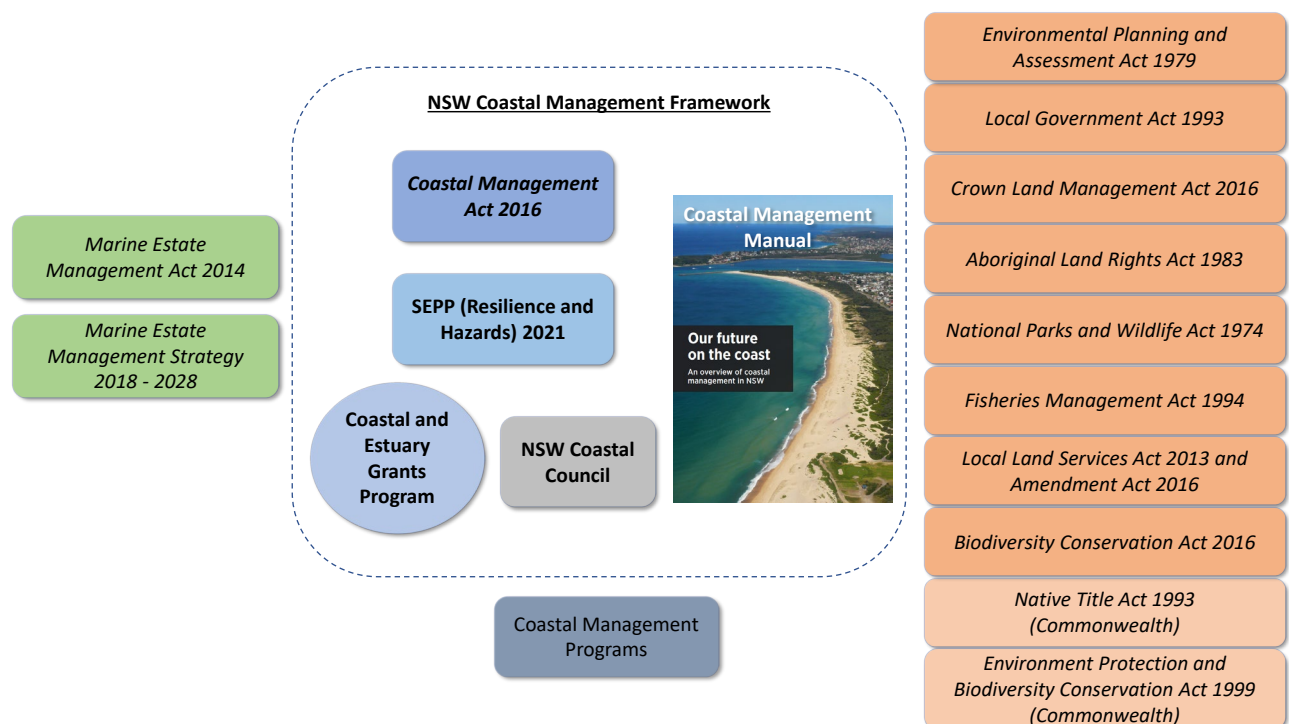


Figure 3: NSW coastal management framework

The *Coastal Management Act 2016* provides guidance on the integrated management of the coastal zone to support ecologically sustainable development to enhance the cultural, social and economic wellbeing of the community. The Resilience and Hazards SEPP is a broader land-use planning framework in NSW which delivers the statutory management objectives of the four coastal management areas which makes up the coastal zone. Chapter 2 (Coastal Management) of the SEPP specifies how development proposals in the coastal zone should be assessed.

Management and protection of all threatened fish, their habitat and threatened marine vegetation in NSW is regulated under the *Fisheries Management Act 1994*. The Department of Primary Industries – Fisheries (DPI - Fisheries) manages this Act to ensure ecologically sustainable development occurs.

Management of Aboriginal Heritage matters in the Ballina Shire are overseen by Jali Local Aboriginal Land Council (LALC) 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.

Land within the study area that is classified as Crown land is managed in accordance with the *Crown Land Management Act 2016*. This act requires environmental, social, cultural heritage and economic issues to be considered as part of the management of Crown land. The rights and interests that First Nations people hold in land and waters under their traditional laws and customs are recognised in the *Native Title Act 1993* and *Aboriginal Native Land Rights Act 1983*.

The *NSW Coastal Management Manual* (OEH, 2018a and 2018b, the Manual) provides guidance for developing a CMP and assists councils in addressing the requirements of the *Coastal Management Act, 2016*. The Manual outlines the mandatory requirements and provides guidance on the preparation, development, adoption and content of a CMP. It includes a process for councils to follow when identifying and assessing coastal environmental, social and economic values and evaluating management actions. It also contains guidance on the integration of a CMP into Council’s Integrated Planning and Reporting (IP&R) framework and land use planning. The Manual outlines a five-stage process for developing and implementing a CMP (Figure 4). This report addresses Stage 1 of the CMP process for Shaws Bay. The Shaws Bay CZMP (which is certified until 31 December 2023) will be replaced by the Shaws Bay CMP.

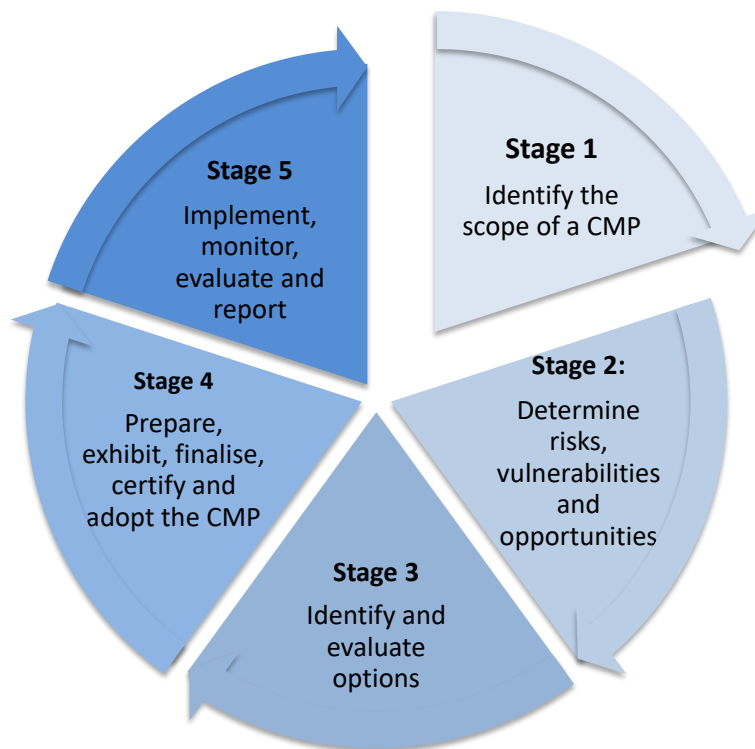


Figure 4: The five-stage process for developing a coastal management program.

Source: Adapted from OEH (2018b)

3.2 Regional and Local Plans

The study area is currently managed in accordance with various regional and local level planning instruments, strategies and management plans implemented by council and other stakeholders. The key regional plans and local plans relevant to coastal management at Shaws Bay are shown on Figure 5.

The strategic direction for management of Shaws Bay is established through the following:

- The NSW Coastal Management Framework (Section 3.1).
- The Marine Estate Management Strategy 2018 - 2028.
- Regional and local plans (Figure 5).
- The IP&R Framework – BSC’s Community Strategic Plan, Delivery Program and Operational Plan.



Figure 5: Regional and local strategies and management plans for Shaws Bay

4. SHAWS BAY CZMP IMPLEMENTATION

The Shaws Bay CZMP identified 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 the CZMP was to accept that some issues cannot be resolved cost-effectively or without compromise.

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. The approach adopted in the CZMP was 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. Other areas were set aside to achieve other management goals where the focus is ecological protection and provision for estuarine vegetation growth with future climate change. The management approach therefore attempted to delineate management focus areas around the bay in order to efficiently achieve the objectives of the CZMP (Figure 6). This approach, which recognised the key processes influencing the ecological health and recreational amenity of the bay as well as key pressures to be faced in the future will also be the focus of the Shaws Bay CMP. The main CZMP goals for each management focus area of the bay are summarised in Table 1.

Table 1: CZMP focus areas and goals

Management Focus Area	Goals
Ecological protection	Provides for enhancement of ecological values with minimal disturbance. Opportunities for nature appreciation and education are 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 is enhanced by improved and additional facilities in these areas.
Integrated use	Providing for a combination of ecological protection and additional passive recreational opportunities.

The majority of actions identified in the Shaws Bay CZMP have now been successfully completed (Table 2 and Figure 7). These works have included dredging, beach nourishment and the creation of sandy beaches, reconstruction of the rock revetment at the eastern end of the east arm, expansion and rectification work on rock groynes on the eastern arm to mitigate erosion, construction of a boardwalk and a saltmarsh basin, rehabilitation of vegetation and creation of protected vegetated areas, educational signage, improved car parking, installation of an access ramp, new public toilets, showers, seating, picnic tables and shelters.

Several other major improvements and complementary projects have also been implemented by BSC within the Shaws Bay precinct since the adoption of the CZMP. These include:

- Children's playgrounds at Pop Denison Park.
- Connecting shared path along entire eastern shoreline.
- Pétanque courts at Pop Denison Park.
- Remediation of sinkholes east of the east arm.
- Landscaping, weed management and native vegetation plantings around the bay.



Figure 6: Shaws Bay CZMP management focus areas

Source: Revised from Hydrosphere Consulting (2015)

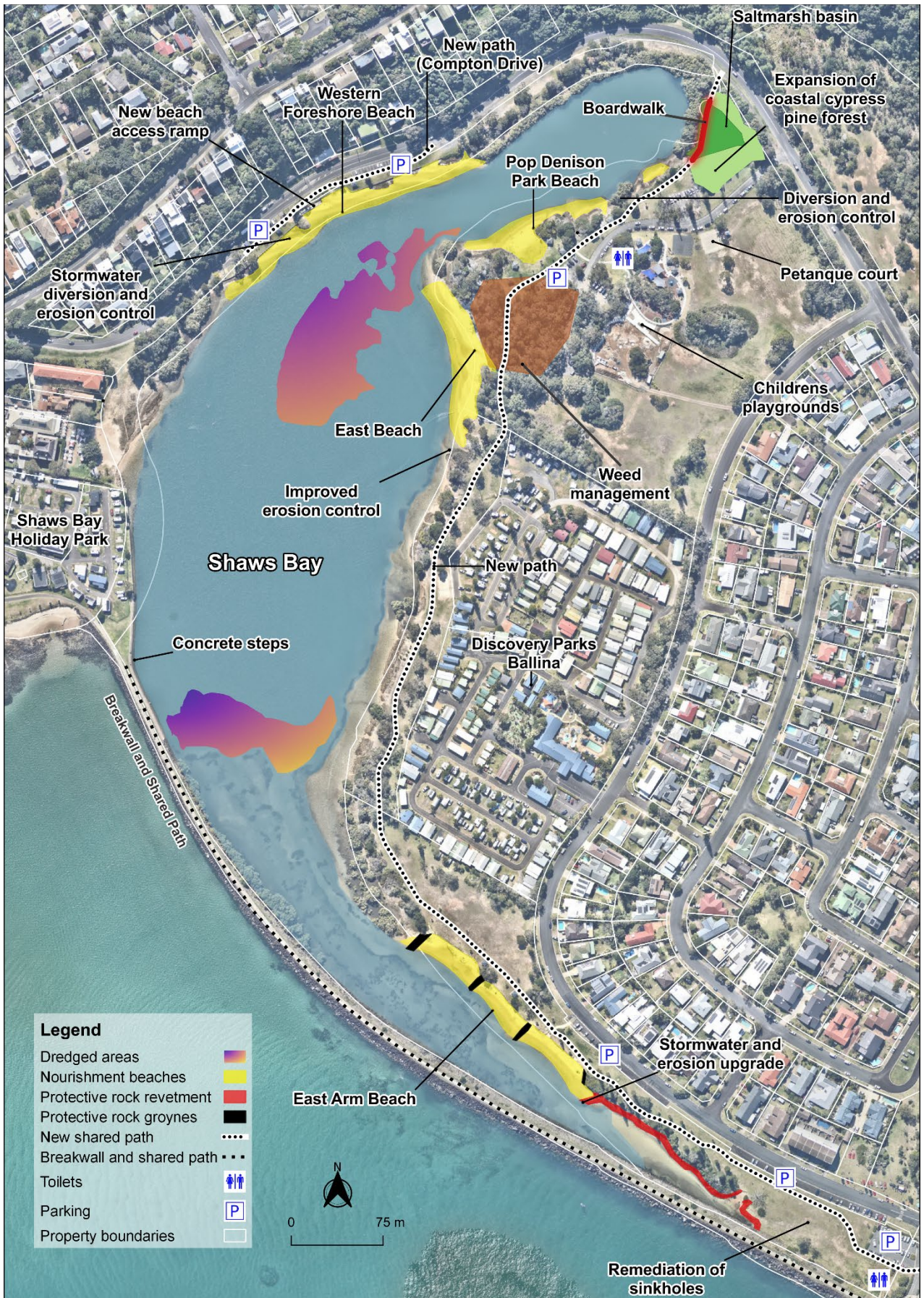


Figure 7: Shaws Bay key features and improvements undertaken as part of CZMP implementation.

Table 2: Status of Shaws Bay CZMP actions

Action	Desired Outcome	Works undertaken	Status	Outcomes and recommendations for future actions
Action 1: Control of East Arm bank erosion and creation of sandy beach	Improved public safety and amenity of Fenwick Drive foreshore and reduced sedimentation in the Bay	Completed in 2018. Works were carried out to improve the function, amenity and safety of the foreshore with new paths, shelters, seating and landscaping. Improvements to rock groyne structures were also carried out to mitigate erosion and assist in the nourishment of the sandy beaches. Additional beach nourishment was undertaken in 2020 using dredged material (Action 2).	Complete	As a result of these works, eroding banks were stabilised and access to the bay was improved. Since completion of the East Arm works, further erosion has occurred along the foreshore. Further works are required to stabilise sand at the East Arm and protect against further erosion via wind and water.
Action 6: Development of Fenwick Drive foreshore area	Enhanced foreshore access and recreational amenity at East Arm			Public safety and recreational access and amenity of the East Arm has been enhanced as a result of the works. Important marine and terrestrial vegetation has been protected with restricted access in some areas.

Action	Desired Outcome	Works undertaken	Status	Outcomes and recommendations for future actions
Action 2: Dredging of main section of Shaws Bay	Reduced infilling and improved water circulation	<p>Completed in 2021. The project involved the following works:</p> <p>Dredging – Two areas in the main section of Shaws Bay were dredged to reduce siltation, maintain deep water and improve tidal circulation.</p> <p>Sand processing – Dredged material was pumped to a temporary processing site at the northern end of Pop Denison Park. Processing was undertaken to remove impurities and produce clean sand.</p> <p>Beach improvement – After processing the dredged material, the clean sand was used to ‘top up’ existing beaches and address areas of bank erosion.</p> <p>Ecological enhancement/ saltmarsh basin – A coastal saltmarsh basin and boardwalk was created in the northern area of the bay as part of marine vegetation compensatory area (see Section 7.5.2 for more details).</p>	Complete	Works were undertaken in accordance with the CZMP tasks and desired outcome of the action. Saltmarsh basin monitoring through the establishment period has shown successful colonisation by saltmarsh species.
Action 3: Review and upgrade stormwater treatment controls	Best-practice stormwater treatment systems are installed and maintained.	<p>Stormwater systems along the western foreshore were redirected and consolidated in 2021.</p> <p>Stormwater open channel drainage at the southern end of Pop Denison Park has been piped and consolidated with an existing stormwater discharge point.</p> <p>The Pop Denison Park lawn area was recontoured to control overland stormwater drainage and discharge to a rock ramp to reduce erosion.</p>	Partially complete	The CZMP action also required a review of the effectiveness of stormwater treatment devices to identify appropriate upgrades to improve the quality of stormwater runoff. This work has not been completed to date but is considered a priority for future work. Further study is recommended as part of Stage 2 of the CMP to assist in the understanding of pollution sources, identifying stormwater upgrade options and directing any further management actions.

Action	Desired Outcome	Works undertaken	Status	Outcomes and recommendations for future actions
Action 4: Western foreshore improvements	Enhanced safety and recreational amenity of Compton Drive foreshore.	Completed in 2018. Improved parking, access ramp into the water, showers, shared-path, seating and picnic shelters along the western foreshore.	Complete	Works were undertaken in accordance with the CZMP tasks and desired outcome of the action.
Action 5: Expansion of Pop Denison Park and improvement of access to the eastern foreshore	Enhanced ecological value, foreshore access and recreational amenity at Pop Denison Park.	Completed in 2021. Nourishment of foreshore including new East Beach using dredged material, returfing of park, drainage improvements, erosion controls, new pavilions, new toilets, revegetation, fencing and pathways, shower, accessible parking, boardwalk, saltmarsh basin, edge plantings and weed management, expansion of coastal cypress pine EEC, information display. Playground facilities were also upgraded in 2022. Works are continuing on new parking areas and a new playground for older children.	Complete	Works were undertaken in accordance with the CZMP tasks and desired outcome of the action.
Action 7: Refurbishment of training wall steps	Enhanced recreational amenity and access to Main Section.	The CZMP action required investigation into options to upgrade the steps to enhance recreational amenity and access to the main section (Crown Lands responsibility).	Not commenced	Works not commenced. Further consultation with Crown Lands required as part of the CMP.
Action 8: Modify conditions of mangrove maintenance permit	Ensure that mangrove maintenance can be undertaken for priority areas around Shaws Bay.	Juvenile mangroves are progressively removed from the bay along the training wall in accordance with a permit from DPI – Fisheries.	Ongoing	Completed in accordance with the CZMP tasks and desired outcome of the action. Ongoing maintenance will be required under the permit. Ongoing review and renewal of the permit and locations for removal is also recommended as part of CMP actions.

Action	Desired Outcome	Works undertaken	Status	Outcomes and recommendations for future actions
Action 9: Weed management along northern side of the training wall	Improve amenity and environmental values along the training wall by removing weed species and restoring native vegetation.	Weed management undertaken at intervals throughout 2018-2021.	Ongoing	Completed in accordance with the CZMP tasks and desired outcome of the action. Ongoing weed control is required to maintain visual amenity and environmental values along the training wall.
Action 10: Education program – public health	Develop tools to improve awareness and notification of Beachwatch results and indicators of risk related to primary contact recreation.	Beachwatch program link to DPE weekly star ratings is available on Council's website Beach Health Ballina Shire Council (nsw.gov.au) . Interpretation of the results and star ratings is available on DPE site.	Ongoing	The ongoing Beachwatch program and improved website and reporting has partially achieved the desired outcome of the action. However, further educational opportunities and new tools available are to be explored as part of the CMP.
Action 11: Education program – estuarine vegetation	The value and role of estuarine vegetation are communicated to the community and visitors.	Educational signage installed around the bay includes information on saltmarsh, seagrass and mangroves. NSW Government also provides education materials e.g. through the MEMS.	Complete	Completed in accordance with the desired outcome of the action. Signage will require maintenance/ replacement over time.
Action 12: Education program – recreational fishing	Increased public awareness of fishing regulations.	Recreational fishing information is included on signage around the bay. Recent signage installed along eastern foreshore with information on fish habitat and protected fish species (i.e. Estuary cod).	Partially complete	Completed in accordance with the desired outcome of the action. Further educational programs to be considered as part of this CMP in collaboration with DPI - Fisheries.

Action	Desired Outcome	Works undertaken	Status	Outcomes and recommendations for future actions
Action 13: Education program – biological irritants	Improve public awareness of biological irritants.	BSC has conducted general educational programs to increase awareness of biological irritants (e.g. midges and mosquitoes) through education materials on Council's website, local media and information boards.	Complete	Specific program for Shaws Bay not commenced, as shire-wide programs are sufficient. The community survey results indicate that this is no longer a major concern at Shaws Bay.
Action 14: Foreshore signage	Information on key processes and human interactions with the Bay is provided on signs.	Information and educational signs have been installed around the bay.	Complete	Completed in accordance with the CZMP tasks and desired outcome of the action. Signage will require maintenance/ replacement over time.
Action 15: Beachwatch water quality monitoring (modified)	Improved knowledge and awareness of risks associated with primary contact recreation.	Recreational water quality is monitored weekly between November and February by BSC at Shaws Bay East, Shaws Bay North, Shaws Bay East Arm and Shaws Bay West. Other ecosystem health indicators (physico-chemical parameters) have also been monitored in Shaws Bay as recommended in the CZMP (refer Section 7.5.1 <i>Case Study - Shaws Bay Water Quality 2021 - 2023</i>).	Ongoing	The majority of tasks were completed in accordance with the CZMP tasks and desired outcome of the action. The one exception was the phasing-out the Shaws Bay North monitoring site due to reduced recreational use as suggested in the CZMP action. This site currently remains part of the monitoring to track trends over time. Further study is recommended as part of Stage 2 of the CMP to assist in the understanding of pollution sources and directing any further management actions.
Action 16: Ecohealth - Monitoring, Evaluation and Reporting Program	Improved knowledge of ecosystem health and collection of data to enable identification of health changes over time.	The Richmond River Ecohealth monitoring program has not yet been repeated. The MER program for the Richmond River (measuring algae present and water clarity) was most recently undertaken in 2018/19 (C- Fair grade). The nearest sampling site was at North Creek.	Not commenced	Ecohealth monitoring has not been undertaken in Shaws Bay to date.

Action	Desired Outcome	Works undertaken	Status	Outcomes and recommendations for future actions
Action 17: Hydrographic survey	Improved knowledge of sedimentation and infilling.	The CZMP action required repeat surveys every five years. Pre- and post-dredging surveys (2020) have been undertaken as part of Action 2.	Ongoing	Completed in accordance with the CZMP tasks and desired outcome of the action. The next survey is due in 2026.
Action 18: Development of strategy to address inundation risk	Improved knowledge of inundation frequency, duration and depth of inundation and development of feasible concepts for managing inundation within Shaws Bay.	Tidal and coastal inundation assessment for Shaws Bay is being undertaken as part of Stage 2 of the Ballina Coast and Estuary CMP including detailed assessment for future sea level rise scenarios. Assessment of risk to Shaws Bay assets and infrastructure will also be undertaken as part of the Ballina Coast and Estuary CMP.	In progress	Work will be completed as part of Stage 2 of the Ballina Coast and Estuary CMP. Outcomes will be available for consideration in Stage 3 and 4 of the Shaws Bay CMP.
Action 19: Review of CZMP progress and monitoring of KPIs	Continuous improvement towards the CZMP objectives across the full range of issues.	Reporting on CZMP implementation is ongoing as part of Council's Healthy Waterways program. This table provides a review of CZMP implementation progress.	Complete	Completed in accordance with the CZMP tasks and desired outcome of the action.
Action 20: 10-year review of CZMP	Management actions and approaches remain appropriate for the long term.	Preparation of the Shaws Bay CMP has commenced and will achieve the desired outcomes of this action.	In progress	Currently in progress in accordance with the CZMP tasks and desired outcome of the action.

5. STAKEHOLDER AND COMMUNITY ENGAGEMENT

Stakeholder engagement is a vital component which spans all stages in the production of a CMP. A key role of the Scoping Study is to involve stakeholders and ensure ongoing commitment for the CMP development and implementation. A summary of the previous consultation activities and community information and feedback as well as consultation activities undertaken during the preparation of this Scoping Study is provided in the following sections. Details of the stakeholder engagement activities carried out as part of this Scoping Study and outcomes are provided in Appendix 1.

5.1 Previous Consultation Activities

Community and stakeholder consultation was undertaken to inform the development of the *Shaws Bay Estuary Management Plan* (EMP, PBP, 2000a) as well as the Shaws Bay CZMP. The 2000 EMP obtained information on community values, issues and concerns. Consultation undertaken for the CZMP included a community survey, project webpage, community drop-in sessions, targeted consultation with key stakeholder groups, Council and agency consultation and is documented in Volume 2 of the CZMP (Hydrosphere Consulting, 2014). The information collected during the consultation program was used to identify management issues, develop management objectives and establish community desires for future management of Shaws Bay. The draft CZMP was placed on public exhibition during September 2014 and public submissions were considered in the final CZMP.

BSC undertook a shire-wide community satisfaction survey in 2022 to identify community priorities. Survey findings relevant to the Shaws Bay CMP include (Micromex Research, 2022):

- Beaches and foreshores are considered to be the most important community facilities.
- The natural environment is the most valued aspect of Ballina Shire.

5.2 Scoping Study Consultation Activities

Targeted consultation was also carried out during the preparation of this Scoping Study to update previous information and engage the community and other stakeholders in the Shaws Bay CMP process. The aims of the Stage 1 engagement activities were to inform, consult and involve stakeholders by bringing all interested parties on board early to share information and ideas and identify stakeholders to be involved in the remaining CMP stages. The consultation activities undertaken during Stage 1 were designed to obtain the following information:

- Estuary values and usage including popular activities and locations.
- Feedback on work completed to date and further work required.
- Issues to be addressed in the CMP.
- The community's vision for the future of Shaws Bay.
- Potential management approaches.

Stakeholder consultation activities included:

- Official notification of the project and request for feedback and registration of interest in the CMP development process. Notifications were sent to all relevant local and state government agencies, First Nations stakeholders, community groups and non-government organisations with an interest in Shaws Bay.
- Ongoing project updates via email to registered contacts.
- Project webpage to provide a portal for two-way communication and registration of interest during the Scoping Study and future CMP stages. Project information, engagement activities and updates are provided through the project webpage.
- Community Survey (online via webpage) open for feedback for six weeks from 22nd May 2023 – 14th July 2023.
- Community market stall to promote the community survey and provide an opportunity for community members to discuss the project, ask questions and fill out the community survey (Plate 3).
- Ongoing engagement with community and interest groups to answer questions, provide information and clarify feedback received.
- Liaison with government agencies for initial information gathering phases and to explore existing information.
- The project team had planned to attend a scheduled meeting between Jali LALC and BSC to discuss the project, however no meetings were able to be scheduled by BSC during the Scoping Study development period. Jali LALC had limited availability due to ongoing commitments and additional obligations during the recovery phase following the Northern NSW flooding events of 2022. BSC is seeking to address current limitations in First Nations consultation across all areas of Council through engagement of an Aboriginal Liaison Officer, who will assist in consultation activities for future stages of the CMP.



a



b

Plate 3: a) Information stall and the Ballina Farmers Market July 2023 b) Survey link Facebook post

5.2.1 Shaws Bay CMP Community Survey

The community survey was open between 22nd May 2023 and 14th July 2023. The survey was designed as an 'opt-in' format available to all members of the public, allowing equal opportunity for those with an opinion to have their say. The survey was advertised widely through BSC webpage and social media and was also sent directly to known interested parties and groups. While the survey approach was not designed to provide

a statistically representative sample, there was a strong response with 181 surveys completed. The results of the survey provide a good snapshot of community opinion about the study area including popular activities and locations of access, current issues, management priorities and the community’s vision for the future of Shaws Bay. The survey and detailed outcomes are provided in Appendix 1.

The community survey highlighted the following:

- The most common activities within the study area are walking/ jogging/ exercise, swimming, wildlife/nature appreciation, relaxing and picnics/BBQs (>80% of respondents said they undertook these activities at Shaws Bay, Figure 8).

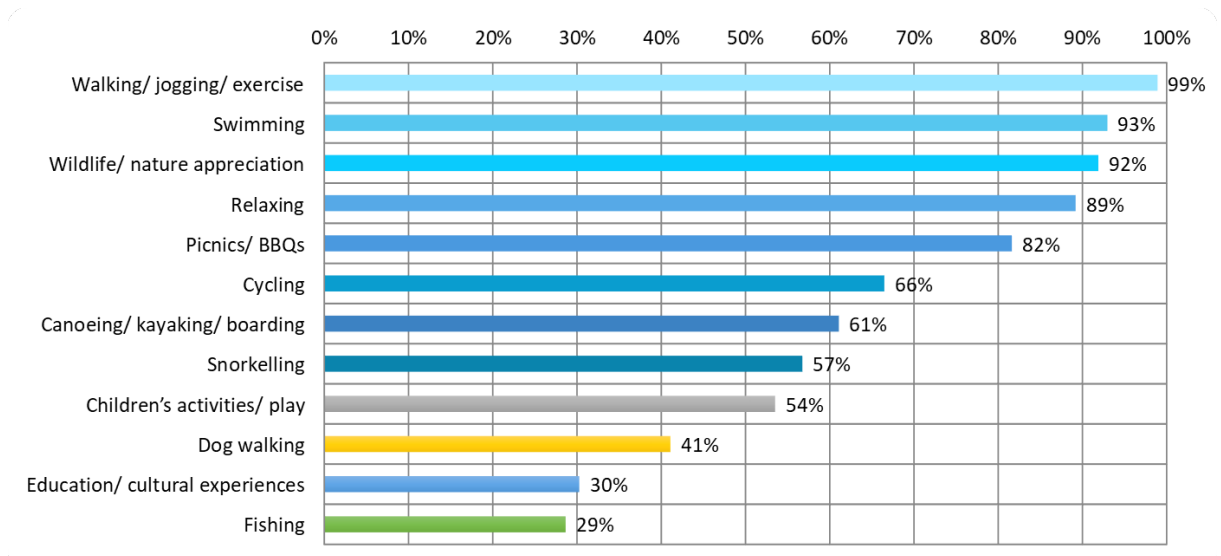


Figure 8: Percentage of respondents who undertake this activity across all Shaws Bay locations

- The most popular swimming locations are the Western Foreshore, Pop Denison Park and East Arm. Walking/ jogging/ exercise, wildlife/nature appreciation, and relaxing activities are undertaken in all areas of Shaws Bay. Picnics and BBQs were most popular at Pop Denison Park, followed by the East Arm.
- Cycling, canoeing/ kayaking/ boarding and dog walking are also popular activities and are undertaken in all areas of Shaws Bay. Snorkelling is most commonly undertaken at the East Arm and children’s activities/ play is most common at Pop Denison Park.
- The less popular activities were fishing and education/ cultural experiences with only 29% and 30% of respondents respectively saying they undertook these activities at Shaws Bay. For those who do undertake these activities, the locations were fairly evenly spread across all areas of Shaws Bay.
- Feedback on the ecological enhancements and recreational improvements undertaken in recent years at Shaws Bay was overwhelmingly positive with the majority of people indicating they ‘love’ the majority of work undertaken (Figure 9). The top five most loved improvements are the new pathways and boardwalk, nourishment of East Beach and Pop Denison Park Beach using dredged sand, New Pop Denison Park playground, nourishment of Western Foreshore Beach using dredged sand and creation of the Coastal Saltmarsh Basin. Many positive written responses were received about the work undertaken to date and some included suggestions for ongoing management.

- The 'I don't like it' responses only made up a small proportion of answers (maximum of 5% in any one category). The two works categories receiving the highest number of 'I don't like it' responses were 'groynes and nourishment of East Arm Beach to reduce erosion' and 'weed management' (10 respondents or 5% of total for both categories). Comments relating to the groynes and nourishment of East Arm Beach identified several issues including nourishment sand eroding into the bay smothering seagrass and infilling the channel so that swimming was restricted except on high tide. Comments relating to weed management identified the need for expansion of the maintenance program to effectively manage weeds.

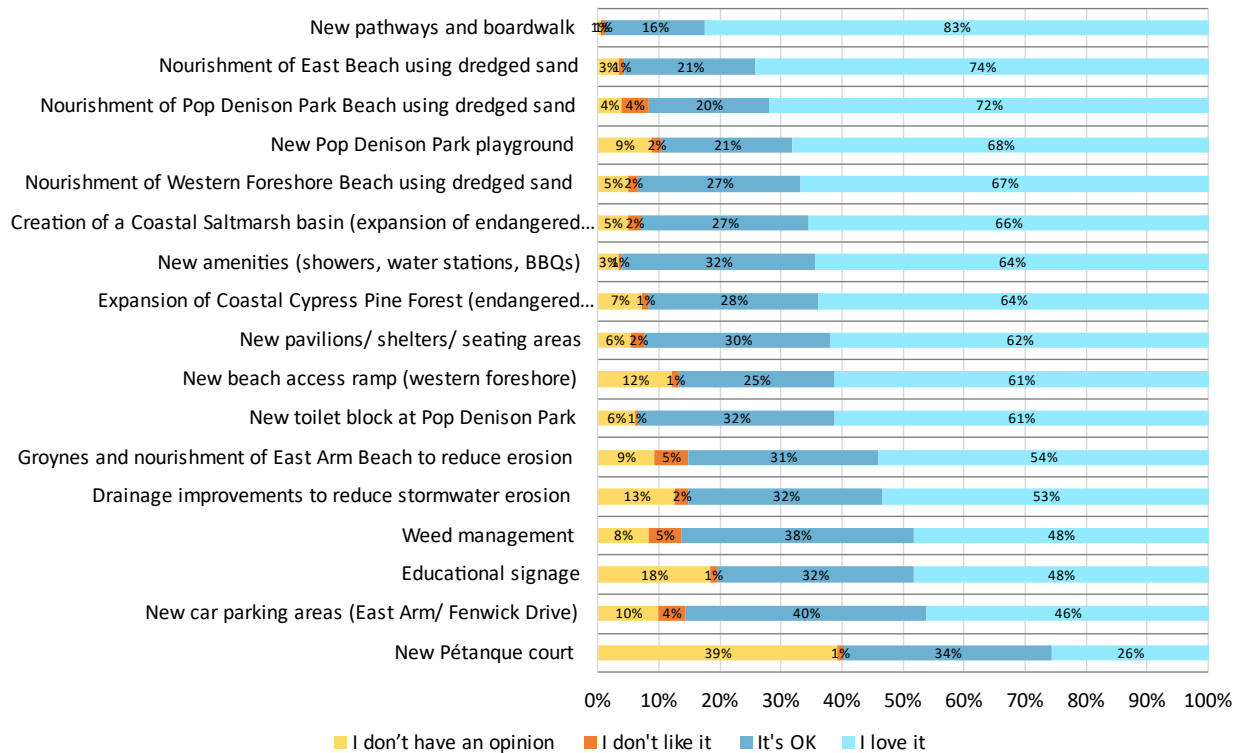


Figure 9: Responses to survey question: What do you think of the ecological enhancements and recreational improvements undertaken at Shaws Bay?

- The top five issues that respondents are concerned about are stormwater pollution, poor water quality, impacts on endangered fish species (e.g. Estuary cod), litter/ rubbish and reduction in fish species or numbers (Figure 10). When comparing the 2023 survey responses to the 2014 survey responses, there is now less concern about siltation and shoreline erosion, but there remains a high level of concern about poor water quality, litter issues and impacts on fish species (including protected species).
- The issues of least concern are insufficient public access to the waterway and carparking with 62% and 52% of respondents respectively stating they are not concerned about these issues. This also represents a change in community priorities from the previous survey in 2014 when difficulties with access to the waterway was included as one of the most important issues.



a



b

Plate 4: a) Stormwater headwalls along the eastern foreshore b) litter on western foreshore

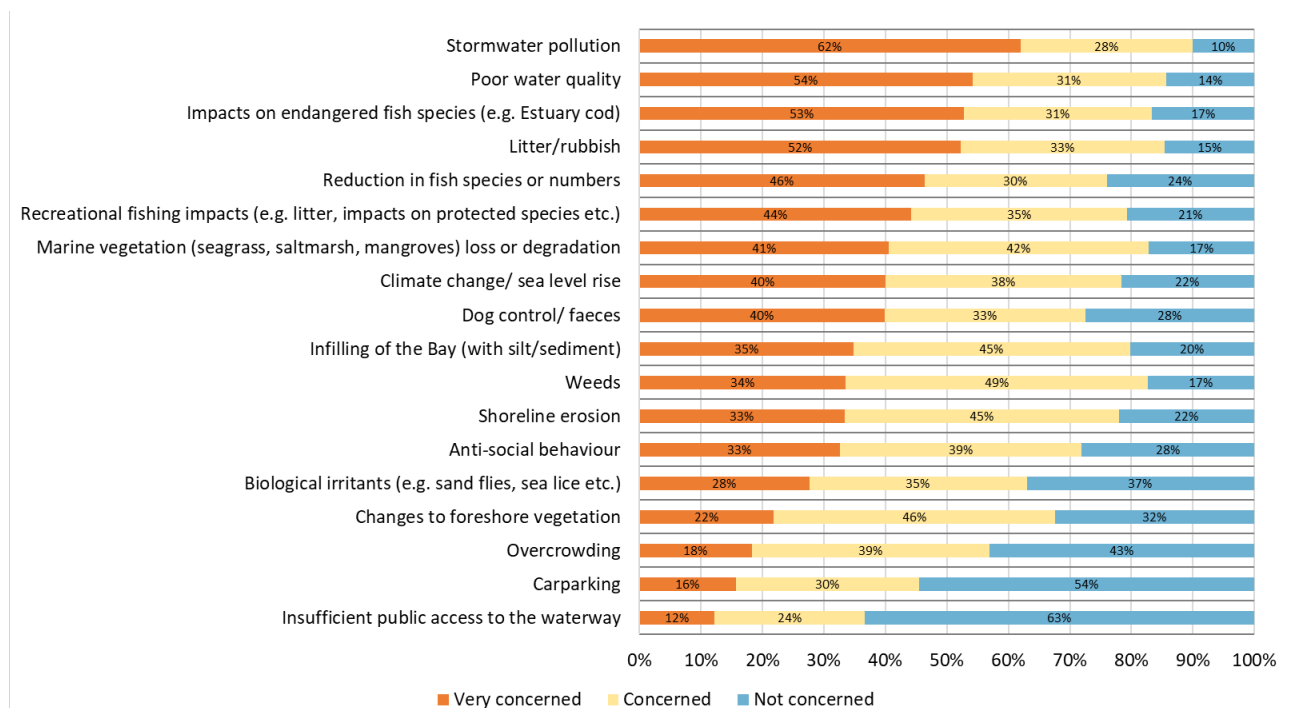


Figure 10: Level of concern about current management issues

- Other issues of concern were nominated by respondents as additional text responses and are summarised as follows (refer Appendix 1 for complete list of responses):
 - Insufficient lighting in many areas around the bay and on steps down the hill from Pine Avenue to the western foreshore area.
 - Sand and debris on pathways and grassed areas of East Arm, creating a hazard for bikes, affecting access to seating and nearby properties.
 - Not enough picnic shelters and shade trees to cater for everyone.
 - Not enough bike racks.

- Unsafe traffic conditions along Compton Drive (i.e. inadequate separation between oncoming traffic and the pathway along Compton Drive at the northern end of Shaws Bay, narrow road entrance to Pop Denison Park and speeding cars along Compton Drive).
- Not enough rubbish bins and dog refuse bag dispensers.
- Lack of areas for dogs to walk on beaches.
- Not enough facilities for older kids.
- Parties at night in Pop Denison Park.
- Toilet block too far away from BBQ areas at East Arm, especially for children, elderly and disabled.
- Overhead powerlines across the lake.
- Occasional discharge of grey water into Shaws Bay from caravans in Shaws Bay Holiday Park.
- Nutrient inflow from dog park north of Compton Drive and Pop Denison Park area.
- Litter such as balloons and non-degradable confetti being left to blow into the water.
- The five most preferred future management priorities are:
 - Ecosystem health monitoring (e.g. fish, marine vegetation, water quality).
 - Enhanced water quality monitoring for recreational activities (i.e. extension of Beachwatch program).
 - Additional stormwater treatment upgrades.
 - Periodic dredging and beach nourishment.
 - Extension of public pathways to create a continuous path around the whole shoreline of Shaws Bay.



Plate 5: a) East Beach area of sand nourishment b) Coastal saltmarsh basin boardwalk pathway

- The survey respondents also considered that the following other management approaches that should be considered for the CMP:
 - Stormwater infrastructure upgrades and/or removal of stormwater discharge to the bay.
 - Expansion of weed management program.
 - Shaws Bay designated as a marine sanctuary.
 - East Arm designated as a marine sanctuary, with fishing allowed in other areas.
 - Make an artificial reef to improve fish health, diversity and numbers (e.g. by sinking some boats).
 - Regular program of dredging to ensure parts of the bay don't become silted out (e.g. East Arm).
 - Improve swimming/ boarding facilities including providing safe access to the water at the concrete steps, install distance buoys for swimmers and boarders (e.g. surf skis, stand up paddle boards etc.) to measure their swim, create a 'lap pool' off the concrete steps.
 - Continue the driveway through to Fenwick Drive to ease traffic congestion around Pop Denison Park/ playground area.
 - Widen the road entrance to Pop Denison Park.
 - Limit speed on Compton Drive to 40 km/hr and provide speed bumps, pedestrian crossing and/or other traffic calming methods to slow traffic in this area.
 - Separation of pathway along Compton Drive from traffic at northern end of the bay.
 - More parking spaces for the children's playground area at Pop Denison Park.
 - More shade areas, shelters, picnic tables and seating.
 - Replace faded signs around the bay.
 - Continuing the next stages of the playgrounds for older kids and include something for teenagers/ all ages (e.g. a pump track, basketball court, futsal field).
 - Bike racks all around the precinct.
 - Improved lighting in all areas and more bins for dog walkers.
 - After hours ranger patrols to discourage night parties.
 - New fences on Compton Drive as pine log fences are falling down.
 - Formation of a Bushcare/ dune care community group to assist management.
 - Ban balloons and non-biodegradable confetti from foreshore areas.
 - More educational signage of the indigenous history and names of the area.
 - Prompt and regular access to any water quality measurements (e.g. signage or an app) to indicate when its unsafe to swim.

- The five most important attributes of Shaws Bay in 10 years from now were identified by the survey respondents as:
 - Good water quality (clean water / safe to swim).
 - Abundant wildlife and biodiversity.
 - Sandy beaches and access to water.
 - Walking / cycling opportunities.
 - Scenic beauty

The breakdown of all responses is provided in Figure 11.

