4 MUMMUGA LAKE ISSUES AND ACTIONS

4.1 Key Estuary Management Objectives

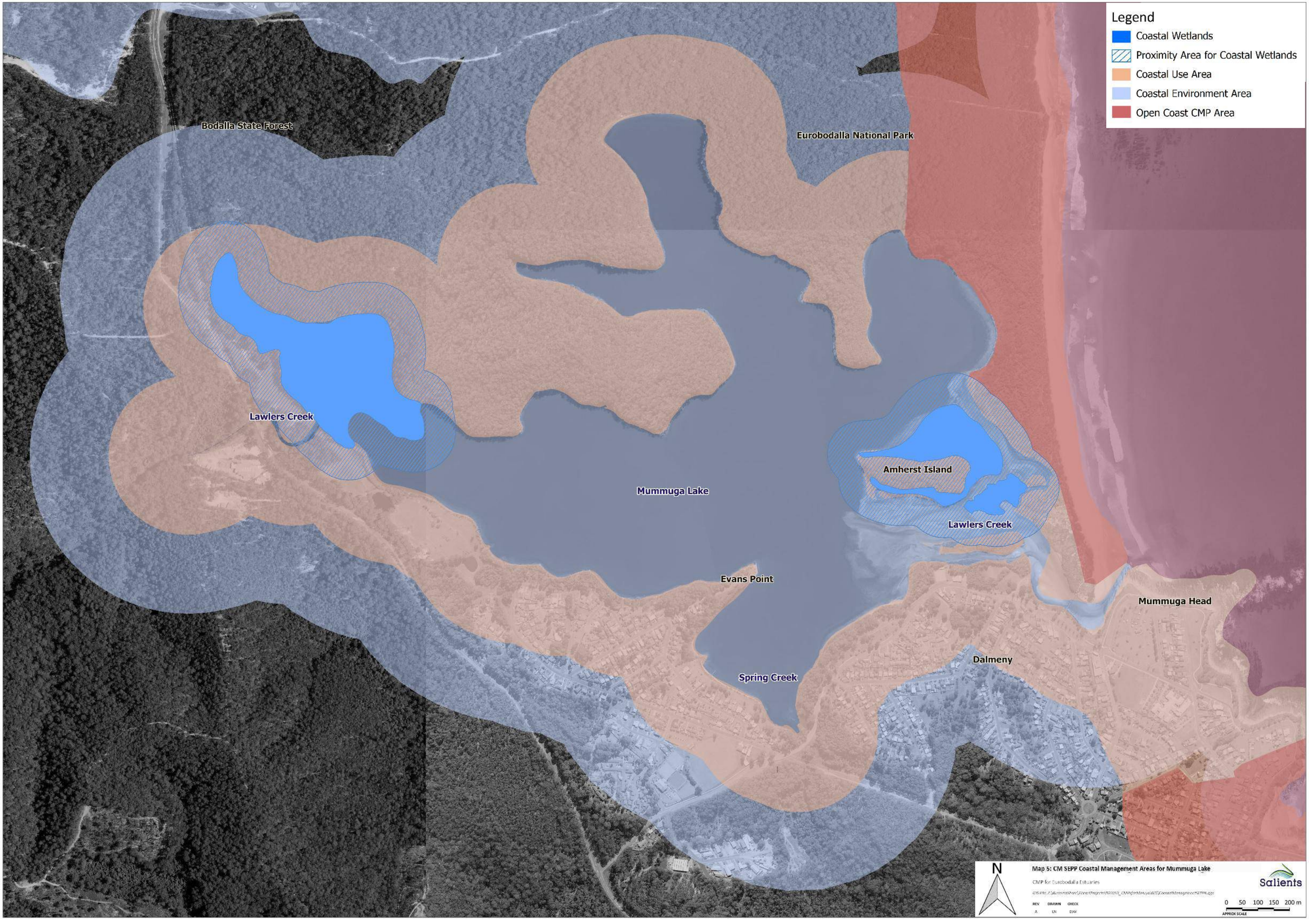
The Coastal Zone Associated with Mummuga Lake is shown in Map 5.

Relevant objectives for the estuary have been extracted from the *Coastal Management Act 2016* based on the management issues present. These were then considered as part of the risk assessment presented in Appendix D. Following that exercise, the "key" objectives, being those most associated with "extreme" or "high" level risks for this estuary, were identified.

The selected objectives were assigned a "focus" rating (very strong, strong, moderate, or minor) based on the risk assessment outcomes. The focus rating can be considered a qualitative measure of the total effort that this Program contains to achieve that objective. These are presented in Table 4.

Table 4 Key Objectives and Classification for Mummuga Lake

Objective	CM Area	CMP Focus	Priority
To protect and enhance the coastal environmental values and natural processes of the estuary, and enhance natural character, scenic value, biological diversity and ecosystem integrity,	Environment	Moderate	3
To reduce threats and improve the resilience of the estuary, including in response to climate change	Environment	Moderate	3
To maintain and improve water quality and estuary health	Environment	Moderate	3
To support the social and cultural values of the estuary	Environment	Moderate	3
To maintain and, where practicable, improve public access, amenity and use of foreshores.	Environment	Moderate	3
To protect and enhance the scenic, social and cultural value of the coast by ensuring development: • is of an appropriate type, bulk and scale for its location • avoids or mitigates against adverse impacts on heritage values • supports and/or incorporates water sensitive urban design • incorporates adequate public open spaces for recreation and associated infrastructure	Use	Moderate	4


Legend
Coastal Wetlands
Proximity Area for Coastal Wetlands
Coastal Use Area
Coastal Environment Area
Open Coast CMP Area
Bodalla State Forest
Eurobodalla National Park
Lawlers Creek
Mummuga Lake
Amherst Island
Lawlers Creek
Evans Point
Mummuga Head
Dalmeny
Spring Creek
N
Map 5: CM SEPP Coastal Management Areas for Mummuga Lake
CMP for Eurobodalla Estuaries
REV
DRAWN
CHECK
A
EN
DW
Salients
0 50 100 150 200 m
APPROX SCALE

The priority score in Table 4 directly relates to the coastal management area to which that objective applies in the CM Act. For example, objectives associated with the coastal wetlands area have a priority score of 1, whereas those associated with the coastal use area have a priority score of 4.

4.2 A Snapshot of Issues

The key issues identified by the risk assessment process are outlined below and presented in Map 6.

4.2.1 Considering the Extent of Future Tidal Inundation around Mummuga Lake

ASSESSED RISK LEVEL

Extreme

RELATED ACTIONS

EM1, EM2, Mu1, Mu2, EM6

The future tidal inundation extents for Mummuga Lake are of some importance to inform planning decisions and to gain an appreciation of how the wetlands in and around the lake will migrate as sea levels rise. There are some low-lying areas adjacent to the Lake that are already prone to flooding when the lake is closed to the ocean. This is expected to be exacerbated as sea levels rise. For future planning purposes, this needs to be better understood.

As mean tide levels rise over time, some fringing areas will be inundated more frequently
Mummuga Lake, Dalmeny

Note that some key issues occur in multiple areas. Locations indicated on map are representative locations.

BODALLA STATE FOREST

EUROBODALLA NATIONAL PARK

CM SEPP coastal wetlands mapping does not match full extent of wetlands

Overfishing within Mummuga Lake

Entrance management and public understanding of effects on water quality

AMHERST ISLAND

Poor condition of boat ramp and car park

Damage/erosion exacerbated by informal access around the entrance and Mummuga Headland

Extent of future tidal inundation is uncertain

Management of saltmarsh / damage from vehicular access

EVANS POINT

MUMMUGA HEAD

DALMENY

Stormwater runoff from urban catchments

N

Map 6: Representative Locations of Key Issues for Mummuga Lake

Salients

GIS File: Z:\Business\Work\Projects\300358_CMPlanGeography\GIS\Cases\MapLocationsKeyIssues.qgz

REV	DRAWN	CHECK
A	JN	DHV

0 50 100 150 200 m

APPROX SCALE

4.2.2 *Informal Access around the Entrance and Mummuga Headland, Dalmeny*

ASSESSED RISK LEVEL

Extreme

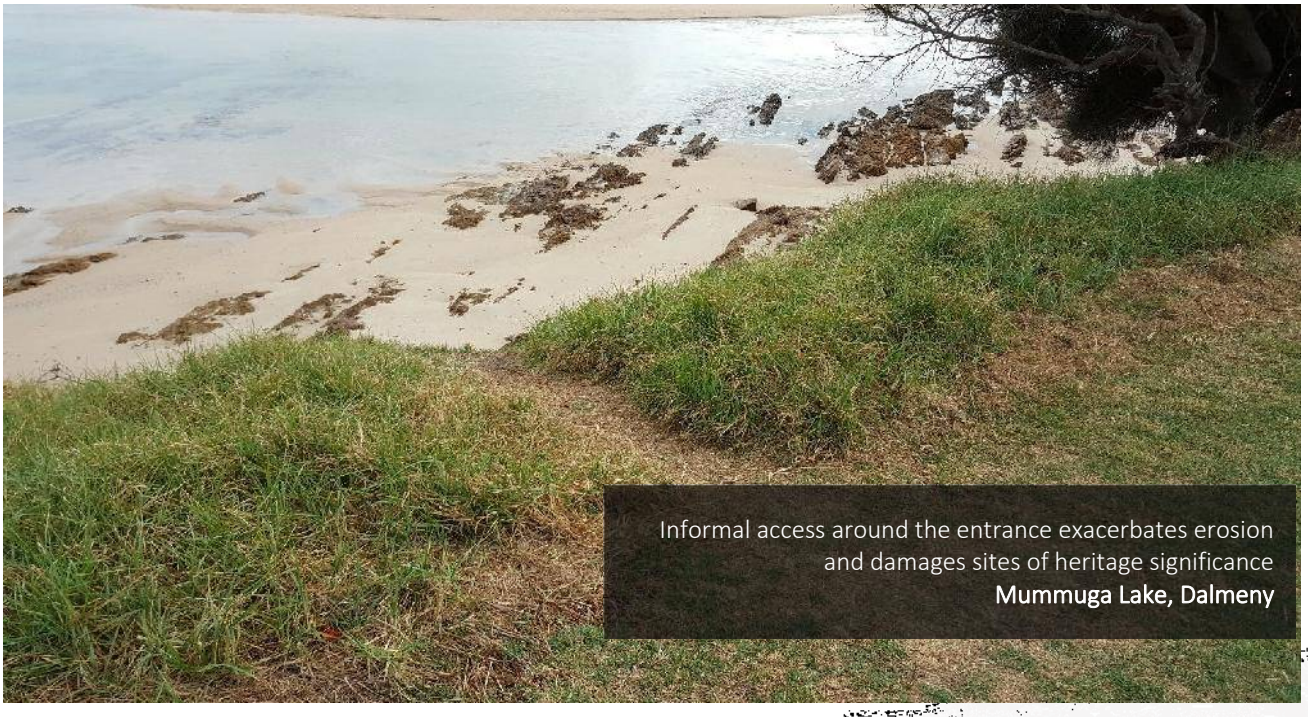
RELATED ACTIONS

Mu3

Following site inspections and meetings with key stakeholders on site, several issues have been identified around the southern foreshores of the Mummuga Lake entrance and extending out onto the adjacent headland.

The key issues are:

- The foreshore protection provided in the immediate vicinity of the entrance seems to have been placed without considering the impact that waves may have on this structure.
- There are lengths of foreshore inside the entrance that are now over steepened due to severe erosion, and vegetation has been substantially undermined and is at risk of collapsing into the channel.
- Informal access across the crest of the foreshore and down the slope in several locations has the potential to enhance erosion and cause bank instability.
- Informal access down the slopes adjacent to the entrance and the northern edge of Mummuga Headland is poorly managed and damage to sites of significance to the local Aboriginal community has been noted and is continuing.
- In some locations, the over steepened slope and lack of a barrier at the crest may pose a safety risk to the public.



Informal access around the entrance exacerbates erosion and damages sites of heritage significance
Mummuga Lake, Dalmeny

4.2.3 Management of Saltmarsh around Southern Foreshores of Mummuga Lake

ASSESSED RISK LEVEL

High

RELATED ACTIONS

Mu4, Mu5

Semi formalised vehicular access is provided through foreshore vegetation around 100m west of the tennis courts. This allows relatively easy access for vehicles onto one of the largest salt marsh areas along the southern foreshores of the lake based on mapping by Elgin Associates (2018). The saltmarsh is present within the Eurobodalla National Park and the Batemans Marine Park and is clearly being damaged by ongoing vehicular access.

An additional area where saltmarsh rehabilitation activities have been undertaken historically by Council exists to the rear of properties along Myuna and Attunga Streets, adjacent to the main body of the lake. Inspection of this site in 2018 indicated that the plantings were reasonably robust, although there was some variability, with some areas being mowed and Kikuyu invading the landward edge of the saltmarsh in others. There is an opportunity here to engage with the community and collaborate on a way forward to managing this area.

Vehicular access is damaging saltmarsh areas within the Eurobodalla National Park
Mummuga Lake, Dalmeny

4.2.4 Stormwater Runoff from Urban Catchments

ASSESSED RISK LEVEL

High

RELATED ACTIONS

Mu6

Improving water quality was the top issue of concern for the local community, based on analysis of the survey completed in 2020. However, limited data provided for review by DPE, from samples collected in 2014 and 2015, indicates that overall quality is good, although a sparse cover of macroalgae was present during one of the sampling dates.

Water quality within coastal lakes, even relatively undisturbed ones such as Mummuga, can vary significantly from season to season depending on rainfall patterns and the state of the entrance. The variability is mostly natural and communities which live around the fringes of these lakes often struggle with this variability. It is not uncommon for a system such as this to have relatively 'good' water quality for a few years and then for conditions to change (rainfall/runoff, entrance condition) such that the quality rapidly deteriorates. Furthermore, what constitutes 'good' water quality for recreational purposes (swimming, boating) is not necessarily optimal for a healthy thriving ecosystem.

The opportunity exists to put some effort into analysing and explaining the context and importance of urban stormwater from Dalmeny to the local community. Any study undertaken can also be used to inform future planning for the expected increase in population at Dalmeny over the next 15 years (~10%). The upcoming Dalmeny Land Release will be subject to an area plan that specifies water quality objectives and development controls for stormwater and erosion management that align with ANZECC guidelines.

Recent changed within the catchment need to be kept in consideration; approximately 40 hectares of land marked for development for several years has recently been sold within the Mummuga Lake catchment. Developments without adequate stormwater, erosion or runoff controls can directly impact water quality within a water body through increased quantities of pollutants, sediment and organic compounds that disrupt the natural equilibrium. Council have stated that the development can only proceed once a Development Control Plan (DCP) is in place. It is through this DCP that stormwater controls, water quality objectives and a number of other factors with the potential to impact Mummuga Lake and its tributaries will be detailed - this will occur with rigorous consultation with the community, local Aboriginal stakeholders and state government agencies.

The DCP will place a high priority on water quality objectives (using the ANZECC guidelines), ensuring stormwater and sewerage are designed with sufficient capacity. Council will assess the development against the requirements of the Marine Estate Management Act (as Mummuga Lake is a part of the

Batemans Marine Park) and the CM SEPP. Both the Act and the SEPP have specific requirements around consideration of the impact of development, which Council must uphold.

Management of stormwater is an ongoing concern expressed by the community
Mummuga Lake, Dalmeny

4.2.5 Boating Access

ASSESSED RISK LEVEL
High

RELATED ACTIONS
EM5

General concerns were expressed by some in the community that there is a lack of access to the lake for boating, resulting in informal access at several locations and damage to foreshores. Certainly, the boat ramp at Attunga St (Evans Point) is in relatively poor condition and the overall facility does not lend itself to intensive use. Runoff from the road here is poorly managed and erosion of sediment from informal parking and unsealed manoeuvring areas would be contributing some sediment to the Lake.

However, discussions with Council staff and TfNSW have indicated that this boat ramp is unlikely to be a priority for upgrade soon. We note that both Council and TfNSW are in the process of reviewing maritime facilities in the Eurobodalla Shire.

The situation should continue to be monitored by the Estuarine Management Advisory Committee (see Action EM5). While no action is proposed under this Program, Council may consider taking steps to reduce the impact of informal parking at the site, potentially paving some areas to facilitate boat turning at the facility.

Boat ramp at Evans Point and associated car parking facilities are in a relatively poor state

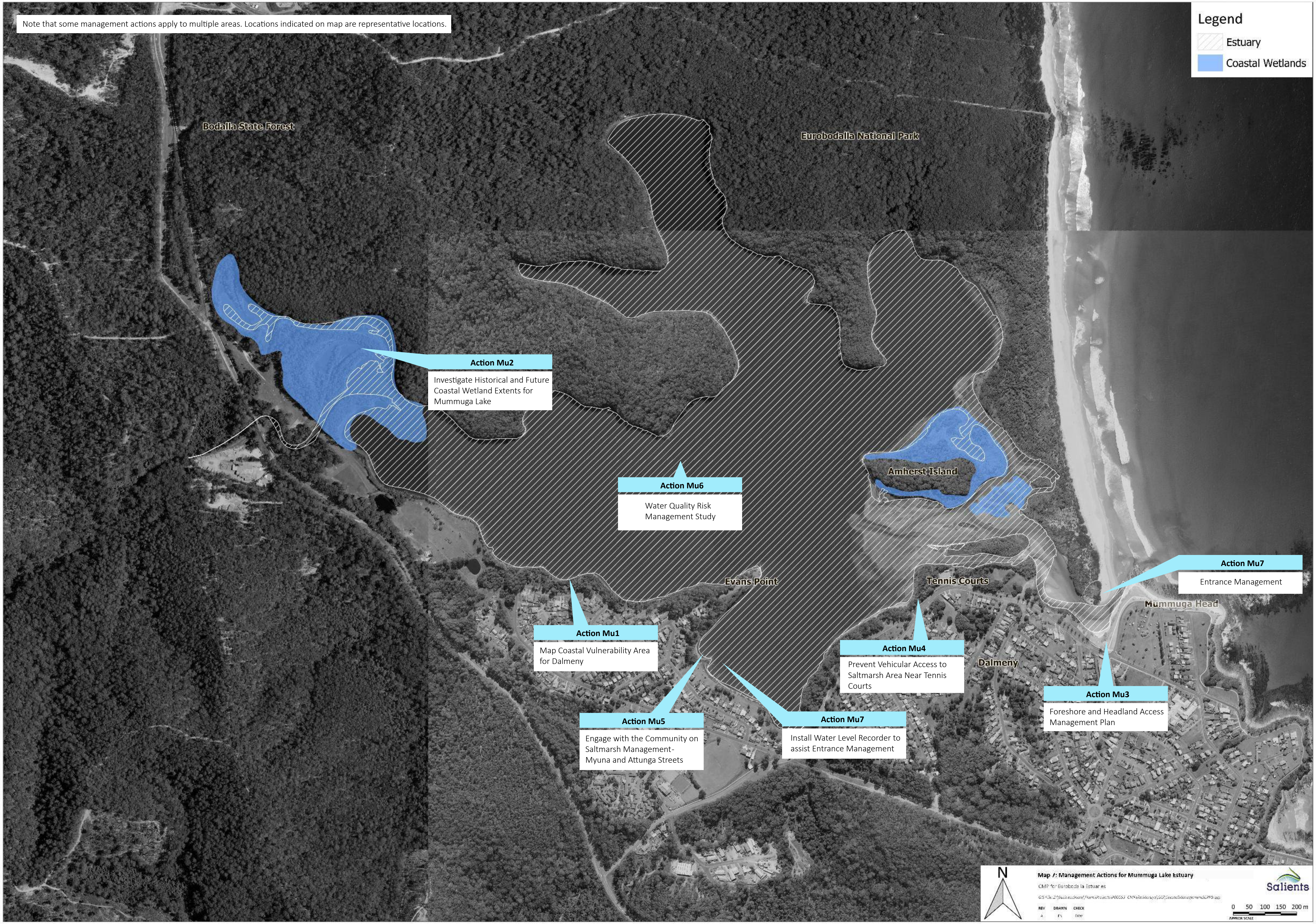
4.2.6 Other Issues

Several other issues of importance also require ongoing vigilance. Action is warranted in some cases, particularly if relatively easy and cost-effective solutions with a high likelihood of a positive impact can be identified. Some of these matters are also, at least partly, being managed through other processes. Several of the 'moderate' risks identified in Appendix D for Mummuga Lake will be addressed by the overarching actions outlined in Section 2.2. The remaining issues of note are:

- Existing CM SEPP mapping does not completely match the full extent and variability of coastal wetlands.
- Concerns relating to overfishing within the lake.
- Entrance management, including raising the community's awareness on the variability and effectiveness of entrance opening to improve water quality. At the time the CMP was being prepared, NPWS was working on updating their entrance management policy for Mummuga.

4.3 Actions to be Implemented by Eurobodalla Shire Council and/or Public Authorities

The actions forming part of the ECMP are outlined below and presented in Map 7. A substantial area of Mummuga Lake falls within the Eurobodalla National Park and actions should be undertaken in consultation with NPWS.



Note that some management actions apply to multiple areas. Locations indicated on map are representative locations.
Legend
Estuary
Coastal Wetlands
Bodalla State Forest
Eurobodalla National Park
Action Mu2
Investigate Historical and Future Coastal Wetland Extents for Mummuga Lake
Action Mu6
Water Quality Risk Management Study
Amherst Island
Evans Point
Tennis Courts
Mummuga Head
Dalmeny
Action Mu7
Entrance Management
Action Mu1
Map Coastal Vulnerability Area for Dalmeny
Action Mu4
Prevent Vehicular Access to Saltmarsh Area Near Tennis Courts
Action Mu3
Foreshore and Headland Access Management Plan
Action Mu5
Engage with the Community on Saltmarsh Management- Myuna and Attunga Streets
Action Mu7
Install Water Level Recorder to assist Entrance Management
N
Map 7: Management Actions for Mummuga Lake Estuary
CMP for Eurobodalla Estuaries
REV A
DRAWN
CHECK
0 50 100 150 200 m
APPROX SCALE
Salients

4.3.1 Action Mu1: Map Coastal Vulnerability Area for Dalmeny

Action EM1 describes broad parameters surrounding the application of existing flood models to look at tidal inundation under future sea level rise scenarios. In the case of Mummuga Lake, there is a pre-existing model of the estuary, and the Floodplain Risk Management Study and Plan (FRMSP) was being developed alongside this ECMP.

An additional study will need to be commissioned to replicate measured tidal behaviour and produce the requirements for mapping tidal planes outlined under Action EM1. However, current tidal behaviour and its variability need to be better understood, and this will require the capture of a water level record from inside the lake (refer to Action Mu7).