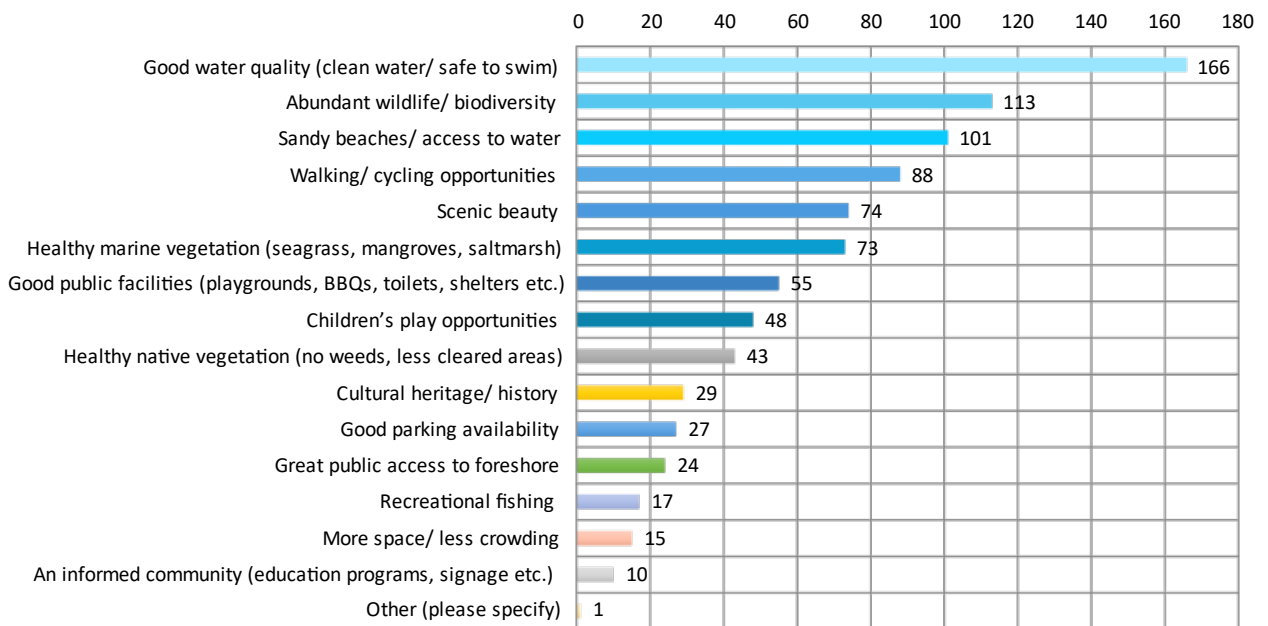


Figure 11: Responses to vision survey question: What are the most important attributes you would like Shaws Bay to have in 10 years from now? (Select up to 5 options)



a



b

Plate 6: a) Shaws Bay Ecological Zone b) Good water quality at East Arm swimming area

5.2.2 Feedback collected on the webpage

The project webpage included a question and answer page and pin map. In addition to the 181 survey responses discussed above there were:

- 622 visits to the webpage.
- 23 participants who downloaded information.
- 2 participants who contributed to a tool (the pin map).

Respondents used the pin map to identify areas requiring dredging and sand nourishment at the East Arm and areas for more picnic shelters near the Surf Club. A summary of responses received on the web page is provided in Appendix 1.

6. CULTURE AND HERITAGE

6.1 First Nations

The original occupation and custodianship of the lands and waters comprising the Richmond River estuary and the Shaws Bay CMP study area by First Nations people dates back many thousands of years. The Bundjalung people are the traditional custodians of the Richmond River estuary. Descendants of the traditional Aboriginal custodians recognise features and places of significance within a cultural landscape. The area now known as Shaws Bay was an important source for gathering shellfish on the shallow sand flats and for traditional fishing practices in river channels. Despite the surrounding density of urban settlement, evidence for these traditions remains on the adjacent ridges of East Ballina, where numerous registered sites of camping places and middens are recorded.

East Ballina Aboriginal Place (gazetted in 2012) extends from the main section of the Shaws Bay study area to Flat Rock and includes East Ballina Cemetery, Chickiba wetlands and Angels Beach. It remains today a place of special significance to Aboriginal culture and people. There is also a parcel of land along the eastern foreshore of Shaws Bay that is subject to an Aboriginal Land Claim (undetermined as of October 2023).

First Nations people continue to contribute to the management of the landscape and natural resources of the region. Aboriginal heritage sites and items exist in and around the estuary and their recognition and protection are important to the local community.

6.2 Early Colonisation

Shaws Bay was an important place in the early colonisation of Ballina and the Richmond River area. It was the only elevated flat ground in the vicinity of the entrance to the Richmond River where fresh water was available and where ships could moor (BSC, 2002). Shaws Bay was named after James Shaw who erected a house on the shoreline. The area was used initially as a base camp for early settlers logging timber in the hinterland and it developed into a depot for supplies coming into the settlement and for timber going out. Cedar logs were floated down the river and creeks and squared for transportation to Sydney and Melbourne. The first saw mill was established in 1853 on the foreshore of Shaws Bay north-east of where Fenwick House was subsequently built in 1886 (BSC, 2002).

The Ballina Local Environmental Plan 2012 (LEP) identifies the following heritage items in the study area (Plate 7 and Figure 12):

- I52 – Victorian manor house known as “Fenwick House”.
- I59 – Former East Ballina (Shaws Bay) Ambulance Station
- I58 – Former Shaws Bay camp site laundry building
- I53 – Monument to HMAS Lismore,
- I54 – Shaws Bay ship wreck sites

The Ballina Local Environmental Plan 2012 also identifies the historic Shaws Bay precinct as an archaeological site (item A3 on Figure 12).

A search of the NSW Heritage Act revealed no items of state significance in the study area.



a



b

Plate 7: a) c1910-20 construction railway on the northern training wall, pilot station buildings and Fenwick House in background b) Shaws Bay recreational uses near concrete steps including diving tower c1960

Source: BSC (2002)



Figure 12: Heritage items identified in Ballina LEP 2012

Source: BSC Intramaps (2023)

7. ENVIRONMENTAL CONTEXT

7.1 Climate

The Northern Rivers region experiences a subtropical climate, with warm humid summers and mild winters. The region has the highest annual rainfall in NSW and can experience intense rainfall and flooding. There is a high degree of seasonal variation in rainfall demonstrating a clear wet/dry seasonal pattern. The highest rainfall typically occurs during summer and in early autumn with the lowest rainfall occurring in late winter and early spring.

Variations in temperature and rainfall in NSW are influenced by the naturally variable climate systems. Although there is natural variability in the climate, there is consensus among climate scientists that the rate and magnitude of climate change is outside the expected range of this natural variability (refer Section 9.2 for discussion of potential climate change impacts at Shaws Bay).

7.2 Topography

Shaws Bay lies within a catchment of approximately 87 ha, with an estuary area of 15.5 ha, volume of 410 ML (at 0.6 m AHD) and average depth of 3 m. The topography of the Shaws Bay catchment includes a steep heavily vegetated escarpment to the west and north and flat delta shoals, back barrier beach and wash over deposits to the east which have been compacted and consolidated with fill material for urban development in the Shaws Bay residential area. The escarpment represents former sea cliffs of basalt rock with a thin sand cover, remnant from former transgressive dune development and Aeolian sand accumulation. The urban development area has a natural substrate of marine sand with imported marine sand and loamy material used as fill.

7.3 Sediments and Geomorphological Processes

7.3.1 Sediment compartments

Sediment compartments (referred to in Schedule 1 of the *Coastal Management Act 2016*) are used to compartmentalise sections of the Australian coastline and marine areas with similar characteristics and processes. A sediment compartment is a section of coast (extending into rivers) which shares a common sediment resource with clearly defined physical boundaries (Short, 2018). The coastal extent of the study area lies within the temperate province, south-east division and central eastern region and is within the “NSW North Coast” primary coastal sediment compartment which extends from Yamba in the south to Coolangatta in the north. Within this primary sediment compartment, the Shaws Bay study area lies within the Cape Byron - Richmond River secondary coastal sediment compartment, as listed in Schedule 1 of the Act (Figure 13).

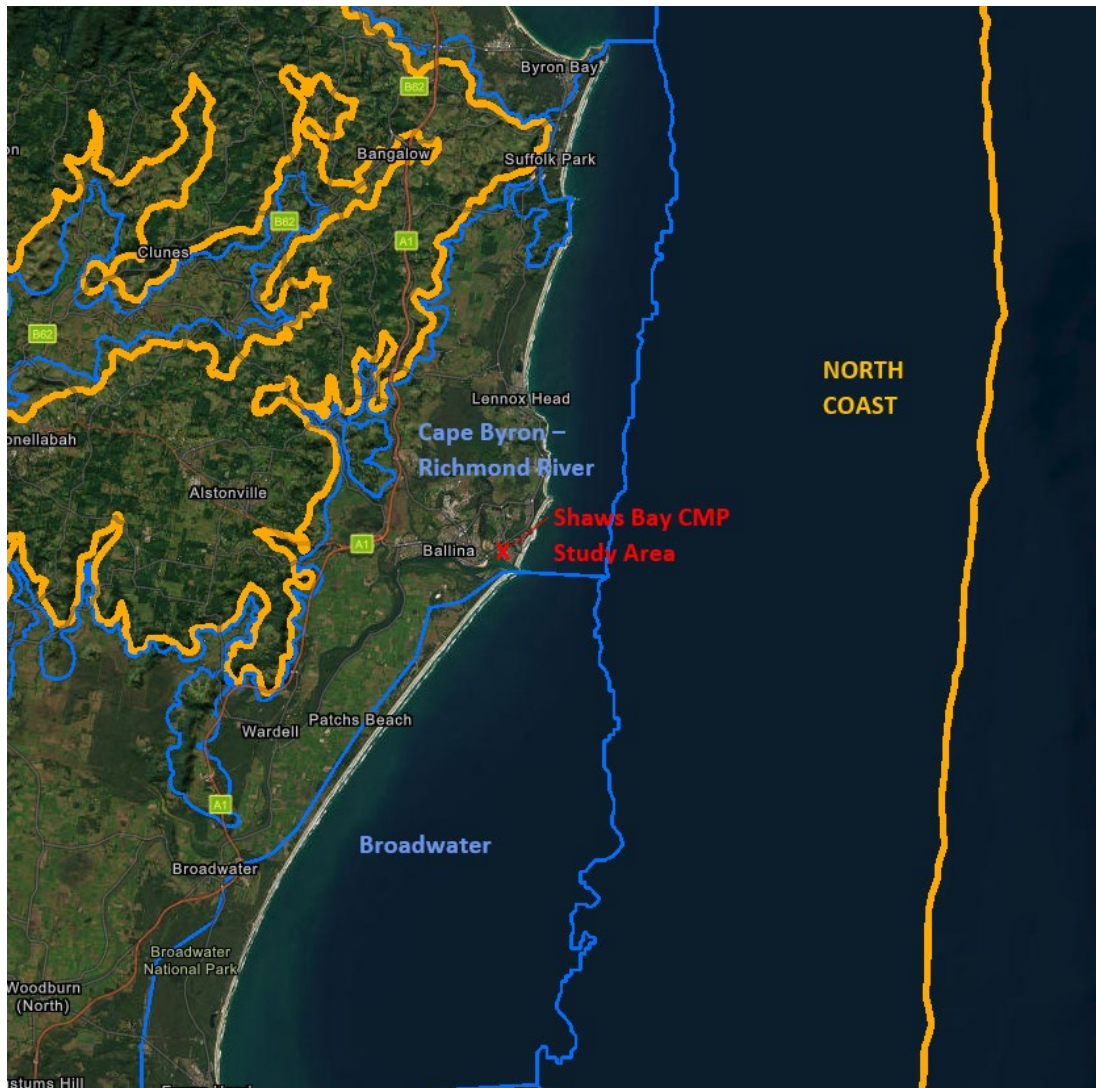


Figure 13: Coastal sediment compartments within and surrounding the study area

Source: Geoscience Australia (2023)

7.3.2 Sediment processes

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 Richmond River and transformed Shaws Bay into a protected estuarine embayment. Since that time, the calmer waters of the bay have promoted sediment infilling without the balancing effect of scouring flood flows.

Shaws Bay consists of three main bathymetric sections - the Northern Section, main section and East Arm (Figure 14). With the construction of the Richmond River training walls commencing in 1889, Shaws Bay became a highly sheltered environment and the effects of wave energy, tidal currents and flood scouring was greatly reduced leading to gradual infilling with sediment. Dredging during the 1970s, 1980s and 1990s maintained deep water in the centre of the bay and the dredged sand was placed around the foreshores to create sandy beaches. Following cessation of regular dredging in the 1990s, the bay gradually infilled with sediment through bank erosion and gradual downslope movement of beach material, as well as deposition of flood-borne river sediments. The Shaws Bay CZMP (Hydrosphere Consulting, 2015) compared 1999 and 2013 bathymetric surveys and estimated that the bay had infilled by an estimated 12,265 m³ over those 14 years (876 m³/year).

7.3.3 Recent Dredging

Dredging undertaken as part of the CZMP implementation in 2020 has been used to recreate the sandy beaches along the Western Foreshore, East Arm and Pop Denison Park including the new “East Beach”. Around 6,000m³ of sediment was dredged in order to reduce the risk of further shallowing of these areas and promote water circulation and maintain water quality. Dredging was undertaken using a cutter-suction dredge which pumped the sediment slurry onshore via pipeline to a processing area at the northern end of Pop Denison Park. At this location, the sediment slurry was passed through a screening and hydro-cyclone plant to remove foreign objects, organics, large shells and silt. Around 620m³ of such unsuitable material was removed from the sediment before the remaining clean sand was transported back to the target beaches. Figure 14 shows Shaws Bay bathymetry based on 2020 post-dredging hydrographic survey.

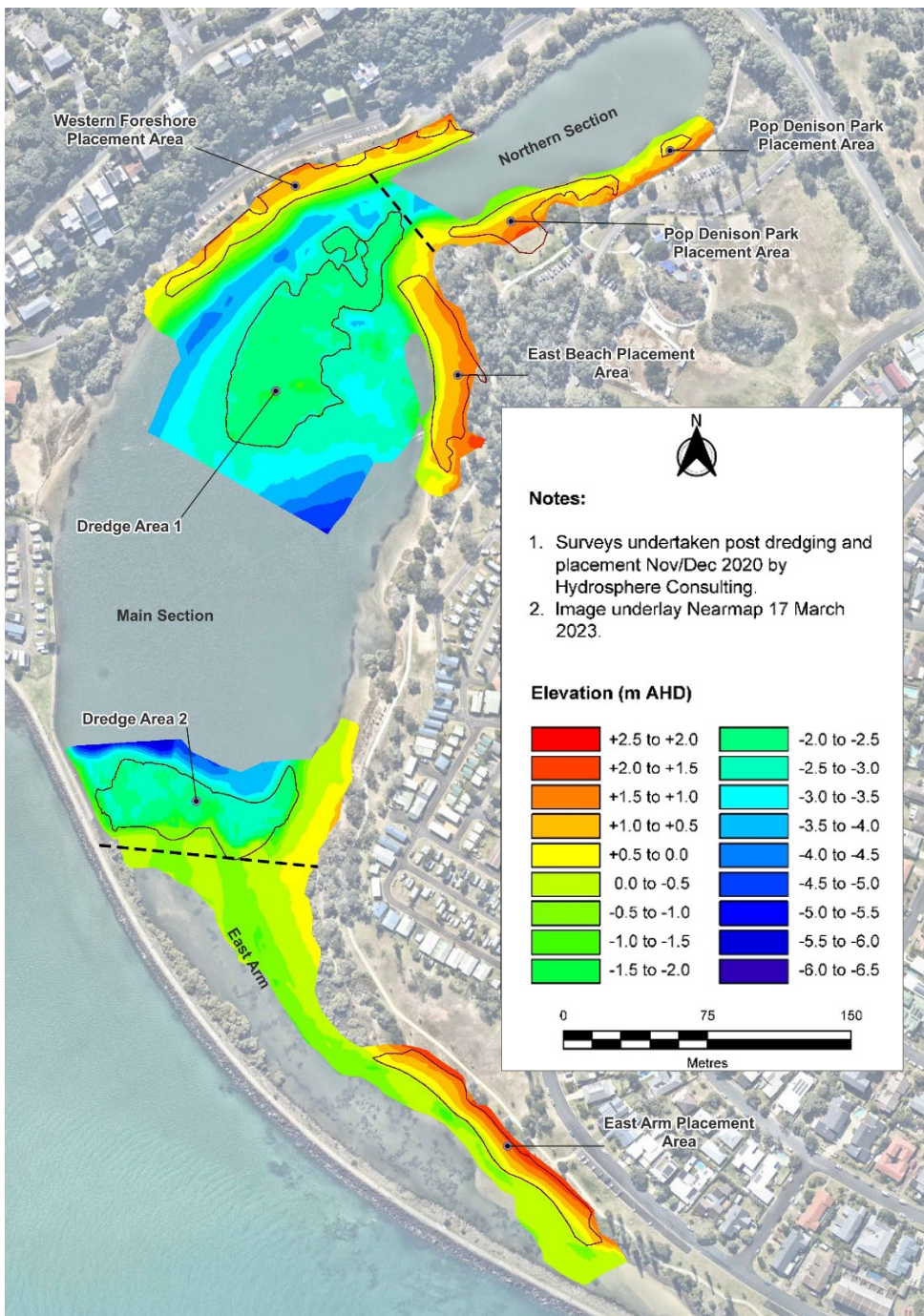


Figure 14: Shaws Bay sections and post-dredging survey elevations 2020

The dominant sources of sediment and processes leading to distribution in the bay are identified as:

- Silt-laden flood waters in the Richmond River which are likely to contribute a significant amount of fine sediment to Shaws Bay. During floods, high turbidity water enters the sheltered environment of the bay through the normal tidal processes and would subsequently deposit much of the suspended silt within the bay. The *Shaws Bay Estuary Processes Study* (PBP, 2000b) estimated that an average of 400 m³/year of fine sediment would enter the bay via this mechanism. The major Northern Rivers flood events occurring in February and March 2022 were likely to have contributed well in excess of the average flood flow sediment to Shaws Bay. Anecdotal reports of up to 10 cm of freshly deposited silt was observed in the East Arm following the February and March 2022 floods. If only a third of this material remained in the bay following flood events, that would equate to an estimated sediment load of over 5,000 m³.
- Fine sediment entrained in local catchment runoff would enter the bay via the stormwater system and through direct runoff. The PBP (2000b) estimated this contribution to be in the order of 75 m³/year.
- The sandy channel within the East Arm is subject to significant tidal currents and resulting scour and bed transport. Prior to bank stabilisation works as part of CZMP implementation, the erosion of the East Arm was estimated to contribute around 12 m³/year of sediment to the bay (PBP, 2000b).
- Redistribution of sediment within the bay and minor erosion of some banks in areas other than the East Arm.

Acid sulfate soils (ASS) is the common name given to naturally occurring coastal sediments and soils containing iron sulfides. ASS can cause water quality impacts if disturbed and exposed to oxygen. State-wide ASS risk mapping was originally prepared by Naylor *et al.* (1998) which indicates the Shaws Bay study area has a low probability of containing ASS.

7.4 Tidal and Freshwater Hydrodynamics

Shaws Bay is dominated by tidal hydrodynamic processes but occasionally receives significant freshwater inputs from the natural catchment as well as stormwater infrastructure that discharges to the bay. The northern part of the catchment is in the form of an encircling bedrock escarpment which generates a number of freshwater springs. These springs emerge at the base of the escarpment and are collected in a catch drain which is then directed under Compton Drive before discharging into the bay (PBP, 2000a). Stormwater can be a significant input to the bay during such extreme events, however the overall contribution of stormwater to the hydrodynamics of Shaws Bay is generally minor (PBP, 2000a).

The oceanic tidal influence on Shaws Bay is due to the open (porous) structure of the training wall separating Shaws Bay from the Richmond River estuary. The influence of the tide is visually apparent, particularly in the East Arm, where tidal flows can be observed, depending on the tide state, to be entering or exiting through the rockwork of the training wall. The levels of high tides within Shaws Bay are very similar to the adjoining Richmond River, indicating that there is no significant impediment to the propagation of high water levels through the matrix of the wall. During spring low tides, the water level in Shaws Bay does not drain to the same low-tide level as the Richmond River, indicating that there is sufficient obstruction in the lower strata of the training wall to impound tidal waters and prevent the full ebb of the tide in the bay. PBP (2000a) noted that this is most likely due to the build-up of sediment within the wall, although many

community members believe that the mangroves and associated sediments fringing the Shaws Bay side of the wall is the main cause of reduced circulation. A field study of was undertaken in mid-2021 as part of CZMP implementation to document the degree of tidal exchange between the Richmond River estuary and the bay. The 2021 data was compared to tidal exchange data collected in 1999 as part of the Shaws Bay Estuary Processes Study (PBP, 2000b). The study showed that tide levels in 2021 were similar to those reported during work in 1999 which indicates that significant reductions in tidal exchange have not occurred over this 22-year time period.

The main circulation patterns during inflowing and ebbing tides are shown in Figure 15. Recent dredging has aimed to increase the rate of tidal exchange in the main section of the bay. It is anticipated that continued sea level rise will lead to greater rates of tidal exchange in the future as the training wall currently appears to allow free exchange of higher water levels (Hydrosphere Consulting, 2021).

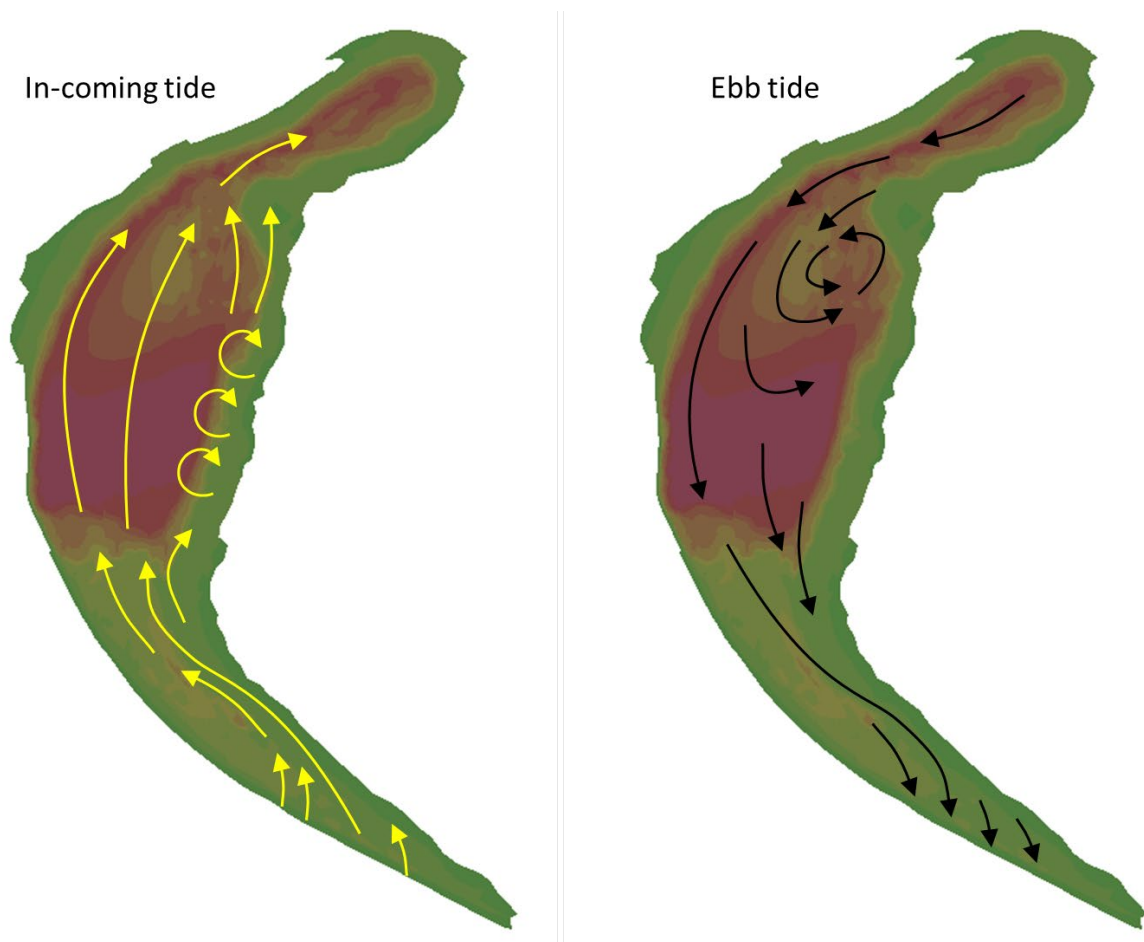


Figure 15: Conceptual diagram of tidal flow patterns in Shaws Bay

Source: Hydrosphere Consulting (2015)

7.5 Ecosystem Health

7.5.1 Water quality

Water quality is one of the most frequent concerns raised by Shaws Bay stakeholders. Water quality conditions in Shaws Bay are generally suitable for a healthy aquatic ecosystem, however poor water quality episodes occur following rainfall events that can result in some areas being unsuitable for swimming (refer to discussion on Beachwatch Partnership Program results below).

Tidal flushing of the East Arm occurs daily and tidal exchange in other parts of the bay generally decreases with distance away from the training wall. 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 major Richmond River catchment flood events also enters the bay, bringing high suspended sediment loads and pathogens making its waters unsuitable for swimming for a number of days after such events. The catastrophic floods of 2022 resulted in long periods of poor water quality in the Richmond River and Shaws Bay.

Urban stormwater enters the bay via stormwater drains draining the surrounding urban catchment of Shaws Bay. The contribution of poor water quality from Shaws Bay catchment stormwater relative to input from the Richmond River varies according to the contribution of flows from both sources, tidal conditions and rainfall (refer to Urban Stormwater Runoff discussion below for further information).

Beachwatch Partnership Program

BSC has been a part of the Beachwatch Partnership Program for over 20 years since its inception in 2002. The water quality of beaches and other swimming locations is monitored to provide the community with accurate information on the cleanliness of the water. To inform the community of water quality results during the summer swimming season, Council provides weekly 'star ratings' on their website. This communication is designed to enable individuals to make informed decisions about where and when to swim. Beachwatch reports are produced annually providing detailed information on beach suitability for each site during the swimming season. Routine assessment can also be used to assess general trends in water quality over the monitored period and help to identify and assess risk factors including:

- The relationship between rainfall and enterococci (bacterial contamination indicator) results and identifying expected 'at risk' periods such as after rainfall events.
- Providing an indication of the impact of pollution sources.
- Where management has been undertaken (such as stormwater improvements), it may enable the effectiveness of management practices to be assessed, and highlights areas where further work is required (OEH, 2012).

Beachwatch results reported in the most recent *North Coast Region State of the Beaches 2022-2023 Report* (DPE, 2023) included the following grades for Shaws Bay shown in Figure 18 to Figure 20:

- Good: Shaws Bay East, Shaws Bay East Arm, Shaws Bay East Beach. Water quality at these sites was frequently suitable for swimming in dry weather, with 91% or greater of dry weather samples within the safe swimming limit (Figure 16 to Figure 18).

- Poor: Shaws Bay North and Shaws Bay West, similar to the previous year. While these sites were mostly suitable for swimming during dry weather, elevated bacterial levels were regularly recorded following light rainfall. DPE (2022) suggests that based on Beachwatch results further investigation is required to show the scale and extent of the problem, and the source of microbial contamination at these sites (Figure 19 and Figure 20).

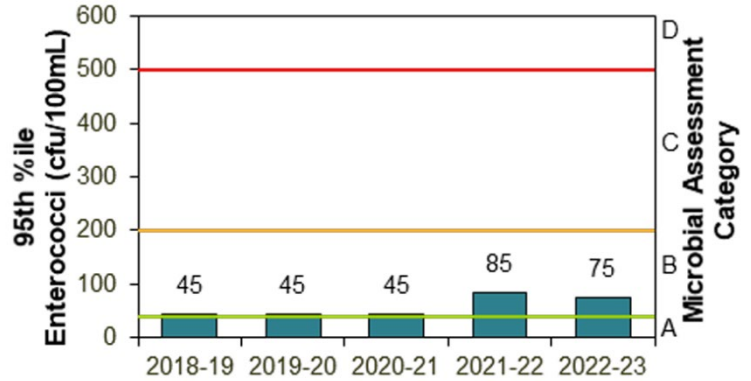


Figure 16: East Arm sampling site map and results 2018 – 2023 (beach grade 2022/23: Good)

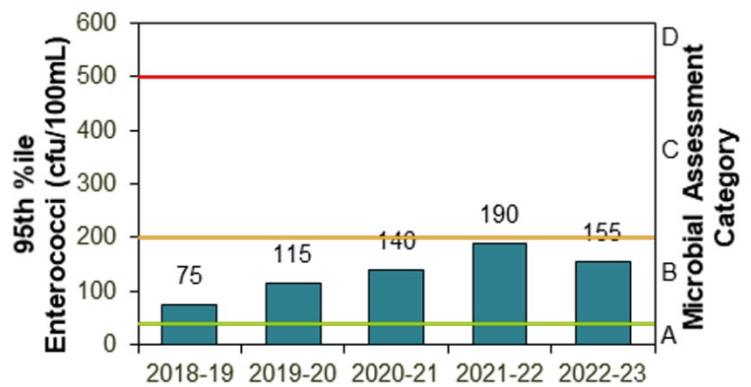


Figure 17: East Beach sampling site map and results 2018 – 2023 (beach grade 2023/23: Good)

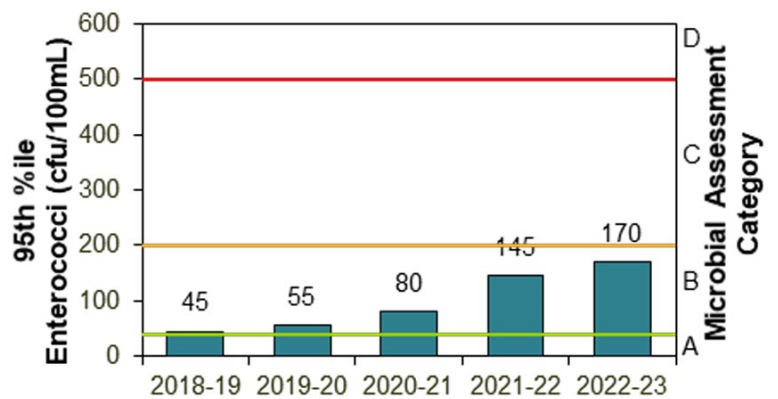
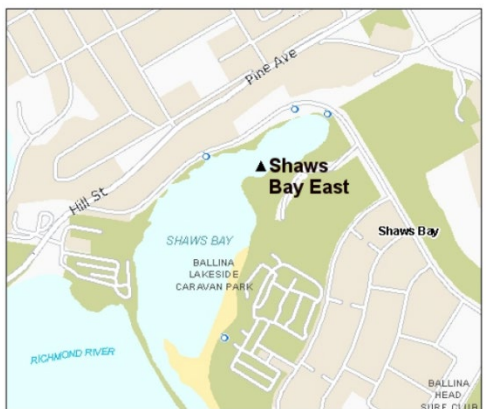


Figure 18: Shaws Bay East sampling site map and results 2018 – 2023 (beach grade 2022/23: Good)

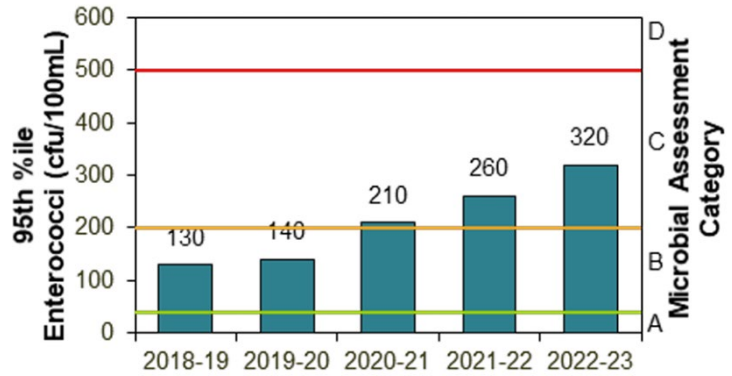
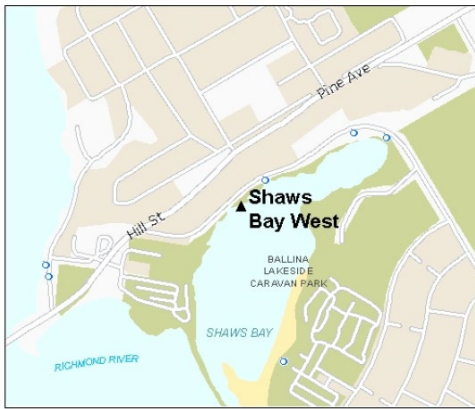


Figure 19: Shaws Bay West sampling site map and results 2018 – 2023 (beach grade 2022/23: Poor)

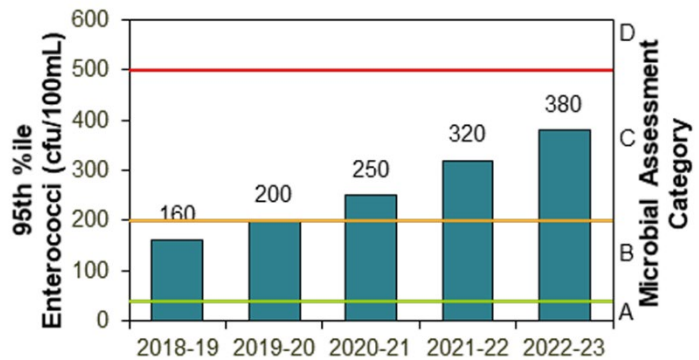


Figure 20: Shaws Bay North sampling site map and results 2018 – 2023 (beach grade 2022/23: Poor)

Further investigation of faecal contamination sources is recommended given the increasing Enterococci counts recorded in recent years at Shaws Bay, particularly at sites Shaws Bay West, North and East. This should include:

- Analysis of existing Beachwatch data and rainfall conditions leading up to each sampling event to determine whether the increasing trends observed are reflecting a true increase in bacterial counts or if timing of sampling in relation to rainfall events is influencing the results.
- A targeted microbial source tracking study to identify the source of faecal indicator bacteria (human, dog, wildlife etc.). The study would assist in identifying sources of bacteria and direct management action.

Case Study - Shaws Bay Water Quality 2021 - 2023

BSC regularly collects field water quality data at the Beachwatch sampling sites. Data from 2021 -2023 has been analysed and is presented below for temperature, turbidity, dissolved oxygen and pH as median values assessed over the sample period (Table 3) and box and whisker plots and time series charts (Figure 21).

There are no locally-derived water quality objectives for Shaws Bay. In the absence of local guidelines, the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018) are considered to be the most relevant published guidelines to use in the assessment of water quality. The guidelines are essentially “trigger values”, the numeric criteria that, if exceeded, indicate potential for harmful environmental effects to occur. The default trigger values are conservative and precautionary. If they are not exceeded, a very low risk of environmental damage can be assumed. If they are exceeded, further investigation is “triggered” for the pollutant concerned. Guidelines are compared against the median value (provided in Table 3 and shown as the middle line in the box and whisker plot) to assess whether water quality conditions are potentially impacting aquatic ecosystem health. Note that NSW DPE are in the process of developing revised water quality guidelines for different estuary types and the findings below could be revisited once revised guidelines are available. The median values for all field data collected between 2021 - 2023 at Shaws Bay sites are shown in Table 3 below. Water quality guideline values (ANZG, 2018) are also shown and exceedances of water quality guidelines are highlighted in red.

During the time period of sample collection from 2021 - 2023, the North Coast of NSW experienced extremely high rainfall and major flooding events of the Richmond River occurred in February and March 2022. Richmond River flooding negatively impacted the water quality in Shaws Bay as evidenced by increased turbidity and decreased dissolved oxygen values at all sites and a very low pH at East Arm and East sites (~pH 4) on one occasion. Despite these events, median values for turbidity and pH were within the ANZG (2018) guideline values for health aquatic ecosystems over the period assessed from 2021-2023.



Richmond River flood waters entering Shaws Bay March 2022

Dissolved oxygen levels were slightly below the guideline values at all sites assessed over this period, with the lowest values recorded during major flooding events (dissolved oxygen ~3 mg/L), likely to be influenced by very poor water quality coming from the Richmond River catchment at this time. Low dissolved oxygen levels (many below the ANZG (2018) guidelines) were also recorded during the following spring and summer period (September 2022 – February 2023) and could be indicative of slow recovery times post-flood. It will be important to assess ongoing water quality conditions to ensure system recovery following flooding events.

Table 3: Median values for field parameters recorded at Shaws Bay Beachwatch sites 2021-2023

Time Period	Site	Temperature (°C)	Dissolved Oxygen (mg/L)	pH	Turbidity (NTU)
2021-2023	East Arm	23.54	5.66	8.18	2.2
2021-2023	East Beach	23.54	5.66	8.18	2.2
2021-2023	East	24.22	6.10	8.12	5.0
2021-2023	North	23.38	6.40	8.14	8.3
2021-2023	West	24.03	5.82	8.26	5.3
Water Quality Guidelines (Estuary)¹					
Lower Guideline		n/a	6.73 mg/L (~80 %sat)	7.0	0.5
Upper Guideline		n/a	9.26 mg/L (~110 %sat)	8.5	10

1. ANZG (2018)
2. Red text indicates exceedances of water quality guidelines for aquatic ecosystem health

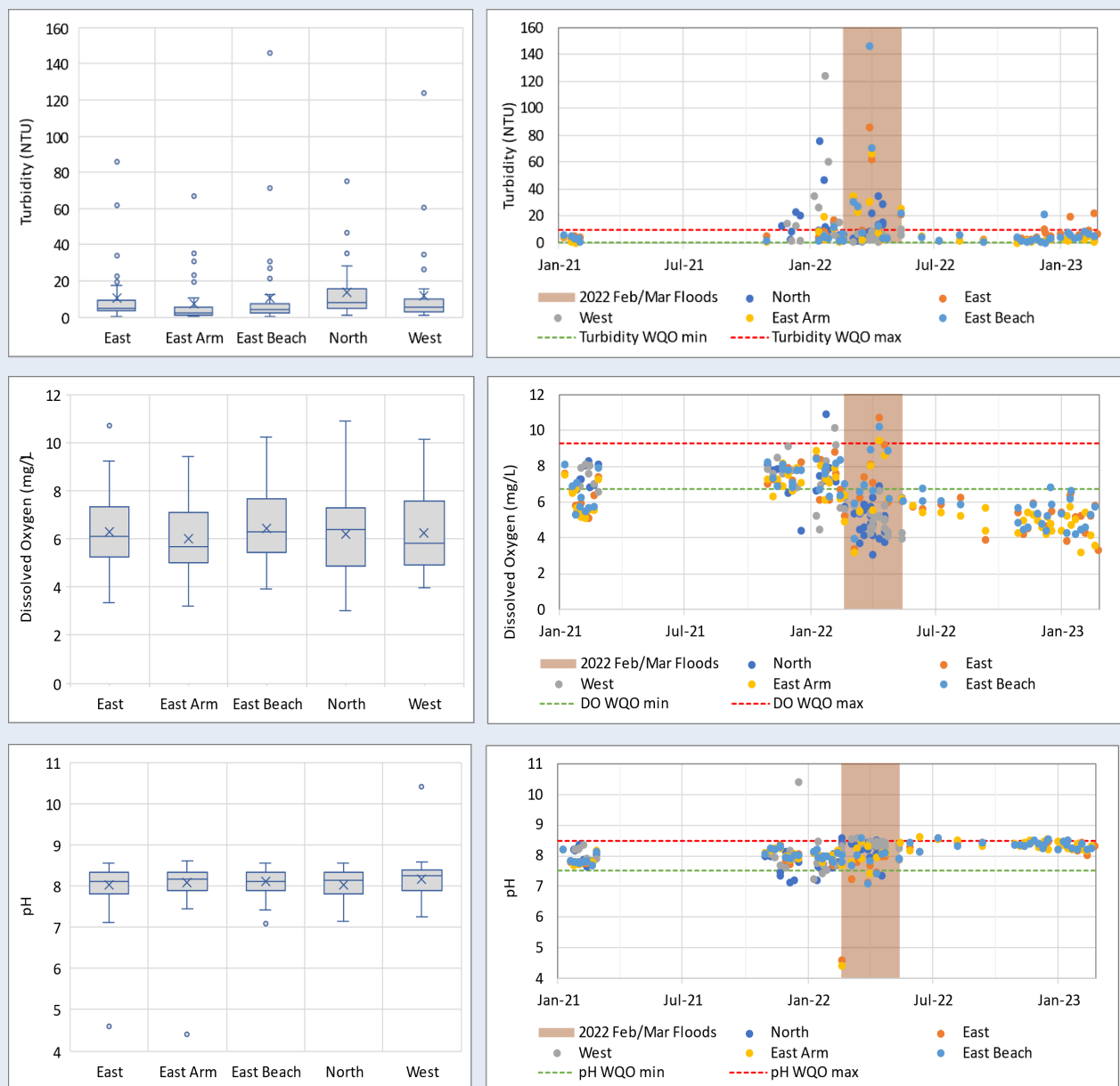


Figure 21: Field water quality results for Shaws Bay Beachwatch sites 2021-2023

Source: Water quality data provided by BSC (2023)

Urban Stormwater Runoff

The majority of areas in the Shaws Bay catchment include stormwater infrastructure to collect and convey stormwater from urban areas to Shaws Bay. There are currently 16 stormwater drains discharging directly into Shaws Bay (Figure 22). Areas such as the Shaws Bay escarpment, the public reserve on the north side of Compton Drive, and Pop Denison Park are not directly serviced by stormwater drains and drainage occurs primarily via infiltration through the soil into groundwater or overland runoff.

PBP (2000a) developed a model to predict both the annual load of pollutants to Shaws Bay and the likely pollutant concentrations in the bay following a major stormwater runoff event (1 in 10 year ARI event). The model demonstrated that the annual pollutant loads are considered to be small compared to the oceanic flushing potential of the bay and are unlikely to have a major impact on overall water quality. The model showed an increase in pollutant concentrations in the bay shortly after a major rainfall event, however the concentrations were within the recommended guideline limits for estuarine systems (ANZECC Guidelines) with the exception of *E. coli*. Based on the results of modelling, PBP (2000a) estimated that elevated *E. coli* levels were likely to persist for less than 12 hours following the event and reported that this was consistent with results of bacteriological sampling carried out in Shaws Bay following rainfall events. The model also found that the Northern Section of Shaws Bay receives a large amount of stormwater runoff relative to its volume and is therefore more susceptible to poorer water quality than other parts of the bay. However, good tidal flushing means that any impacts are short-lived with pollutants being dispersed and advected out of the northern bay relatively quickly (PBP, 2000a). Results of the modelling are consistent with water quality monitoring undertaken recently from 2021 - 2023 which show there are poor water quality episodes following rain events, but the average water quality condition (averaged over both wet and dry periods) achieved the default water quality guidelines for healthy aquatic ecosystems (ANZG, 2018).