Some follow-up work will be required to translate the outputs into actual extents of tidal inundation related to the coastal vulnerability area, and some additional thought will need to go into achieving this, hopefully based on an emerging standard of practice in the next few years. It is not expected that the new study would be undertaken until 2025/26, and it could be funded under DPE's Coast and Estuaries Grants program.

4.3.2 Action Mu2: Investigate Historical and Future Coastal Wetland Extents for Mummuga Lake

Action EM1 provides broad coverage for this action. However, some additional effort should be undertaken at Mummuga Lake. During the scoping study, it was recognised that differences existed between the wetland extents in the CM SEPP and those which were present from other mapping exercises and aerial photography. ICOLLs exhibit variable behaviour and salinity changes in response to the entrance condition, general rainfall patterns, and the volume of water retained behind a closed entrance barrier.

The extent of seagrasses and saltmarsh can be expected to also vary significantly at some locations within Mummuga Lake over time. A study is to be undertaken, including updating and ground truthing the existing condition of vegetation and completing aerial photo / satellite image interpretation to gain a better understanding of the natural variability of different types of wetland vegetation around Mummuga Lake. The study would also assist in identifying how wetland vegetation may respond over time to rising sea levels.

DPI Fisheries intends to repeat seagrass mapping to build upon historical data in the Eurobodalla region. Although Mummuga Lake, Wagonga Inlet and Moruya River are not identified as priority estuaries, it would

be advantageous for Council to utilise the standard DPI seagrass mapping methodology for accurate comparison over time.

4.3.3 Action Mu3: Foreshore and Headland Management and Access Management Plan

An access management and landscape plan for Mummuga Headland, the southern foreshore of Mummuga Lake (east of the Tennis Courts) and the adjacent parkland is required. The plan should consider the following:

- Substantial cultural heritage values, and the possibility of installing informative signage. The local Aboriginal community should be involved in development of the plan.
- The need to rationalise access including railings at the top of the slope by fencing or otherwise separating foot traffic from areas where existing middens could be damaged.
- Provision of safe access down the face of the slope where necessary to address safety issues arising from steep, informal tracks.
- Removal of unstable trees from eroding slopes.
- Assessment of existing structures, particularly where exposed to ocean waves, against coastal engineering standards and development of concepts for improving / replacing those structures. Detailed design and construction can follow as needed.
- Revegetation of areas at the crest of the slope with suitable low relief native species to discourage access down slopes in areas other than those identified for formal access.

Elements of work that have been identified, by Council, as suitable for action are presented in Map 8. An allowance for funding of those actions has been incorporated into the Business Plan. When undertaken, those actions should remain cognisant of the overall *Foreshore and Headland Access Management Plan* to ensure consistency.

The southern foreshore area adjacent the entrance is Crown land reserved for public recreation and managed by Council. This action should be pursued in consultation with DPE – Crown Lands.

4.3.4 Action Mu4: Prevent Vehicular Access to Saltmarsh Area near Tennis Courts

Bollards are to be installed on Council land to prevent vehicular access onto the area of saltmarsh near the tennis courts on Mort Avenue. Initially, 3-5 standard timber bollards may suffice, although if these are vandalised a more robust solution may be required.

Maintain existing rock wall

Formalise access, stabilise and revegetate banks

Revegetation: low relief bank stabilising vegetation

N

Map 8: Foreshore and Headland Management and Access Management Plan

CMP for Turnbull Estuaries

REV	DRAWN	CHECK
A	LS	DPW

Salients

0 10 20 30 40 m

APPROX SCALE

In addition, the short, unsealed track which leads from Mort Avenue and through the foreshore vegetation will be removed and planted out with turf, to eliminate the perception that vehicular access is permitted. In consultation with NPWS, signs may be erected to notify the public that the saltmarsh is at least partly located within the National Park, and to highlight the sensitivity of this area.

4.3.5 Action Mu5: Engage with Community on Saltmarsh Management, Myuna and Attunga Streets

Council and DPI will engage with the community, where properties on Myuna and Attunga St back on to the area of previously rehabilitated saltmarsh. This is likely to take some time and effort to gain a mutual agreement on the importance of the saltmarsh and to develop a way forward in terms of future management.

The destruction of saltmarsh which exists on public land without a permit is an offence under the *Fisheries Management Act 1994*. At other locations, following consultation, an agreement has been reached whereby markers are installed to identify the boundary to which mowing is allowed and DPI Fisheries issues a permit for landowners to mow to that boundary, but not beyond.

Following agreement and implementation of the markers, Council, DPI, and the Batemans Marine Park will ensure that the following occur:

- Regular maintenance to prevent infestation of the salt marsh with grasses and other escapees from residents' back yards.
- Robust monitoring and compliance activities including fines as required.

4.3.6 Action Mu6: Water Quality Risk Management Study

The "Risk-based Framework" methodology (OEH, 2017) shall be used to examine the water quality issues that are a concern for the community. While the methodology has been applied across the NSW coast more broadly, it needs to be revisited with a more local focus. Storm water quality management should include ongoing revisions to the current protections included in the DCP and when developing future Area Plans for urban development areas, such as the Dalmeny Land Release. The DCP for the Dalmeny Land Release should be informed by and updated as a recommendation of the Water Quality Risk Management Study.

In modifying the approach taken, the study is to incorporate the findings from risk-based framework studies being completed at several estuaries on the NSW coast under the Marine Estate Management Strategy.

Importantly, the community needs to be involved in this study from an early stage to ensure that their concerns are being adequately accounted for and addressed by the study.

The study will be used to inform an urban stormwater management strategy which considers ongoing growth of the population surrounding Mummuga Lake.

4.3.7 Action Mu7: Entrance Management

An entrance management plan is presently being prepared for NPWS, which is the lead agency responsible for entrance management at Mummuga.

Discussions with NPWS have identified the need for a near real time permanent water level recorder to support entrance management activities. Such a recorder would have multiple benefits for the lake (see Action Mu1). Recorders such as these are normally installed and managed by DPE.

NPWS and Council are also collaborating at present regarding replacement of the pedestrian bridge across the entrance channel, and this bridge may be upgraded to enable earth moving machinery to cross the bridge, providing better flexibility during entrance opening operations.

This action involves ongoing communication between agencies regarding entrance management activities and the installation of a permanent water level recorder.

5 WAGONGA INLET ISSUES AND ACTIONS

5.1 Key Estuary Management Objectives

The coastal zone associated with Wagonga Inlet is shown in Map 9. Relevant objectives for the estuary have been extracted from the *Coastal Management Act 2016* based on the management issues present. These were then considered as part of the risk assessment presented in Appendix D. Following that exercise, the "key" objectives, being those most associated with "extreme" or "high" level risks for this estuary, were identified.

The selected objectives were assigned a "focus" rating (very strong, strong, moderate, or minor) based on the risk assessment outcomes. The focus rating can be considered a qualitative measure of the total effort that the Program contains to achieve that objective. These are presented in Table 5.

The priority score in Table 5 directly related to the coastal management area to which that objective applies in the CM Act. For example, objectives associated with the coastal wetlands area have a priority score of 1, whereas those associated with the coastal use area have a priority score of 4.

Table 5 Key Objectives and Classification for Wagonga Inlet

Objective	CM Area	CMP Focus	Priority
To protect coastal wetlands and in their natural state, including their biological diversity and ecosystem integrity,	Wetlands	Very Strong	1
To promote the rehabilitation and restoration of degraded coastal wetlands	Wetlands	Very Strong	1
To improve the resilience of coastal wetlands to the impacts of climate change, including opportunities for migration	Wetlands	Very Strong	1
To protect and enhance the coastal environmental values and natural processes of the estuary, and enhance natural character, scenic value, biological diversity and ecosystem integrity,	Environment	Strong	3
To reduce threats and improve the resilience of the estuary, including in response to climate change	Environment	Strong	3

Objective	CM Area	CMP Focus	Priority
To maintain and improve water quality and estuary health	Environment	Strong	3
To support the social and cultural values of the estuary	Environment	Strong	3
To maintain and, where practicable, improve public access, amenity and use of foreshores.	Environment	Strong	3
To protect and enhance the scenic, social and cultural value of the coast by ensuring development: • is of an appropriate type, bulk and scale for its location • avoids or mitigates against adverse impacts on heritage values • supports and/or incorporates water sensitive urban design • incorporates adequate public open spaces for recreation and associated infrastructure	Use	Moderate	4

5.2 A Snapshot of Issues

The key issues identified by the risk assessment process are outlined below and presented in Map 10.

5.2.1 Considering the Extent of Future Tidal Inundation around Wagonga Inlet

ASSESSED RISK LEVEL

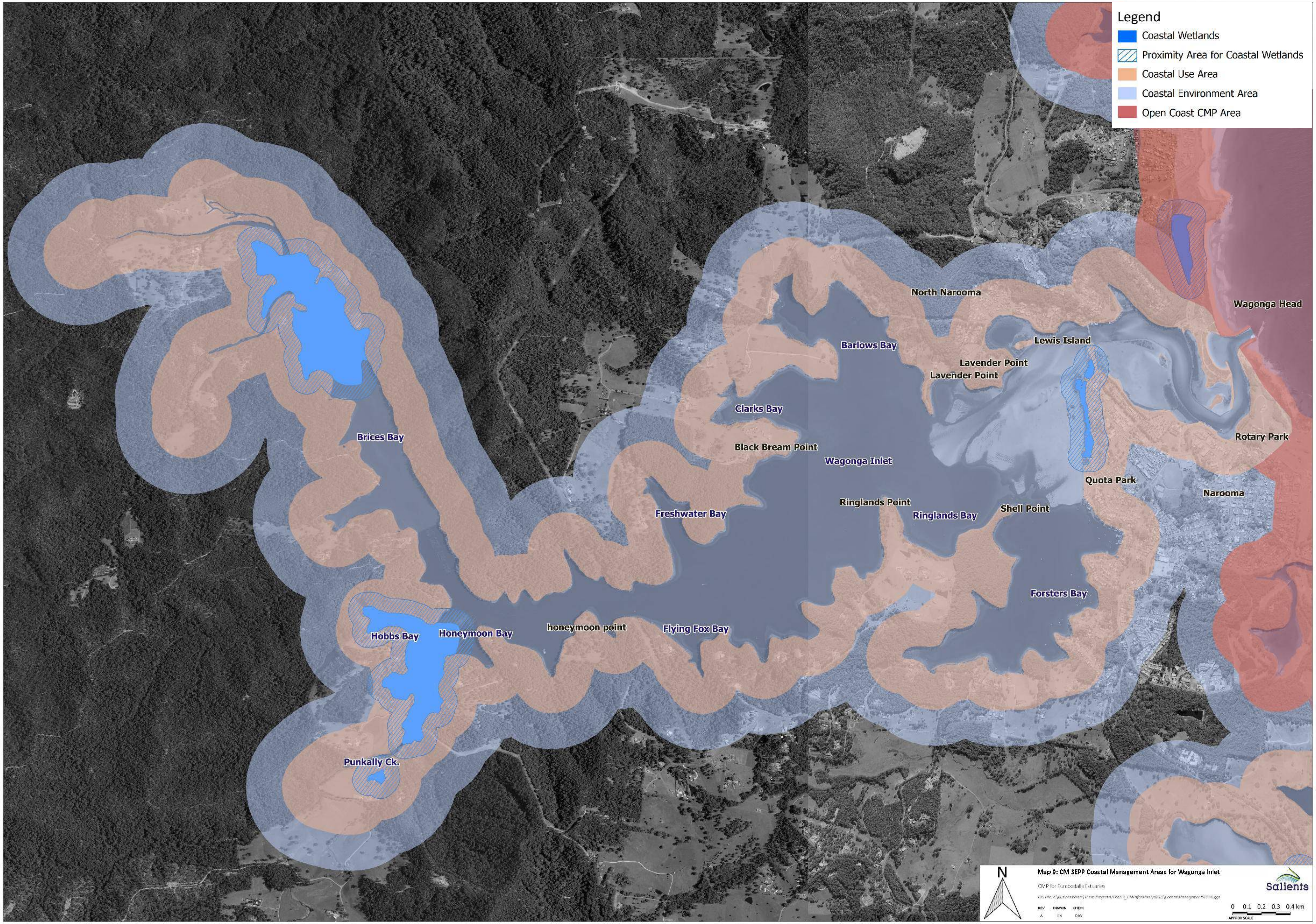
Extreme

RELATED ACTIONS

EM1, EM2, Wa1, Wa2, Wa7, EM6

Understanding the future tidal inundation extents around Wagonga Inlet is important for the following reasons:

- There exists low lying development in and around Narooma, particularly at Narooma Flats, which is already experiencing some impacts from more frequent flooding and tidal inundation.
- Due to topography, the future migration of wetlands is constrained (see also Section 5.2.2).


Legend
Coastal Wetlands
Proximity Area for Coastal Wetlands
Coastal Use Area
Coastal Environment Area
Open Coast CMP Area
North Narooma
Wagonga Head
Barlows Bay
Lewis Island
Lavender Point
Lavender Point
Clarks Bay
Brices Bay
Black Bream Point
Wagonga Inlet
Rotary Park
Quota Park
Narooma
Ringlands Point
Shell Point
Freshwater Bay
Ringlands Bay
Forsters Bay
Hobbs Bay
Honeymoon Bay
honeymoon point
Flying Fox Bay
Punkally Ck.
N
Map 9: CM SEPP Coastal Management Areas for Wagonga Inlet
CMP for Eurobodalla Estuaries
REV
A
DRAWN
EN
CHECK
DJW
Salients
0 0.1 0.2 0.3 0.4 km
APPROX SCALE

Note that some key issues occur in multiple areas. Locations indicated on map are representative locations.

Management of Brices Bay Historic Wharf

Steep topography will limit migration of coastal wetlands as sea levels rise

Mowing to the rear of wetlands prevents saltmarsh from establishing

Entrance channel instability

Lack of waterside maritime facilities in Narooma

Sedimentation and pollution from Punkally Creek catchment

Extent of future tidal inundation is uncertain

Perception of poor water quality within Forsters Bay

NORTH NAROOMA
LEWIS ISLAND
LAVENDER POINT
BLACK BREAM POINT
KINGLANDS POINT
SHELL POINT
QUOTA PARK
ROTARY PARK
NAROOMA
WAGONGA HEAD
HONEYMOON POINT
HORSE POINT

N

Map 10: Representative Locations of Key Issues for Wagonga Inlet

CMP for Eurobodalla Estuaries

GIS File: Z:\Business Share\Projects\180093_CMPforEstuaries\GIS\CoastalManagement180093.qgs

REV	DRAWN	CHECK
A	EN	DAV

Salients

0 0.1 0.2 0.3 0.4 km

APPROX SCALE

The issue of how tidal inundation will evolve is compounded by the behaviour of the entrance. The entrance to Wagonga Inlet was trained in the latter half of the 1970s. Since that time, the entrance has been scouring, tending towards a minor fall in mean lake level and less super-elevation of tides. Partly offsetting this tendency is a gradual rise due to rising mean ocean water levels (sea level rise).

Inundation at the Corner of Lynch St and Nichelsen St, Narooma

5.2.2 *Considering the Future Migration Pathways of Wetlands around Wagonga Inlet Estuary*

ASSESSED RISK LEVEL

Extreme

RELATED ACTIONS

EM1, EM2, Wa1, Wa2, Wa6, Wa7, EM6

Increasing mean tidal levels is an important issue for wetlands around Wagonga Inlet. Neilsen and Gordon (2017) have analysed tidal records and estimated that the mean spring tide range in the estuary has increased in recent decades by 3mm/yr. This has flow on effects, such as a threefold increase in the rate that saltmarsh is being lost from the estuary since the entrance was trained. The loss of saltmarsh from Wagonga Inlet is a cause for considerable concern, and future management of areas where saltmarsh may migrate requires an understanding of potential pathways for that migration.

Wetlands around Wagonga Inlet are expected to suffer from 'coastal squeeze' as sea levels rise. Existing development and steep topography will limit their upslope migration

5.2.3 Mangroves – Narooma Flats

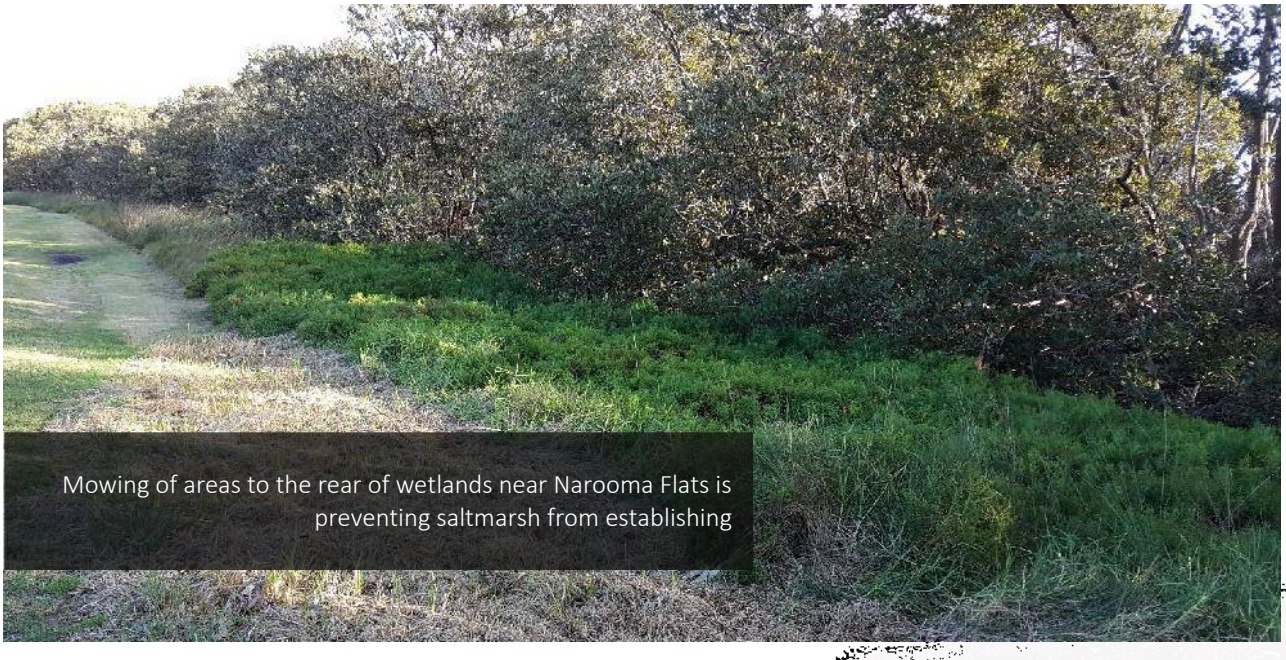
ASSESSED RISK LEVEL

High

RELATED ACTIONS

Wa6

The area of concern stretches from the southwestern edge of the Princes Highway Bridge, adjacent to Riverside Drive, down to approximately McMillan Road. It is presently fringed by a (typically) 30-50m wide stand of riparian mangroves. The grassed reserve to the rear of this stand of mangroves is being mowed, preventing the establishment of saltmarsh in this area.



Mowing of areas to the rear of wetlands near Narooma Flats is preventing saltmarsh from establishing

5.2.4 Entrance Channel Instability

ASSESSED RISK LEVEL

High

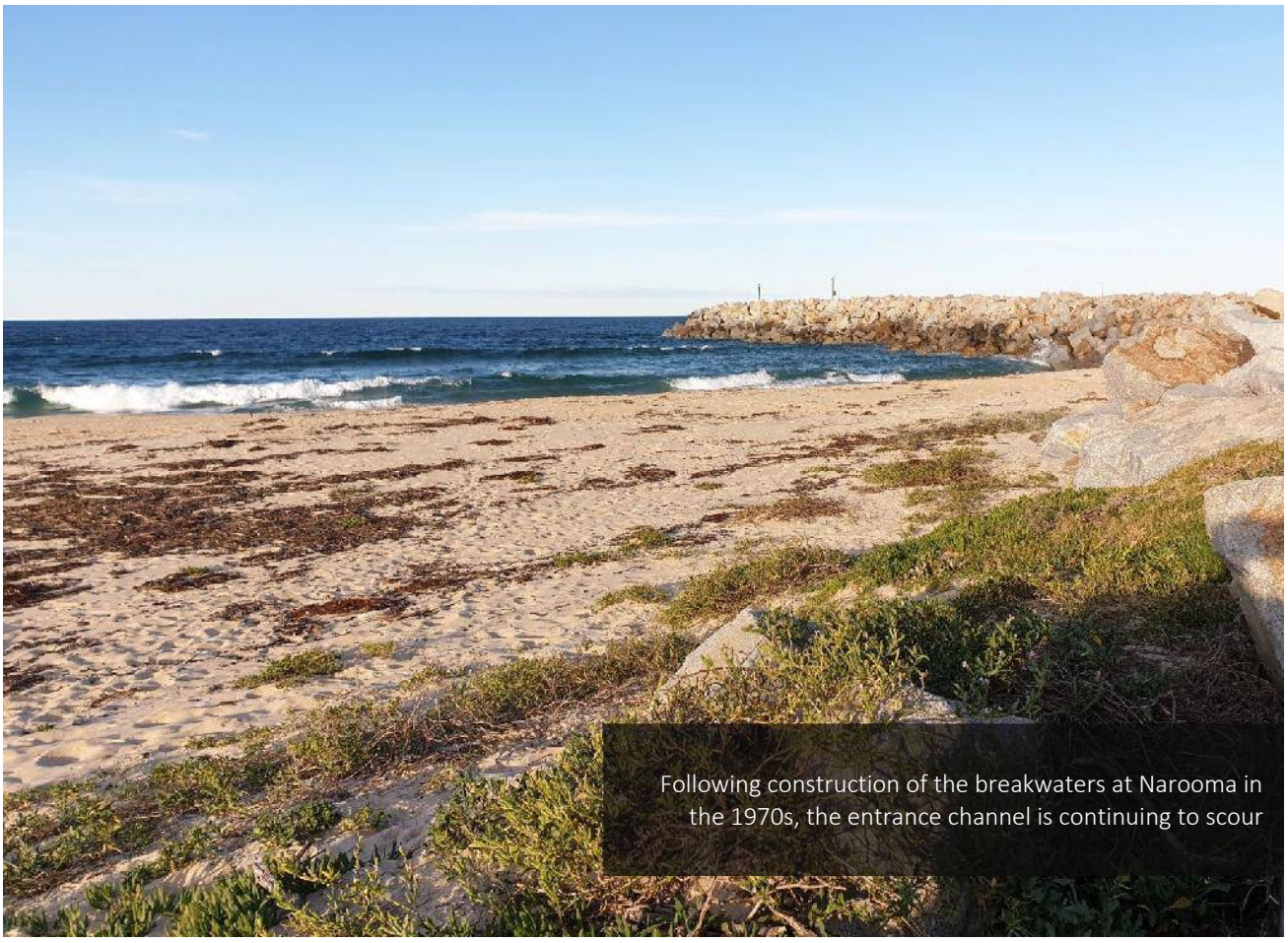
RELATED ACTIONS

Wa7, Wa8

As noted under Section 5.2.2, training of the entrance in the late 1970s has resulted in ongoing change as the entrance channel becomes deeper and larger in response.