Since the 2000 EMP, several stormwater treatment devices have been installed in the Shaws Bay catchment (Figure 22) including filter bag pit inserts into stormwater drains in the Shaws Bay residential area and the installation of two 'Humeceptor' stormwater treatment units to remove pollutants (i.e. sediment, hydrocarbons, nutrients and small-sized litter). These stormwater treatment devices are still in place in 2023, however several of the filter bag pit inserts have become damaged over time and have not been replaced. Although there has not been any formal survey of treatment effectiveness, BSC maintenance staff have reported that the filter pit inserts primarily trap leaves and organic matter and only a very small amount of litter, which is thought to be a minor stormwater pollutant in residential areas. The maintenance cost of the litter baskets is reported to be high and Council staff have indicated that a smaller number of end-of-pipe treatment devices (e.g. gross pollutant trap or similar device) close to discharge points to the bay would be a more effective solution to remove litter and other gross pollutants with lower maintenance costs.

Recent upgrade works in 2017/2018 along the western foreshore on Compton Drive and at the Ballina Surf Club carpark have included installation of bioretention pits to replace standard stormwater pits (Figure 22). Bio-retention systems utilise a vegetated soil media to filter stormwater and trap and remove pollutants through gravity-induced infiltration. Bioretention systems aim to remove nutrients, bacteria, fine sediments and heavy metals from stormwater prior to discharge to a receiving environment. There has not been any assessment of the effectiveness of these devices to date.

Further investigation of current stormwater treatment effectiveness is required to identify appropriate upgrades to the stormwater network.



Figure 22: Shaws Bay stormwater infrastructure

Source: Stormwater infrastructure mapping provided by BSC (2023). Note some filter bag inserts have been removed.

7.5.2 Biodiversity

The NSW Governments web-based Biodiversity Values Map identifies land with high biodiversity value, particularly sensitive to impacts from development and clearing. Figure 23 shows the Biodiversity Values Map (purple extent) for Shaws Bay which extends over the open water of the bay, several foreshore areas and along the northern training wall of the Richmond River.



Figure 23: Biodiversity Values Map for Shaws Bay identifying areas with high biodiversity value

Source: DPE (2023)

Estuarine vegetation

Estuarine vegetation refers to seagrass, mangrove and saltmarsh plant communities. Seagrass occurs in the intertidal or sub-tidal (marine) zone and is generally covered with water except during very low tides, mangroves occur in the intertidal zone between low and high tide and saltmarsh communities occur mostly behind mangroves in the upper limits of the intertidal zone and are only inundated briefly on high tides. Estuarine vegetation performs a number of important ecosystem functions. Saltmarsh, mangrove and seagrass habitats are essential nursery areas for many species of commercially and recreationally important fish and crustaceans and the food they eat, contributing large amounts of organic material to the ecosystem. Depending on their type and location, estuarine vegetation reduces the effects of erosion due to waves or currents and helps trap sediments. Saltmarsh and mangroves also act as a buffer from urban areas and a filtration system for sediment and nutrients entering the waterway from the terrestrial environment. Natural events such as floods and storms can impact on seagrass, mangrove and saltmarsh. Human actions such as construction of infrastructure (e.g. roads, walkways, buildings etc.), sand nourishment, poor quality stormwater discharges from urban areas and direct disturbance from vehicles, watercraft and humans can also influence the distribution, abundance and condition of estuarine vegetation.

The Shaws Bay CZMP presented data on historic distribution of estuarine macrophytes and results of a detailed seagrass survey undertaken in 2014. The latest estuarine macrophyte extents were assessed and mapped by DPI – Fisheries through desktop and field assessment undertaken in September 2020 (Figure 24). The extent and key species for each vegetation type based on the latest mapping is summarised as:

- Fringing mangroves (approximately 7,948 m² in 2020) are in good condition and include River mangrove (*Aegiceras corniculatum*) and Grey mangrove (*Avicennia marina*).
- Seagrass meadows (*Zostera capricorni*) (approximately 17,575 m² in 2020) dominate the East Arm and west and east shorelines.
- Fringing communities of saltmarsh (approximately 3,184 m² in 2020) are dominated by Saltwater couch (*Sporobolus virginicus*) and Shoreline purslane (*Sesuvium portulacastrum*).

The 2020 mapping was undertaken prior to several CZMP actions including dredging, beach nourishment and establishment of the saltmarsh basin in the north of Shaws Bay and major flooding events in 2022. Repeat mapping and assessment of estuarine macrophyte communities is required to continue to track the distribution and health of mangrove, seagrass and saltmarsh habitats at Shaws Bay. This will assist in directing management actions for the ongoing protection and enhancement of estuarine habitats as part of the CMP, and addressing specific community concerns raised such as the loss of seagrass in the East Arm.

Mangroves are successfully colonising many new areas along the foreshore. The proliferation of juvenile mangroves in key access locations is controlled by BSC under a permit from DPI – Fisheries. Figure 24 shows the mangrove exclusion areas under the permit. The current permit arrangements reflect the ecological enhancements undertaken and identify areas for protection of mangroves.



Plate 8: Aerial view of estuarine vegetation along the East Arm of Shaws Bay in 2021

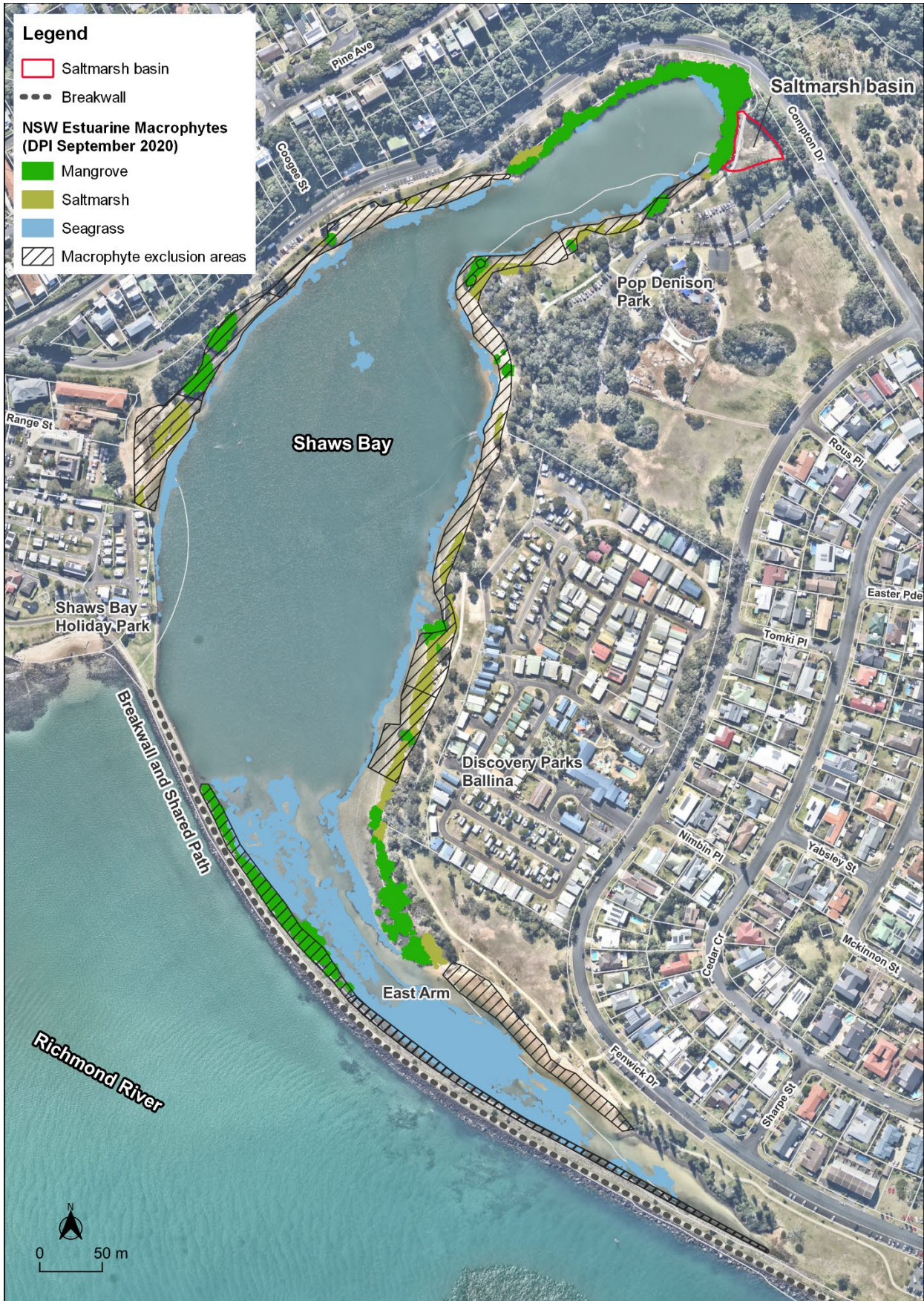


Figure 24: Shaws Bay estuarine habitat (mapped in 2020) showing the locations of mangrove exclusion areas and location of recently constructed saltmarsh basin

Source: DPI – Fisheries (2023)

Case Study – Creation of the Shaws Bay Coastal Saltmarsh Basin

In late 2020, a saltmarsh basin was created at the north-eastern end of Shaws Bay within Pop Denison Park. The intention of the basin was to create an area suitable for saltmarsh habitat now and into the future taking into consideration sea level rise. The basin increased the area of saltmarsh and associated values within the bay and provides an area for estuarine vegetation migration in the future with sea level rise, increasing the ecological and climate change resilience of Shaws Bay. The basin, covering an area of approximately 900 m², was excavated to an elevation range (~0.77 - 2.0 mAHD) suitable for saltmarsh growth. The basin was designed to enable estuarine water exchange into and out of the basin during king tides which occur once or twice per year. The basin area was planted with a variety of saltmarsh species already found at Shaws Bay including Saltwater Couch (*Sporobolus virginicus*), Sea Purslane (*Sesuvium portulacastrum*), Seablite (*Suaeda australis*) and Samphire (*Sarcocornia quinqueflora*).

Monitoring and maintenance of the basin was undertaken post-construction to track vegetation health, composition and coverage (Hydrosphere Consulting, 2023b). The saltmarsh basin is functioning as designed and has been successful in achieving the primary objective of creating a suitable habitat for the future migration of saltmarsh with sea level rise. Ongoing weed monitoring and periodic maintenance will be required to control terrestrial weeds in the basin until tidal regimes are sufficient to control weeds naturally.



a



b



c



d

a) Earthworks commence to create the saltmarsh basin Sep 2020; b) Initial planting of coastal saltmarsh basin; c) Construction elements complete, vegetation has established and supports high tide inundation Jan 2021; d) Established saltmarsh basin June 2023.

Aquatic Fauna

The Estuary Processes Study (PBP, 2000b) included an aquatic fauna assessment of Shaws Bay which recorded a variety of aquatic fauna including Sea mullet, Flathead, School prawns, Snapping prawns, Sea cucumbers, Mud crabs, Moray eels and numerous gastropods including Sydney whelks and Moon snails. Intertidal crustaceans such as Soldier crabs were also observed. Fish species anecdotally caught by recreational anglers and observed in the bay include Bream, Tarwhine, Whiting, Flathead, Giant trevally, Moses perch, Garfish, Mullet, Estuary cod and a range of smaller fish species.

The training wall prevents the passage of large fish from Shaws Bay to the main Richmond River estuary. The number of predatory fish is also restricted to those that have grown within the bay itself. This allows for an abundance of fish species of potentially large size. There are anecdotal reports of exceptionally large fish being caught in Shaws Bay such as Giant trevally.

Case Study - Estuary cod (*Epinephelus coioides*)

Estuary cod (*Epinephelus coioides*) is listed as a protected fish in NSW under the *Fisheries Management Act 1994*. They are a typically brownish fish shading to a dull white underbelly with many brownish-orange spots covering its head and body and dark brown blotchy vertical bars along its body. Colouration may vary and be less distinct in juveniles. Estuary cod are a tropical/ warm temperate marine species that is prevalent throughout many tropical regions of the world. In Australia they are most common in Queensland, Northern Territory and Western Australia, with NSW being at the southern extent of their Australian distribution. Estuary cod are commonly found in lower reaches of estuaries within close proximity to structure such as rock, reef and bridge pylons. In Shaws Bay they are often easily observed swimming along the base of the training wall. They are protected in NSW as (DPI, 2023):

- NSW waters are at the southern extent of the species' Australian distribution.
- The species is susceptible to depletion due to its unusual reproductive cycle, long life, and territorial nature.
- Estuary cod are particularly vulnerable to spearfishing, recreational line fishing, and commercial fishing.

Taking or possessing estuary cod (or any other species of protected fish) is an offence and heavy penalties apply (fines of up to \$55,000 for corporations and up to \$11,000 for individuals).



a



b

a) Estuary cod (*Epinephelus coioides*); b) Fish Habitat signage along Shaws Bay foreshore

Source: DPI Fisheries (2023)

Terrestrial vegetation

Terrestrial vegetation refers to all non-aquatic and non-estuarine plant species including riparian vegetation, which is located adjacent to the bay, above the high tide level. Healthy terrestrial vegetation communities in the catchment are important for maintaining general biodiversity, aesthetic value and improving runoff water quality to Shaws Bay. The study area contains a number of terrestrial vegetation communities which have been recently mapped in the State Vegetation Type Map (SVTM) of NSW Plant Community Types (PCT) shown for the study area in Figure 25 and summarised as follows:

- Large areas of rainforest vegetation occur along the Shaws Bay escarpment to the west and north of Shaws Bay mapped as Subtropical Rainforests (Far North Bangalow Palm Swamp Forest PCTID: 3004) and Littoral Rainforests (Northern Sands Tuckeroo-Banksia Forest PCTID: 3132 and Far North Sands Coastal Cypress Littoral Rainforest PCTID: 3123).
- Patches of Coastal Swamp Forest (Far North Paperbark Gahnia Swamp Forest PCTID: 3990) are mapped in the southern section of Pop Denison Park and smaller patches northeast of the bay along Compton Drive. The vegetation in the southern section of Pop Denison Park was considered by the CZMP to be generally consistent with the Endangered Ecological Community (EEC) Coastal Cypress Pine Forest (CCPF) in the NSW North Coast Bioregion. The Coastal Cypress (*Callitris columellaris*) is prevalent while a number of other species listed as characteristic of the community are also present, including Coastal Banksia (*Banksia integrifolia*), Beach Acronychia (*Acronychia imperforate*), Blady Grass (*Imperata cylindrica*) and Bracken Fern (*Pteridium esculentum*).
- Wallum Sand Heaths (Far North Sandplain Wallum Heath PCT ID: 3801) are mapped in the hind dune areas behind Lighthouse Beach.
- Coastal Headland Heaths (Coastal Foredune Wattle Scrub PCTID: 3788) are mapped in the southeast corner of Lighthouse Beach hind dunes, around the Marine Rescue Tower.



Plate 9: Vegetation types at Shaws Bay

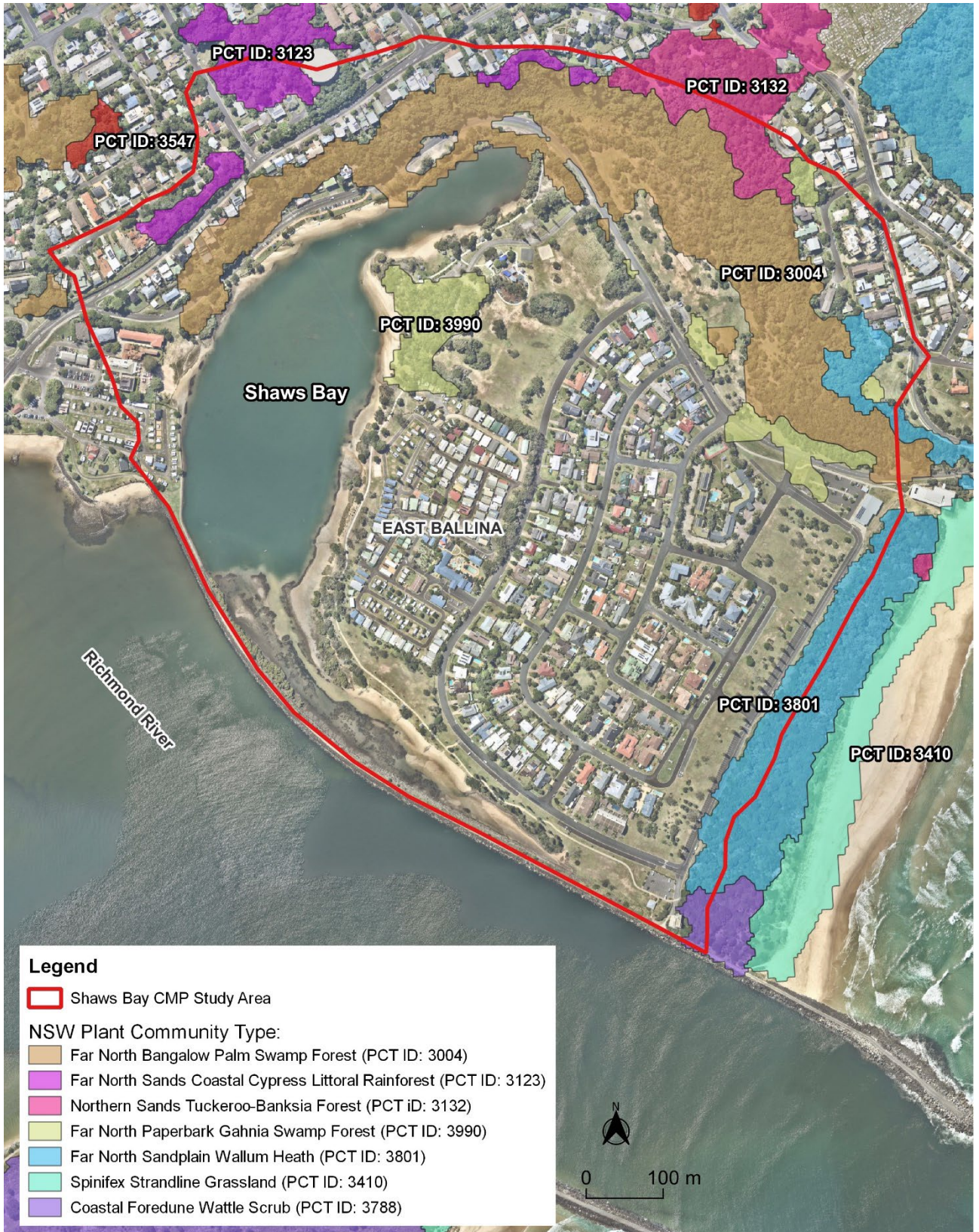


Figure 25: State vegetation type mapping for the Shaws Bay study area

Source: State Government of NSW and DPE (2022)

Birdlife

Shaws Bay is home to a wide range of bird species utilising the area for both food and shelter. Land-based birds inhabit native vegetation along the escarpment, surrounding the bay and throughout the caravan parks and residential areas. Seabirds such as Silver gulls, Pelicans and Cormorants feed on fish and other aquatic animals in Shaws Bay and roost on its shoreline. Shorebirds including a number of listed threatened species forage along the sandbanks, mangroves and seagrass areas at low tide. Threatened shorebird species observed in Shaws Bay include Pied Oystercatcher (*Haematopus longirostris*) - endangered (in NSW) under the *Biodiversity Conservation Act 2016*, Sooty oystercatcher (*Haematopus fuliginosus*) - vulnerable, Black-necked stork (*Ephippiorhynchus asiatus*) – endangered and Curlew sandpiper (*Calidris ferruginea*) - endangered. Larger predatory species (raptors) including the Eastern Osprey (*Pandion cristatus*) - vulnerable and Brahminy Kite (*Haliastur indus*). These species can be regularly seen perched on tall trees or street lights around the bay and actively hunting small animals and fish.

The Richmond River estuary (including Shaws Bay) is a priority location for threatened resident and migratory shorebirds (DECCW, 2010a). The estuary provides important nesting, feeding and roosting habitat for up to 29 species of migratory shorebirds and nine resident species including the critically endangered Beach Stone-curlew (*Esacus magnirostris*) and endangered Pied Oystercatcher (*Haematopus longirostris*) (DECCW, 2010a).



Plate 10: Shaws Bay birdlife

7.6 Coastal Hazards

The *Coastal Management Act 2016* defines the coastal hazards occurring within the coastal zone of NSW encompassing a broad range of natural features including open coastlines, rocky headlands, coastal lakes, lake and estuary entrances and estuarine environments. Shaws Bay is an enclosed coastal embayment within the Richmond River estuary and not all the coastal hazards listed under the *Coastal Management Act 2016* are relevant to the study area. The key coastal hazards relevant to Shaws Bay CMP at present and in future are tidal/ coastal inundation and the erosion of foreshores.

7.6.1 Tidal inundation

Tidal inundation or nuisance flooding is the inundation of land by tidal action under average meteorological conditions. Tidal inundation may include shorter-term incursion of seawater onto low-lying land during an elevated water level event such as a king tide or more permanent inundation due to land subsidence, changes in tidal range or sea level rise. In some scenarios, the risk associated with tidal inundation may be exacerbated when a king tide coincides with coastal inundation or catchment flooding. Ocean levels influence Shaws Bay by flowing through the training wall as discussed in Section 7.4 and can subsequently

penetrate the low-lying areas around Shaws Bay, particularly to the east, either by overland flow or intrusion through the stormwater network.

Tidal inundation risks will be exacerbated by sea level rise. The Federal government’s online coastal inundation model (Coastal Risk Australia, 2021) provides a visual indication of those places at risk from tidal inundation in the present day and at 2100 (Figure 26). The mapping indicates that large areas of the study area may be at risk of tidal inundation in the future, with large parts of the Ballina Holiday & Caravan Park, Pop Denison Park and residential areas at risk of tidal inundation by 2100. This mapping is a coarse assessment that was completed across Australia to provide a broad overview of predicted tidal inundation risk and does not consider local conditions such as tidal flows in coastal waterways that will result from different coastal configurations in some locations (i.e. stormwater infrastructure etc.). Nor does the model take account of the effects of catchment flooding from coincident extreme rainfall events.

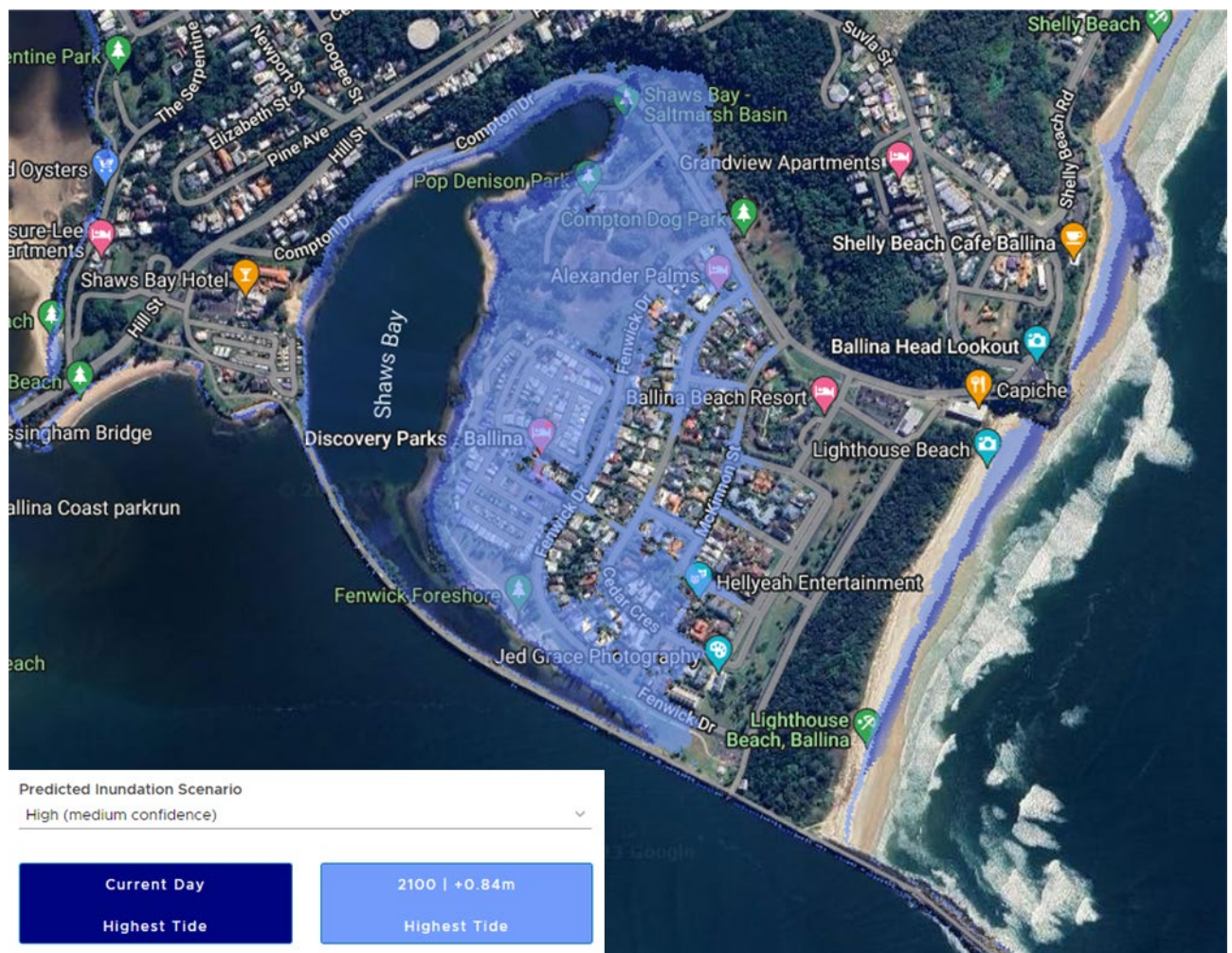


Figure 26: First pass mapping of present-day and 2100 risk from tidal inundation

Source: Coastal Risk Australia (2023)

7.6.2 Coastal Inundation

Coastal inundation occurs when a combination of marine and atmospheric processes raises ocean water levels above normal elevations and inundate low-lying areas or overtop dunes, structures and barriers. It is often associated with storms resulting in elevated still water levels (storm surge), wave setup, wave run-up and over-wash flows. The extent of coastal inundation will be influenced by water levels that are elevated by

other processes such as climate change and sea level rise. Shaws Bay is partly sheltered from marine processes by the Richmond River training wall and urban development but water levels can be influenced by wave setup from the Richmond River. Coastal inundation due to overwash (over the training wall) may be a threat to Shaws Bay with future sea level rise.

Tidal and coastal inundation modelling and assessment for Shaws Bay is being undertaken as part of Stage 2 for the Ballina Coast and Estuary CMP including detailed assessment for future sea level rise scenarios. Assessment of risk to Shaws Bay assets and infrastructure and development of a Coastal Zone Emergency Action Subplan (as required) will also be undertaken as part of the Ballina Coast and Estuary CMP.

7.6.3 Erosion and inundation of foreshores caused by tidal waters with catchment floodwaters

Some Shaws Bay foreshore areas are subject to erosion at present and the risk may increase with increased water level and tidal influence. Water levels in Shaws Bay are directly linked to the tidal hydrodynamic processes of the Richmond River which is subject to catchment flooding. The sheltered environment of Shaws Bay creates conditions more suited to deposition rather than erosion, however erosion is occurring in the following locations:

- The small sandy beach in front of the Shaws Bay Hotel appears to be stable.
- The heavily trafficked and unvegetated banks of the shoreline adjacent to Pop Denison Park in the northeast of the bay are susceptible to erosive forces, both from stormwater runoff during heavy rain as well as physical disturbance from pedestrian traffic. Recent upgrades to foreshore vegetation and stormwater discharge pathways in this area has reduced the risk of erosion in this area, although the areas remain susceptible to erosion which will be exacerbated with sea level rise.
- Erosion of the northern bank of the East Arm has been stabilised through recent bank stabilisation works and sand nourishment but remains susceptible to erosive processes at current sea levels and this will be exacerbated with sea level rise. Prior to the CZMP works, the shoreline of the East Arm had retreated approximately 13 m landward over several decades. Plate 11 shows the location of a stormwater outlet headwall located approximately 13 m into the water in 2015 and Plate 12 shows an aerial view of the same location in 2023, showing recent stabilisation works. Stakeholder consultation as part of this Scoping Study identified concern about nourishment sand eroding into the bay, impacting seagrass and swimming areas and sand blowing from the East Arm beach across footpaths, roads and onto private properties. Further works are required to stabilise sand at the East Arm and protect against further erosion via wind and water.

7.6.4 Other coastal hazards listed under the Coastal Management Act 2016

The full range of coastal hazards listed under the *Coastal Management Act 2016* have been considered by this Scoping Study. The following coastal hazards as defined under the Act are not considered to be occurring within the Shaws Bay study area and do not require further consideration as part of the Shaws Bay CMP:

- Beach erosion - refers to the removal of beach materials by wave action, tidal currents, littoral currents or wind. It is usually associated with storms or with elevated water levels and can occur on the open coast and in estuaries. Beach erosion events are often interspersed with a beach recovery

phase when sediment moves back onshore to rebuild the beach and dunes. Although the sandy beaches of Shaws Bay can be eroded, the key erosion mechanisms are the strong tidal flows and pulsing nature of long period waves propagating from the Richmond River entrance through the training wall, wind waves, stormwater scour and anthropogenic impacts. Although the sandy beaches along the shoreline of Shaws Bay are exposed to erosive mechanisms, they do not experience cyclic erosion and accretion and do not have a beach fluctuation zone like open coast beaches.

- Shoreline recession - refers to continuing landward movement of the shoreline or a net landward movement of the shoreline over a specified time. As shoreline recession occurs, the beach fluctuation zone is translated landward. The southern and majority of the western margins of Shaws Bay are protected by steep to near-vertical rock and concrete wall. The height of the main retaining wall is variable, but the crest is at around 1.8 m elevation and defines the current shoreward extent of Shaws Bay. A receding shoreline has historically occurred along the East Arm of Shaws Bay through mechanisms associated with bank erosion as discussed above. The shoreline in this area has been partially stabilised through sand nourishment and rock groyne construction.
- Coastal lake or watercourse entrance instability - water exchange between the Richmond River estuary and Shaws Bay occurs via spaces in the rock revetment wall which is a fixed structure with high stability.
- Coastal cliff or slope instability - there are no coastal headlands or bluffs within the study area.



Plate 11: Position of the East Arm shoreline in 2015 showing stormwater outlet

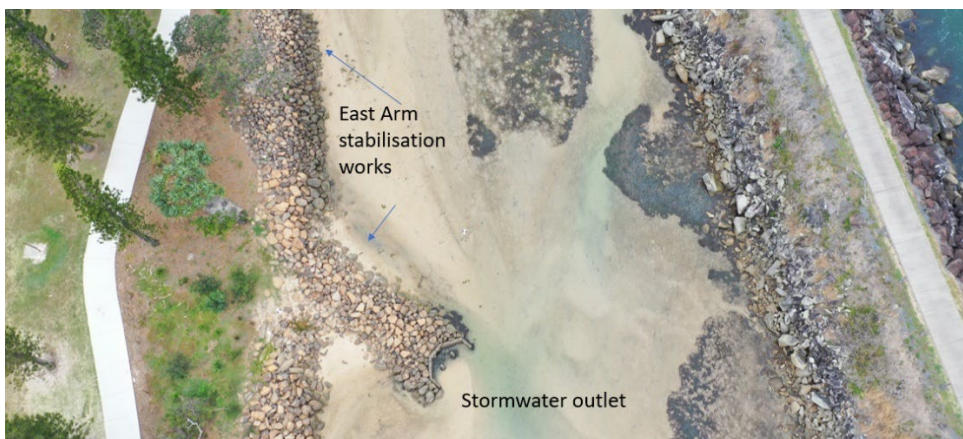


Plate 12: Position of the East Arm shoreline in 2023 (at low tide) following bank stabilisation works.

8. SOCIO-ECONOMIC CONTEXT

The estimated resident population of the Shaws Bay urban area in 2021 was 1,050 (approximately 2.3% of the Ballina LGA population, ABS, 2021). Aboriginal and Torres Strait Islanders made up 2% of the Shaws Bay population. There are approximately 500 dwellings within the study area (approximately 3.2% of dwellings within the Ballina LGA) (ABS, 2021).

Shaws Bay is a regionally unique destination providing sheltered beaches, calm water and a diverse range of recreational amenities which contributes to high visitor numbers. It is a popular tourist destination for activities such as camping, kayaking, swimming, wildlife appreciation, hotel/ dining experiences and sightseeing with many nearby accommodation options. Tourism and recreation are major economic drivers for the North Coast Region. The Shaws Bay Holiday Park on the western foreshore includes 75 camping sites and 16 cabins. Discovery Parks, Ballina on the eastern foreshore includes approximately 130 cabins and 100 camping sites. The Ballina Beach Resort includes 46 hotel rooms.

Ballina is the major strategic centre close to Shaws Bay that provides a range of services to local residents and the wider regional community. Major infrastructure such as Ballina Hospital, Ballina-Byron Gateway Airport and Ballina Shire Council provide significant employment opportunities and services for the community. Investment in projects like the Pacific Highway upgrade have significantly enhanced regional connectivity and have provided new economic opportunities.

The *North Coast Regional Plan 2041* (DPE, 2022) sets a 20-year strategic land use planning framework for the region, aiming to protect and enhance the region's assets and plan for a sustainable future. The plan outlines regional priorities relevant to the Ballina local government area which are related to or have the potential to influence the study area including:

- Expand nature-based, adventure and cultural tourism by investigating opportunities to develop and enhance infrastructure and places which support this, including major event spaces within the shire.
- Support environmentally sustainable development that is responsive to climate change and natural hazards, in particular flood risk.
- Retain and protect local biodiversity through effective management of environmental assets and ecological communities.
- Promote and recognise Aboriginal culture, local character and local creativity and investigate opportunities for the provision and enhancement of cultural and community assets within the shire.

9. FUTURE CONTEXT

9.1 Population growth and land development

Population growth in regional areas of NSW is increasing with the Northern Rivers one of the fastest growing parts of regional NSW. Economic growth in the region will be driven by the growing population as well as by tourism, agriculture and industry. Growth is expected to largely occur in the existing urban growth centres including existing major towns (DPE, 2022b). Population growth in the region is expected to be higher along the coastal fringe, particularly in the Ballina LGA. Increasing local and regional populations are anticipated to increase visitor numbers to Shaws Bay, particularly during peak holiday periods. Increased visitor numbers are likely to place more pressure on the ecosystem values of Shaws Bay due to increased use of the foreshore and waterway and associated increases in litter and waste generation, trampling of sensitive vegetation, recreational fishing impacts and wildlife disturbance.

9.2 Climate change

Shaws Bay will experience broadscale climate change impacts as well as localised impacts into the future. Climate change is an important consideration for strategic planning, particularly in coastal areas where the combined effects of sea level rise and increased storminess are considered key threats. The Sixth Assessment Report of the IPCC Working Group provides information on climate change within the Australasia region (IPCC, 2021). The findings relevant to the study area are:

- Australian land areas have warmed by around 1.4°C between 1910 and 2020 (very high confidence), and annual temperature changes have emerged above natural variability in all land regions (high confidence).
- Heat extremes have increased, cold extremes have decreased, and these trends are projected to continue (high confidence).
- Relative sea level rose at a rate higher than the global average in recent decades. Sandy shorelines have retreated in many locations. Relative sea level rise is projected to continue in the 21st century and beyond, contributing to increased coastal flooding and shoreline retreat along sandy coasts throughout Australasia (high confidence).
- The frequency of extreme fire weather days has increased, and the fire season has become longer since 1950 at many locations (medium confidence). The intensity, frequency and duration of fire weather events are projected to increase throughout Australia (high confidence).
- Heavy rainfall and river floods are projected to increase (medium confidence).
- An increase in marine heatwaves and ocean acidity is observed and projected (high confidence).
- Enhanced warming in the East Australian Current region of the Tasman Sea is observed and projected (very high confidence).

The *BSC Climate Change Policy* (BSC, 2021a) sets organisational emissions reduction targets, and provides a framework for progressing climate change mitigation, adaptation, and resilience strategies for Council and the community. The policy sets the following the targets to achieve emission reduction:

- Reducing BSC's operational greenhouse gas emissions to net-zero emissions by 2030.

- Using 100% renewable electricity for BSC operations by 2030.

BSC has undertaken many actions towards achieving these targets including upgrading facilities and improving energy efficiency of their operations, installation of solar power systems across several council facilities and electric vehicles added to their Council fleet cars. BSC's next step is to prepare a comprehensive Action Plan which will set out the pathway of action to achieve the climate change policy targets by 2030.

9.3 Sea Level Rise

Global average sea levels increased by around 25 cm since 1880, with the rate of rise accelerating in recent decades. Observations show that the rate of global mean sea level rise increased from 1.5 ± 0.2 cm per decade (1901 – 2000) to 3.5 ± 0.4 cm per decade (1993 – 2019, CSIRO, 2020). However, the rates of sea level rise to the north and south-east of Australia (including the central, south and mid-north NSW coast) have been significantly higher than the global average (CSIRO, 2020). Future sea level rise rates will depend on carbon emission pathways and other influences. Depending on future carbon emission scenarios sea levels around eastern Australia could rise between 0.31 m and 0.88 m (relative to 1986 to 2005) by 2090 (DPIE, 2020a). Based on these changes it is expected that sea level rise will result in changes to Shaws Bay including:

- Increased tidal propagation resulting in changing tidal velocities, storm tide inundation, changed geomorphology (shoaling, bank instability and erosion) and migration of estuarine vegetation communities.
- Increased inundation of low-lying lands, infrastructure and development and implications for drainage and flooding in urban areas. It is generally anticipated that rainfall events will become more intense in response to climate change, even if average rainfall reduces. This may result in effects such as more floods as well as greater capacity for erosion and runoff and pollution of waterways within the catchment.
- Existing coastal gravity drainage, stormwater infrastructure, sewerage systems and some roads potentially becoming compromised over time as the mean sea level increases.
- Decrease in the level of protection afforded by existing seawalls and other hard engineering structures due to the increasing threat from larger storm surges and inundation at higher projected water levels.

9.3.1 Migration of Estuarine Vegetation

Sea level rise is expected to increase the average water depth and extend tidal propagation in Shaws Bay with associated changes in salinity regime. It is anticipated that sea level rise will result in the landward recession of fringing estuarine wetland systems. The location of estuarine habitats such as mangrove stands and saltmarsh are controlled principally by tidal range and salinity influence and will gradually respond to changes in increases in average water levels and salinity. There is a risk that natural upslope migration of these wetlands will be curtailed by anthropogenic constraints such as roads, rock walls, retaining walls, urban development and land management practices (e.g. mowing) on the landward side. This impact has been named "Coastal Squeeze" by the Department of Climate Change (now OEH, DECC, 2009, refer Figure 27). Under these conditions the landward side of these important habitats will be fixed but the lower margin

will gradually be pared away, leading to a loss of habitat area. Increased estuary levels will affect riparian and other low-lying vegetation in the freshwater upper reaches of the estuary in a similar way. Waterlogging will gradually kill off the lower vegetation, whereas the upper boundary may be restricted

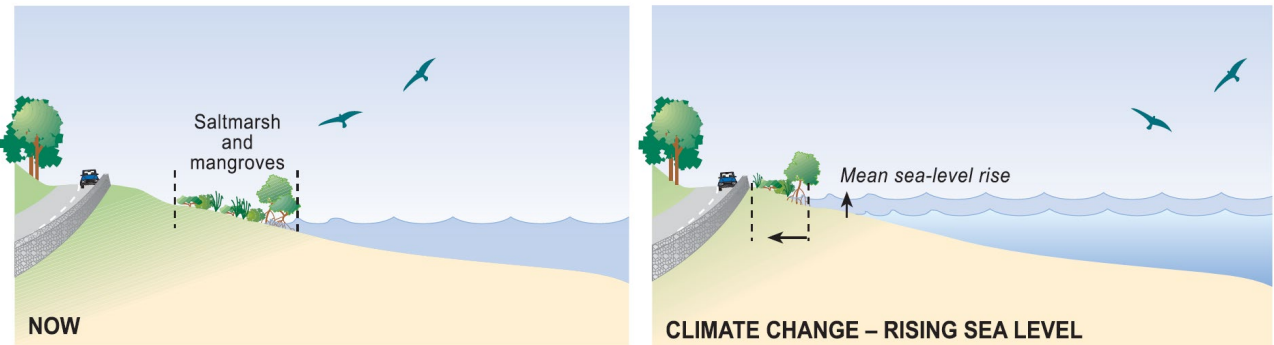


Figure 27: 'Coastal squeeze' under sea level rise: impact of development

Source: DECC (2009)

The Shaws Bay CZMP examined the likely migration of estuarine vegetation with sea level rise and the impact of barriers to migration based on the tidal ranges of different vegetation types. The potential areas were then compared to the existing barriers to migration such as the river training wall, retaining walls along the western foreshore, footpaths, roads, property boundaries and residential areas. This allowed for an estimate of the likely impact of sea level rise on future estuarine habitats in the study area. The following changes in estuarine vegetation distribution were anticipated (Figure 28):

- Total seagrass area will expand in the long-term as current foreshore areas around the perimeter of the bay become sub-tidal zones with increasing water levels and provide areas suitable for seagrass proliferation.
- The suitable tidal range for mangroves will reduce over time as this community is 'squeezed' between seagrass and saltmarsh zones and reduced to a thin band along foreshore areas or lost completely from some areas. This is primarily due to either hard barriers along the southern and western edges of the bay, or the small but steep step in the bank along most of the eastern shoreline. There may be suitable areas of mangrove proliferation north of Compton Drive if a hydrologic connection is maintained under the road.
- The area of mangroves and saltmarsh will be reduced (and eventually lost) along the western foreshore as sea levels rise and these communities are 'squeezed out' against the retaining wall. This risk has been reduced in the short-medium term by recent sand nourishment works along the western foreshore.
- Saltmarsh communities have the greatest potential for expansion as sea levels rise due to the large flat areas on the eastern side of the bay that would become subject to intermittent tidal inundation (i.e. suitable habitat for saltmarsh). The saltmarsh basin created in 2020 as part of CZMP implementation actions at the north-eastern end of Shaws Bay provides an area for estuarine vegetation migration in the future with sea level rise, increasing the ecological and climate change resilience of Shaws Bay.