There are a series of ongoing impacts that will need management. Navigation of the entrance channel upstream of the Princes Highway Bridge is variable and unreliable. Related to this, overall deepening of the channel is resulting in the net movement of sand upstream along the channel and depositing onto the dropover into the deeper part of the estuarine basin. The sand tends to move upstream in waves, which explains why navigation in the area can be unreliable.

Lewis Island is located adjacent to the northern side of the channel, upstream of the bridge, and the ongoing erosion of the southern shoreline of this island and its relationship to dynamics inside the entrance channel is not yet well understood.



Following construction of the breakwaters at Narooma in the 1970s, the entrance channel is continuing to scour

The channel will continue to deepen and widen, making high tides in Wagonga Inlet higher and increasing the tidal range. This may, for example, expose the foreshore of Lewis Island to even larger wind waves.

Overall, the dynamics of the channel are not well understood. A study to understand the mechanics of changes in the entrance, the expected time scale for ongoing evolution, and an assessment of the overriding impact of the process when combined with sea level rise is included in the Program.

5.2.5 Sedimentation and Pollution of Punkally Creek

ASSESSED RISK LEVEL

High

RELATED ACTIONS

Wa3

The oyster industry is important to Wagonga Inlet and the surrounding district. Activities in the catchment of Punkally Creek may be threatening the oyster leases operating at the mouth of the creek.

While it is understood that the sediment load flowing down the creek is high, and that some sources have suggested intermittent faecal pollution of the waters, the exact nature of any faecal pollution and the main causes of erosion and sedimentation are not well understood.

Ongoing erosion, sedimentation and pollution from Punkally Creek catchment is causing issues with oyster farming at its downstream end

5.2.6 Management of Brices Bay Historic Wharf

ASSESSED RISK LEVEL

High

RELATED ACTIONS

Wa4

Repair works were recently undertaken on Brices Bay Historic Wharf. However, the wharf lacks any public facilities such as a toilet or bins. Increased use of this area has resulted in pollution and potential risks to both water quality and cultural heritage in the area. Restoration and revegetation works have recently been undertaken to provide a buffer to at-risk cultural heritage areas.

There is a requirement to maintain and monitor the efficacy of that buffer, and to assess whether further revegetation is necessary. A monitoring and revegetation program would assess whether damage and pollution are continuing and would identify options for future prevention. Future management should involve the Wagonga Local Aboriginal Land Council on future management requirements for the area.

Recent repairs / changes at Brice's Bay Wharf have introduced several other challenges

5.2.7 Other Issues

Several other issues of importance also require ongoing vigilance. Action is warranted in some cases, particularly if relatively easy and cost-effective actions which will almost certainly have a positive impact can be identified. Some of these matters are also, at least partly, being managed through other processes. Several of the 'moderate' risks identified in Appendix D for Wagonga Inlet will be addressed by the overarching actions outlined in Section 2.2. The remaining issues of note are:

- A perception of water quality issues within parts of Forsters Bay.

5.3 Actions to Be Implemented by Eurobodalla Shire Council and/or Public Authorities

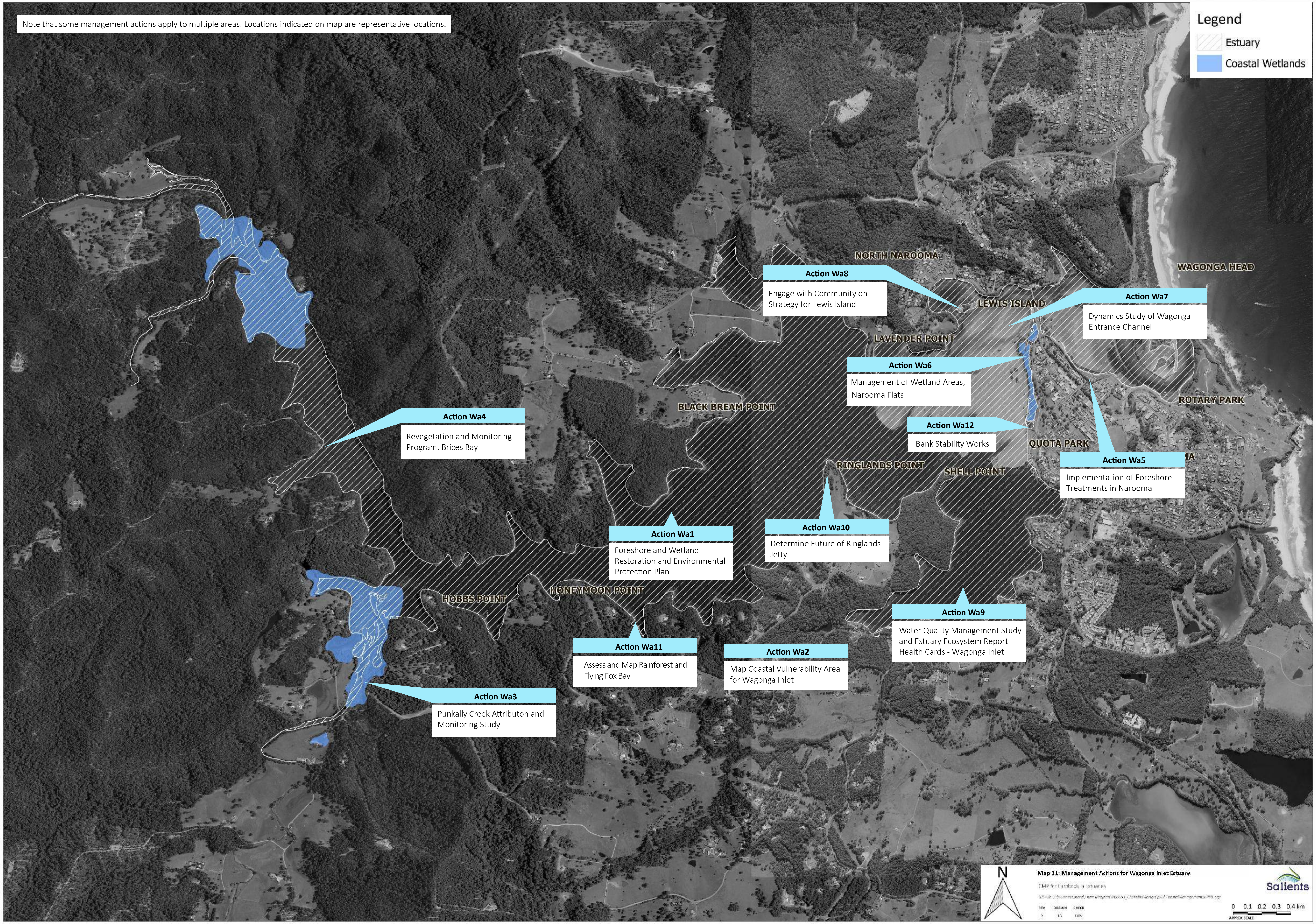
The actions forming part of the CMP are outlined below and presented in Map 11. Most of Wagonga Inlet below mean high water mark is Crown land, as are several foreshore reserves. Appendix F contains a list of key areas of Crown land relevant to the actions contained in this section.

5.3.1 Action Wa1: Foreshore and Wetland Restoration and Environmental Protection Plan

During preparation of this Plan, dedicated consultation with the staff from LLS and Council was undertaken, with data captured from field inspections discussed and used to prepare a *Foreshore and Wetland Restoration and Environmental Protection Plan*. Map 12 shows the locations where works are required including some works that are within areas mapped as CM SEPP wetlands. The layers used to construct this map have been provided to Council for future reference and updating as this sub-program progresses.

There are, broadly, three different types of works targeted:

- Riparian corridor rehabilitation, ideally 30-100 metres wide and including revegetation, reconstruction, and fencing.
- Fencing of low-lying areas where saltmarsh is likely to establish if grazing is excluded.
- Maintenance work, which typically involves weeding and replanting, where required, of native vegetation.



Note that some management actions apply to multiple areas. Locations indicated on map are representative locations.
Legend
Estuary
Coastal Wetlands
NORTH NAROOMA
WAGONGA HEAD
LEWIS ISLAND
LAVENDER POINT
ROTARY PARK
BLACK BREAM POINT
QUOTA PARK
RINGLANDS POINT
SHELL POINT
HOBBS POINT
HONEYMOON POINT
Action Wa8
Engage with Community on Strategy for Lewis Island
Action Wa7
Dynamics Study of Wagonga Entrance Channel
Action Wa6
Management of Wetland Areas, Narooma Flats
Action Wa12
Bank Stability Works
Action Wa5
Implementation of Foreshore Treatments in Narooma
Action Wa4
Revegetation and Monitoring Program, Brices Bay
Action Wa1
Foreshore and Wetland Restoration and Environmental Protection Plan
Action Wa10
Determine Future of Ringlands Jetty
Action Wa9
Water Quality Management Study and Estuary Ecosystem Report Health Cards - Wagonga Inlet
Action Wa11
Assess and Map Rainforest and Flying Fox Bay
Action Wa2
Map Coastal Vulnerability Area for Wagonga Inlet
Action Wa3
Punkally Creek Attributon and Monitoring Study
N
Map 11: Management Actions for Wagonga Inlet Estuary
Salients
REV
DRAWN
CHECK
0 0.1 0.2 0.3 0.4 km
APPROX SCALE

ID	PRIORITY	COMMENT
		PROPERTIES
P1(1)	1	Private property, overly cleared to foreshore, needs remediation.
P2(1)	1	Parts of foreshore require revegetation.
P3(1)	1	Difficult site. Foreshore vegetation required on private land.
		FORESHORES
F1(2)	2	Ongoing weeding required.
F2(2)	2	Maintenance: ongoing weed control and revegetation works.
F3(1)	1	Council foreshore reserve needs revegetation.
F4(1)	1	Foreshore revegetation required. Fencing needs maintenance.
F5(1)	1	Foreshore needs revegetation.
F6(1)	1	Ongoing weeding required.
F7(2)	2	Continue weed management.
F8(2)	2	Ongoing maintenance of foreshore vegetation required.
F9(1)	1	Revegetation of council reserve required.
F10(2)	2	Weed control, maintenance and some revegetation required.

N

Map 12: Preliminary Foreshore and Wetland Restoration and Environmental Protection Plan

CMP for Eurobodalla Estuaries

Salients

REV A | DRAWN EN | CHECK DW

0 0.1 0.2 0.3 km

APPROX SCALE

The works identified by this action all constitute environmental protection works in the context of the CM SEPP. Any structural works identified by this action constitute coastal protection works as defined under the CM Act, and those works are subject to the development consent requirements of s27 of the CM Act. Where coastal protection works are carried out by or on behalf of a public authority and are identified in a certified CMP, those works are permissible under clause 2.16 (2) (a) (i)of the RH SEPP, and where this is the case require an REF to be considered by the determining authority.

In addition to the above, Council will continue to supplement these actions by routinely utilising native species in roadsides, reserves and parks adjoining waterways.

Standard rates used by LLS have been used to cost the restoration options. The work is difficult to schedule for the following reasons:

- Progress is often dependent on the willingness of private landowners to participate.
- Funding sources, such as seasonal grants opportunities, are not always amenable to taking advantage of a willing landowner.