Once available, the contemporary tidal inundation assessment to be completed as part of the Ballina Coast and Estuary CMP can be used to re-assess the predicted migration of estuarine vegetation at Shaws Bay.



2050 Unconstrained

2100 Unconstrained

LEGEND:

Saltmarsh habitat
 Seagrass habitat
 Mangrove habitat

Figure 28: Potential areas for migration of estuarine vegetation with sea level rise (unconstrained)

Source: Hydrosphere Consulting (2015)

9.4 Related Environmental Impacts

Biodiversity will be impacted by climate change induced rising temperatures, sea levels, fire regimes, water quality and ocean chemistry. This will exacerbate degradation of native communities and expansion of invasive species (DECCW, 2010b). Studies suggest climate change could surpass habitat destruction as the greatest threat to biodiversity (Leadley *et al.*, 2010). Some of the most vulnerable ecosystems are found within the study area including saltmarshes and mangroves (EPA, 2021b).

A study by Scanes *et al.* (2020) found that in response to climate change the temperature of Australian estuaries has increased on average approximately 2 °C and they have acidified at a rate of 0.09 pH units over the last 12 years. These changes are orders of magnitude faster than predicted in earlier studies. Projected lower flows, higher temperatures and sea level rise may further reduce water quality. Average and severe fire weather is projected to increase in NSW in the future, mainly in summer and spring, with the largest increases by 2070 to occur in spring (Adapt NSW, 2019c).

10. MANAGEMENT CONTEXT

10.1 Coastal Management Areas

The coastal use area (CUA) and coastal environment area (CEA) within the study area have been mapped as part of the Resilience and Hazards SEPP and are presented in Figure 2. The Resilience and Hazards SEPP mapping is currently not available for the coastal vulnerability area (CVA) and there is no mapped coastal wetlands and littoral rainforest area (CWLRA) within the study area, despite these vegetation communities being present (refer Section 11.4).

The SEPP gives effect to the objectives of the *Coastal Management Act 2016* from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone. This becomes relevant to the preparation of the CMP with regards to the intent and description of recommended actions and their intended approval pathways (if required) under the SEPP. The management of these areas is discussed in the following sections.

10.1.1 Coastal environment area

The CEA is characterised by natural coastal features such as coastal lakes, wetlands and estuarine waters. Within the study area the CEA is mapped over the entire study area (85 ha) except for a small section in the north east. The CEA mapped within the study area is on private land mapped as residential under the Ballina LEP, public land or Crown land mapped as W1 Natural Waterways, or environmental protection zoning under the LEP.

10.1.2 Coastal use area

The CUA is defined as land adjacent to coastal waters, estuaries and coastal lakes and lagoons where impacts of development on the use and enjoyment of these areas need to be considered. The CUA covers all tidal waterways to one km beyond the highest astronomical tide but does not include the waterway itself, typically starting at the low water mark of tidal waters and extending to 250 m landward on either side of the waterway. There is approximately 72 ha of CUA mapped within the Shaws Bay study area. Ownership, zoning and management of land within the CUA is similar to that described for the CEA above, excluding the Shaws Bay water body itself.

10.1.3 Coastal vulnerability area

The CVA is land which is subject to current and future coastal hazards. The CVA within the Shaws Bay study area is not yet mapped in the Resilience and Hazards SEPP.

Coastal hazards within the study area are to be addressed in the CMP include the following (OEH, 2019):

- Tidal inundation - inundation of land by tidal action under average meteorological conditions. Tidal inundation may include shorter-term incursion of seawater onto low-lying land during an elevated water level event such as a king tide or more permanent inundation due to land subsidence, changes in tidal range or sea level rise.
- Erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.

BSC will consider the need to map the coastal and tidal inundation hazards as part of the CVA through the development of the Ballina Coast and Estuary CMP.

10.2 Management Roles and Responsibilities

The study area is managed by BSC, various state government agencies, First Nations groups and private landholders (Table 4). Relevant legislation, regional and local management plans and strategies are discussed in Section 5.7.

Table 4: Management roles and responsibilities

Stakeholder	Role
BSC	<p>BSC has a central role in managing the waterway, foreshore and open space areas of the study area. Council is responsible for the management of public assets including stormwater infrastructure, waste and wastewater management, open space assets and foreshore access points. Council also manages cultural heritage, community events, recreational use of foreshore areas, roads, parking and flora and fauna protection and conservation.</p> <p>BSC is the Crown land manager for several Crown land reserves within the study area including Shaws Bay Reserve (no. 88004, comprising Pop Denison Park and eastern foreshore of Shaws Bay), Ballina Coastal Reserve (no.1010068 comprising the western foreshore, areas north of Compton Drive and open space areas west of Lighthouse Beach), Shaws Bay Holiday Park (no. 84107) and reserve no. 86408 comprising the Pine Avenue Water Reservoir.</p> <p>BSC is also responsible for development planning and controls across the Ballina LGA. The objective of these controls is to achieve development that is consistent with the social, economic and environmental values of the study area and to manage the cumulative impact of development in a sustainable manner.</p>
Jali LALC	<p>LALCs are constituted under the <i>Aboriginal Land Rights Act 1983</i>. LALCs represent their Aboriginal community and aim to protect their interests and further their aspirations. Land is vested in representative land councils who work to deliver tangible economic, social and cultural benefits to Aboriginal communities in NSW. Jali LALC operates within the study area. There are areas of Crown land within the study area, subject to outstanding claims lodged under the <i>Aboriginal Land Rights Act 1983</i>.</p>
DPE – BCD (Biodiversity Conservation Division)	<p>DPE – BCD works closely with local councils and communities to reduce threats from flood risk and coastal storms and ensures that people in NSW are well informed about these risks and better equipped to adapt to climate change. DPE – BCD also works with local councils and communities to maintain or improve the health of estuaries/ lakes and enhance the recreational experience. DPE – BCD provides technical support and funding to councils for the development and implementation of CMPs through the Coast and Estuaries Grant Program. DPE – BCD has provided funding to BSC for the development and preparation of this CMP Scoping Study.</p>

Stakeholder	Role
DPE – Crown Lands	<p>DPE - Crown Lands is responsible for the administration and/or management of Crown land under <i>the Crown Land Management Act 2016</i>. Crown land includes submerged Crown land, seabed and subsoil to three nautical miles from the coastline of NSW that is within the limits of the coastal waters of the State. Crown land includes much of the submerged land of Shaws Bay and associated intertidal areas (below mean high water mark). The northern training wall of the Richmond River which forms the southern extent of Shaws Bay is located on Crown land is the management responsibility of Transport for NSW – Marine Infrastructure Delivery Office (MIDO) (Hydrosphere Consulting, 2023c). The concrete steps adjoining the breakwater are located on Crown waterway and partly on council-managed Crown reserve 1010068 land and are the joint management responsibility of DPE- Crown Lands and BSC (Hydrosphere Consulting, 2023c). The vertical wall in front of the Shaws Bay Holiday Park is located within council-managed Crown reserve 1010068 and is the joint management responsibility of BSC and Reflections. The remaining foreshore areas of Shaws Bay are Crown land reserves managed by BSC (see above).</p> <p>DPE – Crown Lands is responsible for the following activities on Crown land:</p> <ul style="list-style-type: none"> • Crown land management, compliance, bush fire management/ planning, leasing and licensing and reserve administration functions in accordance with the objects and principles outlined in the Act. • Domestic waterfront structures - assessing applications for landowner’s consent for domestic waterfront facilities on Crown land, assessing licence applications and issuing licences for the occupation of Crown land for domestic waterfront facilities and ongoing administration, management and regulation of the use and occupation of domestic waterfront facilities on Crown land. • Direct Crown land management responsibilities including activities such as access management, pest plant and animal management.
DPI – Fisheries	<p>DPI - Fisheries administers the <i>Fisheries Management Act 1994</i> and the <i>Marine Estate Management Act 2014</i> and has jurisdiction over all fish (including oysters, crustaceans, polychaetes), and marine vegetation (saltmarsh, mangroves, seagrass and macroalgae) in State Waters including ‘water land’ below highest astronomical tide (HAT) in the estuaries and extending up to 3 nautical miles offshore.</p> <p>Under the <i>Fisheries Management Act 1994</i>, DPI-Fisheries:</p> <ul style="list-style-type: none"> • Supports economic growth and sustainable access to aquatic resources through commercial and recreational fisheries management, research, aquaculture development, habitat protection and rehabilitation, regulation and compliance. • Mitigates and manages risks from use of land and water. <p>Under the <i>Marine Estate Management Act 2014</i>, DPI - Fisheries is responsible for:</p> <ul style="list-style-type: none"> • Ensuring strategic and integrated management of the whole marine estate – marine waters, coasts and estuaries. <p>Fisheries and aquaculture management, marine biodiversity, marine protected areas, biosecurity, marine estate research, fisheries compliance, marine estate communications and community engagement.</p>

Stakeholder	Role
Transport for NSW (TfNSW)	<p>TfNSW – Maritime is the key agency with statutory and policy responsibilities related to the safety and accessibility of NSW waterways for recreational and commercial vessels.</p> <p>MIDO is a part of TfNSW responsible for state owned coastal infrastructure such as river entrance breakwalls, regional harbours, the NSW Coastal Dredging Strategy, NSW Boating Now Program and the NSW Boating Access Dredging program. TfNSW MIDO is responsible for the northern breakwater of the Richmond River which forms the southern extent of Shaws Bay (Hydrosphere Consulting, 2023c).</p>
Marine Estate Management Authority (MEMA)	<p>MEMA advises the NSW Government on the management of the NSW marine estate. The Authority brings together the heads of the NSW Government agencies with key marine estate responsibilities (DPI, DPE and TfNSW).</p> <p>MEMA ensures policies and programs address priority issues, are well coordinated, efficient, evidence based and result in positive outcomes and undertakes threat and risk assessments, develops management strategies, promotes collaboration between public authorities and fosters consultation with the community.</p> <p>MEMA is responsible for the implementation of the <i>Marine Estate Management Strategy 2018 – 2028</i> (MEMS) (MEMA, 2018). The MEMS provides an overarching strategic approach to the coordinated management of the NSW marine estate, i.e. the coastal waters, estuaries, lakes, lagoons and coastal wetlands. The Strategy considers the ten MEMA management principles as well as priority threats for the marine estate as identified in the NSW marine estate threat and risk assessment (TARA, BMT WBM, 2017).</p>
Heritage NSW	<p>Heritage NSW is responsible for the management and protection of Aboriginal cultural heritage and European heritage in NSW.</p>
EPA	<p>EPA is the primary environmental regulator for NSW. Local councils and other organisations hold environment protection licences issued by the NSW EPA under the <i>Protection of the Environment Operations Act 1997</i> for the operation of EPA licensed operations (e.g. sewerage systems, landfill, quarries and other industry etc.).</p>
Volunteer Marine Rescue NSW, Ballina Unit	<p>Marine Rescue NSW is a volunteer organisation providing information and emergency response for marine vessels. The Marine Rescue Tower is located in the south-east corner of the Shaws Bay CMP study area, adjacent to the northern training wall of the Richmond River.</p>
Shaws Bay Hotel	<p>The Shaws Bay Hotel is a privately-owned licensed venue situated on the western foreshore of Shaws Bay. There is a small sandy beach located in front of the hotel, with access via steps from the hotel to the beach.</p>
Reflections Holiday Parks	<p>Reflections Holiday Parks manage the Shaws Bay Holiday Park on the western side of Shaws Bay. The holiday park is located on council-managed Crown reserve 1010068. A vertical retaining wall separates the holiday park from Shaws Bay which is the joint responsibility of BSC and Reflections (Hydrosphere Consulting, 2023c).</p>
Discovery Holiday Parks	<p>Discovery Holiday Parks manages the Ballina Holiday & Caravan Park on the eastern side of Shaws Bay. The caravan park is privately owned and covers an area of approximately 5.4 ha.</p>

Stakeholder	Role
Community/ interest groups and organisations	Community groups and organisations that use Shaws Bay for sporting and recreational activities (e.g. Titanics Winter Swimming Club, Rainbow Region Dragon Boat Club, Ballina Triathlon Club, Ballina Pétanque Club, Ballina RSL Fishing Club). Other community groups and organisations undertake a range of projects including dune care, bush regeneration and estuary restoration programs (e.g. Ballina Coastcare, Ballina Environment Society, OzFish (Richmond River Chapter), ECOFishers NSW).
NSW Police	The NSW Police work with the community to improve all aspects of public safety. Key responsibilities include enforcing laws, road safety and responding to emergencies.
State Emergency Service (SES)	The SES is responsible for provision of emergency and rescue services during times of natural hazard emergencies and disasters, including flooding, storms (including storm tide and severe erosion events) and tsunami events.

11. SCOPE OF THE CMP

11.1 Purpose

The Shaws Bay CMP will provide a long-term coordinated strategy for managing Shaws Bay. An integrated whole-of-government and community approach is required to implement the CMP, with BSC, state government agencies, stakeholders, community and interest groups and local residents working together to achieve the CMP objectives.

The CMP will incorporate management actions and strategies to address key threats and support a diversity of natural values and human uses into the future. The CMP will consider the range of timeframes (immediate, 20 years, 50 years, 100 years) where appropriate as required by the *Coastal Management Act 2016*. This Scoping Study presents the scope of the CMP, the forward program and costs to implement Stages 2 to 4 of the CMP. Recommended management actions will be developed in the CMP to help balance and manage uses so that they are compatible with the environmental, social and economic values of the study area and to ensure short-term actions are compatible with issues and threats in the longer term. The actions for this CMP will be developed for a ten-year management timeframe reflecting the implementation phase of the CMP. Longer term pressures such as climate change and sea level rise will be considered in the formulation of management actions to best adapt to future threats and ensure the conservation of the environmental, social and economic values for future generations.

11.2 Vision

A CMP vision statement has been developed from community and stakeholder feedback that is consistent with the objects of the *Coastal Management Act 2016*, the management objectives for the coastal management areas and council's vision and objectives as identified in the Community Strategic Plan.

Shaws Bay is a healthy natural ecosystem with clean water, high biodiversity and scenic beauty. It will be sustainably managed for the greatest benefit of the community and environment now and into the future.

11.3 Objectives

Section 12 of the *Coastal Management Act 2016* states that: “*The purpose of a coastal management program is to set the long-term strategy for the coordinated management of land within the coastal zone with a focus on achieving the objects of this Act.*”

The objects of the *Coastal Management Act 2016* (Section 3) are to manage the coastal environment of NSW in a manner consistent with the principles of ecologically sustainable development for the social, cultural and economic well-being of the people of the State, and in particular:

- (a) *to protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience, and*
- (b) *to support the social and cultural values of the coastal zone and maintain public access, amenity, use and safety, and*

- (c) to acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone, and*
- (d) to recognise the coastal zone as a vital economic zone and to support sustainable coastal economies, and*
- (e) to facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making, and*
- (f) to mitigate current and future risks from coastal hazards, taking into account the effects of climate change, and*
- (g) to recognise that the local and regional scale effects of coastal processes, and the inherently ambulatory and dynamic nature of the shoreline, may result in the loss of coastal land to the sea (including estuaries and other arms of the sea), and to manage coastal use and development accordingly, and*
- (h) to promote integrated and co-ordinated coastal planning, management and reporting, and*
- (i) to encourage and promote plans and strategies to improve the resilience of coastal assets to the impacts of an uncertain climate future including impacts of extreme storm events, and*
- (j) to ensure co-ordination of the policies and activities of government and public authorities relating to the coastal zone and to facilitate the proper integration of their management activities, and*
- (k) to support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions, and*
- (l) to facilitate the identification of land in the coastal zone for acquisition by public or local authorities in order to promote the protection, enhancement, maintenance and restoration of the environment of the coastal zone, and*
- (m) to support the objects of the Marine Estate Management Act 2014.*

The CMP will also ensure that the objectives for the mapped coastal management areas as described in the Resilience and Hazards SEPP are achieved.

The CMP objectives may be refined as the CMP is developed to reflect local issues and values and remain consistent with state government objectives. The CMP will include the development of performance indicators where relevant, for inclusion in the CMP monitoring, evaluation and reporting framework.

11.4 CMP Area

The CMP study area is defined and described in Section 2. The key ecosystem health challenges facing Shaws Bay are linked to its physical characteristics including the significant modifications that have occurred since European settlement and the pressure from recreational uses, urban stormwater and increasing risks of climate change and coastal hazards. The CMP for Shaws Bay will therefore provide a coastal management planning process which recognises the influence of the coastal issues and activities on the health of the bay. The next stages of the CMP development will identify the priority actions and sustainable funding sources.

The CMP development will consider the suitability of the mapped coastal management areas (Figure 2) as follows:

- The Resilience and Hazards SEPP defines the requirements for approval of development and clearing of native vegetation within the Coastal Wetlands and Littoral Rainforest Area (CWLRA). There is no CWLRA currently mapped under the SEPP, however there are vegetation communities present within the study area that are likely to meet the definition of the CWLRA. A review of the vegetation communities is recommended to afford the ecological communities the required level of protection from future land use pressures, development and coastal hazards. A review based on the methodology developed by EarthScapes Consulting (2023) for Byron Shire Council is considered to be appropriate. BSC is currently preparing a CMP for the Ballina Coast and Estuary and it would be appropriate to undertake the review for the entire LGA coastal zone as part of that CMP. The desired outcomes of the review would include:
 - Identification of additional areas suitable for CWLRA mapping.
 - Exclusion of areas which impact on Council operational activities (e.g. maintenance of stormwater assets and other infrastructure that may occur within these areas).
- There is currently insufficient information available on coastal hazards to map the CVA (bank erosion and tidal inundation) as part of the Resilience and Hazards SEPP or Council's LEP. Inundation studies will be undertaken during Stage 2 of the Ballina Coast and Estuary CMP (including Shaws Bay study area) and BSC will consider whether these coastal hazards should be mapped and included in the SEPP or LEP (via a planning proposal).

11.5 First Pass Risk Assessment and Gap Analysis

Following the identification of the current threats and issues within the study area, a first pass (or preliminary) risk assessment and gap analysis was completed to prioritise risks and identify those that should be further investigated in subsequent stages of the CMP.

The objectives of the first pass risk assessment and information gap analysis are:

1. Identify potential management issues/ threats within the study area and assess the risk to known values and assets.
2. Identify gaps in knowledge relating to each issue and assess the importance of addressing each knowledge gap to allow for effective future management.
3. Establish if the risk and/or gap in knowledge warrants further investigation or detailed assessment.

The risk assessment and gap analysis were combined into one process to streamline the investigation and identify where gaps in knowledge will hinder successful future management of issues.

11.5.1 Methodology

The risk assessment process identifies credible risks, the likelihood of the risk event occurring given existing controls, the consequences to environment, social and economic values and public safety should the event occur and applies a risk rating. The risk assessment is consistent with AS/NZS ISO 31000: *Risk Management – Principles and Guidelines*. The methodology uses the risk assessment process and qualitative scales outlined in the following tables to assess the risk of identified issues impacting the values and assets of the study area under current management practices (based on the framework adopted for the Threat and Risk Assessment (TARA) for the Marine Estate). The consequence of each threat considered potential impacts as listed in Table 5. The likelihood of each threat (Table 6) was based on existing studies and observations where available.

Table 5: Qualitative measures of consequence or impact

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

Source: Adapted from MEMA (2015)

Table 6: Qualitative measures of likelihood under current management practices

Likelihood	Description
Almost certain	A very large certainty that this will occur in this situation within the timeframe.
Likely	Expected to occur in this situation within the timeframe.
Possible	Some clear evidence exists to suggest this is possible in this situation within the timeframe.
Unlikely	Uncommon, but has been known to occur elsewhere. Expected to occur here only in specific circumstances within the timeframe.
Rare	Never reported for this situation, but still plausible within the timeframe.

Source: Adapted from MEMA (2015)

Table 7: Qualitative risk estimation

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Minimal (Min)	Low	Moderate (Mod)	High	High
Likely	Minimal (Min)	Low	Moderate (Mod)	High	High
Possible	Minimal (Min)	Low	Low	Moderate (Mod)	High
Unlikely	Minimal (Min)	Minimal (Min)	Low	Low	Moderate (Mod)
Rare	Minimal (Min)	Minimal (Min)	Minimal (Min)	Low	Moderate (Mod)

The risk assessment evaluates the present-day risk and also considers how the risk level is likely to change in the future (i.e. over 20, 50 and 100 years). This includes assessment of it how factors such as climate change, increasing development pressures and population increase will impact these risks. Where available, future risk levels have been assigned based on data for these risks. In other cases, a qualitative assessment has been undertaken considering the expected future changes.

The first-pass risk assessment considers the risk to values from categories of issues and key threats in the Study area. Although it is acknowledged that the threat will vary across the study area. The assessment typically focusses on the detrimental, rather than the beneficial impacts of the threat, unless otherwise indicated. The potential highest consequence level to any asset or value was used for the assessment.

A Risk Assessment Workshop was held in August 2023 with council and agency representatives to discuss the first-pass risk assessment. At the workshop, a draft risk assessment was presented and discussed. The main aim of the workshop was to gain concurrence on the risk rating of the identified threats, data gaps and recommended Stage 2 studies.

11.5.2 Risk Assessment Outcomes

The management issues and threats affecting the study areas and results of the first-pass risk assessment and gap analysis are provided in Appendix 2. The risk assessment outcomes identify the key threats to be addressed in the Shaws Bay CMP. Based on the existing information, the threats with a high risk in the current timeframe and emerging threats are listed below.

Key management issues (high risk threats within the current timeframe):

- T1. Urban stormwater discharges
- T2. Poor water quality episodes
- T3. Catchment flooding (from Richmond River)
- T7. Litter and microplastics
- T11. Loss or degradation of estuarine vegetation (mangroves, saltmarsh, seagrass)
- T22. Extreme weather events (e.g. prolonged dry periods and increased frequency and magnitude of storms/ flood events)

- T30. Roads/ traffic adjacent to pedestrian pathways and recreation areas
- T32. High demand/ visitor numbers, particularly during peak holiday periods
- T34. Lack of compliance with regulations (by users)

Emerging issues (high risk threats in 20 years in addition to the current threats above):

- T19. Increasing tidal/ coastal inundation
- T20. Anthropogenic barriers (i.e. physical barriers, land use and planning constraints) to migration of vegetation communities with sea level rise.

11.5.3 Information gaps

Accurate and detailed information about risk and consequence is necessary to assist decision makers generate effective management strategies which identify and prioritise future actions and investment or justify a business-as-usual approach. The risk assessment completed as part of this Scoping Study considered existing information and identified remaining knowledge gaps related to each issue. The importance/ priority of resolving each knowledge gap to allow for effective future management of the issue was also assessed using the scale outlined in Table 8. The gap analysis considered the level of existing information, the current studies underway or planned to address key knowledge gaps as well as stakeholder feedback.

Table 8: Importance of knowledge to management of Shaws Bay

Priority	Description
Low	This knowledge is not required for management decisions/ actions/ planning – academic interest only.
Medium	The knowledge would improve the effectiveness of management.
High	Management action required within the timeframe of this CMP cannot proceed effectively without this knowledge.

Recommendations for Shaws Bay Stage 2 studies to address high priority knowledge gaps have been identified as:

- S1. A targeted microbial source tracking study to identify the source(s) of harmful bacteria contributing to poor water quality episodes. This information is required in Stage 2 to direct management action to address the source of pollution, which is currently unknown.
- S2. Identify effective stormwater treatment devices and appropriate upgrades to improve the quality of stormwater entering the bay. This information is required in Stage 2 to provide preliminary scoping of potential options and allow for the CMP to adequately develop, plan and cost management actions ready for on-ground implementation.
- S3. Repeat mapping and evaluation of estuarine vegetation distribution. This information is required in Stage 2 to assess current distribution, issues, potential causes and allow for targeted management action in the CMP.

Additional studies that would improve the effectiveness of management but could be undertaken at a later stage (e.g. included in the CMP at Stage 4) have been identified as:

- S4. Develop a method of assessing and reporting estuary health.
- S5. Implementation of estuary health monitoring program.
- S6. Cultural recognition/ awareness project(s) communicating cultural values and connection to Country.

12. PRELIMINARY BUSINESS CASE AND FORWARD PLAN

12.1 Benefits of CMP Development

Shaws Bay provides a high level of ecosystem services and recreational amenity (e.g. habitat for flora and fauna and aesthetic value) contributing to Ballina’s continuing ecosystem health, social and economic value. These values are threatened by increasing pressure from extreme weather events, climate change, sea level rise, existing urban development and visitor pressures.

There are many organisations from the federal, state, regional and local level that are involved and have responsibilities in governing and managing the study area. Collaboration, cooperation and resource support amongst stakeholders is required to provide effective coastal management outcomes.

Engagement and consultation with the local community and key stakeholders conducted as part of this Scoping Study has highlighted the expectations of the community to progress with estuary management. In addition, the community, key stakeholders and public authorities are willing to participate in a coordinated and collaborative approach to management of the study area. This collaboration will provide additional benefits to all stakeholders.

The CMP process provides a mechanism for effective management of short-term risks and development of adaptation pathways for longer-term or increasing risks while addressing the challenges of limited resources, significant threats to coastal values and multiple stakeholders. Continuing with the development of the CMP will assist with:

- Strengthening stakeholder relationships responsible for management in the coastal zone and the shared understanding of the values, risks and management priorities for each of those stakeholders.
- Obtaining funding for coastal management actions through the NSW Coastal and Estuary Grants Program (refer Section 12.2).
- Protecting, conserving and promoting the sustainable integrated management of ecosystem services and other social, cultural, environmental and economic values of the study area, now and for future generations.
- Collaboration with relevant First Nations representatives i.e. Traditional Owners and LALCs as well as other community organisations.
- Early identification of opportunities to reduce and adapt to future risks and to reduce associated future financial costs (e.g. disaster management costs), particularly with emerging coastal, climate and political risks.
- Limiting liability of BSC under Section 733 of the *Local Government Act 1993* with respect to land in the coastal zone through acting in “good faith”, i.e. by preparation of a CMP “*substantially in accordance with the principles and mandatory requirements set out in the current coastal management manual under the Coastal Management Act 2016*”.

The CMP will set the long-term strategy for the coordinated management of Shaws Bay and ensure that the values and benefits of the study area are enhanced and maintained for future generations. In continuing with the preparation and implementation of a CMP, BSC should consider:

- The obligation to implement a certified CMP under the *Coastal Management Act 2016*.
- The immediate financial cost of CMP preparation (though these are considered negligible in comparison to the future financial risk of not preparing a CMP as discussed below).
- Competing needs for internal council resources (funding, staff and equipment etc.).
- Competing needs for external stakeholder resources (funding, staff and equipment etc.). Early engagement with stakeholders required to collaborate on the CMP will ensure these risks are minimised.
- External agency priorities and responsibilities.
- Community expectations regarding expected actions. Transparency in the CMP and community engagement process may help to minimise unrealistic expectations from the community.

There are a number of risks associated with not developing a CMP. These include:

- A lack of understanding of key threats to estuary values and areas exposed to coastal hazards can result in inadequate or ineffective management practices and development controls.
- The lack of an adequate risk management process can result in a diminished ability to effectively evaluate and prioritise management actions which reduces the cost-effectiveness of government efforts and resources.
- Timely intervention is required before estuary health issues become more intractable.
- A lack of engagement with the local community can result in a lack of support or even opposition amongst the community and key user groups. This can result in a deficit of credibility and trust between the councils and the community and can derail the implementation of future management actions. A lack of engagement can also result in an incomplete understanding of local community values and therefore a misdirection of management effort and resources. Despite this, the level of community support can vary based on the issues experienced by individual community members in different areas, regardless of the level of engagement.
- No contemporary plan to guide management actions and investment of resources to effect sustainable coastal management.

It is evident that the benefits of continuing with the development and implementation of this CMP significantly outweigh the alternative financial costs as well as the costs to coastal and estuary values.

12.2 Funding

The development of the CMP and subsequent actions are expected to be funded through BSC and state government contributions, monetary grants and volunteer works by community members and organisations. Some actions will be funded under normal council operating budgets or through existing programs and grants. BSC operates an annual budget primarily through rates and charges as well as fees, investment revenues, loans, property management and operating grants. A key funding source is the BSC Healthy

Waterways Program funded primarily through a special rate variation (BSC, 2021b). It will not be possible for BSC to implement all actions without additional sources of funding. As such, identification of grants and the submission of successful funding applications will be an important component of the CMP and the development stages.

The NSW Government's Coastal and Estuary Grants Program provides technical and financial support to local government to help manage the coastal zone. The program supports coastal and estuary planning projects and the implementation of works identified in certified CZMPs or CMPs. Grant offers are subject to state-wide priorities and availability of funds each financial year. Funding is currently available under five funding streams for a planning stream and four implementation streams for actions included in a certified CMP.

Other funding opportunities include the NSW Environment Trust, DPIE – Crown Lands funding, DPI – Fisheries grants, other NSW Government programs, partnerships with local community groups, research institutions and universities. The MEMS also includes many targeted projects which may provide useful information for the CMP.

12.3 Forward Plan

BSC will coordinate the development of the CMP and will collaborate with land managers, state government agencies, industry and community representatives to provide effective coastal management outcomes.

The forward plan outlines the next four stages of the CMP process. The requirements for Stages 2 – 5 of the CMP process are detailed in the *NSW Coastal Management Manual* and summarised in the following sections. The CMP will be developed over the next two years.

12.3.1 Fast-tracking

Section 1.11.2 of the *NSW Coastal Management Manual* (OEH, 2018a) discusses the situations where a fast-track process for the preparation or review of a CMP may be appropriate. Council may 'fast-track' from Stage 1 to 4, or only complete parts of Stages 2 to 3 where:

- The first-pass risk assessment indicates that the vulnerability is low and the risks are acceptable.
- The management issues are not complex and the council can demonstrate that they are adequately managed.
- There are few stakeholders and/or there is an existing, successful management partnership between stakeholders, including adjoining councils, public authorities and key community groups.
- Council has previously prepared a detailed study to evaluate all relevant coastal hazards and risks and has robust, up-to-date scientific information about coastal change.
- Council has a clear understanding of trends in the condition of natural systems in the coastal environment area, and the ecosystem services they provide, based on up-to-date scientific evidence.
- Council demonstrates that it has adopted and is implementing best practices in its role in protecting the condition of the coast.

- There have been no major events or new studies released that would change the previous assessment of risk, including likely changes in socioeconomic conditions.
- Council has a clear understanding of community satisfaction with coastal management processes, costs and benefits distribution and outcomes, that supports continuation of the current approach.
- Council has a sustainable funding strategy in place for coastal management, which is integrated with its resourcing strategy and asset management plan under the IP&R process.

This Scoping Study presents the details of ongoing management activities, investigations and results of recent stakeholder engagement activities for Shaws Bay. There is a high level of understanding of risks, current processes and ecosystem trends and the remaining data gaps to be addressed have been identified. The majority of CZMP actions are either complete, ongoing or underway and the majority of risks have been reduced to an acceptable level. Through the successful implementation of CZMP actions, BSC has demonstrated that it has adopted and is implementing best practices in its role in protecting the condition of Shaws Bay and has a sustainable funding strategy in place for coastal management, which is integrated with its IP&R process. The Shaws Bay CMP satisfies many of the requirements for a fast-tracking pathway as described in the CMP Manual. It is considered that the concise Stage 2 outlined as recommended tasks in Table 9 is appropriate and focussed on filling the data gaps required to direct management action. This will be followed by Stage 3 Options Assessment (approx. 6 months) and Stage 4 CMP Development (approx. 6 months). Additional desirable tasks have also been identified through the risk assessment process and included in Table 9, which could be included in CMP actions at Stage 4.

12.3.2 Stage 2 – determine risks, vulnerabilities and opportunities

Stage 2 involves undertaking detailed studies that will help to identify, analyse and evaluate risks, vulnerabilities and opportunities. Studies prepared in Stage 2 provide information to support decision-making in later stages of the planning process. The additional information assists communities to better understand coastal management issues and to analyse and evaluate coastal risks and opportunities. Stage 2 of the CMP for Shaws Bay will include:

- Continuing engagement with the community and stakeholders.
- Refining understanding of key management issues (where there are knowledge gaps) as described in Section 11.5.3 and included as recommended Stage 2 tasks in Table 9.
- Analysing and evaluating current and future risks (detailed risk assessment) building on the first-pass risk assessment (Section 11.5) and outcomes of Stage 2 detailed studies.
- Identification of opportunities to reduce risks and enhance the environmental, social and economic values.

Concurrent with Stage 2, BSC will consider whether planning controls should be updated with any new information available.

12.3.3 Stage 3 – response identification and evaluation

Stage 3 involves the identification and evaluation of management options. Stage 3 of the CMP for Shaws Bay will include:

- Development of a strategic approach to risk management: alert, avoid risks, active intervention, planning for change, emergency response.
- Identifying and collating information on management options.
- Evaluating management actions, considering:
 - Feasibility (is it an effective and sustainable way to treat the risks?).
 - Viability (economic assessment).
 - Acceptability to stakeholders.
- Engaging public authorities about implications for their assets and responsibilities.
- Preparing a business plan for implementation – capital and operational costs, distribution of costs and benefits, funding and delivery.

Stage 3 will consider all findings from Stage 1, Stage 2, stakeholder engagement activities and discussions with relevant agencies and land managers. It is envisaged that a large component of this stage will involve combining and prioritising actions to address key issues and threats as identified during Stages 1 and 2.

Formal consultation will take place with each agency with either a responsible or supporting role for each action. A cost-benefit analysis will be undertaken for any options requiring detailed analysis to determine socio-economic viability (potentially required for very high-cost options).

12.3.4 Stage 4 – finalise, exhibit and certify the CMP

Stage 4 will involve the preparation of the draft CMP document, review by BSC and Government agencies, placement of the draft CMP on public exhibition and consideration of feedback from all stakeholders. BSC and DPE – BCD will then review and approve the final CMP for certification and implementation (Stage 5).

The CMP for Shaws Bay will include:

- Coastal management actions (10 years) for BSC and other public authorities where applicable.
- Links to the IP&R framework and land use planning system.

12.3.5 Stage 5 – implementation, monitoring and reporting

The CMP will be implemented by BSC following certification, in accordance with the IP&R framework, land use planning system and partnerships. This framework will guide the implementation of the CMP, ensure all required monitoring and reporting is completed and will provide a framework for the review and assessment of CMP outcomes.

12.4 CMP Engagement Strategy

A shared understanding of the risks and opportunities and stakeholder and community support for resulting actions included in the CMP will be beneficial during implementation phases. A stakeholder engagement strategy for the preparation of the CMP has been developed from the previous stakeholder consultation outcomes and the outcomes/ findings of consultation activities undertaken for this Scoping Study. Coastal management planning will include community engagement, including with First Nations people throughout

the process from development to implementation. The aim of the strategy is to inform all key stakeholders of the project and provide them with the opportunity to contribute to the development of the CMP through a variety of methods. The strategy has been prepared as a stand-alone document and lists each activity to be undertaken as well as the aim/ objective of the activity, content to be delivered, target stakeholders, delivery method, timing, frequency and who is responsible for delivering the activity.

12.5 CMP Development

BSC will develop the remaining stages of the Shaws Bay CMP over the next two years. BSC will rely on funding from the BSC Healthy Waterways Program, the NSW State Government Coastal and Estuaries Grants Program and other external sources to ensure affordability of the CMP development. The Forward Plan (including responsibilities, costs and timing) for Stages 2 – 4 of the CMP for Shaws Bay is provided in Table 9 and Table 10. The tasks listed in the Forward Plan have been developed using the information available during the preparation of this Scoping Study. Outcomes from the Stage 2 tasks and other information that becomes available during Stages 2 and 3 may identify further tasks which may also be required to better inform the CMP development.

Preliminary cost estimates have been developed for each stage of the CMP development. In-kind costs across the life of the CMP (e.g. liaison with internal BSC departments and councillors, compilation and synthesis of relevant data, fulfilling data requests, coordination with stakeholders and consultants) have not been included. BSC will ensure that staff resources are adequate to deliver this project. CMP implementation costs will be identified in the CMP.

Table 9: Forward Plan for the CMP for Shaws Bay – Stage 2: determine risks, vulnerabilities and opportunities

CMP task ¹	Rationale, scope, objective and key tasks	Cost (low) ²	Cost (high) ²	Stakeholders	2024/25	2025/26
S1. A targeted microbial source tracking study to identify the source(s) of harmful bacteria contributing to poor water quality episodes.	<p>Rationale: Beachwatch monitoring of faecal indicator bacteria (Enterococci) for the last three summers (2020-2023) have shown 'Poor' grades for primary contact recreation in the North and West Shaws Bay sampling sites, and higher Enterococci levels associated with rainfall. There has been an increasing trend in Enterococci levels at these locations from 2020-2023. There are many potential sources of faecal bacteria to Shaws Bay (e.g. wildlife/birds, dogs, human sources) but the relative contribution from potential sources and hence the required management response is unknown.</p> <p>Scope of work: A targeted microbial source tracking utilising DNA analysis techniques to identify the sources of bacteria (e.g. human, dog, bird, other wildlife etc.).</p> <p>Objective: Identify sources of bacteria and recommend management action to address the source(s).</p> <p>Key tasks:</p> <ul style="list-style-type: none"> • Study design including selection of sample sites, timing, replicates etc. • Field sampling program. • Laboratory analysis. • Review and analysis of results. • Document findings and recommend management action to address the source(s) for consideration in Stages 3 and 4 of the CMP. 	\$25,000	\$40,000	DPE – BCD, NSW EPA (Beachwatch Partnership)	6 months	

CMP task ¹	Rationale, scope, objective and key tasks	Cost (low) ²	Cost (high) ²	Stakeholders	2024/25	2025/26
<p>S2 - Identify effective stormwater treatment devices and appropriate upgrades to improve the quality of stormwater entering the bay</p>	<p>Rationale: There are a number of stormwater outlets discharging directly to Shaws Bay. Current urban stormwater impacts and the relative contribution of pollution compared to other catchment sources is unknown. The 2023 community survey identified poor water quality and stormwater pollution as a key concern. The effectiveness of urban stormwater management controls has not been assessed.</p> <p>Scope of work: A study to review current stormwater treatment effectiveness in the Shaws Bay catchment. A whole of catchment stormwater approach is required to identify appropriate upgrades to the stormwater network.</p> <p>Objectives: Identification of priority stormwater upgrade works and preliminary concepts, locations and costing for priority sites. The overall objective is to improve the quality of stormwater entering the bay.</p> <p>Key tasks:</p> <ul style="list-style-type: none"> • Undertake an audit of current stormwater treatment devices in the catchment documenting key data including device type, age, functionality, maintenance schedule and location of outlets etc. • Review all available water quality information including rainfall event data to identify any stormwater related impacts. • Evaluate the effectiveness of existing stormwater treatment devices. • Conduct a comprehensive review of various stormwater treatment technologies and devices available. • Assess potential options for stormwater upgrades in the catchment considering available space and existing infrastructure, costs and suitability. • Prepare a shortlist of stormwater treatment improvements, including preliminary concept design, costs, and timelines for Stage 3 of the CMP. 	\$30,000	\$40,000	DPE – BCD, DPE – Crown Lands, DPI – Fisheries	6 months	

CMP task ¹	Rationale, scope, objective and key tasks	Cost (low) ²	Cost (high) ²	Stakeholders	2024/25	2025/26
<p>S3 - Repeat mapping and evaluation of estuarine vegetation distribution.</p>	<p>Rationale: Loss of seagrass in Shaws Bay is a key community concern. Contributing factors include sedimentation/ siltation, dredging, turbidity, nutrients, major flood events, water depth, water temperature etc. The relative contribution of factors to seagrass decline has not been evaluated. DPI - Fisheries is responsible for monitoring and management of estuarine vegetation. The latest estuarine vegetation mapping (mangroves, saltmarsh, seagrass) was completed by DPI - Fisheries in 2020. Consultation with DPI-Fisheries during the Scoping Study indicated that repeat mapping at Shaws Bay has not been scheduled to date and is unlikely to occur within the timeframe of CMP development.</p> <p>Scope of work: Updated mapping is required to assess current estuarine vegetation extents and track the distribution and health of mangrove, seagrass and saltmarsh habitats at Shaws Bay.</p> <p>Objectives: Detailed and up to date mapping of estuarine vegetation extents and evaluation of trends, likely contributing factors and potential management options for ongoing protection (for consideration at Stage 3 of the CMP). This will also assist in addressing specific community concerns such as the loss of seagrass in the East Arm.</p> <p>Key tasks:</p> <ul style="list-style-type: none"> • Background information review - collate available data, aerial photographs, and remote sensing data related to estuarine vegetation. • Employ GIS techniques to map and delineate estuarine vegetation extents. • Ground-truth mapped extents to confirm areas and vegetation composition. • Analyse historical data and mapping results to identify trends in the changes of estuarine vegetation extents over time. • Investigate potential contributing factors affecting vegetation health and distribution. • Document results and options for ongoing protection of estuarine habitats for consideration in Stage 3 of the CMP. 	\$5,000	\$10,000	<p>DPI – Fisheries, DPE – BCD</p>	<p>3 months</p>	

CMP task ¹	Rationale, scope, objective and key tasks	Cost (low) ²	Cost (high) ²	Stakeholders	2024/25	2025/26
Detailed risk assessment	Analysis and evaluation of current and future risks (updated first pass risk assessment).	\$5,000	\$5,000	DPE – BCD	1 month	
Stage 2 documentation	Documentation, feedback and concurrence.	\$5,000	\$5,000	DPE – BCD	2 months	
Stakeholder engagement	Refer Community and Stakeholder Engagement Strategy. Stakeholder engagement will also be required as part of Stage 2 studies.	\$10,000	\$15,000	DPE – BCD	12 months	
<i>Stage 2 total recommended tasks</i>		<i>\$80,000</i>	<i>\$115,000</i>		12 months (July 2024 - June 2025)	

CMP task ¹	Rationale, scope, objective and key tasks	Cost (low) ²	Cost (high) ²	Stakeholders	2024/25	2025/26
S4 - Develop a method of assessing and reporting estuary health	<p>Rationale: Lack of community awareness of estuary health, associated threats and benefits, regulations and opportunities for community to 'do the right thing' has been identified as an ongoing threat to the ecological health of Shaws Bay. Improved estuary health assessment and reporting to the community is required to address this threat.</p> <p>Scope of work: Develop an estuary health monitoring and reporting program based on successful and cost-effective programs applied in other NSW estuaries.</p> <p>Objectives: A program that is cost-effective and targeted and capitalises on existing and ongoing monitoring (e.g. Ecohealth, BSC monitoring, MEMS monitoring) that informs the assessment of priority threats, provides information to the community and other stakeholders on ongoing ecosystem health and assists in the identification of management approaches and required investment in restoration actions.</p> <p>Key tasks:</p> <ul style="list-style-type: none"> Literature review and data compilation of all existing information and ongoing programs. Develop approach which may include collation and consolidation of existing information and programs, additional monitoring and assessment of estuary health to fill any gaps in information. Develop resource requirements and opportunities including citizen science as well as methods of presenting monitoring outcomes to the community. 	\$10,000	\$15,000	DPE – BCD, NSW EPA (Beachwatch Partnership)	6 months	
S5 - Implementation of estuary health monitoring program	Implement the estuary health monitoring program and community engagement activities based on S4 outcomes.	\$30,000 (\$15,000 p.a)	\$40,000 (\$20,000 p.a)	DPE – BCD	Ongoing	

CMP task ¹	Rationale, scope, objective and key tasks	Cost (low) ²	Cost (high) ²	Stakeholders	2024/25	2025/26
S6 - Cultural recognition/ awareness project(s) communicating cultural values and connection to Country	<p>Rationale: Lack of recognition of cultural values and involvement of First Nations people in decision making and management have been identified as ongoing threats to the cultural values of Shaws Bay. Further work is necessary to engage with First Nations people and identify cultural values for protection.</p> <p>Scope of work: Consultation and co-design/ development of projects in collaboration with First Nations groups to increase understanding of cultural values and traditional management practices.</p> <p>Objectives: Increase awareness and recognition of Shaws Bay cultural values and increase involvement of First Nations people in decision making and management.</p> <p>Key tasks:</p> <ul style="list-style-type: none"> • Identification of groups and organisations with capacity and interest to be involved in CMP actions. • Develop potential project descriptions to include priority, responsibility, partnerships, costs, approval requirements, funding and ongoing maintenance requirements. • Prepare a shortlist of potential projects for consideration in Stage 3 of the CMP. 	\$30,000	\$40,000	First Nations, DPE – BCD, DPE – Crown Lands	6 months	
<i>Total – desirable tasks</i>		\$70,000	\$95,000		12 months (timing to be confirmed)	
<i>Total - recommended and desirable tasks</i>		\$150,000	\$210,000			

1. Refer Risk Assessment and Gap Analysis, Appendix 3.

2. Not including BSC or other agency staff costs.

Table 10: Forward Plan for the CMP for Shaws Bay – Stage 3 and Stage 4

CMP task	Scope and Expected Outcome	Cost (low) ¹	Cost (high) ¹	Stakeholders	2024/25	2025/26
<i>Stage 3 – response identification and evaluation</i>						
Options assessment ²	Development of strategic response to risks, identification and evaluation of management options	\$40,000	\$50,000	DPE – BCD, DPE – Crown Lands, DPI – Fisheries, community groups, First Nations		6 months
Business Plan	Development of business plan for implementation - capital and operational costs, distribution of costs and benefits, funding and delivery	\$10,000	\$15,000	DPE - E&H		1 month
Stakeholder engagement	Refer Community and Stakeholder Engagement Strategy	\$15,000	\$20,000	DPE - E&H		6 months
<i>Stage 3 total</i>		<i>\$65,000</i>	<i>\$85,000</i>		<i>6 months (July 2025 – December 2025)</i>	
<i>Stage 4 – finalise, exhibit and certify the CMP</i>						
CMP documentation	Documentation, feedback and concurrence	\$20,000	\$30,000	DPE - E&H		3 months
CMP exhibition	Public comment	\$5,000	\$10,000	-		2 months
CMP finalisation	Final CMP document	\$5,000	\$10,000	DPE - E&H		1 month
Stakeholder engagement	Refer Community and Stakeholder Engagement Strategy	\$10,000	\$15,000	DPE - E&H		2 months
<i>Stage 4 total</i>		<i>\$40,000</i>	<i>\$65,000</i>		<i>6 months (January 2026 – June 2026)</i>	

1. Not including BSC or other agency staff costs.

2. Not including detailed assessment of costs and benefits of high risk and complex options (if required).

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GLOSSARY AND ABBREVIATIONS

Acid sulfate soils (ASS)	ASS is the common name given to soils containing iron sulfides. When the iron sulfides are exposed to air and produce sulfuric acid, they are known as actual ASS. 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.
AHD	Australian Height Datum
Amenity	A desirable or useful feature or facility of a building or place
Aquatic	Living or growing in water, not on land.
BCD	Biodiversity and Conservation Division (a Division of DPE)
BSC	Ballina Shire Council
CEA	Coastal Environment Area (as defined by the Resilience and Hazards SEPP)
CMP	Coastal Management Program
Coastal hazard	Either or a combination of the following: beach erosion; shoreline recession; coastal lake or watercourse entrance instability; coastal inundation; coastal cliff or slope instability; tidal inundation; erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.
CSP	Community Strategic Plan
CUA	Coastal Use Area (as defined by the Resilience and Hazards SEPP)
CVA	Coastal Vulnerability Area (as defined by the Resilience and Hazards SEPP)
CWLRA	Coastal Wetland and Littoral Rainforest Area (as defined by the Resilience and Hazards SEPP)
CZMP	Coastal Zone Management Plan
DECCW	Former (NSW) Department of Environment, Climate Change and Water (now DPE)
Dissolved Oxygen	Oxygen dissolved in the water (oxygen saturation).
DPE	Department of Planning and Environment
DPI	(NSW) Department of Primary Industries
DPI Fisheries	NSW Department of Primary Industries – Fisheries
DPIE	Former (NSW) Department of Planning, Industry & Environment (now DPE)
Ecosystem	Refers to all the biological and physical parts of a biological unit (e.g. an estuary, forest, or planet) and their interconnections.
EEC	Endangered Ecological Community
EMP	Estuary Management Plan
EPA	(NSW) Environmental Protection Agency
Estuarine	Part of the river channel with a mix of fresh water and salt (tidal) water

Foreshore	That part of the shore that lies between the mean high tide mark and the mean low tide mark
Geomorphology	Characteristics, origin and development of landforms.
ha	Hectares
HAT	Highest Astronomical Tide
Holocene	The current geological epoch which began approximately 11,700 years ago.
Hydrology	The study of water and its properties, including precipitation onto land and returning to oceans
Inundation	Rising and spreading of water over land
IP&R	Integrated Planning and Reporting
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
Littoral	Related to or near the coastline.
MEMA	Marine Estate Management Authority
MEMS	Marine Estate Management Strategy
MIDO	Marine Infrastructure Delivery Office
NPWS	National Parks and Wildlife Service
OEH	Office of Environment and Heritage
PCT	Plant Community Types
Riparian	Of, on or relating to the banks of a watercourse
Sediment	Sediment is solid material that is moved and deposited in a new location. Sediment can consist of rocks and minerals, as well as the remains of plants and animals. It can be as small as a grain of sand or as large as a boulder. Sediment moves from one place to another through the process of erosion.
Sedimentation	The deposition or accumulation of sediment
SEPP	State Environmental Planning Policy
SVTM	State Vegetation Type Mapping
TARA	Threat and Risk Assessment
Terrestrial	Living or growing on land (not aquatic)
TfNSW	Transport for NSW
Turbidity	A measure of the amount of light-attenuating particles in a water body

APPENDIX 1 STAGE 1 COMMUNITY CONSULTATION OUTCOMES

This Appendix provides a summary of consultation activity outcomes undertaken during the preparation of the Stage 1 Scoping Study including:

- *Project Report: Your Say Ballina - Shaws Bay Coastal Management Program*
- *Full text responses received during the community survey*
- *Hard copy survey questions*

Project Report

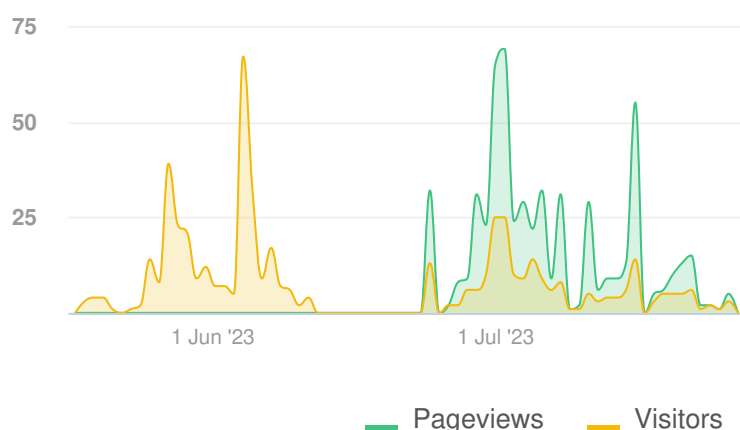
05 August 2022 - 25 July 2023

Your Say Ballina

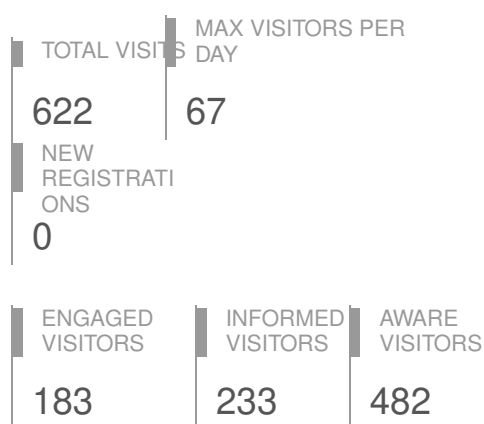
Shaws Bay Coastal Management Program



Visitors Summary

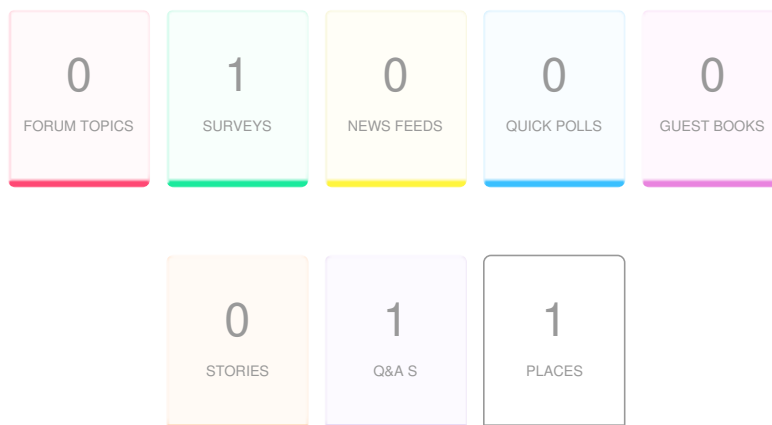


Highlights



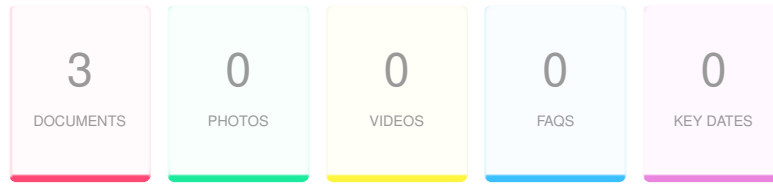
Aware Participants		Engaged Participants	
482		183	
Aware Actions Performed	Participants	Engaged Actions Performed	
Visited a Project or Tool Page	482	Registered	Unverified
Informed Participants	233	Anonymous	
Informed Actions Performed	Participants	Contributed on Forums	0
Viewed a video	0	Participated in Surveys	10
Viewed a photo	0	Contributed to Newsfeeds	0
Downloaded a document	23	Participated in Quick Polls	0
Visited the Key Dates page	4	Posted on Guestbooks	0
Visited an FAQ list Page	0	Contributed to Stories	0
Visited Instagram Page	0	Asked Questions	0
Visited Multiple Project Pages	54	Placed Pins on Places	2
Contributed to a tool (engaged)	183	Contributed to Ideas	0

ENGAGEMENT TOOLS SUMMARY



Tool Type	Engagement Tool Name	Tool Status	Visitors	Contributors		
				Registered	Unverified	Anonymous
Qanda	Ask a Question - Shaws Bay Coastal Management Program	Archived	8	0	0	0
Place	Map your feedback - Shaws Bay Coastal Management Program	Archived	13	0	2	0
Survey Tool	Community Survey - Shaws Bay Coastal Management Program	Archived	226	10	0	171

INFORMATION WIDGET SUMMARY



Widget Type	Engagement Tool Name	Visitors	Views/Downloads
Document	Shaws Bay CMP Study Area	16	17
Document	Shaws Bay Coastal Zone Management Plan - Volume 1 - November 2015	7	7
Document	Shaws Bay Coastal Zone Management Plan - Volume 2 - November 2015	2	2
Key Dates	Key Date	4	4

ENGAGEMENT TOOL: PLACE

Map your feedback - Shaws Bay Coastal Management Program

Visitors 13	Contributors 2	CONTRIBUTIONS 2
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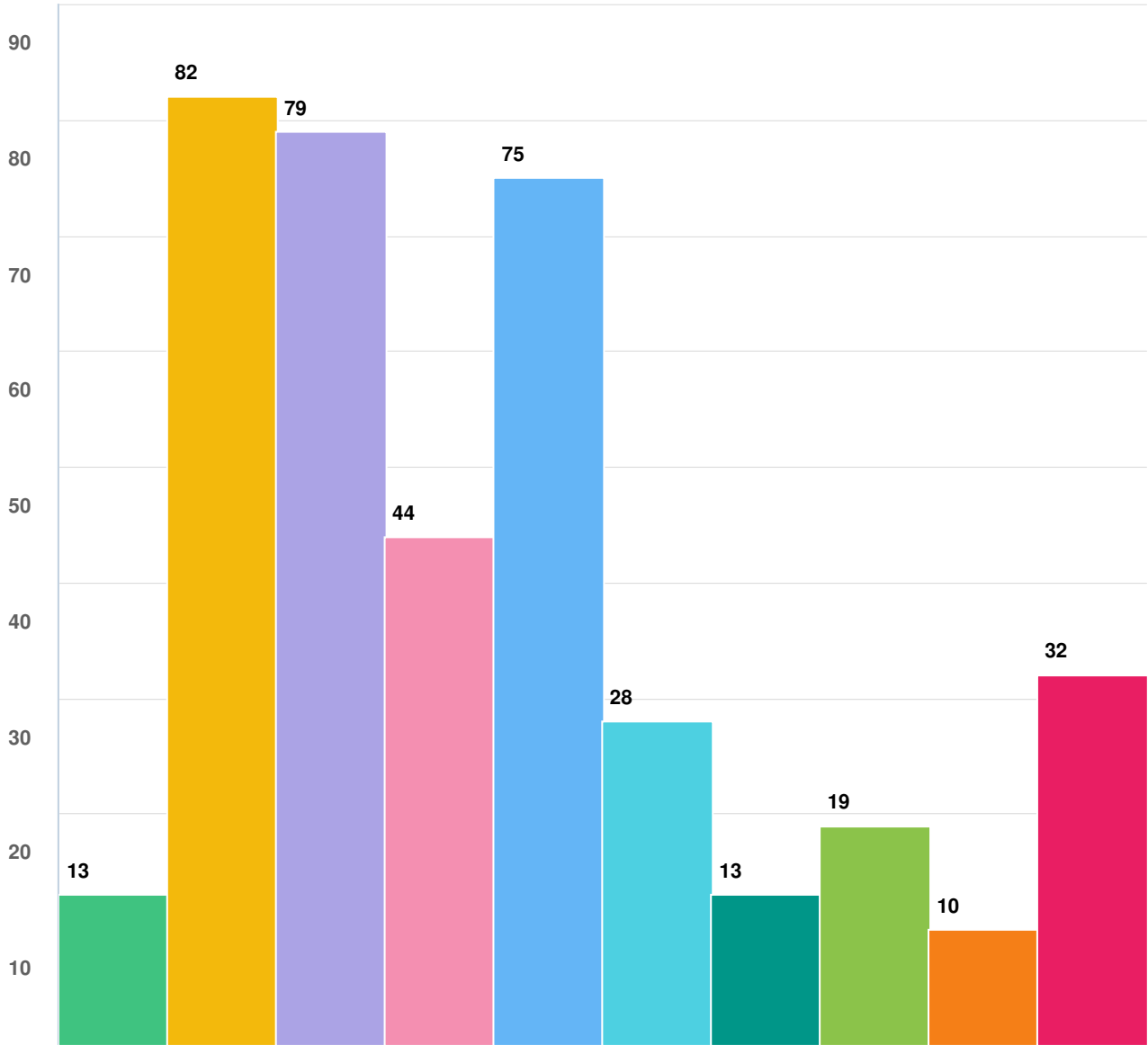
<p>2023-05-25 20:33:31 +1000</p> <p>Astrid</p> <p>CATEGORY</p> <p>Elements that should be improved</p>	<p>The sand in this area would benefit from dredging, as all of the sand that was relocated to the east arm beach has now eroded into the bay, choking the sea grass, and reducing the water available for fish and wildlife biodiversity and swimming</p> <p>Address: 54 Fenwick Drive, East Ballina New South Wales 2478, Australia</p> <p>http://www.yoursayballina.com.au/shaws-bay-coastal-management-program/maps/shaws-bay-cmp-map-your-feedback?reporting=true#marker-136403</p>
<p>2023-06-16 10:51:13 +1000</p> <p>Victor</p> <p>CATEGORY</p> <p>Elements that should be improved</p>	<p>Put some picnic tables on the bit of greenery opposite the surf club kiosk.</p> <p>Address: 65 Lighthouse Parade, East Ballina New South Wales 2478, Australia</p> <p>http://www.yoursayballina.com.au/shaws-bay-coastal-management-program/maps/shaws-bay-cmp-map-your-feedback?reporting=true#marker-137697</p>

ENGAGEMENT TOOL: SURVEY TOOL

Community Survey - Shaws Bay Coastal Management Program

Visitors 226	Contributors 181	CONTRIBUTIONS 186
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Swimming (Please choose all locations where you undertake this activity)



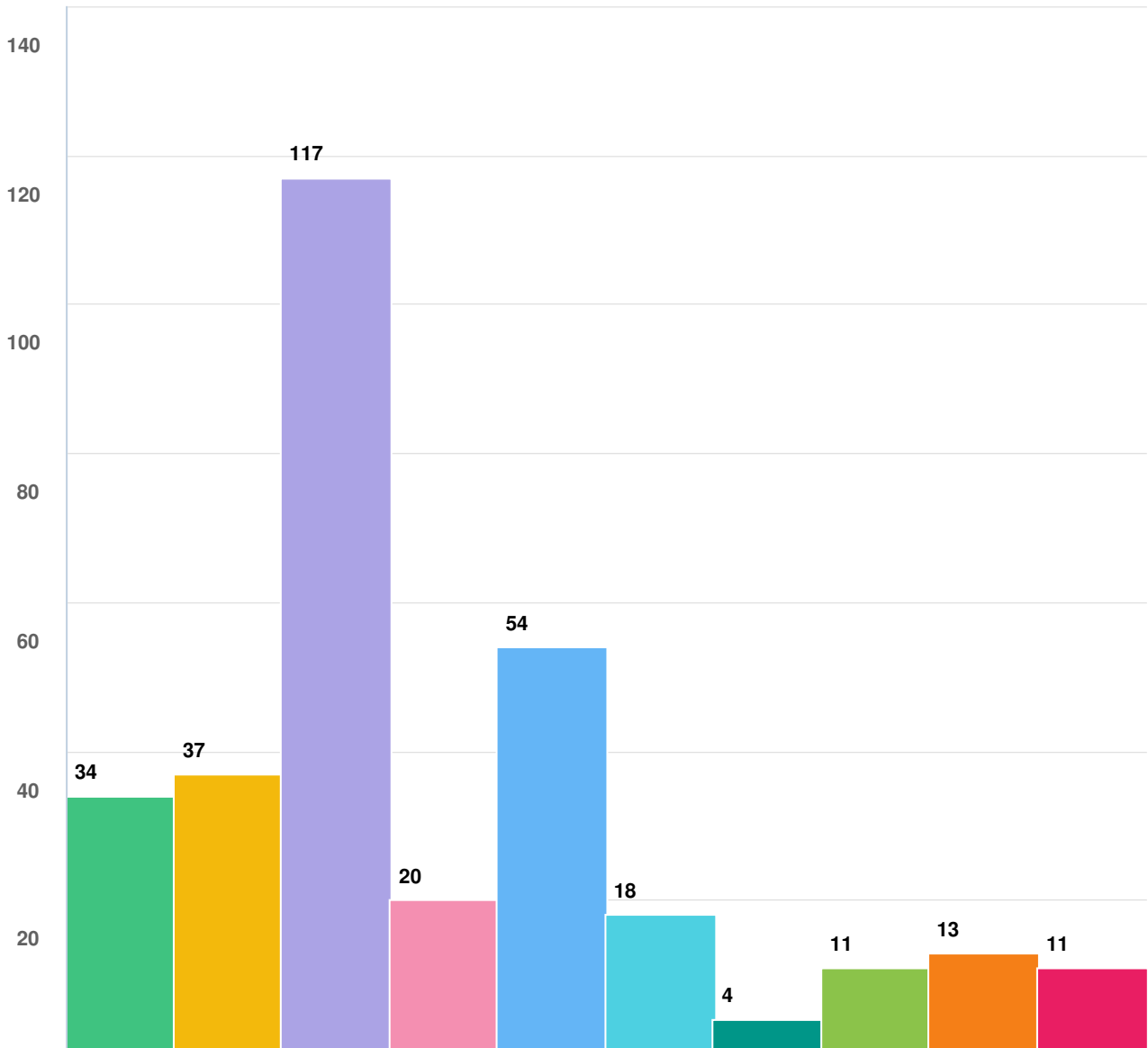
Question options

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Optional question (183 response(s), 3 skipped)

Question type: Checkbox Question

Picnics/BBQs(Please choose all locations where you undertake this activity)



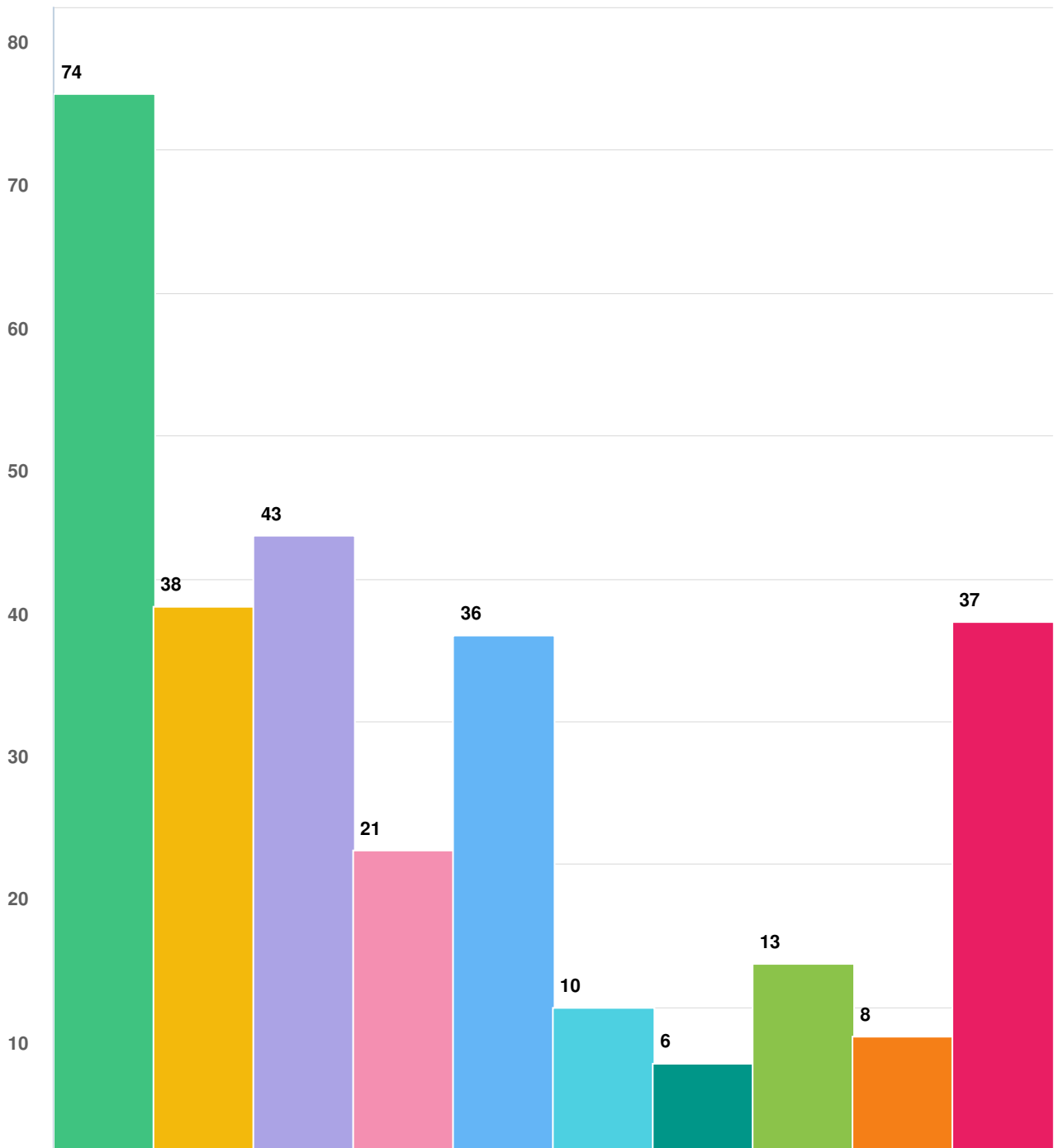
Question options

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Optional question (184 response(s), 2 skipped)

Question type: Checkbox Question

Canoeing/ kayaking/ boarding(Please choose all locations where you undertake this activity)



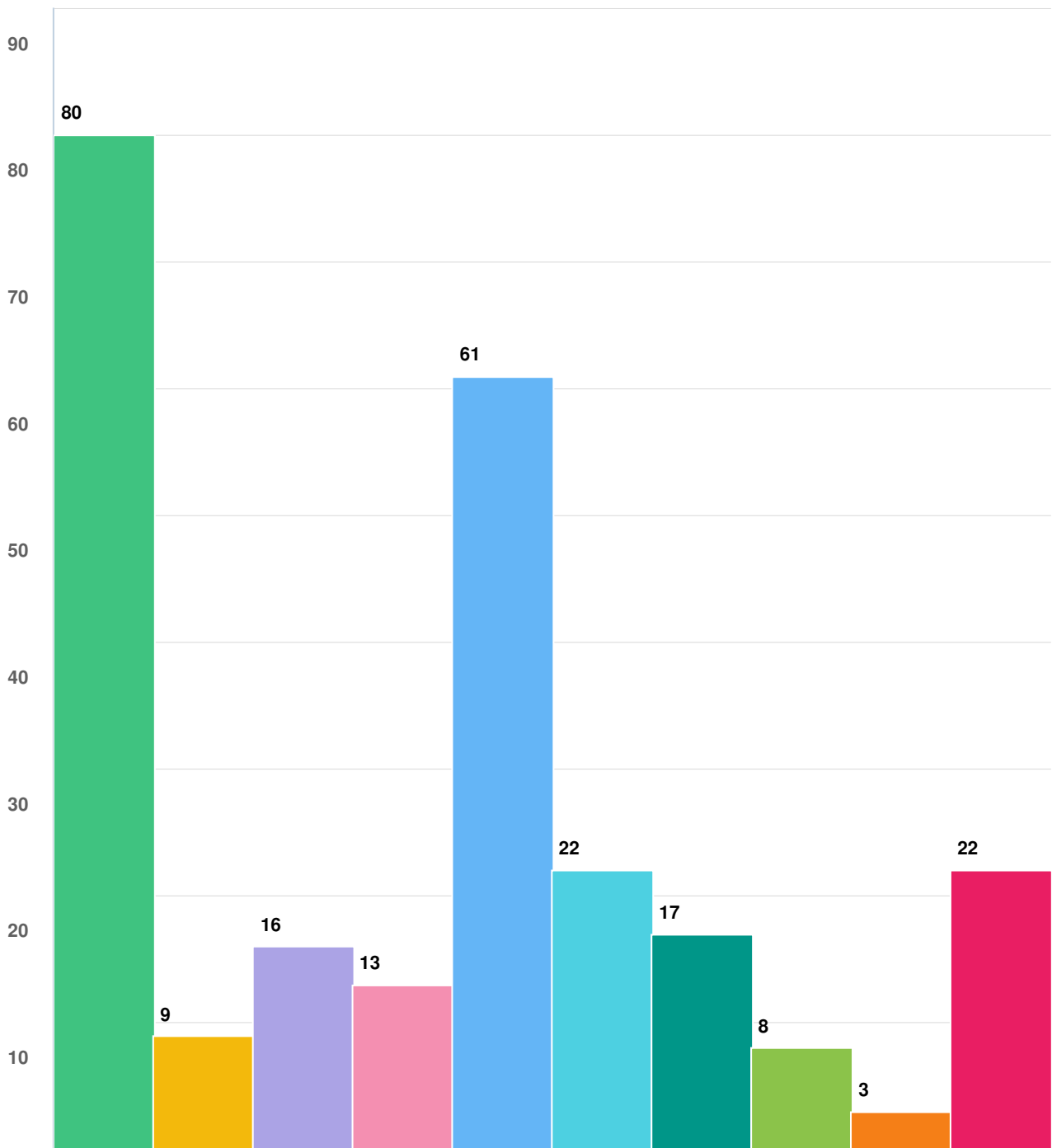
Question options

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Optional question (183 response(s), 3 skipped)

Question type: Checkbox Question

Snorkelling(Please choose all locations where you undertake this activity)



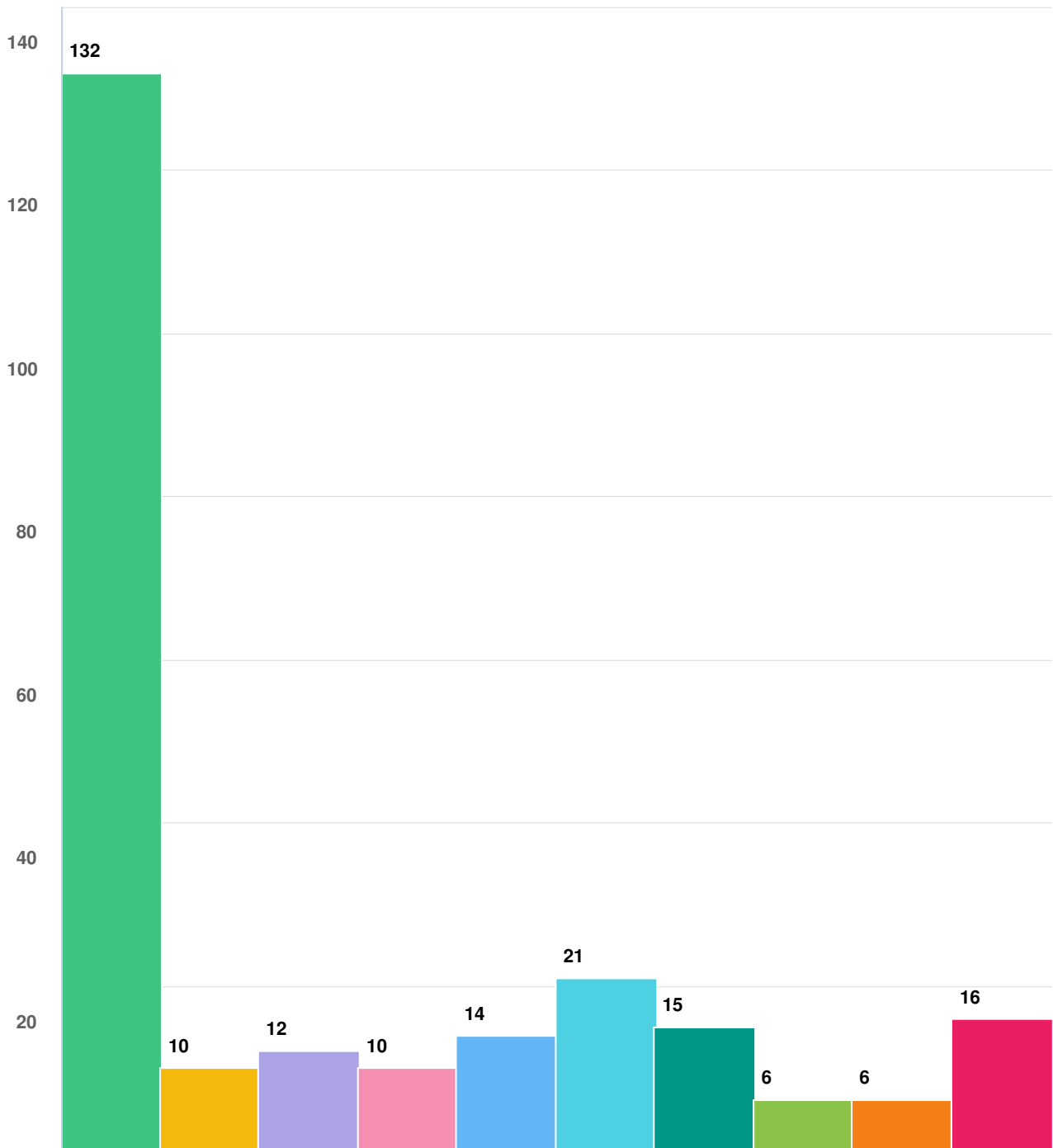
Question options

- I don't undertake this activity ● Western foreshore ● Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach) ● East Arm ● Breakwall and shared path ● Concrete steps
- Shaws Bay Holiday Park (west side beach) ● Shaws Bay Hotel beach ● All areas

Optional question (183 response(s), 3 skipped)

Question type: Checkbox Question

Fishing(Please choose all locations where you undertake this activity)



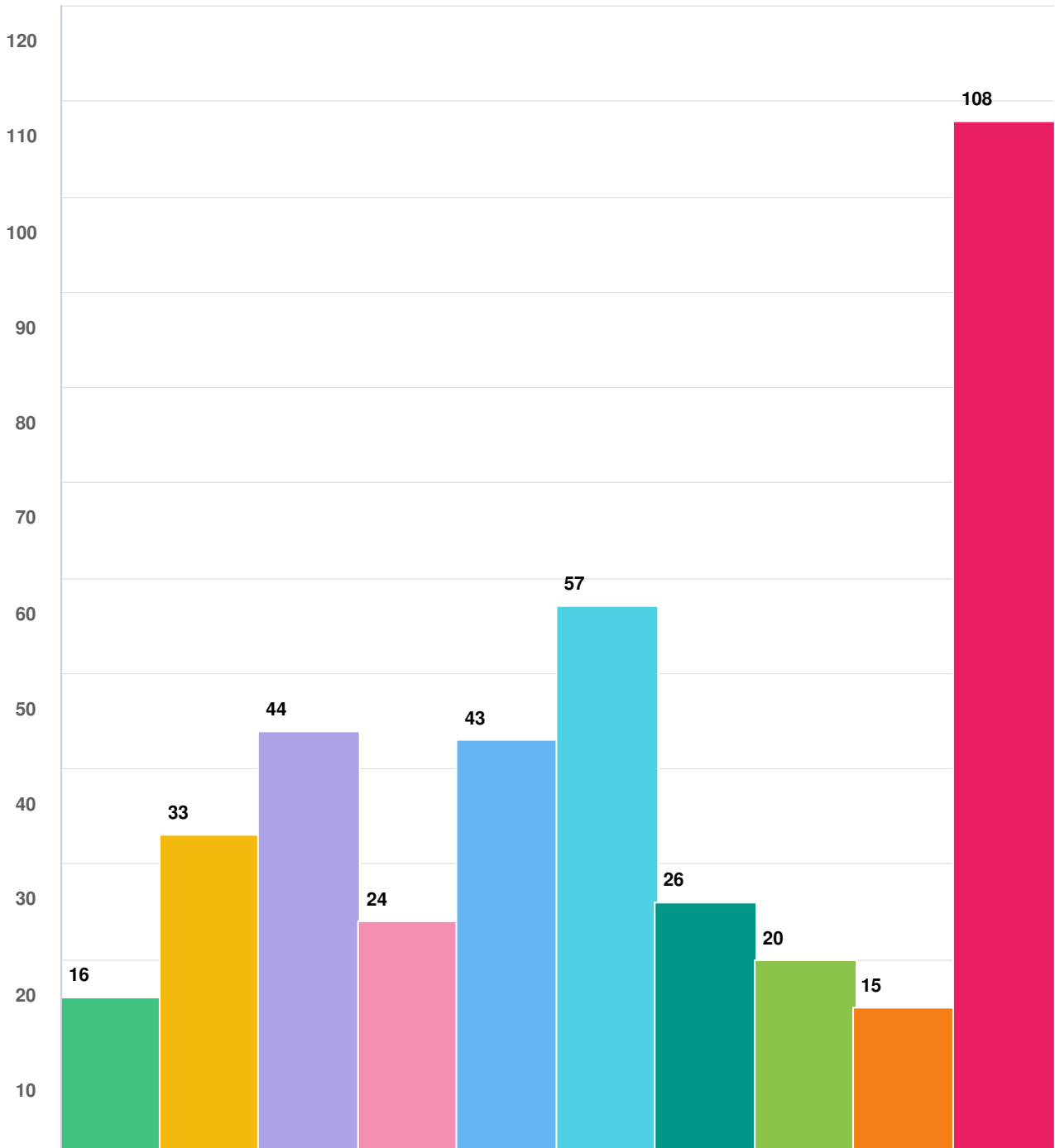
Question options

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- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Optional question (182 response(s), 4 skipped)

Question type: Checkbox Question

Wildlife/ nature appreciation(Please choose all locations where you undertake this activity)



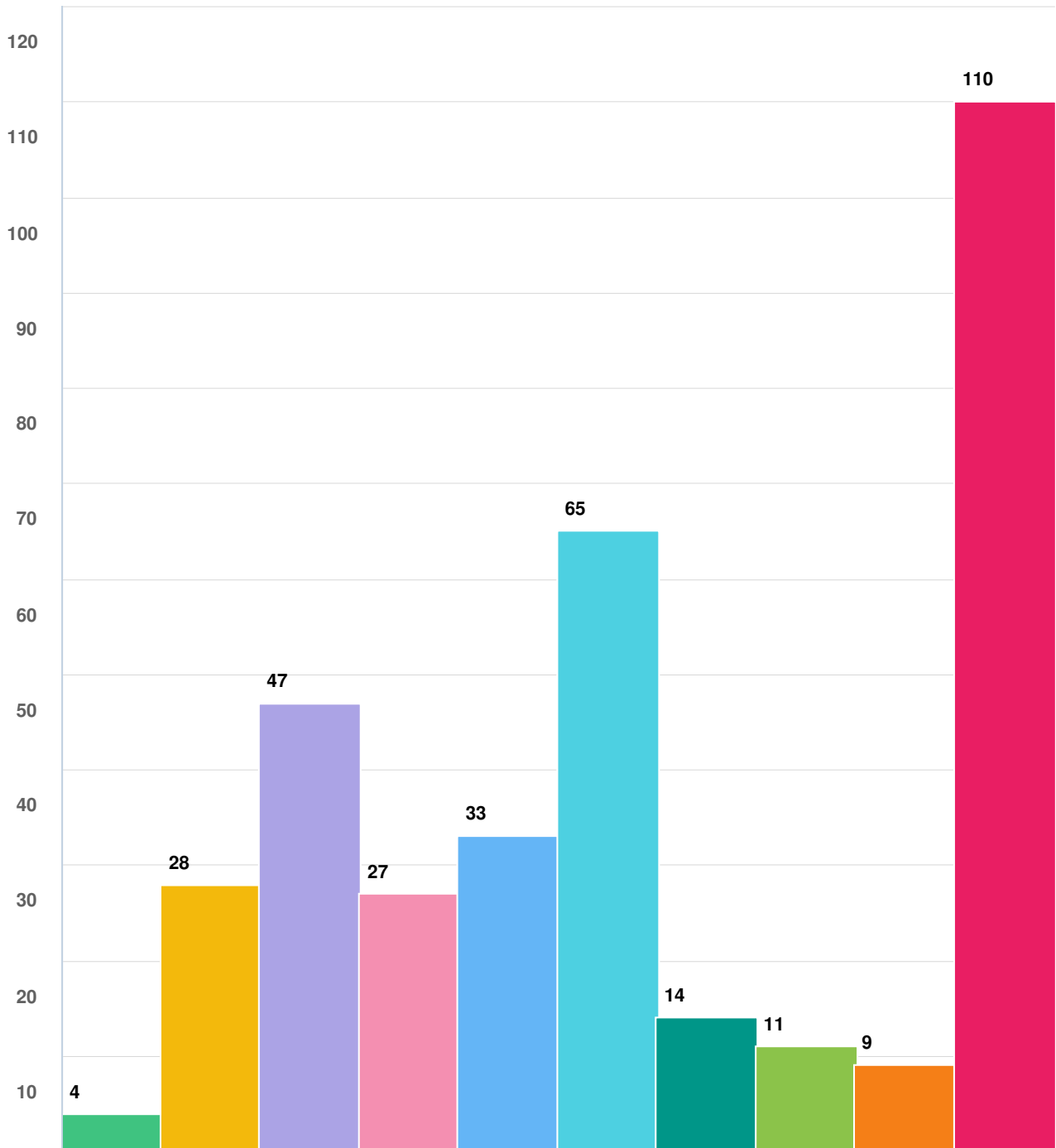
Question options

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- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Optional question (181 response(s), 5 skipped)

Question type: Checkbox Question

Walking/ jogging/ exercise(Please choose all locations where you undertake this activity)