Aside from private land, Council is also responsible for the management of riparian zones, including the substantial coastal foreshore reserve along the southern foreshore of Wagonga Inlet, stretching from Hobbs Bay around to the eastern foreshore of Forsters Bay. While not shown on Map 12, general repair and protection works throughout southern Wagonga Inlet are included in this Management Action. Potential sources of funding for works include:

- Private land: Local Land Services.
- Public land: DPE Grants streams (Coasts and Estuaries, Environmental Trust) and Local Land Services.

For the reasons outlined above, it is difficult to precisely program when works at a given site will be achievable. The time estimates and costs provided in the Business Plan are based on the experience of LLS and Council over recent years and it is estimated that works shown in Map12 would take around 5 years to complete.

Council will take the lead role in administering the Foreshore and Wetland Plan, with LLS providing support and project management services, particularly on private land. Council will keep up to date records, as described in Section 7 , and works will be coordinated through the Estuarine Management Advisory Committee (Action EM5).

5.3.2 Action Wa2: Map Coastal Vulnerability Area for Wagonga

Action EM1 describes broad parameters surrounding the application of existing flood models to look at tidal inundation under future sea level rise scenarios. In the case of Wagonga Inlet, there is a pre-existing model of the estuary, and the Floodplain Risk Management Study and Plan (FRMS&P) was being developed concurrently with this ECMP.

An additional study will need to be commissioned to replicate measured tidal behaviour and produce the requirements for mapping tidal planes outlined under Action EM1. In the case of Wagonga Inlet, it will be important that the Dynamics Study of Wagonga Entrance Channel (Action Wa7) be completed before Action Wa2, so that future evolution of the channel can be incorporated into the projected changes in tidal behaviour.

Some follow-up work will be required to translate the outputs into actual extents of the tidal inundation related coastal vulnerability area, and some additional thought will need to go into achieving this, hopefully based on an emerging standard of practice in the next few years. It is not expected that the new study would be undertaken until 2024/25, and it could be funded under DPE's Coast and Estuaries Grants program.

5.3.3 Action Wa3: Punkally Creek Attribution and Monitoring Study

LLS, in conjunction with the Soil Conservation Service, are in the process of implementing a plan to protect some foreshores within the Punkally Creek catchment. At the time of drafting, plans for the proposed works were not available. Any works that are undertaken in the catchment should be based on sound science and an understanding of the geomorphological effects that will arise from, for example, the implementation of works that harden the banks or bed of the creek. Care needs to be taken to ensure that the protection strategy adopted along the creek does not result in enhanced erosion in other areas.

Furthermore, we understand that staff from DPE EHG have recently collected a sample from the waterway for subsequent testing to determine the presence or otherwise of faecal pollution and the origin of any faecal pollution detected (human or animal source).

Ultimately, a cohesive, well thought out strategy for managing issues along Punkally Creek needs to be developed to ameliorate any ongoing threats to the oyster industry. This management action aims to provide the necessary background scientific understanding to justify development of such a strategy.

The Attribution Study should contain the following elements:

- Field inspection of the creek to determine the characteristics and state of the waterway and to pinpoint any areas of particular concern.
- Inspection of aerial photography and historical ground survey data (and LiDAR) to assess the historic morphological evolution of the creek, identifying both historical and current locations of erosion and the rate at which shoals at the downstream end of Punkally Creek have grown in recent times.
- Identification of key land use practices (both historical and current) that have led to ongoing sedimentation.
- Identification of areas of saltmarsh that should be targeted for fencing to exclude stock access.
- Development of recommendations for future management, including conceptual design of any foreshore treatments around areas of acute erosion.
- Investigate potential water quality pollutant sources and assess the impact of land use on water quality at Punkally Creek.

A formal report detailing the findings of the study should be prepared.

Furthermore, as works are presently going ahead, steps need to be put in place to monitor the impact of those works and to identify if additional corrective actions are required.

This management action is to be led by LLS, with support and involvement from DPE, Council, local oyster growers, and the NSW Food Authority.

5.3.4 Action Wa4: Revegetation and Monitoring Program, Brices Bay

If the historic site at Brices Bay is to remain accessible to the public, a monitoring and revegetation program should be set up to evaluate the impacts to:

- Water quality.
- Cultural heritage sites in the vicinity of Brices Bay.
- Efficacy of the recent revegetation, which serves as a physical buffer for foot traffic.

The function of this action will be to monitor the performance of the buffers and increasing their size as needed, while gathering data on use of the area. In the short term, education of the public and businesses that organise trips to the site needs to be undertaken to ensure there is general awareness of the limited toilet facilities and to ensure that all rubbish is removed from the site.

5.3.5 Action Wa5: Implementation of Foreshore Treatments in Narooma

Council has recently prepared a Plan of Management for the Narooma Sport and Leisure Precinct, which includes the Nata Oval Crown Reserve including the Caravan Park to the northeast of the Princes Highway and the foreshore reserve between the Caravan Park and the Inlet.

Saltmarsh species are already forming on the sand flats between the foreshore and the training wall of Wagonga Inlet. There is substantial interest in improving the ecological values at this site, considering that saltmarsh is likely to disappear from other locations around Wagonga Inlet as sea levels rise due to coastal squeeze. DPI are also considering the installation of an oyster shell reef in the near vicinity of this site.

Oyster reefs are still a distinctive estuarine habitat in Wagonga and Moruya estuaries where they exist along small sections of the foreshore edge and as remnant shell beds. These remnant reefs provide important fish habitat alongside opportunities for oyster reef restoration within the CMP study area.

A Concept Design Report for the Wagonga Inlet Living Foreshore Project was completed in October 2021. The Elements and Project Areas are presented in Figure 3. The work is to be completed as part of this CMP Action.

With the benefits of oyster reefs in mind, the Wagonga Inlet Living Shoreline (WILS) project was identified as an intent during initial development of this CMP, but has built momentum rapdily and work will have begun on the project by the time this CMP is certified. The WILS is a collaborative project between Eurobodalla Shire Council, NSW Department of Primary Industries (DPI) Fisheries, The Nature Conservancy Australia (TNC) and the Australian Government.

The project involves transforming and restoring a section of the Wagonga Inlet shoreline between the Narooma Swimming Centre and Ken Rose Park. The proposed outcome is an innovative solution to coastal management to protect this valuable section of the Inlet, long-term, whilst supporting saltmarsh species and recognising the local Yuin peoples connection to the area. The 'living' shoreline aims to improve foreshore protection and water quality, enhance access and recreation opportunities, revive lost oyster reefs once prevalent throughout the Wagonga Estuary, improve habitat for fish, and provide a sheltered area for saltmarsh habitat to expand.

'Living' shorelines such as the WILS provide a natural approach to coastal protection by using plants and other natural elements to soften wave energy and prevent erosion, rather than traditional methods such as rock walls. They have also been shown to enhance water quality and improve fish production and overall biodiversity.

Specically, the project will include the replacement of the existing failing rock wall with banks of low-growing riparian vegetation to create an environmentally-friendly seawall, and restore 1,700 m2 of intertidal Sydney rock oyster reef habitat in the area adjacent to the remediated bank using locally-quarried rock and local sterile oyster shells, which will encourage further oyster growth. A further 1,000 m2 of subtidal native flat oyster reef habitat will be established on the sea floor; deeper than the Sydney Rock Oyster reef and a jetty will allow recreational snorkelling and swimming above the reef. Lastly, a gentle slope will allow saltmarsh to encroach landwards towards the caravan park.

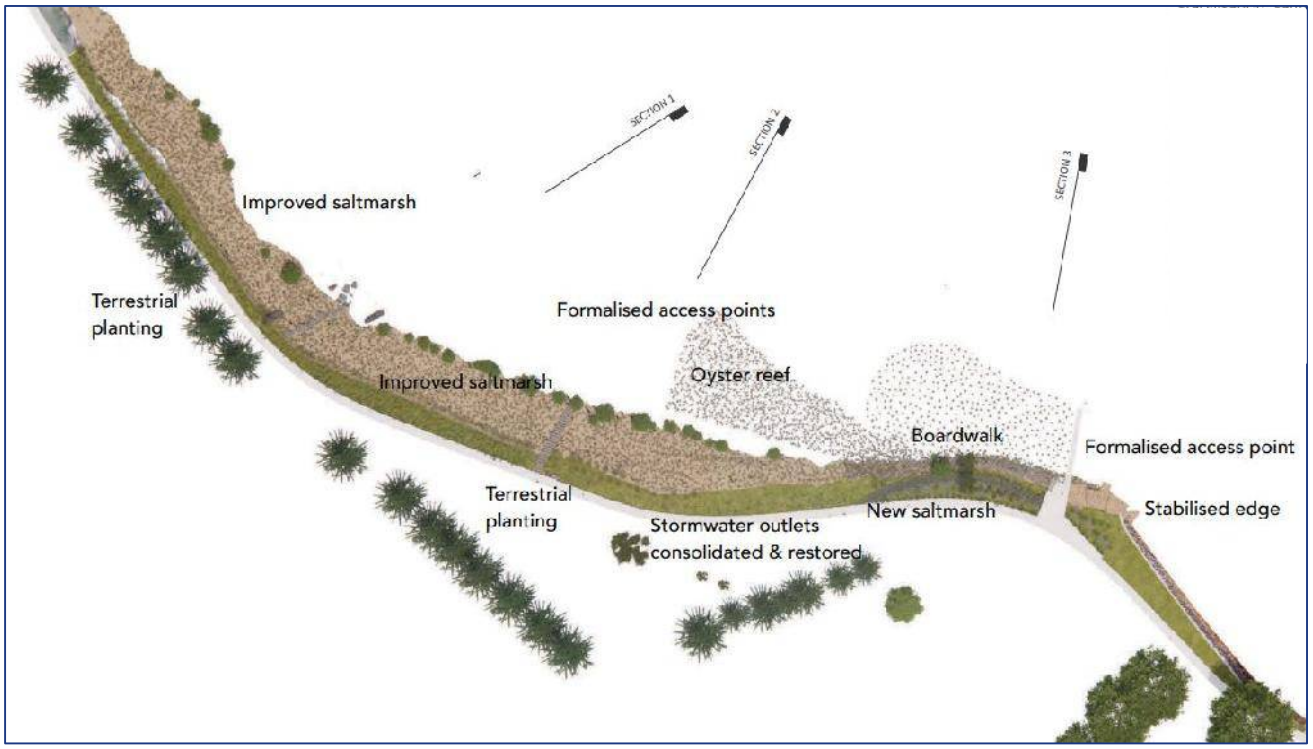


Figure 3 Elements of Wagonga Inlet Living Foreshore Project, Narooma (supplied by Council)

5.3.6 Action Wa6: Management of Wetland Areas, Narooma Flats

The grassed foreshore behind the mangrove stand is to be surveyed and assessed for the viability of saltmarsh species. From site inspection saltmarsh species are present but being mown during maintenance activities. This activity is an offence under the *Fisheries Management Act 1994* and should cease.

The area is to be surveyed and markers or an edging placed at the landward extent of the saltmarsh viable area to delineate where mowing should and should not occur. Council will continue to maintain this area through periodic inspection and weeding to encourage salt marsh to establish.

The works identified by this action all constitute environmental protection works in the context of the CM SEPP.

5.3.7 Action Wa7: Dynamics Study of Wagonga Entrance Channel

In preparation for completion of this study, DPE have been approached to complete a hydrosurvey upstream of the bridge at Narooma, including the entirety of the flood tide delta to its upstream extents where it drops over into the main estuarine basin and into Forsters Bay. Recent (2018) airborne laser scanned bathymetry exists for the area downstream of the bridge. The dynamics study of Wagonga Entrance Channel will be led by Council with support from DPE EHG and should include the following:

- Comparison of available hydrosurveys to determine the amount of sediment that has been scoured from the channel and exported into Wagonga Inlet.
- Processing of the airborne laser scanned bathymetry data to assess bedforms in the channel and ascertain the dominant directions of sediment transport.
- Interpretation of historical aerial and satellite imagery from before and since training of the entrance to assess shoal development patterns.
- Completion of an Escoffier type analysis and incorporation of sea level rise projections to estimate the rate at which the entrance channel will continue to evolve over coming decades and up to 100 years in the future if the available information warrants it.
- Assessment of the processes (wind wave, current) contributing to the erosion of Lewis Island and whether there are options which could be adopted to arrest erosion.
- Provide recommendations regarding the expected changes to entrance bathymetry over different time frames for subsequent use in the flood model used to calculate future tidal inundation (Action Wa2).
- Provide recommendations regarding likely medium-term evolution of the entrance channel upstream of the Highway Bridge to help with planning navigation channels.
- Provide recommendations regarding whether dredging is likely to be feasible to assist with navigation, noting that the entrance was dredged in the mid-2000s, but its effectiveness was short lived.
- Dredging of the channel adjacent to Lewis Island has frequently been proposed by the community, it is expected that the outcomes of the Dynamics Study will better inform future management of the channel. Discussions with Maritime gave further weight to the perception of navigational difficulties upstream of the Princes Highway bridge. While Council's position is that dredging is a NSW State

Government responsibility, this study will aim to guide best practice for dredging, allowing Council to petition for the NSW State Government to undertake dredging in the near future.

5.3.8 Action Wa8: Engage with community on strategy for Lewis Island

Issues surrounding future use and access to Lewis Island are complicated. The Island is valued very highly by the local community, but its southern foreshore is receding rapidly. Attempts to arrest this erosion in recent years, including substantial effort from the local community, have been unsuccessful.

Overlying issues with Lewis Island which need to be balanced with the concerns of the local community include:

- Public access and safety.
- Past use by a pair of endangered Pied Oystercatchers, which seems to have been disturbed by public accessing the Island at night and lighting fires.
- The apparent presence of sites of importance to Aboriginal Heritage as suggested by the Wagonga LALC.
- Concerns with mangrove specimens being smothered by sand.

This action will be informed by the completion of Action Wa7, which will answer whether there is a feasible solution that would enable protection of the foreshore from erosion.

Options for future management which may be considered include:

- Foreshore protection.
- Nourishment.
- Completely removing the timber boardwalk leading to the island.
- Commit to investigating illegal use of the island, such as illegal camping, littering or consumption of alcohol.
- Fencing of Pied Oystercatcher nesting areas during breeding season.
- Prominent signage on the importance of Pied Oystercatchers and fines associated with their disturbance.
- Restriction of dog access to Lewis Island and installation of ordinance signs to support this.

The community needs to be invited to contribute to finding a solution which balances the competing values at Lewis Island. Information or on-site drop-in sessions informing the community of the potential and preferred options to manage the foreshore erosion would provide an opportunity to do this.

5.3.9 Action Wa9: Water Quality Management Study and Estuary Ecosystem Report Health Cards – Wagonga Inlet

The "Risk-based Framework" methodology (OEH, 2017) shall be used to examine the water quality issues that are a concern for the community in and around Forsters Bay. While the methodology has been applied across the NSW coast more broadly, it needs to be revisited with a more local focus.

The study is to be informed by experience gained during studies being completed at several estuaries on the NSW coast under the Marine Estate Management Strategy, as well as Council's water quality report cards collected in the interim. The report cards provide a 'snapshot' of the ecological health of our estuaries using several important ecological indicators. The study will be used to inform an urban stormwater management strategy which considers ongoing growth of the population surrounding Wagonga Inlet.

The Estuary Ecosystem Health Report Cards discussed as part of the MER Program (Section 7) will help support the required study.

This action can be used to inform and set water quality targets for the relevant DCP (the Narooma Township DCP) when it is next reviewed.

5.3.10 Action Wa10: Determine future of Ringlands Jetty

The derelict jetty on the Eastern Side of Ringlands Point has been closed to the public due to its dilapidated nature for over 15 years. Initially planned for demolition, this action has been delayed at the request of local community members and a recreational boating organisation, Boats Afloat Inc. The organisation have proposed to co-ordinate a rebuild of the jetty to modern construction standards, including consideration of the extensive posidonia beds that surround the jetty. This design is likely to include bollards that protect crafts from damaging seagrass beds, and materials that allow for sunlight to reach the seagrass beds. Consultation with Marine Parks and Fisheries will be integral to the design and construction of this replacement jetty.

It is understood that the Boating Now fund, or a similar boating infrastructure grant will be the primary funding body for this action. Council will offer support to the community association in their design and rebuild of the jetty if and when appropriate grant funding can be sought to fund this action. If grants are

not successful, or the community association responsible for undertaking the work is unable to meet the requirements of this action, Council will seek to clarify the future of the jetty by the end of this business plan (2027).

5.3.11 Action Wa11: Investigate and Map Rainforest at Flying Fox Bay

There are, presently, no littoral rainforests mapped in the CM SEPP around Wagonga Inlet. However, a potential area has been identified by Council staff in Flying Fox Bay.

This action will involve investigation of this area and, if it is confirmed as meeting the required hydrological and floristic characteristics of littoral rainforest, the development of maps for consideration in a future planning proposal (Action EM6).

5.3.12 Action Wa12: Bank Stability works in Wagonga Inlet

Two locations along the shoreline in Wagonga are experiencing bank instability and have been identified for foreshore protection works. The description of these sites and the requirement for works are based on text provided by Council staff.

Any structural works identified by this action constitute coastal protection works as defined under the CM Act, and those works are subject to the development consent requirements of s27 of the CM Act. Where coastal protection works are carried out by or on behalf of a public authority and are identified in a certified CMP, those works are permissible under clause 2.16 (2) (a) (i) of the RH SEPP, and where this is the case require an REF to be considered by the determining authority.

The bank stabilisation works adjacent to Centenary Drive/ Mill Bay and Quota Park must be carefully designed and adhere to 'Environmentally Friendly Seawall' Guidelines (Office of Environment and Heritage and Catchment Management Authority, 2009). DPI Fisheries and Batemans Marine Park will be consulted in the early planning stages to ensure adequate environmental assessment and the most suitable options for the sites are adopted.

Location 1. Centenary Drive above the iconic Mill Bay boardwalk on the northern shoreline of Wagonga Inlet has become increasingly unstable. Following storm events in early 2021, the road partly collapsed, and one lane was closed. This presents a significant access limitation to Bar Beach and boat ramps, including the only ramp in Wagonga Inlet with boat trailer parking. Without bank stabilisation works, the condition of this road is likely to worsen, and the road may collapse. Damage and potential closure of the Mill Bay boardwalk, a very popular walking and bicycle route, could result.

Bank Instability and road slip on Riverside Drive, above the iconic Mill Bay boardwalk, could lead to loss of access and damage to the boardwalk if left untreated

Location 2. A low-lying revetment protects the foreshore of Quota Park, Narooma from erosion. A short (few metres long) gap between revetment walls near public amenities adjacent to the southern end of the car park exists to the rear of a small mangrove stand, and shoreline erosion has occurred here. It is proposed to fill this gap using an environmentally friendly solution consistent with DPE EHG guidelines, designed in collaboration with Batemans Marine Park.

Shoreline erosion at Quota Park is to be mitigated through design and construction of an environmentally friendly seawall, in collaboration with Batemans Marine Park

6 BUSINESS PLAN

6.1 Intent of the Estuarine CMP

Key to determining the timing and way that different actions of the ECMP will be funded and implemented is understanding the benefits that will arise from the ECMP, and who the beneficiaries are.

Examination of the key management objectives for each Estuary (Sections 3.1, 4.1 and 5.1) demonstrates that:

- The focal Coastal Management Areas are the Coastal Wetland and Coastal Environment Areas.
- Where objectives aren't seen to have "Environmental Benefit" as the focus, such as preservation of heritage items, public access, or public facilities, the objectives can be seen as contributing to building or maintaining collective wealth within the community.

From these two points, most benefits are widespread and not targeted to any group or individual. Individual consideration of each proposed action (Sections 3.3, 4.3, and 5.3) also supports this conclusion.

In summary, all actions presently included in this ECMP can be seen to overwhelmingly accrue benefits to public and not private interests.

Accordingly, all funding should come from public sources (Local, State and Federal Government).

6.2 Costs and Funding Arrangements

A detailed discussion of funding options and responsibilities is outlined in Appendix F. One substantial difficulty for small local councils when planning for estuary management in NSW is that future funding from grant sources, at both state and federal level is uncertain in the medium term. Grant funding programs are normally contestable, and the likelihood of success can be affected by:

- Demand for the program.
- The rules surrounding the matching funding required changing from year to year.
- Variability in the pool of available funding, depending on other demands on public funds. For example, substantial uncertainty could be expected to arise as the economic impact of COVID-19 continues to be felt across Australia.

Eurobodalla Shire Council most commonly uses funds from general revenue, mostly derived from ordinary council rates, to leverage additional funding from external grants programs that provide funding for coast and estuary related management activities. A review of Council's operational plan at Scoping Study stage, indicated that council used around $115,000 of its Environmental fund, largely derived from an environmental levy, for coast and estuary management in the 2017/2018 financial year. Council's operational plan for the past two years has not separated out expenditure on coast and estuary management.

Under section 495 of the *Local Government Act 1993* Council can levy a special rate on some of the land in its local government area, to cover works that would benefit that land. At this point in time, amounts additional to the existing Environment Levy already charged to residents are not recommended.

Discussions with Council staff during preparation of this CMP, noting that council manages other estuaries and the open coast, have indicated that no more than $50,000 per annum should be assumed as a forward budget for actions in the CMP for the Moruya, Mummuga and Wagonga Estuaries. This is based on experience over the past few years, noting the present highly constrained funding environment for local councils.

Several grant programs have been identified (see Appendix F):

- Coast and Estuary Planning and Implementation Funding from DPE (presently funding on a 1:2, Local: State Govt. ratio).
- Floodplain Management Grant Funding from DPE (presently funding on a 1:2, Local: State Govt. ratio).
- NSW Environmental Trust, Environmental Education, Environmental Research and Restoration and Rehabilitation Administered by DPE (funding ratio is variable, success more likely with some contribution assume 1:2).
- DPI Fisheries: Habitat Action Grants (1:1 funding available for projects up to $40,000).
- DPI Flagship Fish Habitat Rehabilitation Grants (supports works including hydrological and environmental investigations and on-ground works, A maximum of $400,000 with projects running for up to two years).
- MIDO Rescuing our Waterways Program: For the case of this CMP, works would require 1:1 funding. To be successful, works would typically need to be of primary benefit to navigation. However, TfNSW is presently reviewing rules and eligibility.

In addition to these grant sources, South East Local Land services also has funds to help with environmental repair and restoration works. There may also be opportunities for Council to access Federal grant programs. However, these tend to be ephemeral in nature, rather than a regularly programmed funding scheme. As such, they should be considered a supplementary source of funding and should not be relied upon for completing the actions programmed into the CMP.

Consultation with state government agencies has secured advice committing to support the management actions proposed in the CMP. The relevant advice is provided as Appendix G. For contestable grants programs, Council has secured commitment that the proposed projects will be eligible for consideration.