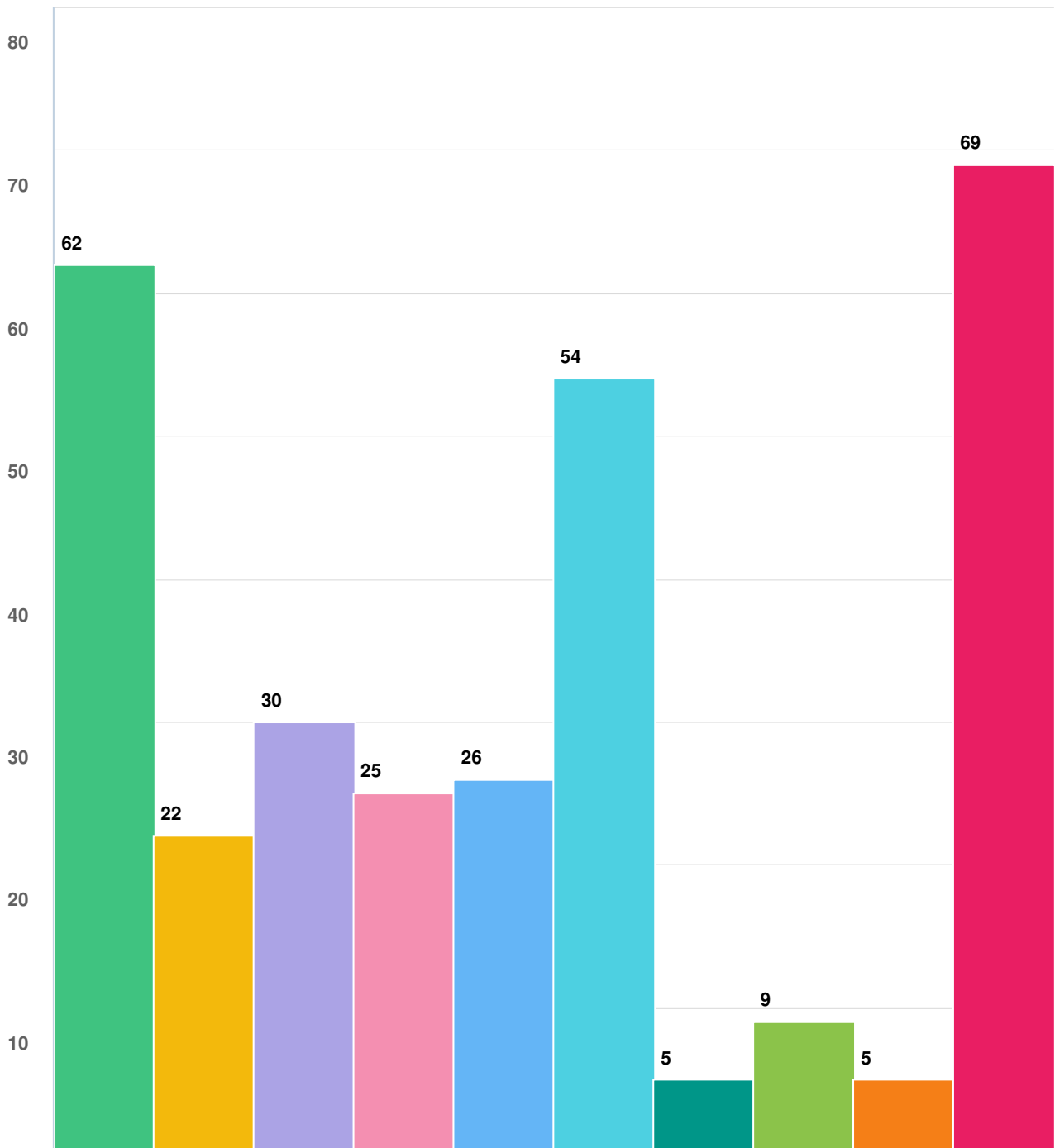
Question options

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Optional question (182 response(s), 4 skipped)

Question type: Checkbox Question

Cycling(Please choose all locations where you undertake this activity)



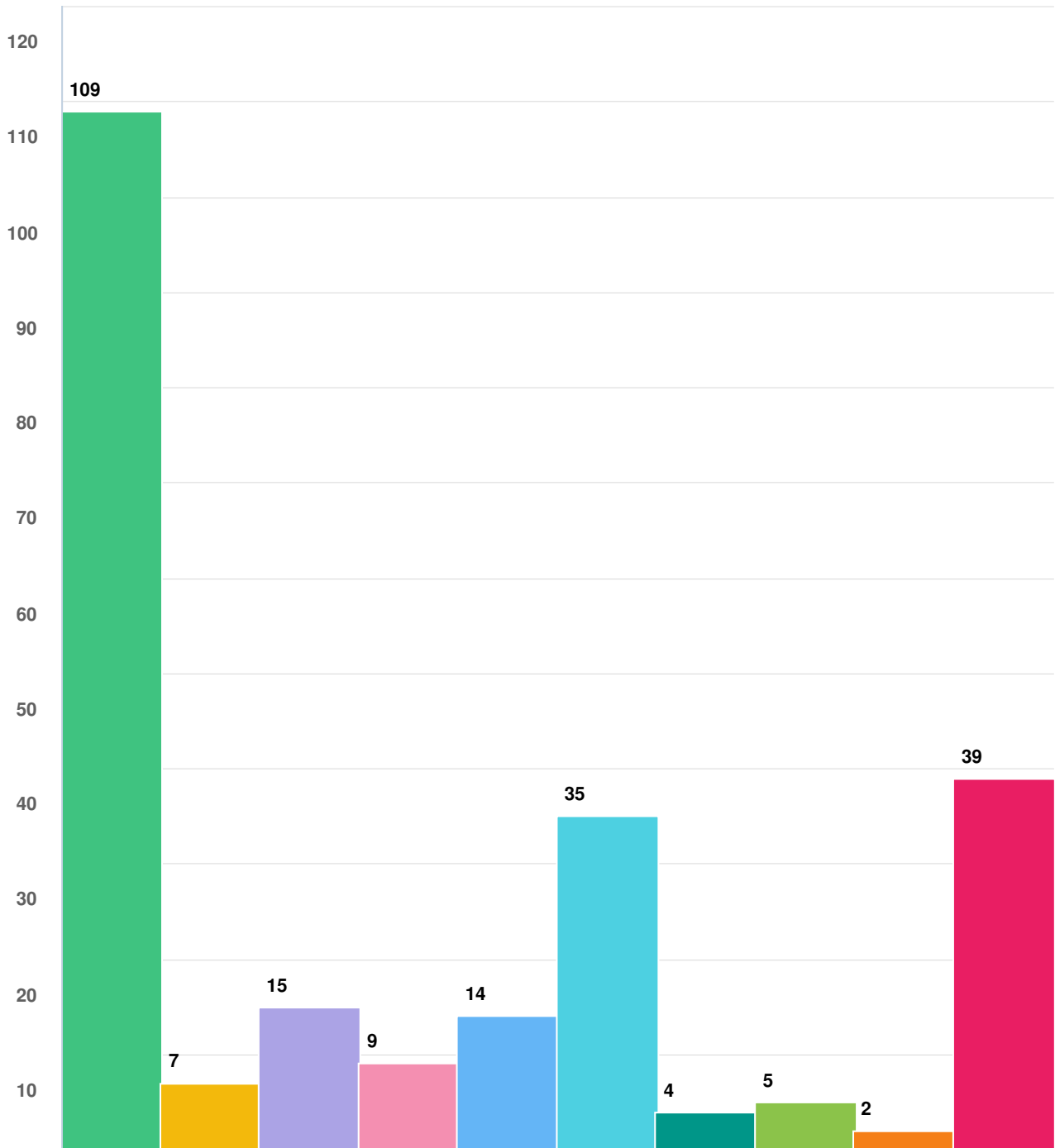
Question options

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Optional question (183 response(s), 3 skipped)

Question type: Checkbox Question

Dog walking(Please choose all locations where you undertake this activity)



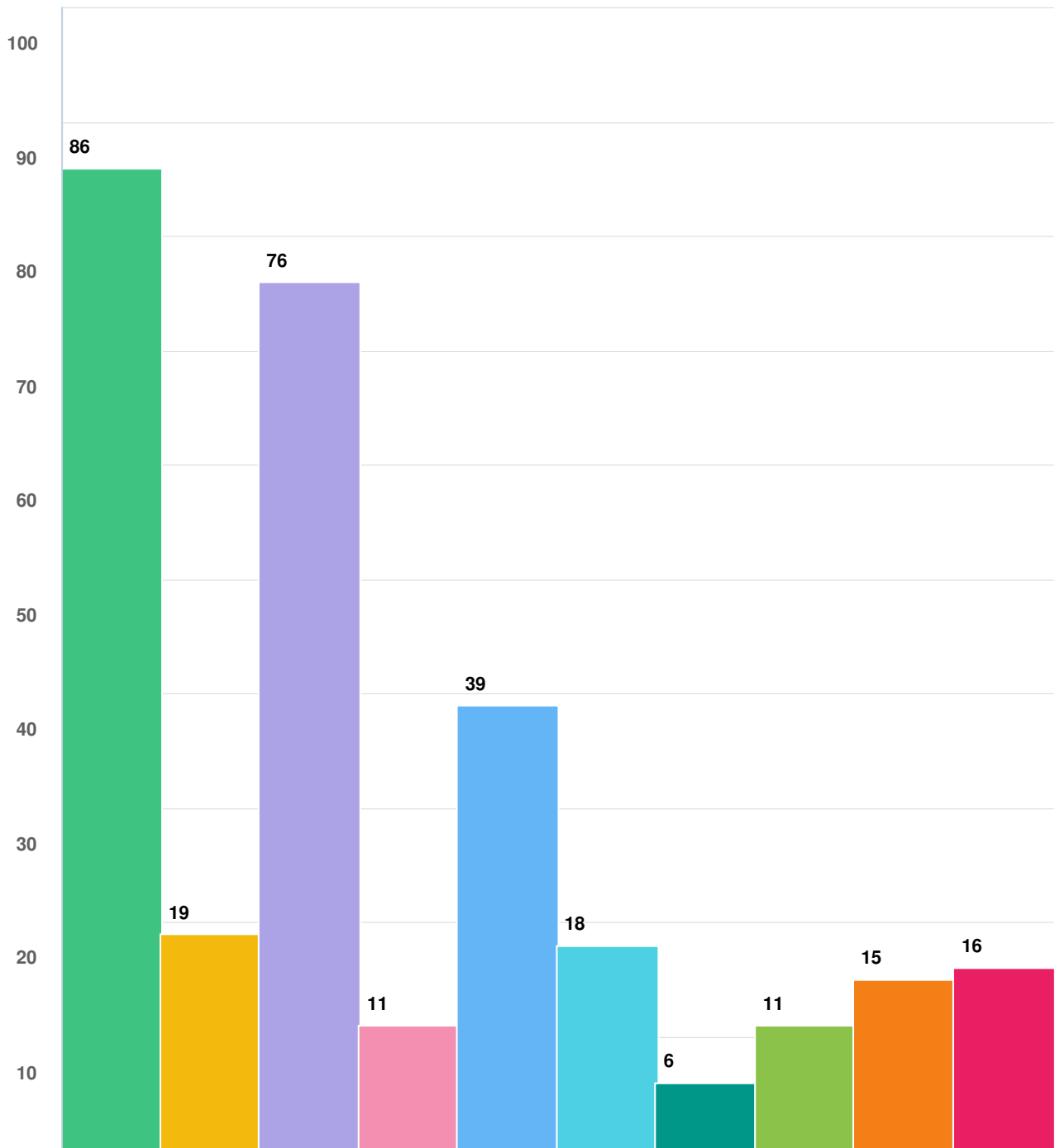
Question options

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Optional question (183 response(s), 3 skipped)

Question type: Checkbox Question

Children’s activities/ play(Please choose all locations where you undertake this activity)



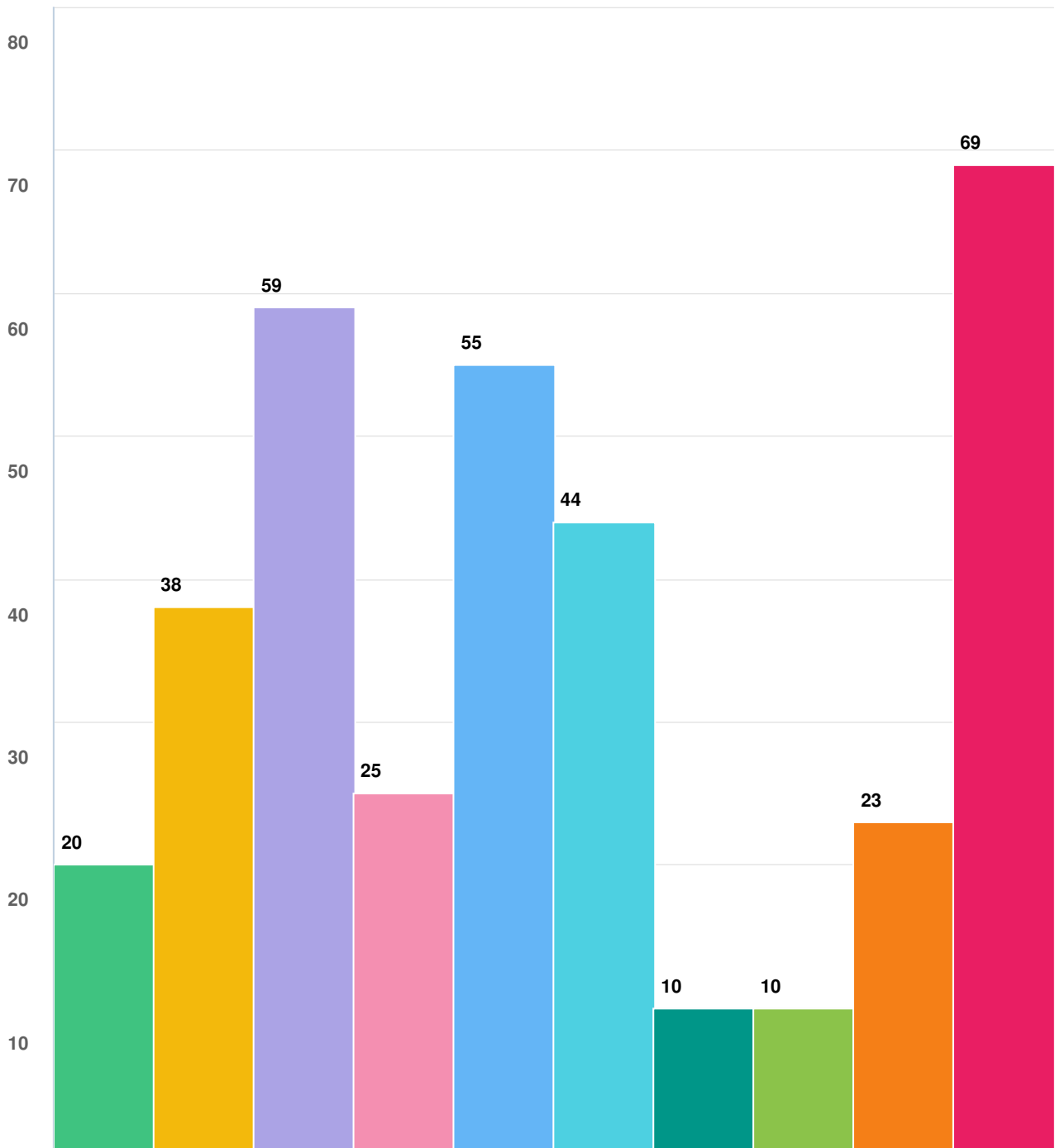
Question options

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Optional question (183 response(s), 3 skipped)

Question type: Checkbox Question

Relaxing(Please choose all locations where you undertake this activity)



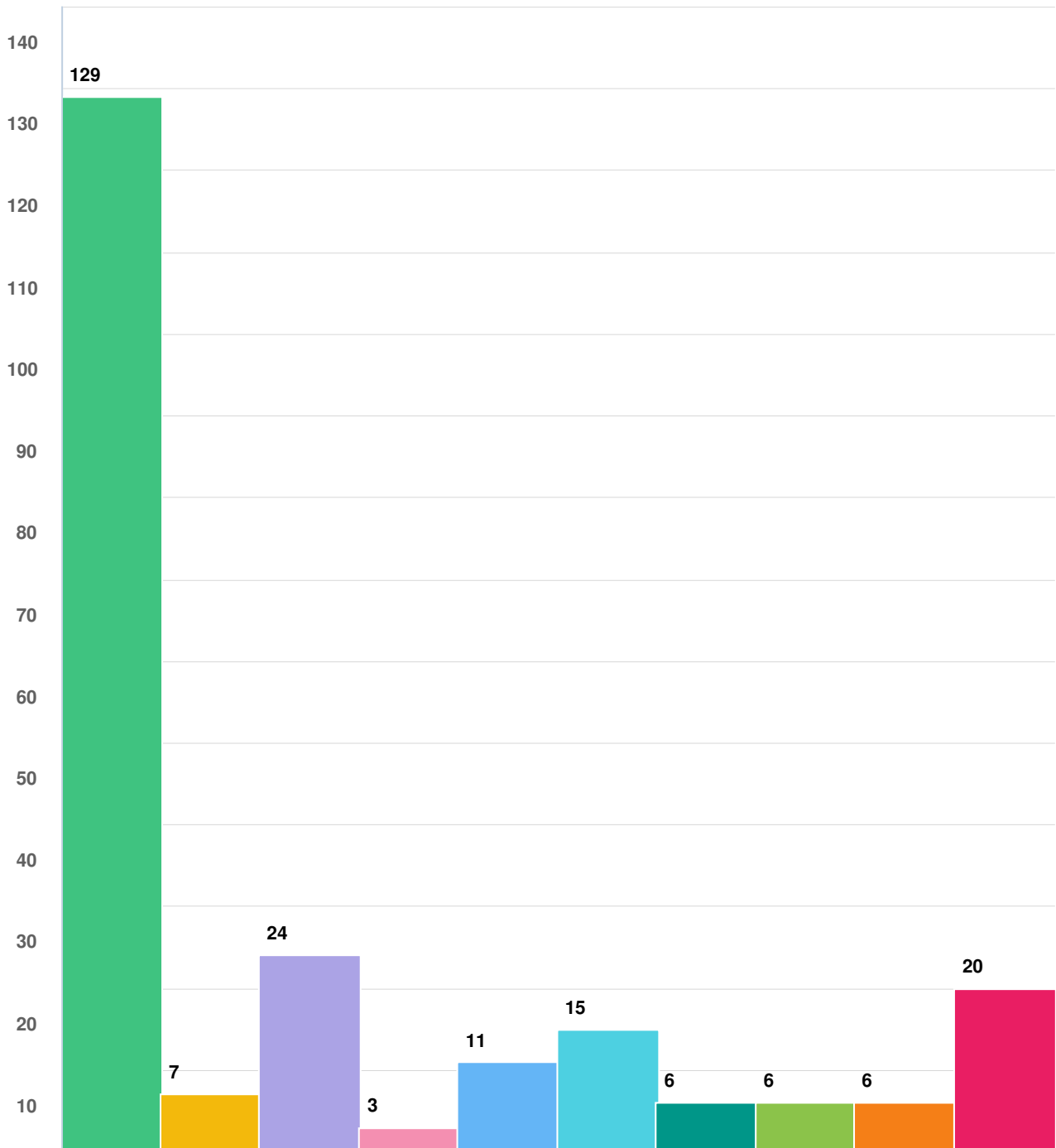
Question options

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- Western foreshore
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- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Optional question (183 response(s), 3 skipped)

Question type: Checkbox Question

Education/ cultural experiences(Please choose all locations where you undertake this activity)



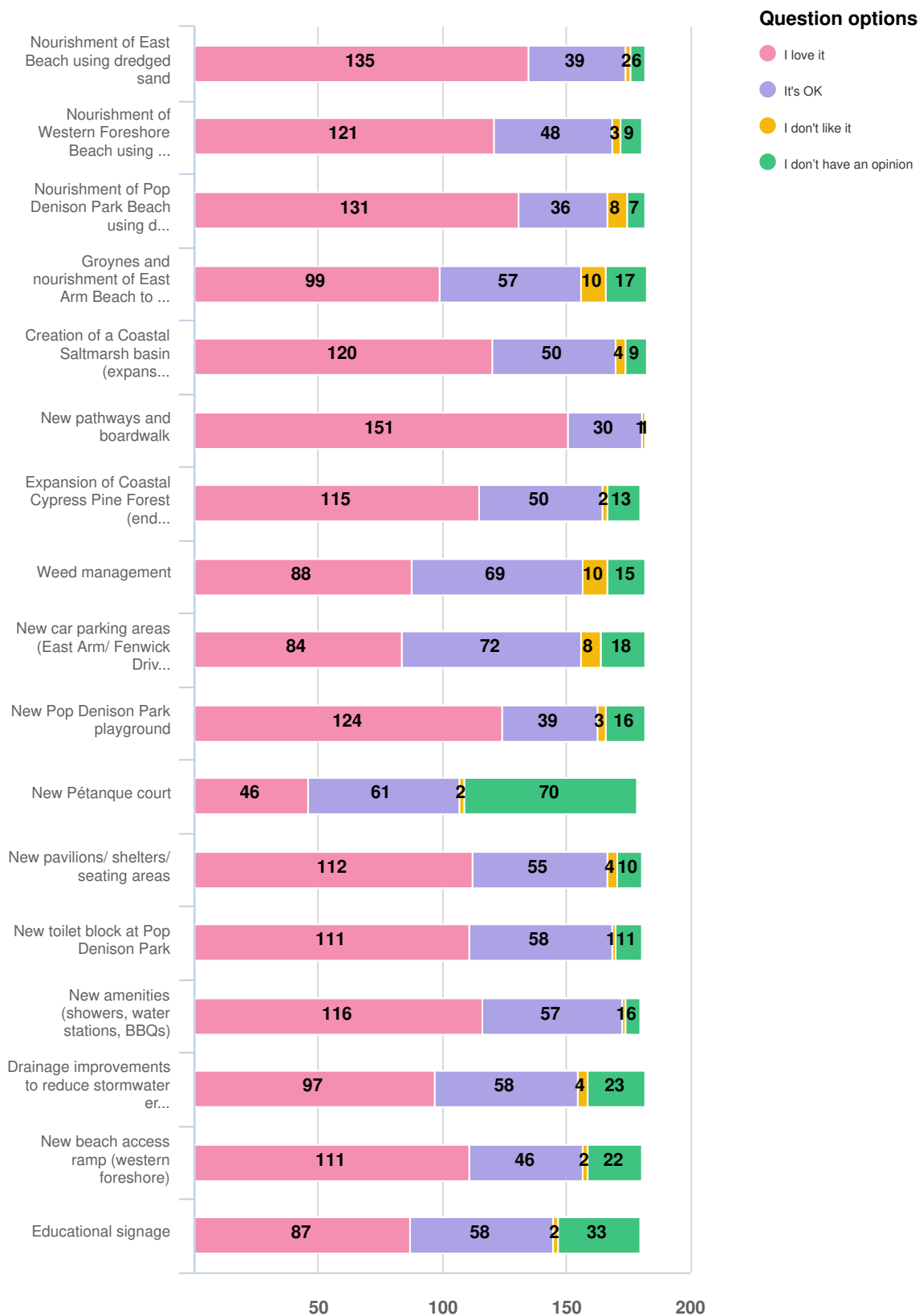
Question options

- I don't undertake this activity
- Western foreshore
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- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Optional question (181 response(s), 5 skipped)

Question type: Checkbox Question

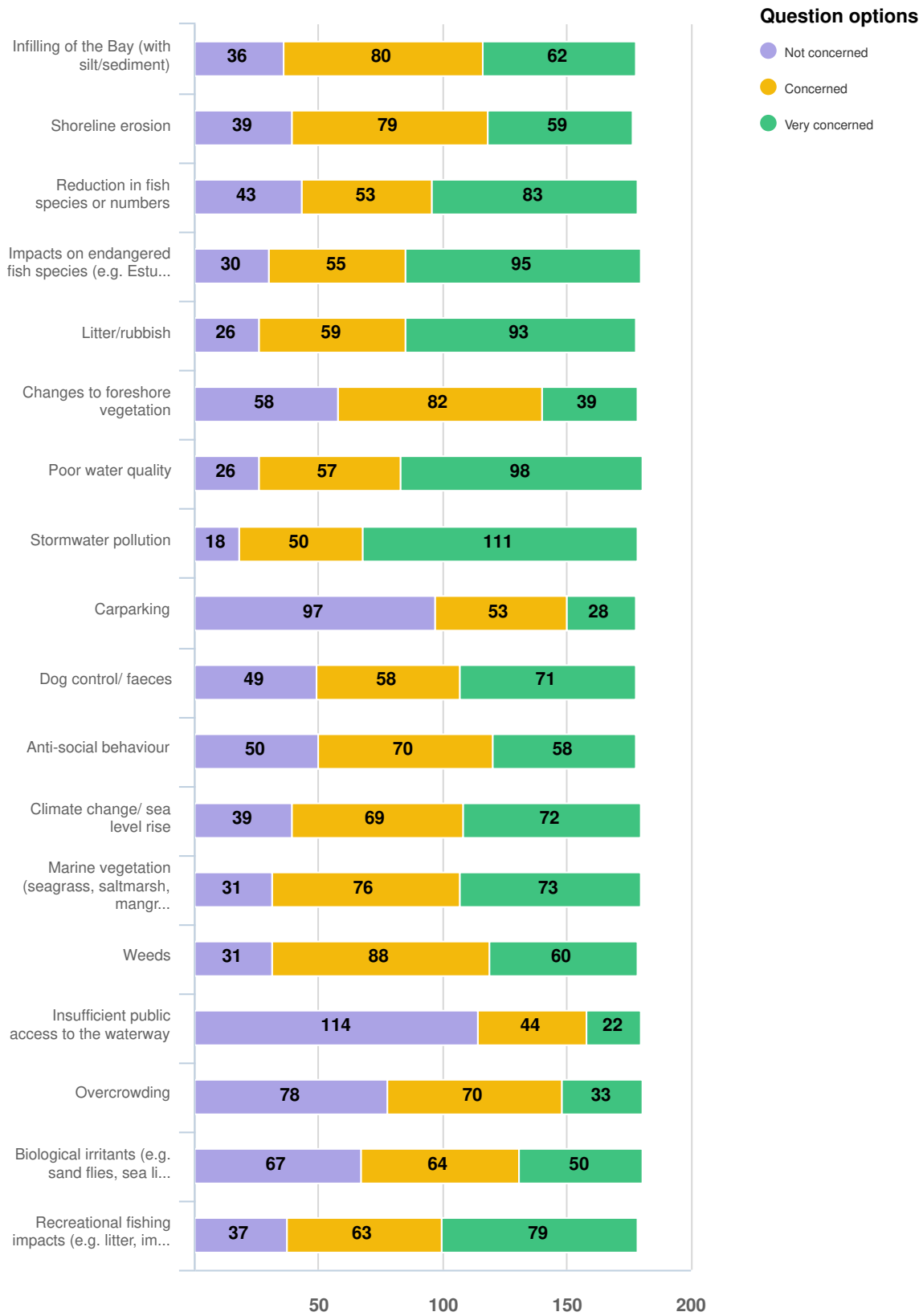
Completed works What do you think of the ecological enhancements and recreational improvements undertaken at Shaws bay?



Optional question (183 response(s), 3 skipped)

Question type: Likert Question

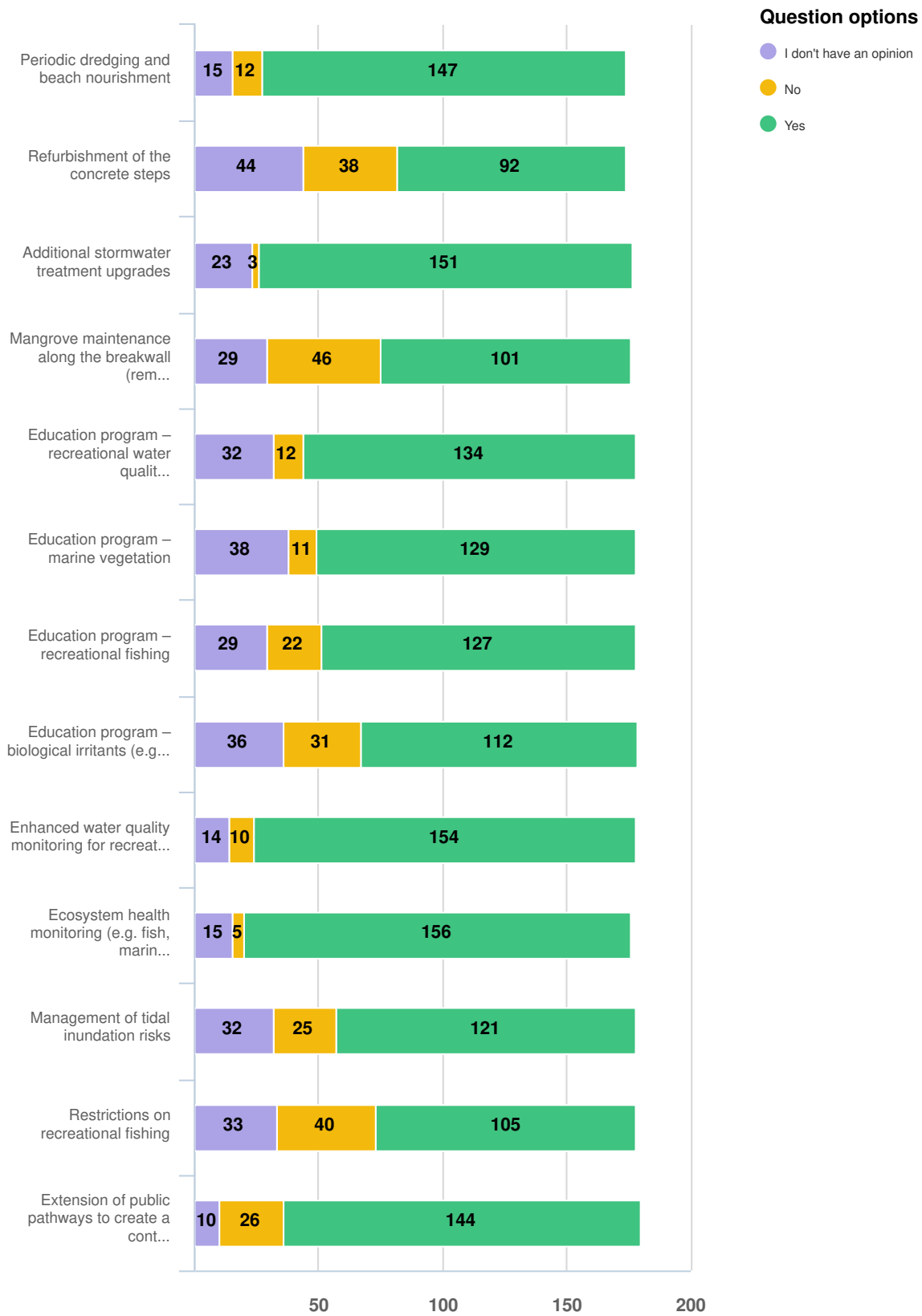
Current management issues Given the improvements undertaken at Shaws Bay, how concerned about these issues are you?



Optional question (182 response(s), 4 skipped)

Question type: Likert Question

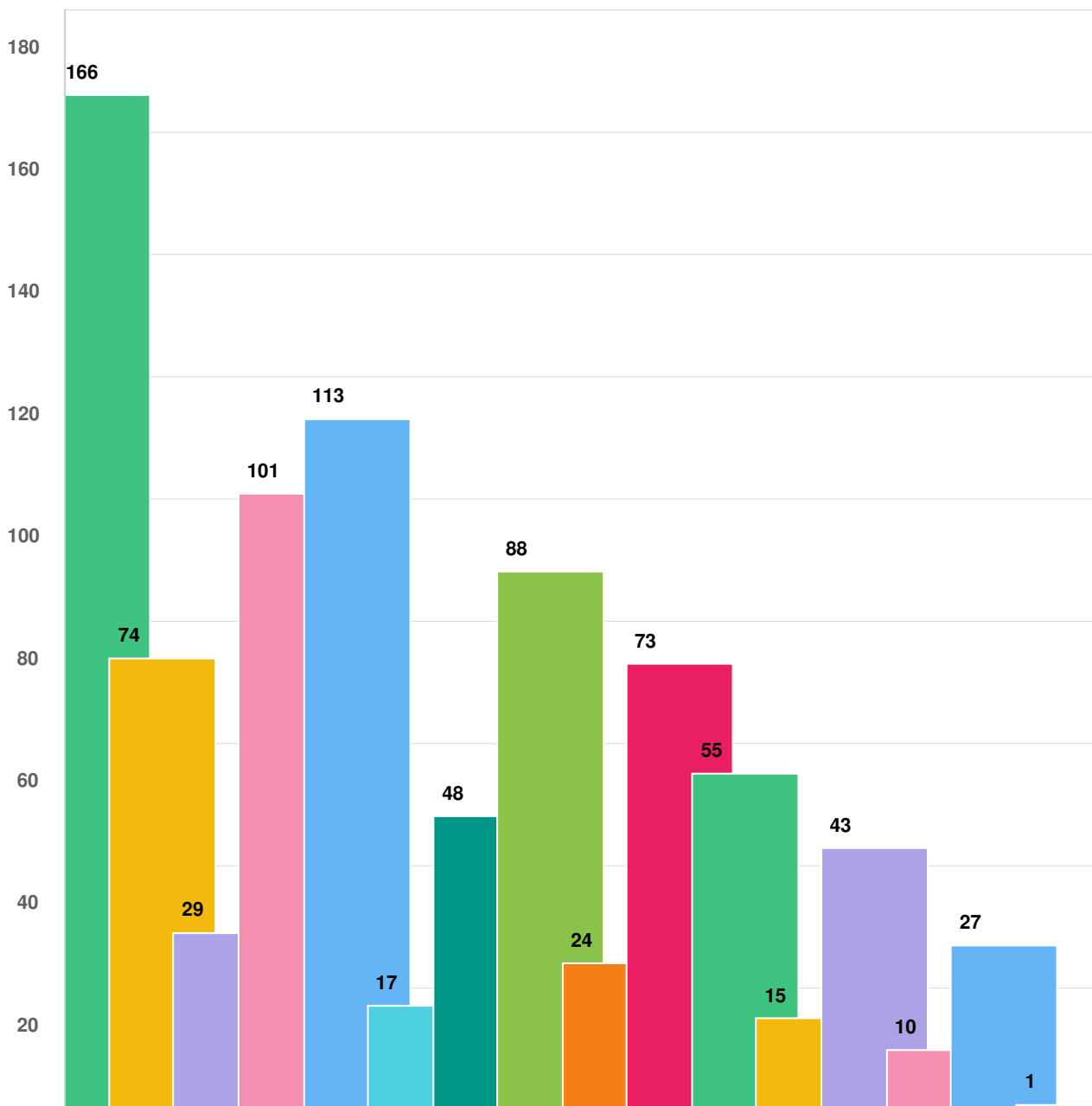
Potential future improvementsThe CZMP included other new actions, ongoing actions and management priorities. Should these a...



Optional question (180 response(s), 6 skipped)

Question type: Likert Question

Vision for Shaws Bay As part of developing the new CMP for Shaws Bay, the project team would like to capture the community's...



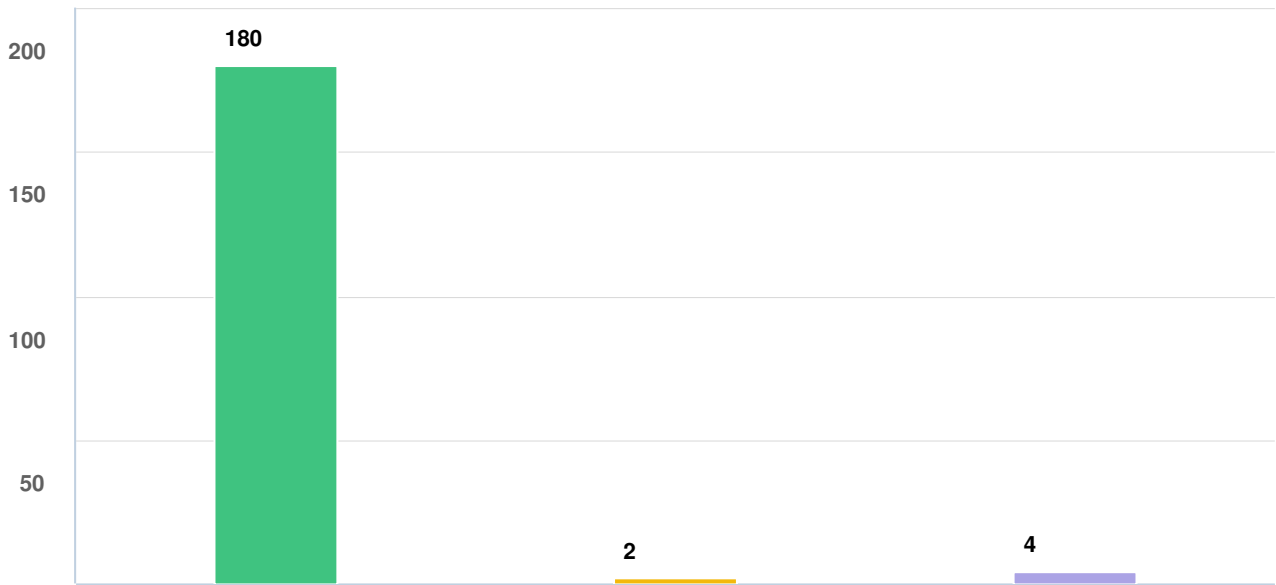
Question options

- Other (please specify)
 ● Good parking availability
 ● An informed community (education programs, signage etc.)
- Healthy native vegetation (no weeds, less cleared areas)
 ● More space/ less crowding
- Good public facilities (playgrounds, BBQs, toilets, shelters etc.)
 ● Healthy marine vegetation (seagrass, mangroves, saltmarsh)
- Great public access to foreshore
 ● Walking/ cycling opportunities
 ● Children's play opportunities
- Recreational fishing
 ● Abundant wildlife/ biodiversity
 ● Sandy beaches/ access to water
 ● Cultural heritage/ history
- Scenic beauty
 ● Good water quality (clean water/ safe to swim)

Optional question (182 response(s), 4 skipped)

Question type: Checkbox Question

In what capacity are you completing this survey?



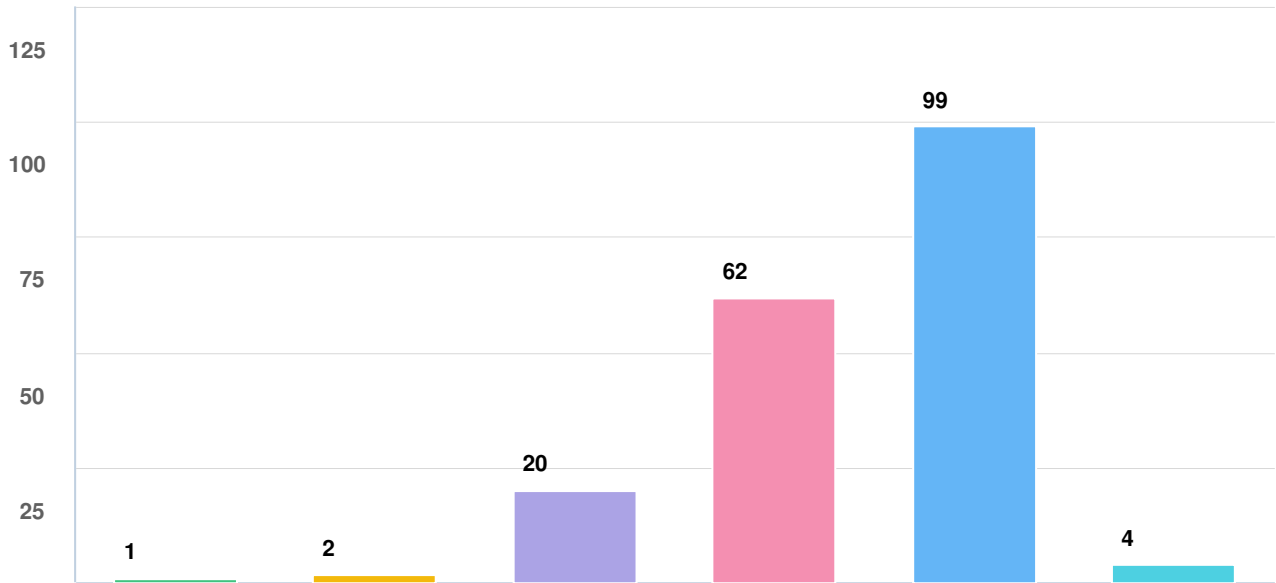
Question options

- Other (please specify)
- As a community group/organisation
- As an individual

Mandatory Question (186 response(s))

Question type: Checkbox Question

What is your age?



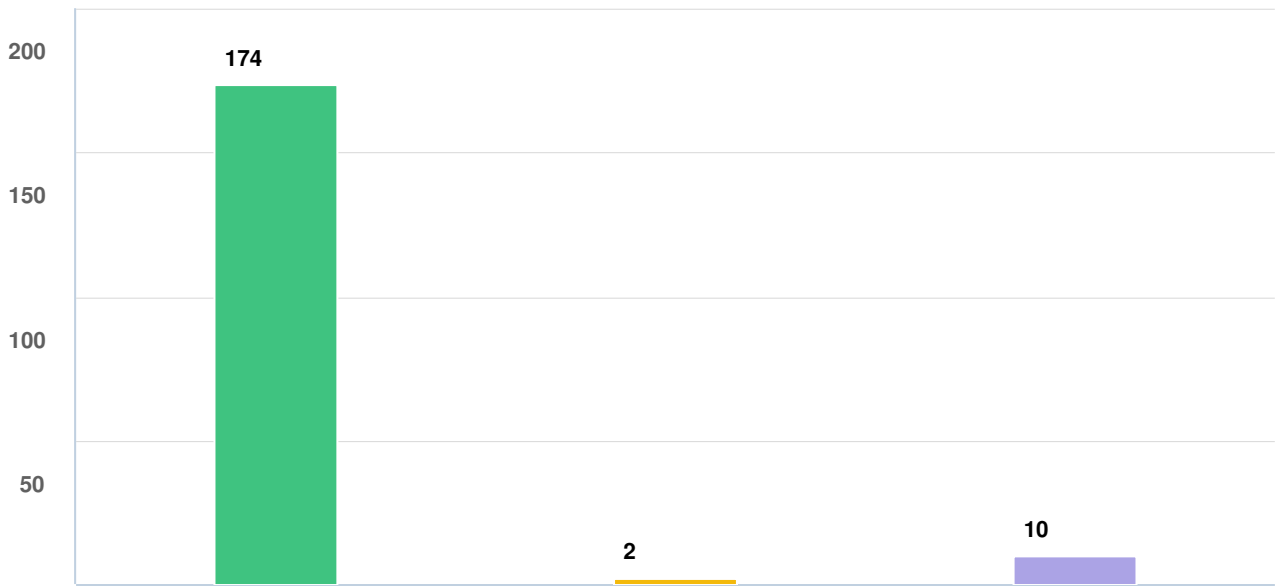
Question options

- 80 + 60 - 79 40 - 59 18 - 39 Under 18 I would prefer not to say

Mandatory Question (186 response(s))

Question type: Checkbox Question

Are you of Aboriginal and/or Torres Strait Islander Origin?



Question options

- I would prefer not to say
- Yes - Aboriginal
- No

Mandatory Question (186 response(s))

Question type: Checkbox Question

Survey Question	Text responses
<p>Survey Question 1 - Your activities at Shaws Bay – please add more detail about your responses if relevant:</p>	<p>I would like to see the kayking/boating activities kept down one end of the lake as it can be dangerous swimming when there are a lot of craft on the water with inexperienced people and children paddling.</p>
	<p>A pump track would be great down near the park at pop Denison ! Easy for the whole family to enjoy as it is all located at the same spot.</p>
	<p>As a resident and ratepayer in Shaws Bay, my family and I make significant use of and highly the public amenity that the precinct provides. Further improvement to the ecological enhancement will be necessary to maintain this provision in the long term.</p>
	<p>Council could sink a few boats in the deeper areas and make a artificial reef for snorkelling and scuba diving</p>
	<p>Found inadequate parking around Pop Denison area, especially since playground opened. Suggest another entrance to parking for parents with kids</p>
	<p>I enjoy reading the signage around the bay & the wall</p>
	<p>I freel fishing should be banned in the bay and it become a marine park as it is the one safe place you can see all types of sea life up close when snorkeling .</p>
	<p>I just love using these areas and the nature enhancements happening here.</p>
	<p>I participate in the rainbow Region dragon Boat Regatta.</p>
	<p>I think council is doing a marvelous job in all of the Ballina shire. But i think a couple of shelters with out any tables & BBQ'S would benefit small groups for various activities in all weather conditions</p>
	<p>I use the ramp on western side and e walking track</p>
	<p>I was born in ballina. Shaws bay is special. I would love to see it used more for swimming as it did in the 60's. It would be packed with people. More parking needed as in Australia Day it was crazy down there.,</p>
	<p>Its a beautiful area which I would love not to get spoilt, but should be well maintained, but with no dogs.</p>
	<p>Limit spread of mangroves</p>
	<p>Love Pop Denison park. The playground is sensational.</p>
	<p>Mountain Bike pump track next to the Pop Denison Park. This would be great for young kids and the community of mountain bikers.</p>
	<p>Need for additional lighting from Pop Denison Park to North wall. Extremely dark</p>
	<p>Need more toilet Blocks for ppl wirh Disabilities closer to the bbq areas so parents dont have to drive there kidlets up to ammenities near life saving area. Elderly ppl cant walk that far.</p>
	<p>Needs toilet block at east end of break wall & shared path area I live in that area looking at break wall there is a lot of people & children that we in the bushes along that area & on occasion s they have also used their bowels .</p>
	<p>Please make the East Arm a fishing free zone!! Many families snorkel and swim there. Also protect the very small fish that populate the area. Please move the bike track closer to the road, so children don't run across it when going from the picnic blanket</p>

Survey Question	Text responses
	Responding on behalf of the Ballina Lighthouse and Lismore SLSC. Shaws Bay is a great community asset and the Club uses it often for our Nippers when the ocean conditions are not suitable for putting juniors at risk.
	Running, cycling, dog walking the path that loops around bay. Past caravan parks, along wall, and around past Compton drive
	Safe place for young anglers so a wide range of activities needs to be promoted as there is very little for youth to do in regional areas
	Shaws Bay is a unique cultural and environmental asset and I fully support councils plan to improve and protect the area.
	Something needs to be done about knocking down or fixing up the building opposite the Western Foreshore. Paths need signs updated and bikes need a speed limit!
	Swim; standup paddle; walk or cycle throughout and around Shaws Bay daily but enter water predominantly at the western shore at the ramp
	Take the grandkids in for a swim eastern area
	The areas around East arm need dredging to open up the flow and remove sludge. Also groynes need attention as they have washed away
	The concrete steps and in front of the Shaws Bay caravan park should be improved. The steps are full of oyster shells. The shared path should connect the entire loop in front of the shaws and caravan park.
	The concrete structures under the break wall are some of the ugliest I've seen yet the area itself is beautiful.
	The east arm grass area needs more shade from trees. A huge amount of sand blows into the grass at the east arm. This needs addressing
	The improvements to date are excellent
	The relatively undeveloped northern end of the western foreshore is much appreciated in its undeveloped state. I would be disappointed to see it become hard parking as I like to day park my large RV there within sight of the water.
	Walking and cycling around Shaws Bay is a daily commitment. Swimming, and canoeing mainly in the warmer months. The playground has been a fantastic resource for the grandchildren. They also like fishing off the concrete steps. So many activities is wonderful
	We live on Shaws Bay western side swimming and snorkelling regularly having recognised most of the fish life
	We love snorkeling and seeing the vibrant fish include the giant cod
	We moved to Fenwick Drive 12 months ago. We congratulate council on the work done to create the world class amenity at this wonderful location. It is great to see the regular use of the area, particularly by young families.
	Youmping for nippers should not be allowed
	Observing/watching the birdlife at East Arm and along North Wall. Goynes at East arm need more rock now.

Survey Question	Text responses
<p>Survey Question 2 - What do you think of the ecological enhancements and recreational improvements undertaken at Shaws bay? – please add more detail about your responses if relevant:</p>	<p>No responses</p>
<p>Survey Question 3 Current management issues - Given the improvements undertaken at Shaws Bay, how concerned about these issues are you? – please add more detail about your responses if relevant:</p>	<p>Construction of groynes has limited benefit with substantial impact to beach amenity. Accepting that sand movements is inevitable, this should be managed by routine/reactive dredging or mechanical excavation and included in the management plan.</p> <p>Council have done an amazing job beautifying Shaws bay and improving this amenity, continual improvement will be fantastic.</p> <p>Definitely need more signage for visitors and the likes, people are always asking questions re the fish life and species observed in the east Arm</p> <p>Drainage improvements to reduce stormwater erosion - more could be done. New Pétanque court - some shade structure???? Need to stop people parking on the grass on Western foreshore.</p> <p>Eastern arm beach has been reduced to no water but for a very small channel at low tide with grasses only in very middle, of channel. along the rock wall in same area were once very deep crevices</p> <p>Eastern beach - sand has already disappeared into the water- east beach area is now so shallow no fish are there and along the rock wall has become very muddy and not beautiful and clear as it used to be</p> <p>Enhanced beaches in Shaw's Bay are great and make it so much more pleasant to use the bay for water activities</p> <p>Good to see the area spruced up. It needed it.</p> <p>Grounds at east arm can be dangerous at times, sand disappears between rocks and can be an issue when kids are playing.</p> <p>Have questioned a few of the works, but very impressed overall</p> <p>I am disappointed the recreational playground is predominantly focused on small kids and parents. Something for teenagers, such as a basketball court (combined FUTSAL field) would provide an outlet for elder kids, teenagers and adults too.</p> <p>I am very impressed with the work that the council has done in the Shaws Bay area. I regularly snorkel, when the water is clear enough and I use the area with my walking group frequently. The new plantings are growing well and the area is well used .</p> <p>I don't like the idea of dredging due to destroying natural marine vegetation. The mangroves that filter the water should remain. Anything that is beneficial to keeping this area thriving, should remain. Protect the marine life/environment is important.</p>

Survey Question	Text responses
	I feel that the new paths need repairing in places. More trees need to be planted in open grass areas I.e. near southern end of Lakeside Caravan park. i.e. near the end of Lakeside Caravan Park and up towards the Flotilla.
	I love the upgrades - council have done great!
	It's a shame there aren't more bike racks near Pop Denison & pétanque courts
	It's all been terrific and have appreciated most improvements to date, but it looks as if it's starting to go over the top, the latest railings and ramp on the western beach are too much. Spoiling the natural look
	Maybe the equivalent of a dune care community group to assist management?
	More parking is needed And more undercover shelter alongside more bbq facilities was better before upgrading pop Denison have tables need shaded clothes for sun shelter
	More seating and seating with cover is needed at Pop Denison park, it is always packed and well used which is great but we can never get a seat 😞
	More Tables and benches at kids playground. More seating from Pop Denison park to north wall
	Mountain bike pump track next to Park for kids.
	Need more Pavilions shelters and seating. Mainly on the Western side.
	Need toilets east end. Clean up bush scrub along footpath east wall walkway
	Numerous cyclists in this area and yet no Bike Racks along pathways or Pop Denison Park, The area near the Marine Air Sea Rescue where there are numerous bikes go up and down the wall if had bike racks at the corner of marine rescue
	Perhaps more shade areas
	Require more shaded seating throughout Shaws Bay
	Sand has washed away near on the eastern shore leaving a steep entry to the water.
	Some cars access the Ballina Holiday park via the Pop Denison carpark. Not good. Signs are fantastic for education and information. Some are faded and need updating.
	Some more bench seating at Pop Denison & the western foreshore would be great. If expansion/new board walks, regular bench seating to sit would be valuable
	The areas looking great
	The new playground is first-class
	The nourishment and sand out on east arm beach has eroded into the bay, significantly reducing swimable area and clogging the bay with sand so that fish and wildlife have reduced water in this area, it would benefit from being dredged.
	There is insufficient weed management currently occurring within the ecological restoration zones. What has been completed so far has significantly improved the ecological function and biodiversity within the precinct but more is required.
	There is no new car park at the east arm/ Fenwick drive area? The rock groins at the eastern arm are now covered in sand, so what's the point, sand is now drowning the seagrass
	Very dangerous Shared Path behind Main beach needs to be walking only. Construct a bike pathway across the road on the western grass area behind the parking spaces.

Survey Question	Text responses
	<p>We have observed on numerous occasions, party litter such as balloons and non degradable confetti being left to blow into the water. This is a real danger to marine life. I highly recommend that these products be banned from the park areas.</p> <p>We live in Wardell, but come to Shaws Bay regularly in the warmer months to relax and swim. We particularly enjoy the Eastern arm and the improvements undertaken there in the last few years. It would be good to have a few more picnic tables and shelter</p> <p>Well done, so far.</p> <p>Would like more education signage of the indigenous history and names of the area.</p>
<p>Survey Question 4 -Other management issues. Do you believe there are any other issues or problems at Shaws Bay? Please explain your answer</p>	<p>As a fairly recent Ballina citizen I have been impressed by what has been done. I would be concerned if the area became too "prettified" . It seems just right as it is. Clearly climate change is going to be an ongoing issue.</p> <p>Beach degrades, mangroves taking over</p> <p>Clean up the old run down building on the west side of the basin opposite the swimming area. Would be good to see the toilet block and seating next to Shaws Bay Hotel cleaned up.</p> <p>Consideration of nearby residents needs to be a priority.</p> <p>Council has put major money into the pop Denison end, yet it is the worst place to swim due to the lack of water movement, so there are always sea lice present. Silt on east arm is becoming a major issue, and east arm is unusable on a low to medium tide</p> <p>Dogs not on leads or behaving badly is very common unfortunately</p> <p>Estuary cod - extensive signing required to stress that these fish must not be targeted or caught. Carparking - insufficient spaces in Pop Denison park and playground area</p> <p>Fishing in Shaws Bay should not be allowed - very concerned at the cod etc being taken</p> <p>Fishing should be stopped. Banned. This is an aquarium. It's a tourist sites. NO FISHING</p> <p>Fishing!!! I travel from Tweed Heads most high tides to snorkel in Shaw's Bay. In Shallow water you can swim swim with incredible fish (Giant Trevally, Queensland Grouper, Estuary Cod etc) that most people only see on a Great Barrier Reef Trip.</p> <p>Get rid of fishing in this area Plenty other areas to fish</p> <p>I believe Shaw's Bay should be a Marine park to protect protect beautiful fish from people fishing. Snorkeling will attract more people to see the big cod</p> <p>I believe that Compton Drive should be changed to a 40 km speed limit from Hill St intersection to the path at Pop Denison Park.</p> <p>I don't think stormwater drains should drain into Shaws Bay.</p> <p>I feel there needs to be more shelters constructed in the area as it is becoming increasingly popular. These shelters could be constructed on the grassed areas near the East Arm and on the grassed areas towards the the amenities block</p> <p>I think that shaws bay should be a marine sanctuary and that fishing should not be allowed in shaws bay as there is so many exotic species that should be left alone in there so it keeps on replenishing for generations.</p>

Survey Question	Text responses
	I think the improvements have done amazing things for the bay and continuing to manage the concerns and issues above is essential. Living in Ballina environmental concerns and impacts that we have on the environment are always a priority.
	I would like to see no fishing allowed in Shaws Bay. Unfortunately I have seen extremely large fish caught, and left on the bank to rot.
	Illumination. There is excellent lighting on the Rockwell at night, resulting in many people coming to walk and exercise in the evening. However, the remainder of the walkway around the lagoon isn't lit, meaning it doesn't feel safe to walk the loop.
	Infilling of the bay is an ongoing risk and there should be a regular program of dredging to ensure parts of the bay don't become silted out. There may also need to be some management of the mangroves to prevent them from choking the bay.
	Insufficient lighting or poorly lit areas such as on the steps from Pine Avenue down to Western Foreshore area. Lack of areas for residents and visitors to walk dogs on beaches. Some shires allow dogs on beaches before 7.30 or after 4.30 pm.
	More Dog Refuse Bag dispensers in the area would be great on the Eastern/Pop Dennison side.
	My responses are generic across all areas. Despite the improvements the massive population increase is having a massive negative impact.
	Need for extra lighting on pathways
	Need more bike racks and paths swept or blown off on corner near Discovery park & sand over path near ground beach
	Need to get rid of overhead powerlines across the lake
	Need toilet block east end walkway people urinating along walkway in bushes. I live there and see it happen
	No, not at this stage. However if the human interference of this area is too much/incorrect it could be detrimental. I think the water quality appears quite good at times. So any of the vegetation around that assists this should remain.
	Not particularly except a number of people who either don't know or don't think the no dogs on beach rules apply to them. I'm more concerned if something can be done about re-shaped sandbar at Missingham Bridge /Gawandi Beach surf spot since flood movement
	Occasional discharge of grey water into Shaws Bay from caravans in Shaws Bay Holiday Park. I have reported this activity to Council. Monitoring from Park management should keep this problem in check.
	One again I reiterate that fishing in the bay should be banned.
	More parking needed at Pop Denison Park. We love taking our grandchildren to the park, 2-3 times a week. We try to avoid weekends when it's busy and parking is an issue.
	Parking
	Path signs need refreshing and with the increased pedestrians need signage 'keep to the left' and 'bikes ring bells when approaching pedestrians, plus should have a bike speed limit!
	Please address the issues I raised. Protect fish from fishing in eastern arm. Protect children from bikes by moving away from beach edge at eastern arm. Protect walking folk from old farts on electric bikes hooning around the curves behind main beach.

Survey Question	Text responses
	Please don't close for fishing, people with disabilities can access and take kid's fishing. May suggest better educational signage regarding fish in Bsy and more rubbish disposal bins
	Please ignore my responses in item 16. There is no correlation between the question proposed and the topics for comment. The survey is a great idea but has been poorly written.
	Please stop fishing in Shaw's bay
	possible overuse in the future but that is a problem in Ballina in general
	Road into Pop Denison and surrounding car park badly needs re-surfacing. More parking space required due increasing popularity.
	Rock wall on north wall at east arm is now a mud flat where as it once was a deep rock pools and crevices for all kinds of fishes. Frog habitats on toilet side of Compton drive are continuously mowed down because of long grass??? But could be made into a
	Saturday night alcohol consumption and underage drinking.
	Shaws bay attracts more than it's fair share of Council resources and funding compared to the other foreshore areas in the Ballina Coastal Reserve (managed by Council).
	Since dredging and new sandy beaches established weed has reappeared on the sandy bottom in swimming areas.
	Sometimes at night there are parties at Pop Denison. Neighbours should be able to contact after hours ranger and area patrolled.
	Speed of traffic on Compton Drive is too fast noting the increased number of children using Shaws Bay. Suggest Compton Drive speed be reduced to 40km/hr between Hill St intersection and Pop Denison turn off.
	Stop public fishing in Shawn's Bay due to low numbers of fish.
	Stormwater directed into the bay is a major contributor to poor water quality
	The biggest problem with Shaws Bay is overland pollution in heavy rain
	The cars that access the caravan park. Especially during peak periods. Only one car is allowed so tenants get the other car in using Pop Denison access.
	The clay capping around the cypress forest restoration area requires remediation for better water infiltration. Constructed wetland to manage nutrient inflows from the dog park on the opposite side of Compton Dr. to be considered for improvements to WQ.
	The fish in the bay are decreasing because of the late night fishermen who are not being fined for netting the bay or taking illegal species.
	The old pathway along Compton Drive is too close to the road and oncoming traffic, especially turning the corner at the northern end of Shaws Bay. It is very dangerous with no separation between cars and pedestrians/cyclists, especially small children.
	The open area at the rear of The Shaws Bay Hotel causes noise issues when live music plays across the water.
	The sand put on east arm beach has eroded into the bay, and now a lot of area that used to be sea grass has been covered in sand. Without being dredged the east arm will likely completely fill with sand, most of the volume of fish species are found here

Survey Question	Text responses
	<p>Very concerned about the water clarity and mud deposits along the wall. More oysterz would help clean up the water</p> <p>Very much numerous tourists and locals using the facility</p> <p>Was told that there would be a recreation/play area for teens with a flying fox etc, when will that happen?</p> <p>Would like prompt and regular access to any water quality measurements maybe signage or an app to indicate when its unsafe to swim here.</p> <p>Overcrowding at holiday times. The water flow through the wall has improved since the early March flood last year so we now need to better **** the *** area so that it is more accessible.</p>
<p>Other potential improvements. Should other actions or additional improvements or management priorities be considered for the new plan? Please explain your answer</p>	<p>A boardwalk joining the stone wall at boundary of the council caravan park and the southern end of Shaws Bay Hotel beach to the stone wall at Crompton Dr would create great access to and from the wall walk and Crompton Dr .It would also protect sen</p> <p>A definite need to widen the shared pathway from the north western end of Compton Drive leading up the hill to the Shaws Bay Hotel</p> <p>a full circumference Shared Path of the bay would be excellent</p> <p>A path in front of the Holiday Park (ie on top of the sea wall) - I regularly walk this and there are often sink holes - it is quite dangerous</p> <p>A potential ocean 'lap pool' off the concrete steps to provide free exercise area</p> <p>A timber boardwalk along the concrete steps going out 5m. Widen the footpath on Compton Drive between Hill st and Western foreshore beach area. Restaurants/cafe on Compton Drive opposite western beach area be redeveloped.</p> <p>Addition of constructed wetland to manage nutrient inflows from dog park/water quality improvement/biodiversity, soil remediation of clay capping to enhance water infiltration. Expansion of weed management program.</p> <p>Additional funding should be prioritized to other foreshore areas in Ballina Shire over additional improvement works in Shaws Bay</p> <p>As a child in the 60s there was never a time that there were sea lice there. Fixing the strips would be good but needs to have rails and oysters removed. I remember they were very steep and cut feet from oysters were very deep cuts.</p> <p>As a resident in Fenwick drive I believe that shaws bay should be a marine sanctuary as there are so many people that illegally fish in shaws bay at night and catch lots the endangered estuary cod.</p> <p>As said earlier, please retain the rough parking area on the northern end of the western side.</p> <p>Better linkage of this area to other recreational areas</p> <p>Bike racks</p> <p>Bike Racks all around the precinct. As numerous bike riders use all these pathways but no area for people to put bikes and go for walks around foreshore</p> <p>Clean out the muddy sand. It's a walk at low tide. It needs to be deeper</p>

Survey Question	Text responses
	Compton drive toilet block and its surrounds should be beautified. Stairs from hill st down to Compton drive need to be cleaned up and vegetation improved. Wetland area should be established at base with rocks etc for frog habitat paperbarks-no mowing
	Continue the driveway through to Fenwick Street to ease traffic congestion around Pop Denison / playground area
	Could distance buoys be installed in the Bay for swimmers and boarders to measure their swim?
	Could we add a pontoon?? Allow someone to set up a hire shop for SUPs and kayaks?
	Dredging if the east arm of the bay
	Eastern end walkway need's bushes cleaned up. Lots of snakes come out of bushes along the walkway
	Encourage snorkeling and ban fishing. Education boards with unusual fish that inhabit the bay.
	extension of walkways would be valuable (eg area in front of the Hotel)
	Fishing in Shawn's Bay should be band
	Fishing should be prohibited. The eastern arm is choked full of sand, it is the best part of the bay to swim due to the inrush of fresh water, yet it is unusable until a high tide. The east is lice free and clean fresh water but sand is choking the east
	I don't have an informed opinion on the 2 issues above. I trust the council to maintain mangroves if needed and I know they already monitor water quality. At the times I go to Shaws Bay I 'm not bothered by sandflies.
	I like the idea of a path all the way around the bay . However I'm concerned about to much concrete
	I think it is now good the way it is. How about letting nature do its job with some things. Instead of trying to control everything.
	I think recreational fishing is important for the tourists however I believe the East Arm should be made a marine sanctuary with no fishing as there is an immense attraction here for viewing and snorkelling. Should be protected.
	I would like more exlanation on the mangrove removal as I do not inderstand the pros and cons of this type of vegetation management
	I would like to see better access at the concrete steps. It is quite dangerous to try and get into the water either at high or low tide and getting out is virtually impossible. Not to mention slippery stair and oysters. It's such a beautiful area
	If wanting opinions, leave enough space to write all that needs to be said..toilet on Compton drive could be painted to look appealing rather than derelict.
	Improved car parking around Pop Denison Park. Once the second, older children's playground has been completed, there will be even more pressure on parking in this area.
	Improved lighting in all areas and more bins for dog walkers - eg breakwater-encourage people to do the right thing, not leave as no option to drop off dog bags/rubbish
	Just to build an elevated walkway in front of the hotel and caravan park to allow safe circumnavigation of Shaw's bay.

Survey Question	Text responses
	Keep up the great environmental improvements and places to Emily them. And educational signs to understand how it all works. Thank you.
	Loop around entire bay and in front of the shawsy should be prioritised. Increased vegetation and native habitat should be investigated.
	More native shade trees along the eastern arm. Better water quality management (runoff from cane/macca farming). Building of the senior children's park. Better monitoring of dogs of leashes and swimming in Shaws Bay.
	more shade trees on east beach and east arm
	Need to get rid of overhead powerlines across the lake
	New fences on Compton Drive as pine log fences are falling down! Needs more parking spaces for Children's Playground area in the area near the pétanque courts. This could be used by families to safely access the park and players too. Widen the entrance .
	Outdoor activities for teenagers and adults, such as a combined futsal/basketball court, pickle ball courts etc.
	Pathways to be brushed and cleared regularly
	Pedestrian crossing or pedestrian island provided to ensure safe crossing across Compton Drv from Pop Denison Park to the off leash dogarea
	Please move the old pathway along Compton Drive (north of the recently upgraded section) further away from the road and separate from traffic. Could have formalised parking areas in front of path like was done for section to the south (which is great).
	Recreational fishing should not be restricted except for the signage necessary to protect the Estuary Cod
	Reduce speed limit in Compton Drive to 40 kms
	Signs to explain Heritage ie The Rifle Range, The course of the river in 1842, Wreck sites.
	Sink a few boats make a artificial reef to improve fish health , diversity and numbers
	Suitable lighting for safety
	The entire area (pub, old units and caravan park) needs a rethink. Redesign the whole area and build a new larger police station there. That would encourage a safer public space, especially at night.
	The path from Western side to breakwall would be very good. Continuing the next stages of the playgrounds.
	The population is increasing with new housing estates - with lots of new families so this has to be taken into account
	There are so many amazing places to fish in Ballina. I would LOVE to see all fishing stopped in the bay. Definitely the East arm. It's dangerous for swimmers/snorkelers and devastating to see those beautiful big fish caught.
	There needs to be lights on the stairs up from Crompton to Pine Avenue, and cutting back of the growth.
	Toilet block east arm beach area plus more undercover tables
	Water quality timely communication is my primary concern in regards to swimming safety

Survey Question	Text responses
<p>Is there any other information you wish to provide to the project team? Additional comments can be provided here.</p>	<p>'- make shaws bay a marine sanctuary - make a pump track down near the new playground in pop Denison park.</p> <p>1. The grassed area located next to the Shaws Bay Hotel beach is home to numerous bird life including Egrets, Ducks, Ibis, and ground dwelling Plovers and shouldn't be extended into a bigger beach area. There is also a stretch of sea grass along the shoreline which should be protected.</p> <p>2. Spraying of Roundup along the length of north wall should be stopped and a more environmentally friendly alternative used. We have seen families of Blue Wrens disappear and are concerned that the spray runoff will go into the water below.</p> <p>A clearer understanding of the outcomes of this survey and any future work done on the Shaws Bay Area. CAN THE TEMPORARY FENCING THAT HAS NOW BEEN THERE FOR YEARS PLEASE BE REPLACED. WITH A MORE FITTING FENCE TO NOT ONLY PROTECT THE AREA AND ALSO BE VISUALLY ENCHANCED.</p> <p>Additional comments relate to:</p> <p>The ongoing problem of inconsiderate dog owners. Since the beach replenishment program the beaches on the east beach and east arm beach people regularly take their dogs onto these new beaches. Dogs are also regularly taken onto the grassed area of Pop Denison Park in and around the barbeque facilities. Maybe stronger signage will work? More regular patrols from the rangers?</p> <p>Use of Shaws Bay by recreational and serious swimmers (triathletes etc.). The water off Pop Denison Park beach i.e. the far north eastern portion of Shaws Bay contains the coldest water in the Bay particularly in the May to October period. This is because it receives much of the freshwater (colder than sea water) runoff from the ridgeline above Compton Drive and there is less flushing of this portion of the Bay from the warmer tidal inflow. Most swimmers using Shaws Bay can't use the east arm beach area to access the rest of the Bay as the recent dredging did not occur in this area. The east arm area is only easily navigable at high tide. I recognise that there are Seagrass beds in this location. I have no solution to this matter apart from the potential promotion of seagrass beds in the far north-eastern corner of the Bay where the water is colder and less likely to be utilised by swimmers for 5 months of the year. The promotion of seagrass in this location would offset any losses caused by dredging in the east arm beach area.</p> <p>Lack of parking particularly during the warmer months. Cars parking on the entry roadway to Pop Denison park are a hazard to children and a significant hazard for drivers who have to drive along a very narrow sealed area of the remaining roadway. I would imagine Council are aware of this problem and will remedy the matter by providing ample parking on the large area of the grassed reserve nearby. I think a portion of this grassed reserve should be set aside for creating a native vegetation area. I don't believe that this regenerated conservation area should have pedestrian access through it. Pedestrian access promotes rubbish dumping, dog faeces/attacks on native animals and weed problems on the edges of pathways.</p> <p>Additional shade in some areas would be beneficial - e.g. over the pathway from East Arm Beach toward North Wall as that can be far too hot in Summer. Might also provide more habitat for animals</p>

Survey Question	Text responses
	<p>As a long term resident of Ballina I have seen many changes to Shaws Bay including the construction of Compton Drive, the development of Shaws Bay residential development and the Discovery Caravan Park . I have seen the ocean almost break through into Shaws Bay in the 1974 cyclonic weather. I have seen the demise of two resident turtles and many mature fish including cod and giant trevally. I have seen the gradual degradation of water quality due to silt laden flood waters from the upstream Richmond River catchment. Nonetheless I have swum in Shaws Bay in all seasons for over 55 years on an almost daily basis, water quality permitting. I see the two greatest threats to this water body as pollution and recreational fishing. The pollution issue is a whole of catchment problem. The reduction of the resident fish population is one more readily resolved by placing a ban on recreational fishing in the bay. There are ample locations and opportunities for recreational fishing in the near vicinity without depleting a limited stock in Shaws Bay.</p>
	<p>Clean up out of control bush area east end & put in more tables for people to enjoy</p>
	<p>Council has done a great job and it is satisfying to see so many people using the area. Fishing should be banned to give the marine life a chance.</p>
	<p>Council should be commended for having such wonderful facilities in Shaws Bay.</p>
	<p>Create a mountain Bike Pump Track for kids and young mountain bike enthusiasts. This should be placed right next to the Pop Denison Park. Please!</p>
	<p>Create a pump track near the park for kids, similar to the Suffolk park pump park!</p>
	<p>developing safe learn to swim areas for young people could be an additional thought process.</p>
	<p>Ecological protection. Traffic calming and on the other side of Shaw's Bay limit jet skis. The gold coast attitudes are rapidly impacting and changing ballinas peace and beauty and distressing marine life. Let's market Ballina for a beautiful environment and low key lifestyle, not the gold coast lifestyle. Cars on beaches, Noise, speeding cars and jet skis etc. they are coming in droves now and destroying nature and all Good work going on. Here. PLEASE LISTEN AND ACT</p>
	<p>Every time I ask a dog owner to take their dog out of the water, they say they didn't see the sign. More signs prohibiting dogs please. We want to protect the birdlife.</p>
	<p>Fix the very poor area next to Compton drive stairs It's a mess Turn it into little exercise area</p>
	<p>Having been swimming in Shaws Bay for over 40 yrs I compliment and appreciate the improvements made to the Bay precinct by BSC . Such an asset to Ballina</p>
	<p>I am blown away every time I snorkel in Shaw's Bay by the incredible fish. I would LOVE for it to be a fishing free zone.</p>
	<p>I do feel that a couple of Shelters with concrete base and just a roof, that could accommodate a dozen people would be of great use</p>
	<p>I feel there is a need for slow-down bumps along the western foreshore road.</p>
	<p>I love Shaws Bay. Keep up the good work and protect the fish, children and walkers.</p>
	<p>I think it would be good to get rid of some of the weeds, like prickly pear, that grow along the bay side of North Wall.</p>

Survey Question	Text responses
	I think the planned pump track should be built next to Pop Denison Park not next to the netball courts.
	I used to live in East Ballina until relatively recently and I'm in Shaws Bay on average 3 times a week all year.
	I would like to see more signs about the impact of dogs on beaches/in Shaws Bay - educative signs about their impact so people consider keeping them on a leash; some simple signs about native plants and animals similar to those great ones about the First Nations heritage would connect people with the environment; as a Coastcarer I often gets asked about what we are going and about what each plant is
	I would like to see the whole of Shaw's Bay become a marine reserve. No fishing allowed.
	I would not like to see any further development (eg caravan parks, shops etc) encroaching on any part of the Shaws Bay area under discussion.
	I'm afraid this survey has been poorly designed and will provide only superficial data and possibly incorrect conclusions. I was going to suggest a boardwalk to be built in front of the holiday park to complete a walking / cycling circuit around the bay but despite the 'have your say' title there doesn't appear to be any dedicated area for this. I have no criticism of Shaw's Bay itself and the work Council has done is fantastic!
	It's a great area to be enjoyed by all.
	Keep it looking the same way but make it environmentally friendly
	Keep up the excellent work. Shaw's Bay is one of the reasons I have enjoyed moving to this area 7 years ago. Improvements over the last couple of years have made it even better.
	Keep up the great work
	Love Shaws Bay but don't want to see it loved to death and therefore degraded, education in local media and Community Connect can be ongoing to educate the local community about respecting this wonderful asset we have.
	Love using the bay, have done so for 60 odd years, the recent improvements are great, we need to let kids learn to fish in the bay but we need to protect what has become an amazing fish environment in the East Arm.
	More small shade covers for individuals/families to sit under . More access to food shops and more access to amenities particularly on the western side such as toilets, bbqs seating etc
	More trees please
	No
	No
	Please consider extending the lighting along the rock wall to the end, along to the surf club, and back all the way to the town centre. With daylight ending at approx 5-5:30 in the winter, it would significantly increase the opportunity to utilise these great walk/riding paths and facilities.
	Please use rocks not concrete on future break wall maintenance.

Survey Question	Text responses
	<p>PONTOON IN THE MIDDLE WOULD BE GREAT. THERE ARE 2 IN THE NAMBUCCA HEADS AREA, AND THEY ARE ALWAYS OCCUPIED. HAVE A PHOTO WITH CHILDREN ON IT.</p>
	<p>Priority consideration to be given to nature-based solutions for managing water quality/biodiversity/long-term investment return on capital expenditure for further improvement works - e.g., clay capping around Pop Denison Park is a major barrier for water infiltration, high volume surface flows result in large nutrient inflows (particularly from the dog park on the northern side of Compton Dr.) which impacts water quality, reduces establish capacity of plantings currently placed within the coastal cypress pine forest at the park's entrance and around the saltmarsh basin. Low cost, ecologically restorative solutions such as a constructed wetland would provide multiple benefits for these problems over the longer term.</p> <p>Additionally, weed management program is currently insufficient to assist in the establishment of plantings used to enhance the precinct's public amenity. Recommend engaging professional bush regeneration services/expanding BSC's bush regen. team to meet this current capacity shortfall.</p> <p>Civil works to be completed around entry point for road access/drainage. Current state of park entry is dangerous with potholes.</p>
	<p>protect the big cod! no rec fishing should happen here anymore... theres too many threats already and those big beauties are iconic and should not have there heads cut off and left on the steps. it's appalling. tourists need to fish elsewhere</p>
	<p>Regular visitor</p>
	<p>security lighting is also an issue at night, its a very dull area.</p>
	<p>Shaws Bay has an amazing diversity of fish not found anywhere else in a small safe area. I feel recreational fishing should be banned in this area to allow the public to get up close and personal with the sealife. I love fishing but this place needs to be protected for the future.</p>
	<p>Shaws Bay is a beautiful area and with a little more attention could be given the lift it badly needs. fencing, dredging, tree planting which could be done by residents and school students in consultation with council would be great initiative! A few more shelters!</p>
	<p>Shaws bay was a very attractive swimming area in history before the vegetation took over large sections of the forshaw. I am a strong supporter of not allowing anymore loss of the sandy forshaw to vegetation.</p>
	<p>Thank you for doing this - it's an important part of the family-friendly aspect of Ballina</p>
	<p>The east arm has filled with sand. It's now very shallow.I'm worried it will eventually be unswimable.</p>
	<p>The improvements are great and it is a great community asset that is well used.</p>
	<p>The need for repairs to the revetment wall at North Creek is more urgent than some items for Shaws Bay</p>
	<p>The recent works and improvements done in the bay are amazing, and benefit locals and tourists alike. Ongoing regular dredging and monitoring biodiversity will ensure the ongoing vitality of the bay itself.</p>

Survey Question	Text responses
	<p>The survey form submitted before I could add comments. Key improvements to the amenity - more trees/shade areas in east arm, no fishing in east arm and catch and release in remainder (snorkelling amongst the fish is a unique experience for the area), provision of boardwalk around west side of bay to complete full circuit, improved educational signage on cultural, heritage and history similar to coastal track.</p>
	<p>The whole project has been very positive for the town</p>
	<p>This is a potential tourist observation of the fish...if any left. From the wall. I spend a little of time talking there to tourists</p>
	<p>We are very happy with the Bay how it is. The more access you give the more it opens up to deterioration & over use. & abuse. There is a great balance of walkers,runners, bike riders mums with prams kids on scooters now plus swimmers & kayakers & fishermen. Just the water quality needs looking at. Bird life is wonderful too.</p>
	<p>We have seen the diversity and number of fish life diminish over the last five years. We have noted Groper, Rock Cod, King Fish, giant Trevally, Flathead and numerous other tropical fish in the bay and believe recreational fishing should be banned. We are constantly pickup rubbish, fishing line, fish hooks etc which have been left behind and have saved a number of bird life that have been entangled in fishing line. We are also constantly picking up rubbish including broken glass, bottles, cans and plastic from the foreshore of the Shaws Bay Hotel.</p> <p>Thank you for the opportunity to hear and present our concerns.</p>
	<p>We'd like a pump track to be built in Pop Denison parklands- currently wasted space. We'd also like the older kids playground to be built.</p> <p>We would also love a footpath on Fenwick Drive so locals (and their little kids) can safely access the area. With the increase in vehicle numbers Fenwick Drive is increasingly dangerous for kids and adults to navigate.</p> <p>Something also needs to be done about the brown water the inundates the bay with heavy rain- it takes weeks to clear.</p> <p>Thank you</p>
	<p>Without dredging the eastern side the bay is being choked from the inrush of fresh water at every high tide. What is the point in spending tax dollars on improving the bay and the surrounds when it is deteriorating slowly due to the inrush of sand. Who in their right mind decided that dredging the pop Denison end of the bay and dumping the sand to the eastern arm of the bay was a good idea? This is we're the sand comes into the bay, so building up the beaches to the east has only introduced more sand to the end we're the fresh water enters the bay under the wall. When the beaches were topped up with dredged sand, the sand was placed bellow the tide line. You don't have to be an environmental engineer to understand that if you dump sand bellow the high tide level the sand will just wash away and continue to build up below the tidal mark, now the east is unfit for use on a low tide. Because of this dumping of sand to the east, the sea grass that was protected against the recent dredging is now becoming buried in silt and incoming sand that flows in with the tides.</p>
	<p>Would be good to have a locked electricity box especially for events. When booking the area can pay to get the key for the box.</p>
	<p>Would love to chat to team re the stairs from hill st to Compton drive and the area at the bottom of the stairs - the natural spring- it is full of frogs The area could very easily be naturally enhanced to improve the frog habitat, and improve the natural vegetation to reduce the need for maintenance by mowing etc</p>

Survey Question	Text responses
	<p>Yes the team really needs to consider bicycle racks all around the area so people can park their bikes and walk along wall or along foreshow.. Spent millions at Pop Denison Park and yet no bike racks there are lots of families ride their bikes with children instead of cars and no facilities to put their bikes they have to just lye them around the area. Also the fenced off area at the other end of shaws Bay the Hotel side overgrown area fenced not looked after it is not a very good site to see when driving along picturesque area and see this area needs to be cleaned up and either think about putting bike racks there as well as so many people are know riding their bikes along the North Wall or having coffee at the Brighton Street Coffee Shop. Apparently Ballina is promoted as a Bike friendly area which it is and so many people are using their bikes to enjoy our beautiful Ballina. Seriously council you need to really get yourself out there and get all these facilities people friendly and enviromentally friendly to make Ballina a unique place of Australia which it is becoming. Superseding the Byron Bay..</p>
	<p>A couple more DPI/Fisheries signs, re protected fish species and badly needed!</p>

Shaws Bay Coastal Management Program

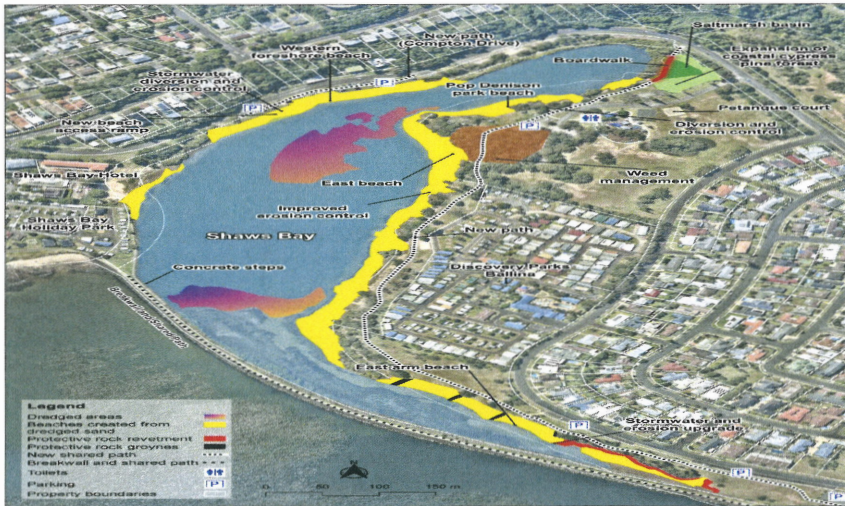
Your Say Ballina

Community Survey - Shaws Bay Coastal Management Program

This survey takes about 10-15 minutes to complete. Your input is valued and appreciated.

Study Area

For the purposes of collecting information for this survey, the questions relate to the main areas of Shaws Bay, recent ecological enhancements, and recreational improvements shown on the following map.



Shaws Bay Coastal Management Program

Your Say Ballina

Your activities at Shaws Bay (select all that apply).

Swimming

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Picnics/BBQs

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Canoeing/ kayaking/ boarding

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Snorkelling

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps

Shaws Bay Coastal Management Program

Your Say Ballina

- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Fishing

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Wildlife/ nature appreciation

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Walking/ jogging/ exercise

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Cycling

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path

Shaws Bay Coastal Management Program

Your Say Ballina

- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Dog walking

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Children's activities/ play

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Relaxing

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path
- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Education/ cultural experiences

(Please choose all locations where you undertake this activity)

(Choose all that apply)

- I don't undertake this activity
- Western foreshore
- Pop Denison Park
- Ballina Holiday & Caravan Park (east side beach)
- East Arm
- Breakwall and shared path

Shaws Bay Coastal Management Program

Your Say Ballina

- Concrete steps
- Shaws Bay Holiday Park (west side beach)
- Shaws Bay Hotel beach
- All areas

Please add more detail about your responses if relevant

Completed works

What do you think of the ecological enhancements and recreational improvements undertaken at Shaws bay?

Questions	I don't have an opinion	I don't like it	It's OK	I love it
Nourishment of East Beach using dredged sand				
Nourishment of Western Foreshore Beach using dredged sand				
Nourishment of Pop Denison Park Beach using dredged sand				
Groynes and nourishment of East Arm Beach to reduce erosion				
Creation of a Coastal Saltmarsh basin (expansion of endangered ecological community)				
New pathways and boardwalk				
Expansion of Coastal Cypress Pine Forest (endangered ecological community)				
Weed management				
New car parking areas (East Arm/ Fenwick Drive)				
New Pop Denison Park playground				
New Pétanque court				
New pavilions/ shelters/ seating areas				
New toilet block at Pop Denison Park				
New amenities (showers, water stations, BBQs)				
Drainage improvements to reduce stormwater erosion				
New beach access ramp (western foreshore)				
Educational signage				

Please add more detail about your responses if relevant

Current management issues

Given the improvements undertaken at Shaws Bay, how concerned about these issues are you?

Questions	Very concerned	Concerned	Not concerned
Infilling of the Bay (with silt/sediment)			
Shoreline erosion			
Reduction in fish species or numbers			
Impacts on endangered fish species (e.g. Estuary cod)			
Litter/rubbish			
Changes to foreshore vegetation			
Poor water quality			

Shaws Bay Coastal Management Program

Your Say Ballina

Stormwater pollution			
Carparking			
Dog control/ faeces			
Anti-social behaviour			
Climate change/ sea level rise			
Marine vegetation (seagrass, saltmarsh, mangroves) loss or degradation			
Weeds			
Insufficient public access to the waterway			
Overcrowding			
Biological irritants (e.g. sand flies, sea lice etc.)			
Recreational fishing impacts (e.g. litter, impacts on protected species etc.)			

Other management issues

Do you believe there are any other issues or problems at Shaws Bay? Please explain your answer

Potential future improvements

The CZMP included other new actions, ongoing actions and management priorities. Should these actions be considered for the new plan?

Questions	Yes	No	I don't have an opinion
Periodic dredging and beach nourishment			
Refurbishment of the concrete steps			
Additional stormwater treatment upgrades			
Mangrove maintenance along the breakwall (removing juvenile mangroves)			
Education program – recreational water quality			
Education program – marine vegetation			
Education program – recreational fishing			
Education program – biological irritants (e.g. sand flies)			
Enhanced water quality monitoring for recreational activities			
Ecosystem health monitoring (e.g. fish, marine vegetation, water quality)			
Management of tidal inundation risks			
Restrictions on recreational fishing			
Extension of public pathways to create a continuous path around the whole shoreline of Shaws Bay			

Other potential improvements

Should other actions or additional improvements or management priorities be considered for the new plan? Please explain your answer

Shaws Bay Coastal Management Program

Your Say Ballina

Vision for Shaws Bay

As part of developing the new CMP for Shaws Bay, the project team would like to capture the community's vision for the Bay.

What are the most important attributes you would like Shaws Bay to have in 10 years from now? (Select up to 5 options)

(Choose any 5 options)

- Good water quality (clean water/ safe to swim)
- Scenic beauty
- Cultural heritage/ history
- Sandy beaches/ access to water
- Abundant wildlife/ biodiversity
- Recreational fishing
- Children's play opportunities
- Walking/ cycling opportunities
- Great public access to foreshore
- Healthy marine vegetation (seagrass, mangroves, saltmarsh)
- Good public facilities (playgrounds, BBQs, toilets, shelters etc.)
- More space/ less crowding
- Healthy native vegetation (no weeds, less cleared areas)
- An informed community (education programs, signage etc.)
- Good parking availability
- Other (please specify)

In what capacity are you completing this survey?

(Choose any 1 options) (Required)

- As an individual
- As a business
- As a government agency
- As a community group/organisation
- Other (please specify)

Phone number (optional)

Email address (optional)

What is your age?

(Choose all that apply) (Required)

- I would prefer not to say
- Under 18
- 18 - 39
- 40 - 59
- 60 - 79
- 80 +

Are you of Aboriginal and/or Torres Strait Islander Origin?

(Choose all that apply) (Required)

- No
- Yes - Aboriginal
- Yes - Torres Strait Islander
- I would prefer not to say

Shaws Bay Coastal Management Program

Your Say Ballina

In what suburb do you live?

(Required)

Is there any other information you wish to provide to the project team? Additional comments can be provided here.

Thank you

Thank you for taking the time to complete the survey. Additional opportunities will be available if you wish to be involved in the development of the CMP for Shaws Bay.

Progress on the development of the CMP will be available on Your Say Ballina.

APPENDIX 2 FIRST-PASS RISK ASSESSMENT AND GAP ANALYSIS

This Appendix provides a summary of the first pass risk assessment undertaken during the preparation of the Stage 1 Scoping Study.

First-Pass Risk Assessment and Gap Analysis

OBJECTIVES

The objectives of the first pass risk assessment and information gap analysis are:

1. To identify potential management issues/ threats within the study area and assess the risk to known values and assets.
2. To identify gaps in knowledge relating to each issue and assess the importance of addressing each knowledge gap to allow for effective future management.
3. To establish if the risk and gap in knowledge warrants further investigation or detailed assessment.

The risk assessment and gap analysis were combined into one process to streamline the investigation and identify where gaps in knowledge will hinder successful future management of issues.

RISK ASSESSMENT METHODOLOGY

Key information sources are background information, stakeholder feedback and the status of actions from the previous CZMP. Priority threats identified in the TARA for the Marine Estate (BMT WBM, 2017) were also considered where relevant.

The risk assessment process identifies credible risks, the likelihood of the risk event occurring given existing controls, the consequences to environment, social and economic values and public safety should the event occur and applies a risk rating. The risk assessment is consistent with AS/NZS ISO 31000: *Risk Management – Principles and Guidelines*. The methodology uses the risk assessment process and qualitative scales outlined in the following tables to assess the risk of identified issues impacting the values and assets of the study area under current management practices (based on the framework adopted for the TARA for the Marine Estate). The consequence of each threat considered potential impacts as listed in Table 1. The likelihood of each threat (Table 2) was based on existing studies and observations where available.

The risk assessment evaluates the current day risk and also considers how the risk level is likely to change in the future (i.e., over 20, 50 and 100 years). This includes assessment of it how factors such as climate change, increasing development pressures and population increase will impact these risks. Where available, future risk levels have been assigned based on data for these risks. In other cases, a qualitative assessment has been undertaken considering the expected future changes.

Table 1: Qualitative measures of consequence or impact

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

Source: Adapted from MEMA (2015)

Table 2: Qualitative measures of likelihood under current management practices

Likelihood	Description
Almost certain	A very large certainty that this will occur in this situation within the timeframe.
Likely	Expected to occur in this situation within the timeframe.
Possible	Some clear evidence exists to suggest this is possible in this situation within the timeframe.
Unlikely	Uncommon, but has been known to occur elsewhere. Expected to occur here only in specific circumstances within the timeframe.
Rare	Never reported for this situation, but still plausible within the timeframe.

Source: Adapted from MEMA (2015)

Table 3: Qualitative risk estimation

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Minimal (Min)	Low	Moderate (Mod)	High	High
Likely	Minimal (Min)	Low	Moderate (Mod)	High	High
Possible	Minimal (Min)	Low	Low	Moderate (Mod)	High
Unlikely	Minimal (Min)	Minimal (Min)	Low	Low	Moderate (Mod)
Rare	Minimal (Min)	Minimal (Min)	Minimal (Min)	Low	Moderate (Mod)

GAP ANALYSIS

Accurate and detailed information about risk and consequence is necessary to assist decision makers generate effective management strategies which identify and prioritise future actions and investment or justify a business-as-usual approach. The risk assessment also identifies knowledge gaps related to each issue and the importance of resolving each knowledge gap to allow for effective future management of the issue using the scale outlined in Table 4. The gap analysis considered the level of existing information, the current studies underway or planned to address key knowledge gaps as well as stakeholder feedback.

Table 4: Importance of knowledge to management of Shaws Bay

Priority	Description
Low	This knowledge is not required for management decisions/ actions/ planning – academic interest only.
Medium	The knowledge would improve the effectiveness of management.
High	Management action required within the timeframe of this CMP cannot proceed effectively without this knowledge.

FIRST-PASS RISK ASSESSMENT OUTCOMES

The first-pass risk assessment (Table 5) identifies key threats to be addressed in the CMP. Based on the existing information, the threats with a high risk in the current timeframe and emerging threats are listed below.

Key management issues (high risk threats within the current timeframe):

- T1. Urban stormwater discharges
- T2. Poor water quality episodes
- T3. Catchment flooding (from Richmond River)
- T7. Litter and microplastics
- T11. Loss or degradation of estuarine vegetation (mangroves, saltmarsh, seagrass)
- T22. Extreme weather events (e.g. prolonged dry periods and increased frequency and magnitude of storms/ flood events)
- T30. Roads/traffic adjacent to pedestrian pathways and recreation areas
- T32. High demand/ visitor numbers, particularly during peak holiday periods
- T34. Lack of compliance with regulations (by users)

Emerging issues (high risk threats in 20 years in addition to the current threats above):

- T19. Increasing tidal/ coastal inundation
- T20. Anthropogenic barriers (i.e. physical barriers, land use and planning constraints) to migration of vegetation communities with sea level rise

Recommendations for Shaws Bay Stage 2 Studies to address high priority knowledge gaps have been identified as:

- S1. A targeted microbial source tracking study to identify the source(s) of harmful bacteria contributing to poor water quality episodes.
- S2. Identify effective stormwater treatment devices and appropriate upgrades to improve the quality of stormwater entering the bay.
- S3. Repeat mapping and evaluation of estuarine vegetation distribution.

Additional studies that would improve the effectiveness of management but could be undertaken at a later stage (e.g. included in the CMP at Stage 4) have been identified as:

- S4. Develop a method of assessing and reporting estuary health.
- S5. Implementation of estuary health monitoring program.
- S6. Cultural recognition/ awareness project(s) communicating cultural values and connection to Country.

Table 5: Threats, preliminary risk assessment and knowledge gaps

Threat	Potential impacts	Current management approach	Present day risk		Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies	
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps		Priority
T1. Urban stormwater discharges	<p>Export of sediment and associated pollutants to waterways.</p> <p>Increased suspended sediment in waterways (i.e., high turbidity/ 'dirty' water).</p> <p>Nutrient export.</p> <p>Contamination from hydrocarbons, faecal matter, fertiliser/ pesticides etc.</p> <p>Reduced recreational viability/ value.</p> <p>Risk to human health (exposure to faecal bacteria etc.)</p> <p>Impacts on aquatic ecosystem health (e.g., fish, seagrass, saltmarsh, mangroves etc.)</p> <p>Reduced tourism value.</p>	<p>Ballina Shire Urban Stormwater Management Plan (2012).</p> <p>Filter bag inserts/ litter baskets on most inlet pits within Shaws Bay residential area (cleaned on reactive basis, some not operational currently).</p> <p>16 stormwater discharge points to the bay (some buried/ blocked).</p> <p>Two Humeceptor units (near Shaws Bay Hotel and Lighthouse Beach carpark) removes small size litter, hydrocarbons, sediment and some nutrients.</p> <p>Two bioretention pits (Compton Drive and Lighthouse Beach carpark) filters stormwater through soil medium for removal of sediment, nutrient, hydrocarbons, some bacteria.</p>	Major	Almost certain	High	High	High	High	<p>The CZMP identified urban stormwater discharges as a major source of pollutants to Shaws Bay. Previous modelling as part of the Estuary Processes Study (PBP, 2000), indicated that pollutants are likely to be diluted and dispersed relatively quickly through most areas in the bay and any impacts are expected to be short lived. However the northern section of the bay has reduced dilution capacity due to smaller resident volume and pollutants discharged to this section have a greater relative impact on water quality in the short-term.</p> <p>Physico-chemical water quality data from 2021-2023 indicate water quality conditions are within recommended guidelines for aquatic ecosystem health most of the time. There are short-term poor water quality periods associated with rainfall events, and prolonged periods when the Richmond River is in flood.</p> <p>Beachwatch monitoring of faecal indicator bacteria (Enterococci) for the last three summers (2020-2023) have shown 'Poor' grades for primary contact recreation in the North and West sampling sites, and higher Enterococci levels associated with rainfall. There has been an increasing trend in Enterococci levels at these locations from 2020-2023. Sources of faecal bacteria are unknown (e.g. wildlife/birds vs. dog vs. human sources).</p> <p>Current urban stormwater impact and relative contribution of pollution compared to other catchment sources is unknown.</p> <p>The 2023 community survey identified poor water quality and stormwater pollution as a key concern.</p> <p>The effectiveness of urban stormwater management controls has not been assessed although BSC staff have indicated that maintenance of pit filter baskets is problematic. An improved stormwater treatment system to increase stormwater quality entering the bay has not been identified but would be beneficial.</p>	High	<p>S1. <u>A targeted microbial source tracking study to identify the source(s) of harmful bacteria contributing to poor water quality episodes.</u></p> <p>The study would assist in identifying sources of bacteria and direct management action.</p> <p>S2. <u>Identify effective stormwater treatment devices and appropriate upgrades to improve the quality of stormwater entering the bay.</u></p> <p>The investigation would identify and provide preliminary scope for potential options which will be considered further during Stage 3 Options Assessment.</p>

Threat	Potential impacts	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps	Priority	
T2. Poor water quality episodes. Typically elevated levels of harmful bacteria following rainfall making water unsafe for swimming. Possible bacteria sources in the catchment include dog faeces, sewage system, wildlife/ bird droppings.	Reduced recreational viability/ value. Risk to human health (exposure to faecal bacteria etc.) Water unsafe for swimming. Reduced tourism value.	Monitoring of bacteria via Beachwatch Partnership Program. Dog waste bag dispenser and bins for waste provided at points around the bay and at the off-leash dog exercise area north of Shaws Bay. Signage around the bay to advise dogs are not permitted on beaches or in the water, are to remain on a lead, and owners are responsible to pick up and dispose of pet waste (not always effective). Ranger patrols and control of offences. BSC sewage system licensed and regulated by EPA. Monitoring and reporting undertaken in accordance with licence. Breaches of licence conditions are addressed by licence holders in accordance with EPA directions.	Major	Almost certain	High	High	High	High	Beachwatch monitoring of faecal indicator bacteria (Enterococci) from 2020/2021 and 2021/22 summers indicate 'Poor' grades for primary contact recreation in the North and West sampling sites, and higher Enterococci levels associated with rainfall. Sources of faecal bacteria are unknown (e.g. wildlife/birds vs. dog vs. human sources).	High	Investigation as part of S1. A targeted microbial source tracking study to identify the source(s) of harmful bacteria contributing to poor water quality episodes.
T3. Catchment flooding (from Richmond River)	Poor water quality (sedimentation, pollutant transport). Siltation/ sediment deposition Impacts on aquatic ecosystem health (e.g., fish, seagrass, saltmarsh, mangroves etc.) Bank erosion/ damage to land, infrastructure and assets. Reduced recreational viability/ value. Reduced tourism value.	Ballina Coast and Estuary CMP RRCMP MEMA Floodplain risk management plans. NSW Flood Prone Land Policy.	Major	Almost certain	High	High	High	High	Council's flood model is being updated within the catchment and calibrated to March 2022 floods. Additional investigation of knowledge gaps is not recommended as part of the Shaws Bay CMP. Existing regulation and strategies are expected to guide flood planning and management. RRCMP and Coastline CMP actions	NA	Nil

Threat	Potential impacts	Current management approach	Present day risk		Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies	
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps		Priority
T4. Limited tidal exchange through training wall due to mangrove growth.	Poor water quality (reduced flushing) Siltation/ sediment deposition Impacts on aquatic ecosystem health (e.g., fish, seagrass, saltmarsh, mangroves etc.) Reduced recreational viability/ value. Reduced tourism value.	Tidal exchange study completed 2021. Tidal exchange modelling completed in 1999 as part of Estuary Processes Study (PBP, 2000).	Minor	Rare	Low	Low	Low	Low	A recent tidal exchange study showed that tide levels in 2021 were similar to those reported during 1999, despite mangrove growth which indicates that significant reductions in tidal exchange do not appear to be occurring.	NA	Nil
T5. Pesticide and herbicide pollution	Export of pollutants to waterways (e.g., pesticides and herbicides). Reduced recreational viability/ value. Risk to human health (exposure to chemicals etc.) Impacts on aquatic ecosystem health (e.g., fish, seagrass, saltmarsh, mangroves etc.) Reduced tourism value.	Chemicals regulated by EPA and NSW government under <i>Pesticides Act 1999</i> . Expected minor use in urban areas and public reserves.	Moderate	Unlikely	Low	Low	Low	Low	The level of current pesticide and herbicide use, pollution and impacts throughout the catchment is unknown. The small catchment size and expected minor household use does not present a high risk, therefore further investigation is not considered warranted.	NA	Nil
T6. Chemical/ fuel spills	Export of pollutants to waterways (e.g., hazardous chemicals, hydrocarbons etc.).	HAZMAT clean-up by first responders (e.g. RFS), EPA monitoring and assessment/ reporting if required (major spills).	Major	Unlikely	Low	Low	Low	Low	Existing knowledge is considered adequate for future management.	NA	Nil

Threat	Potential impacts	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps	Priority	
T7. Litter and microplastics	<p>Visual pollution</p> <p>Harm to wildlife through ingestion, entanglement, choking, suffocating etc.</p> <p>Habitat structure modifications.</p> <p>Leaching of toxic chemicals (e.g., from breakdown of plastics).</p>	<p><i>Protection of the Environment Operations Act 1997</i> regulates littering in NSW.</p> <p>Education programs include EPA's Litter Prevention Program, container deposit scheme, rubbish bins, community clean up days (e.g. annual clean up Australia day, public education campaigns (e.g. Don't be a tosser!).</p> <p>NE Waste conducts local education programs.</p> <p>Post-flood river and shoreline clean-up.</p> <p>Council bins provided in public reserves.</p> <p>The <i>Ballina Shire Council Illegal Dumping and Litter Prevention Strategy 2023-2028</i> adopted in July 2023.</p>	Major	Almost certain	High	High	High	High	<p>The 2023 community survey identified litter/rubbish as a key concern at Shaws Bay and there were calls for more bins in the precinct.</p> <p>The <i>Ballina Shire Council Illegal Dumping and Litter Prevention Strategy 2023-2028</i> was adopted in July 2023. The strategy sets targets for reductions in litter and dumping of waste within the shire, provides for community education and awareness, prevention, infrastructure and clean up, regulation and enforcement and evaluation and monitoring. BSC will introduce NSW EPA Local Litter checks to provide data on the scale of litter issues which will include the Shaws Bay study area. This will provide a baseline to monitoring the success of implementation of the strategy.</p>	NA	Nil
T8. Dredging	<p>Increased suspended sediment in waterways (i.e., high turbidity/ 'dirty' water).</p> <p>Changes in morphology.</p> <p>Sedimentation.</p> <p>Direct impacts on estuarine vegetation (i.e., seagrass, saltmarsh, mangroves).</p>	<p>CZMP Action 2: Dredging of Main Section of Shaws Bay completed 2021.</p> <p>Dredging REF and associated estuarine vegetation offsets.</p> <p>DPI Fisheries permit to harm marine vegetation and associated conditions.</p>	Moderate	Almost certain	Mod	Mod	Mod	Mod	<p>Potential impacts of dredging conducted in 2021 were assessed through an REF and offsets agreed with DPI Fisheries to compensate for direct loss of seagrass within dredging areas. A permit to harm marine vegetation was issued by DPI Fisheries for the works.</p> <p>Bathymetric survey was completed pre and post-dredging in 2021 for dredged areas only. Repeat survey planned to occur every 5 years (due in 2026). This will be included as a CMP action for ongoing implementation.</p> <p>CSIRO completed LiDAR and bathymetric survey of the whole study area in late 2022. This is expected to be available by June 2024.</p> <p>Estuarine vegetation mapping undertaken by DPI in June 2020 (pre-dredging). No post-dredging mapping of estuarine vegetation is currently available.</p>	High	S3. <u>Repeat mapping and evaluation of estuarine vegetation distribution.</u>

Threat	Potential impacts	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps	Priority	
T9. Siltation and sedimentation	<p>Increased suspended sediment in waterways (i.e., high turbidity/ 'dirty' water).</p> <p>Changes in morphology.</p> <p>Sedimentation.</p> <p>Direct impacts on estuarine vegetation (i.e., seagrass, saltmarsh, mangroves).</p>	CZMP Action 2: Dredging of Main Section of Shaws Bay completed 2021.	Moderate	Almost certain	Mod	Mod	Mod	Mod	<p>Bathymetric survey was completed pre and post-dredging in 2021 for dredged areas only. Repeat survey planned to occur every 5 years (due in 2026). This will be included as a CMP action for ongoing implementation.</p> <p>CSIRO completed LiDAR and bathymetric survey of the whole study area in late 2022. This is expected to be available by Dec 2023.</p> <p>Impact of major catchment flooding on siltation in Shaws Bay is unknown although anecdotal observations indicate deposition of a thick layer of silt (approx. 10cm) along the East Arm immediately following the 2022 flood events.</p> <p>Estuarine vegetation mapping undertaken by DPI in June 2020 (pre-dredging). No post-dredging mapping of estuarine vegetation currently available.</p>	NA	Nil
T10. Shoreline recession and beach erosion	<p>Loss of foreshore land.</p> <p>Increased suspended sediment in waterways (i.e., high turbidity/ 'dirty' water).</p> <p>Changes in morphology.</p> <p>Sedimentation.</p> <p>Direct impacts on estuarine vegetation (i.e., seagrass, saltmarsh, mangroves). Smothering seagrass beds and other benthic habitat.</p> <p>Reduced recreational viability/ value.</p> <p>Reduced tourism value.</p> <p>Compromised assets (e.g., stormwater, sewerage, roads).</p>	<p>Bank stabilisation works including rock walls and groynes to stabilise and armour banks (e.g. East Arm, Western Foreshore).</p> <p>Dredging and beach nourishment to replace eroded foreshore material.</p> <p>Stormwater outlet modifications to protect against scour and erosion (e.g. rock armouring)</p>	Moderate	Almost certain	Mod	Mod	High	High	<p>The sheltered environment of Shaws Bay creates conditions more suited to deposition rather than erosion. Most foreshore areas of Shaws Bay are stable and protected by either rock revetment or estuarine vegetation. Recent work as part of CZMP implementation has helped to stabilise remaining areas susceptible to erosion through stormwater runoff, pedestrian traffic and wind (e.g. East Arm groynes and nourishment, and nourishment in Northern and western sections of the bay).</p> <p>Some community members have raised concerns about nourishment sand in the East Arm eroding into the bay, smothering seagrass and infilling the channel and reducing swimming areas. Nearby residents have also raised concerns about sand blowing from the East Arm beach across footpaths, roads and onto private properties. Further works are required to stabilise sand at the East Arm and protect against further erosion via wind and water.</p> <p>The level of sand deposition in the East Arm is not currently known however repeat survey planned to occur every 5 years (due in 2026). CSIRO completed LiDAR and bathymetric survey of the whole study area in late 2022. This is expected to be available by June 2024.</p>	High	S3. Repeat mapping and evaluation of estuarine vegetation distribution.

Threat	Potential impacts	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps	Priority	
T11. Loss or degradation of estuarine vegetation (mangroves, saltmarsh, seagrass)	<p>Loss and/or degradation of aquatic habitats/ protected marine vegetation.</p> <p>Loss of biodiversity.</p> <p>Reduced fish numbers and species diversity.</p> <p>Reduced recreational viability/ value.</p> <p>Reduced tourism value.</p>	<p>DPI - Fisheries policy and guidelines for protection of estuarine vegetation.</p> <p>Mapping of estuarine vegetation extents at various times.</p> <p>Creation of Shaws Bay saltmarsh basin to allow for unimpeded upslope migration of estuarine vegetation communities with sea level rise.</p> <p>Mangrove clearing permit from DPI Fisheries (juvenile mangroves only in certain agreed areas to maintain access and infrastructure services)</p>	Major	Almost certain	High	High	High	High	<p>Loss of seagrass in Shaws Bay is a key community concern. Contributing factors include sedimentation/ siltation, turbidity, nutrients, major flood events, water depth, water temperature etc. The community has raised concerns about nourishment sand along the East Arm eroding into the bay, smothering seagrass and infilling the channel and reducing swimming areas. The relative contribution of factors to seagrass decline has not been evaluated.</p> <p>DPI - Fisheries is responsible for monitoring and management of estuarine vegetation. The latest estuarine vegetation mapping (mangroves, saltmarsh, seagrass) was completed by DPI - Fisheries in 2020. Updated mapping is required to assess current extents.</p> <p>There are vegetation communities present within the study area that are may meet the definition of the CWLRA, however there are no CWLRA currently mapped under the SEPP. A review of the SEPP mapping of CWLRA is recommended for as part of the CMP for the Ballina Coast and Lower Estuary for the entire Ballina LGA coastal zone.</p> <p>Vegetation Management Plan to be developed as part of the Shaws Bay CMP to provide an overall strategy for estuarine and terrestrial vegetation.</p> <p>Review of DPI Fisheries permit areas for mangrove removal will be undertaken as part of the CMP to ensure the areas align with current access and infrastructure provision</p>	High	S3 Repeat mapping and evaluation of estuarine vegetation distribution.
T12. Lack of comprehensive, integrated ecosystem monitoring strategy and reporting system	<p>Decision makers do not have reliable information to support management activities and to best direct investment into ecosystem health.</p> <p>Reduced community understanding/ awareness of estuary health issues and management actions.</p>	<p>Beachwatch Partnership Program and additional physico-chemical parameters assessed by BSC during Beachwatch sampling over recent sampling periods.</p>	Moderate	Almost certain	Mod	Mod	Mod	Mod	<p>Existing Beachwatch program does not provide holistic analysis or presentation of ecosystem health and does not allow for trends to be tracked through time.</p> <p>Additional studies identified above (S1, S1 and S2) will provide further information on ecosystem health to direct management and provide opportunities for community education. Communication of outcomes of ecosystem health to the community would be beneficial through a integrated health report.</p> <p>The CMP will include an action to develop an assessment and reporting system for estuary health that will integrate existing information (e.g. Beachwatch, water quality assessment) and additional data gathered as part of detailed studies in a format suitable and accessible to the public. This will include consideration of option to provide a real-time predictive warning system for water quality.</p>	Med	<p>S4. Develop an assessment and reporting system for estuary health.</p> <p>S5. Implementation of estuary health monitoring program.</p>

Threat	Potential impacts	Current management approach	Present day risk		Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies	
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps		Priority
T13. Lack of community awareness of estuary health, associated threats and benefits, regulations and opportunities for participation	Reduced community understanding/ awareness of estuary health issues and management actions. Reduced incentive/ opportunities for community to 'do the right thing' and being actively involved in protecting the health of Shaws Bay.	Council signage and engagement as part of this CMP and other Council strategies (e.g. Illegal Dumping and Littering Strategy).	Moderate	Likely	Mod	Mod	Mod	Mod	Community engagement is considered a key part of all CMP stages. The CMP will include community engagement and education strategies.	Med	S4. Develop an assessment and reporting system for estuary health. S5. Implementation of estuary health monitoring program.
T14. Future development, urban growth	Increased population and tourism in the region increases many other threats such as litter/waste, overcrowding and biodiversity impacts.	Land use planning and development controls. Recreational vs environmental zoning and associated controls at Shaws Bay (e.g. fencing and signage). Enhancement of other areas within the Ballina Shire to provide similar outdoor/water recreational activities and better distribute visitor numbers between different sites (e.g. Teven Reserve, The Serpentine etc.)	Moderate	Almost certain	Mod	Mod	High	High	Limited future urban development within the Shaws Bay catchment under Council's current land use planning and development controls. Outside of the immediate catchment, local and regional population increases are projected which will increase pressure on Shaws Bay through increased visitor numbers. Additional investigation of knowledge gaps is not recommended as part of the Shaws Bay CMP. Existing regulation and strategies are expected to guide future development in the region.	NA	Nil
T15. Aquatic weeds	Water quality impacts (e.g., reduced dissolved oxygen). Degradation of aquatic habitats. Loss of biodiversity. Displacement of native species. Alteration of native habitats. Reduced amenity/aesthetics.	Aquatic weeds are not prevalent at Shaws Bay. Managed by DPI Fisheries.	Minor	Possible	Low	Low	Low	Low	The native Microdictyon algae has historically formed large smothering mats through seagrass. This was noted as an issue in the 2000 Estuary Processes Study and while not recently raised as an issue, there is a periodic risk to ecosystem health. Existing knowledge is considered adequate for future management.	NA	Nil

Threat	Potential impacts	Current management approach	Present day risk		Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies	
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps		Priority
T16. Recreational fishing	<p>Reduced fish numbers and species diversity.</p> <p>Loss and/or degradation of aquatic habitats/ protected marine vegetation.</p> <p>Fishing waste/ litter (e.g., fishing line, hooks, traps, nets sinkers etc.) posing threat to wildlife.</p> <p>Loss of biodiversity.</p> <p>Impacts on endangered fish known to inhabit the bay (i.e., Estuary cod).</p>	<p>Recreational fishing rules and regulations including fishing closures under the <i>Fisheries Management (General) Regulation 2019</i>.</p> <p>Signage at Shaws Bay regarding the Endangered Estuary Cod.</p> <p>Recreational fishing surveys carried out by DPI - Fisheries to inform adaptive management.</p> <p>Recreational Fishing Management Strategy and Environmental Assessment undertaken by DPI - Fisheries.</p>	Major	Possible	Mod	Mod	Mod	Mod	<p>DPI – Fisheries is responsible for monitoring the impacts and managing the sustainability of the fishery.</p> <p>MEMS Initiative 6: Sustainable fishing and aquaculture includes a number of research programs to allow for effective management.</p> <p>Additional investigation of knowledge gaps is not recommended as part of the Shaws Bay CMP.</p>	NA	Nil
T17. Terrestrial weeds	<p>Loss of biodiversity.</p> <p>Displacement of native species.</p> <p>Alteration of native habitats.</p> <p>Reduced recruitment of native riparian vegetation.</p> <p>Reduced habitat availability.</p> <p>Water quality impacts.</p> <p>Reduced amenity.</p> <p>Related social and economic factors.</p>	<p>CZMP Action 9: Weed management along northern side of the training wall undertaken.</p> <p>BSC ongoing weed management of revegetation areas.</p>	Minor	Likely	Low	Low	Low	Low	Existing knowledge is considered adequate for future management.	NA	Nil

Threat	Potential impacts	Current management approach	Present day risk		Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies	
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps		Priority
T18. Predation and invasion by feral animals/ pest species	<p>Loss of biodiversity.</p> <p>Displacement/predation of native species and livestock.</p> <p>Alteration/degradation of native habitats.</p> <p>Reduced amenity.</p> <p>Related social and economic factors.</p>	<p>Managed by various agencies and local government under <i>Biosecurity Act 2015, North Coast Regional Strategic Pest Animal Management Plan 2018-2023, National Parks and Wildlife Act 1974</i>, state and local biodiversity strategies.</p>	Minor	Unlikely	Min	Min	Min	Min	<p>The occurrence/scale of invasion by feral animals/pest species at Shaws Bay has not been assessed (e.g. cane toad, feral cats etc.).</p> <p>Additional investigation of knowledge gaps not recommended as part of the Shaws Bay CMP. Existing regulation and strategies are expected to guide pest management in the region.</p>	NA	Nil
T19. Increasing tidal/ coastal inundation	<p>Shoreline recession</p> <p>Increased frequency of flooding and inundation.</p> <p>Loss of riparian vegetation.</p> <p>Migration of estuarine and riparian vegetation communities.</p> <p>Unsafe or loss of access to waterways.</p> <p>Loss of amenity.</p> <p>Public safety risks.</p> <p>Reduced tourism value.</p> <p>Damage to cultural heritage sites.</p> <p>Council liability and legality issues.</p> <p>Changing tidal velocities.</p> <p>Storm tide inundation.</p> <p>Changed geomorphology (shoaling, bank instability and erosion).</p> <p>Compromised assets (e.g., stormwater, sewerage, roads, infrastructure).</p> <p>Related social and economic factors.</p>	<p>Ballina Emergency Management Plan.</p> <p>CZMP actions to adapt to rising sea levels:</p> <p>Creation of Coastal Saltmarsh Basin and ecological zones to facilitate migration of estuarine vegetation.</p> <p>Beach nourishment and bank erosion protection</p> <p>Stormwater outlet modifications to protect against scour and erosion (e.g. rock armouring)</p>	Moderate	Almost certain	Mod	High	High	High	<p>Coarse assessment available from Coastal Risk Australia and OEH (2018c). However, a higher level of understanding of local inundation extent and frequency with climate change and the associated risk is required.</p> <p>Coastal inundation modelling/ assessment is being undertaken as part of Stage 2 for the Ballina Coast and Estuary CMP including detailed assessment for future sea level rise scenarios. Assessment of risk to Shaws Bay assets and infrastructure will also be undertaken as part of the Ballina Coast and Estuary CMP including development of a Coastal Zone Emergency Action Subplan (as required).</p> <p>Additional investigation of knowledge gaps not recommended as part of the Shaws Bay CMP. Outcomes of the Ballina Coast and Estuary CMP and any other relevant information available at the time are expected to guide management actions that will be considered for the Shaws Bay CMP.</p> <p>Funding requirements to mitigate risks is unknown.</p>	NA	Nil

Threat	Potential impacts	Current management approach	Present day risk			Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps	Priority	
T20. Anthropogenic barriers (i.e. physical barriers, land use and planning constraints) to migration of vegetation communities with sea level rise	Loss of estuarine vegetation.	MEMS state-wide <i>Marine Vegetation Management Strategy</i> currently under development. CZMP actions to adapt to rising sea levels: Creation of Coastal Saltmarsh Basin and ecological zones to facilitate migration of estuarine vegetation.	Moderate	Likely	Mod	High	High	High	Mapping of areas of projected migration of estuarine vegetation communities with sea level rise completed as part of the CZMP. Mapping to be updated once revised tidal inundation mapping is available.	NA	Nil
T21. Average warming and extreme temperatures	Increased flooding risk. More severe droughts. Increased number of hot days and higher rates of evaporation.	BSC Climate Change Policy (2021) BSC Climate Strategy and Environmental Action Plan - HE1.1 Our planning considers past and predicted changes to the environment.	Minor	Almost certain	Low	Mod	High	High	Climate projections and climate change impacts for Australia and regions reported by government agencies based on the latest national and international research. Adapt NSW provides interactive mapping of climate change projections for all regions of NSW (i.e. changes in temperature, rainfall, fire risk etc.).	NA	Nil
T22. Extreme weather events (e.g. prolonged dry periods and increased frequency and magnitude of storms/ flood events)	Increased bushfire risk. Loss of biodiversity (particularly estuarine vegetation). Increased water temperatures. Increased acidification of estuaries.		Major	Almost certain	High	High	High	High	Existing knowledge is considered adequate for future management.		
T23. Increase in mosquito-borne diseases	Human health impacts due to increased incidence of mosquito-borne diseases associated with increased temperatures, sea level rise and extreme rainfall events.	NSW Health conducts surveillance of mosquito populations and disease transmission and provides information and advice.	Minor	Possible	Low	Mod	High	High	The 2023 community survey results indicated that most residents are concerned about biological irritants at Shaws Bay but it was not in the top 10 list of concerns. Existing knowledge is considered adequate for future management.	NA	Nil
T24. Biological irritants (e.g. sandflies, sea lice etc.)	Reduced recreational amenity/ value. Reduced tourism value. Risk to human health.		Minor	Likely	Low	Low	Low	Low		NA	Nil

Threat	Potential impacts	Current management approach	Present day risk		Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies	
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps		Priority
T25. Lack of recognition of cultural values and connection to Country.	Loss of or damage to items of heritage significance or cultural heritage values. Lack of recognition and protection of Native Title rights.	NPW Act and Heritage NSW regulations.	Moderate	Likely	Mod	Mod	Mod	Mod	Limited public information/ understanding about Shaws Bay cultural values/ stories. Lack of knowledge of traditional management practices. Any impact of future CMP actions on potential Native Title rights cannot be determined until CMP actions are developed. This is a high priority data gap to be addressed in collaboration with the Richmond River CMP and Ballina Coast and Estuary CMP studies and actions. Targeted consultation with First Nations community and land managers will be undertaken during all stages of the CMP.	Med	S6. Cultural recognition/ awareness project(s) communicating cultural values and connection to Country.
T26. Lack of involvement of First Nations people in decision making and management		Current land claim within Shaws Bay study area Native Title legislation BSC Aboriginal Liaison Officer RCC Aboriginal Liaison Officer	Moderate	Likely	Mod	Mod	Mod	Mod			
T27. Damage to Aboriginal cultural heritage items/ sites	Loss of or damage to items of heritage significance or cultural heritage values.	Cultural heritage assessment as part of approval processes, AHIMS, Heritage NSW.	Major	Possible	Mod	Mod	Mod	Mod	Location and nature of Aboriginal cultural heritage items/ sites is unknown in the study area. Items and sites are identified where development is planned through the cultural heritage assessment and approval process.	NA	Nil
T28. Bushfire (impacts on biodiversity)	Fauna mortality. Reduced vegetation cover. Displacement of native species. Alteration of fauna habitats. Increased erosion risk. Increased nutrient and sediment load to waterways. Water quality impacts. Public safety risks. Asset damage/destruction. Related social and economic factors.	BSC fire and emergency management plans. RFS fire response.	Catastrophic	Unlikely	Mod	Mod	Mod	Mod	Existing knowledge is considered adequate for future management.	NA	Nil

Threat	Potential impacts	Current management approach	Present day risk		Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies	
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps		Priority
T29. Limited or lack of access infrastructure / recreational facilities	Restricted public access. Construction of unauthorised access points. Erosion. Public safety risks. Reduced amenity. Reduced tourism value.	Foreshore improvement works implemented as part of the CZMP.	Moderate	Rare	Min	Min	Low	Mod	The 2023 community survey identified community concern regarding insufficient picnic shelters and shade during peak periods, lack of adequate parking during peak periods, safety risks at the concrete steps and inadequate lighting around the precinct. Existing knowledge is considered adequate for future management.	NA	Nil
T30. Roads/traffic adjacent to pedestrian pathways and recreation areas.	Public safety risks (injury/fatality). Reduced amenity. Reduced tourism value.	NSW Police regulation (e.g., speed signs, monitoring and enforcement/fines etc). Upgrade of western foreshore parking areas including reconfiguration of pathway behind parking areas and allowing safe separation from traffic so this stretch. Although these works do not extend along the length of Compton Drive pathway.	Catastrophic	Possible	High	High	High	High	The 2023 community survey identified community concern regarding public safety risks due to traffic speeding on Compton Drive, inadequate separation of pathway from road along Compton Drive at northern end of the bay. Existing knowledge is considered adequate for future management.	NA	Nil
T31. Insufficient, or inappropriate public education and signage (e.g. outdated or non-existent)	Reduced awareness and compliance with regulations. Public safety risks. Reduced amenity.	Education signage at many locations around the bay. Council education campaigns.	Minor	Unlikely	Min	Min	Min	Min	Existing knowledge is considered adequate for future management.	NA	Nil
T32. Anti-social behaviour and unsafe practices	Public safety risks. Reduced amenity. Noise disturbance. User conflict.	BSC Rangers patrol area. NSW Police regulation.	Moderate	Likely	Mod	Mod	Mod	Mod	Existing knowledge is considered adequate for future management.	NA	Nil

Threat	Potential impacts	Current management approach	Present day risk		Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies	
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps		Priority
T33. High demand/ visitor numbers, particularly during peak holiday periods	Littering. Waste generation. Pet droppings left behind. Damage to sensitive environments (e.g., estuarine vegetation). Wildlife disturbance. Reduction in protected fish species.	Regulation and enforcement (limited by available resources). Complaints reported to BSC Signage regarding dog waste/bins Ranger e-bikes for patrols	Major	Likely	High	High	High	High	Existing knowledge is considered adequate for future management.	NA	Nil
T34. Lack of compliance with regulations (by users)	Littering. Pet droppings left behind. Damage to sensitive environments (e.g., estuarine vegetation). Reduction in protected fish species.	Regulation and enforcement (limited by available resources). Complaints reported to BSC Signage regarding dog waste/bins BSC no balloon policy in public areas (note this only applies to large events and not small informal gatherings) Ranger e-bikes for patrols	Major	Likely	High	High	High	High	Current level of impact on receiving environments and current contribution compared to other sources is unknown.	High	S1. A targeted microbial source tracking study to identify the source(s) of harmful bacteria contributing to poor water quality episodes. This study will assist in identifying level of impact. The CMP will include ongoing opportunities for collaboration with regulatory agencies.
T35. Delays to projects due to Crown Lands licence processing times	Projects on Crown Land have long start-up periods. Reduced community confidence. Potential to affect grants and funding with limited timeframes.	Applications prepared for Crown Lands licences as required. Processing times depend on the nature of works, status of land and consultation requirements.	Moderate	Likely	Mod	Mod	Mod	Mod	Existing knowledge is considered adequate for future management.	NA	Nil

Threat	Potential impacts	Current management approach	Present day risk		Future Risk			Assessment of Knowledge Gaps		Recommendation for Shaws Bay Stage 2 Studies	
			Consequence	Likelihood	Current Risk	20-year	50-year	100-year	Current knowledge and data gaps		Priority
T36. Limited understanding of existing management actions including their effectiveness	Decision makers do not have reliable information to support management activities and to best direct investment. Reduced community understanding/ awareness of estuary health issues and management actions.	Project specific monitoring in some locations.	Minor	Almost certain	Low	Low	Low	Low	No comprehensive approach to tracking and reporting on the effectiveness of management actions. The CMP will include an action to develop an assessment and reporting system for estuary health that will integrate existing information (e.g. Beachwatch, water quality assessment) and additional data gathered as part of detailed studies in a format suitable and accessible to the public. This should include a targeted monitoring program to track effectiveness of management actions in specific areas / targeted management actions.	NA	Nil
T37. Inappropriate development within coastal hazard areas	Potential asset and infrastructure risk.	Resilience and Hazards Coastal Vulnerability Areas are not mapped.	Major	Possible	Mod	Mod	Mod	Mod	Coastal hazard areas are not mapped in the Resilience and Hazards SEPP. Coastal inundation modelling/ assessment is being undertaken as part of Stage 2 for the Ballina Coast and Estuary CMP including detailed assessment for future sea level rise scenarios. Assessment of risk to Shaws Bay assets and infrastructure will also be undertaken as part of the Ballina Coast and Estuary CMP including development of a Coastal Zone Emergency Action Subplan (as required). Outcomes of the Ballina Coast and Estuary CMP are expected to guide management actions that will be considered for the Shaws Bay CMP. Additional investigation of knowledge gaps not recommended as part of the Shaws Bay CMP.	NA	Nil
T38. Inaccurate or incomplete mapping of Resilience and Hazards SEPP Coastal Wetland and Littoral Rainforest area	Inappropriate development and land use. Difficulty in gaining approvals for minor or routine works.	Resilience and Hazards SEPP mapping based on repealed SEPP 14 (Coastal Wetlands), updated in 2012, SEPP 26 (Littoral Rainforests) based on mapping prepared in 2003 and updated prior to adoption of the SEPP.	Major	Possible	Mod	Mod	Mod	Mod	There are vegetation communities present within the study area that may meet the definition of the CWLRA, however there are no CWLRA currently mapped under the SEPP. A review of the SEPP mapping of CWLRA is recommended for as part of the CMP for the Ballina Coast and Lower Estuary for the entire Ballina LGA coastal zone.	Mod	Nil
T39. Lack of funding and resourcing for coastal management	Lack of resources to maintain on-ground works over the long-term. Lack of resources to support management activities and enforce regulations.	Council budgets Healthy Waterways levy External grant funding	Major	Possible	Mod	Mod	Mod	Mod	Existing knowledge is considered adequate for future management.	NA	Nil