Expenditure for the four-year period has been outlined, covering the short and medium terms. After four years, we expect the CMP will be reviewed. This is necessary as many of the actions proposed are studies and research which are needed to inform future management actions that could result in the recommendation of further on-ground works.

The breakdown of funding, indicating expected council contributions and funding from external sources for each calendar year is presented in Table 6. A more detailed breakdown of funding for all management actions is presented in Section 6.3.

Table 6 Projected Expenditure on ECMP for Moruya, Mummuga and Wagonga Estuaries

Year	Council Funds	External Funds
2022/23	$47,167	$585,333
2023/24	$61,300	$498,700
2024/25	$141,000	$383,000
2025/26	$138,667	$378,333

6.3 Program for Delivery

A program for delivery of the Management Actions in the ECMP, including funding sources, contributions and timing is presented in Table 7. Actual timing for different actions is dependent on both the expected value to be derived from the action, the urgency surrounding the issues each action is intended to address and the availability of funds from year to year. The annual costs in Table 7 are inclusive of both operational and maintenance costs.

Table 7 Eurobodalla Estuary Management Program - Business Plan: Delivery

	Management Option	Capital Cost	Annual Cost	Total ESC Contribution	Total External Contribution	External Funding Source	Responsibility for Delivery		Funding and Delivery Program								Notes
									2022/2023		2023/2024		2024/2025		2025/2026		
							Primary	Other	ESC	External	ESC	External	ESC	External	ESC	External	
Overarching Actions	EM1: Future Tidal Inundation Mapping to Inform other Actions	$ -	$ -				Council	DPE-EHG			$ -	$ -	$ -	$ -			Funded under subordinate actions (Mo3, Mu1, Wa2). Could be completed as a single package
	EM2: Map Migration Pathways for Coastal Wetlands	$ -	$ -				Council	DPE-EHG	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	Funded under subordinate actions.
	EM3: Preliminary Mapping of "At-Risk" Aboriginal Heritage Sites	$ 1,500.00	$ -	$ 1,500.00			Council	DPE-EHG	$ 1,500.00								
	EM4: Apppropriately Planning for Growth and Identifying Offsets	$ -	$ -	$ -	$ -	General Agency Operations	Council	DPE-EHG, DPE-Planning	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	In-house contribution Council and Agencies
	EM5: Establish Estuarine Management Steering Committee and Meet Regularly	$ -	$ -	$ -	$ -	General Agency Operations	Council	DPE-EHG, DPI-Fisheries, Local Land Services	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	In-house contribution Council and Agencies
	EM6: Investigate and validate CM SEPP mapping. Submission of Planning Proposal	$ -	$ -	See Mo3, Mu1, Wa1			Council	DPE-EHG							$ -	$ -	As required, once all preceding actions are complete. May occur Post 2024/2025
Moruya River	Mo1: Foreshore and Wetland Restoration and Environmental Protection Plan	$ -	$ 100,000.00	$ 10,000.00	$ 390,000.00	LLS	LLS	Council, DPE-EHG	$ -	$ 100,000.00	$ 10,000.00	$ 90,000.00	$ -	$ 100,000.00	$ -	$ 100,000.00	
	Mo2: Scientific, Hydraulic, Heritage and Migration Feasibility Study of Malabar Wetland	$ 250,000.00	$ -	$ 83,333.33	$ 166,666.67	C&E Grants	Council	DPE-EHG, DPI-Fisheries, Crown Lands							$ 83,333.33	$ 166,666.67	
	Mo3: Map Coastal Vulnerability Area for Moruya	$ 10,000.00	$ -	$ 10,000.00			Council	DPE-EHG					$ 10,000.00	$ -			Expected Adjunct to FRMP Modelling for Moruya River
	Mo4: Deua River Sediment Delivery Assessment	$ 100,000.00	$ -	$ 33,333.33	$ 66,666.67	C&E Grants	Council	DPE-EHG							$ 33,333.33	$ 66,666.67	
	Mo5: Assess Historical Changes to Tides	$ 5,000.00	$ -	$ 1,666.67	$ 3,333.33	C&E Grants	Council	DPE-EHG	$ 1,666.67	$ 3,333.33							
	Mo6: Provide Interpretive and Educational Signage around Quandolo Island / Eurobodalla National Park		$ -		$	General Operations - staff time	NPWS			$ -							In-house contribution Council and Agencies
	Mo7: Restore rock walls at Brierly's Boat Ramp and Russ Martin Park	$ 172,000.00	$ -	$ 57,333.33	$ 114,666.67	C&E Grants	Council	DPE-EHG, Crown Lands					$ 57,333.33	$ 114,666.67			
Mummuga Lake	Mu1: Map Coastal Vulnerability Area for Dalmeny	$ 15,000.00	$ -	$ 5,000.00	$ 10,000.00	C&E Grants	Council	DPE-EHG			$ 5,000.00	$ 10,000.00					
	Mu2: Investigate Historical and Future Coastal Wetland Extents for Mummuga Lake	$ 20,000.00	$ -	$ 6,700.00	$ 13,300.00	C&E Grants	Council	DPE-EHG			$ 6,700.00	$ 13,300.00					
	Mu3: Foreshore and Headland Access Management Plan	$ -	$ 12,000.00	$ 16,000.00	$ 32,000.00	C&E Grants	Council	DPE-EHG	$ 4,000.00	$ 8,000.00	$ 4,000.00	$ 8,000.00	$ 4,000.00	$ 8,000.00	$ 4,000.00	$ 8,000.00	
	Mu4: Prevent Vehicular Access to Saltmarsh Area near Tennis Courts	$ 10,000.00	$ -	$ 10,000.00		C&E Grants	Council	NPWS	$ 10,000.00	$ -							
	Mu5: Engage with Community on Saltmarsh Management, Myuna and Attunga Streets	$ -	$ -			General Operations - staff time	Council	DPI-Fisheries									Minimal Funding requirement, mark accessways and monitor
	Mu6: Water Quality Risk Management Study	$ 30,000.00	$ -	$ 10,000.00	$ 20,000.00	C&E Grants	Council	DPE-EHG					$ 10,000.00	$ 20,000.00			
	Mu7: Entrance Management	$ -	$ 1,000.00	$ 4,000.00			NPWS	Council + DPE-EHG	$ 1,000.00	$ -	$ 1,000.00	$ -	$ 1,000.00	$ -	$ 1,000.00	$ -	
Wagonga Inlet	Wa1: Foreshore and Wetland Restoration and Environmental Protection Plan	$ -	$ 25,000.00		$ 100,000.00	LLS	LLS	Council, DPE-EHG	$ -	$ 25,000.00	$ -	$ 25,000.00	$ -	$ 25,000.00	$ -	$ 25,000.00	
	Wa2: Map Coastal Vulnerability Area for Wagonga	$ 20,000.00	$ -	$ 6,600.00	$ 13,400.00	Floodplain Risk Management Program or C&E Grants	Council	DPE-EHG			$ 6,600.00	$ 13,400.00					
	Wa3: Punkally Creek Attribution and Monitoring Study	$ 100,000.00	$ -		$ 100,000.00	LLS	LLS	Council, DPE-EHG	$ -	$ 100,000.00							
	Wa4: Revegetation & Monitoring, Brices Bay	$ -	$ 3,000.00	$ 4,000.00	$ 8,000.00	C&E Grants	Council	DPE-EHG	$ 1,000.00	$ 2,000.00	$ 1,000.00	$ 2,000.00	$ 1,000.00	$ 2,000.00	$ 1,000.00	$ 2,000.00	
	Wa5: implementation of Foreshore Treatments in Narooma	$ 630,000.00	$ -	$ 20,000.00	$ 610,000.00	TNC Grants, DPI Fisheries, NSW Environmental Trust	Council	DPI Fisheries, Crown lands	$ 10,000.00	$ 305,000.00	$ 10,000.00	$ 305,000.00					
	Wa6: Management of Wetland Areas, Narooma Flats	$ 1,000.00	$ 1,000.00	$ 5,000.00			Council		$ 2,000.00	$ -	$ 1,000.00	$ -	$ 1,000.00	$ -	$ 1,000.00	$ -	
	Wa7: Dynamics Study of Wagonga Entrance Channel	$ 36,000.00	$ -	$ 12,000.00	$ 24,000.00	C&E Grants	Council	DPE-EHG	$ 6,000.00	$ 12,000.00	$ 6,000.00	$ 12,000.00					
	Wa8: Engage with Community on strategy for Lewis Island	$ 30,000.00	$ -	$ 10,000.00	$ 20,000.00	C&E Grants	Council	DPE-EHG, NPWS	$ 5,000.00	$ 10,000.00	$ 5,000.00	$ 10,000.00					
	Wa9: Water Quality Management Study and Estuary Report Cards – Wagonga Inlet	$ -	$ 15,000.00	$ 20,000.00	$ 40,000.00	C&E Grants	Council	DPE-EHG	$ 5,000.00	$ 10,000.00	$ 5,000.00	$ 10,000.00	$ 5,000.00	$ 10,000.00	$ 5,000.00	$ 10,000.00	
	Wa10: Determine future of Ringlands Jetty	$ 10,000.00	$ -	$ 10,000.00			Council								$ 10,000.00		
	Wa11: Assess and Map Rainforest at Flying Fox Bay	$ -	$ -	$ -	$ -	General Operations - staff time	Council	DPE-EHG	$ -								
	Wa12: Bank Stability works	$ 155,000.00		$ 51,666.67	$ 103,333.33	C&E Grants	Council	DPE-EHG, Crown Lands					$ 51,666.67	$ 103,333.33			

Abbreviations: C&E: Coast and Estuary, **DPI:** Department of Primary Industry, **DPE:** Department of Planning and Environment, FRMP: Floodplain Risk Management Program Grants (DPE), **LLS:** Local Land Services, NPWS**:** National Parks and Wildlife Service, **TNC:** The Nature Conservancy

7 MONITORING, EVALUATION AND REPORTING PROGRAM

Beyond action implementation, the ECMP requires ongoing monitoring, evaluation, and reporting (MER). The objective of this process is to maintain focus on program implementation, highlight successful actions and provide early warning of potential problems. The responsibility for the MER program sits mostly with the Estuarine Management Advisory Committee, chaired by Council, with membership from relevant public authorities. The committee would be established upon certification of the ECMP.

The implementation of ECMP actions for which the Council is to take responsibility, including the MER program, are to be enacted by Council through the Integrated Planning and Reporting (IPR) System. The IPR framework provides a means by which State Plans and Strategies, and Councils Community and Strategic Plans are activated into meaningful operational projects, with progress reported back to stakeholders and the community. The ECMP will form one of the "Other Strategic Plans" within this framework.

The Eurobodalla Shire Council Community Strategic Plan (2017), Delivery Program (2017-2022) and Operational Plan (2021-2022) was reviewed in late 2021. This provides an ideal opportunity to integrate the ECMP within the IP&R Framework. Specifically, the following actions will be taken:

- The updated Community Strategic Plan will be consistent with the vision and key objectives of this ECMP.
- The Delivery and Operational Plan are a combined document.
    - The implementation of the ECMP will be listed within the local government responsibilities for relevant delivery plan outcomes, such as those relating to protection of the natural environment.
    - The ECMP will be listed as a Key Supporting Document within the Delivery Program.
    - Implementation of the CMP will be identified as a Key Project within the Operational Plan.

Under the IP&R framework, Council produces an Annual Report documenting the progress of key project actions within the Delivery and Operational Plan. Eurobodalla Shire Council produces both a 6 monthly

and annual report. It is via this mechanism that the progress and outcomes of the ECMP will be reported to stakeholders and the community

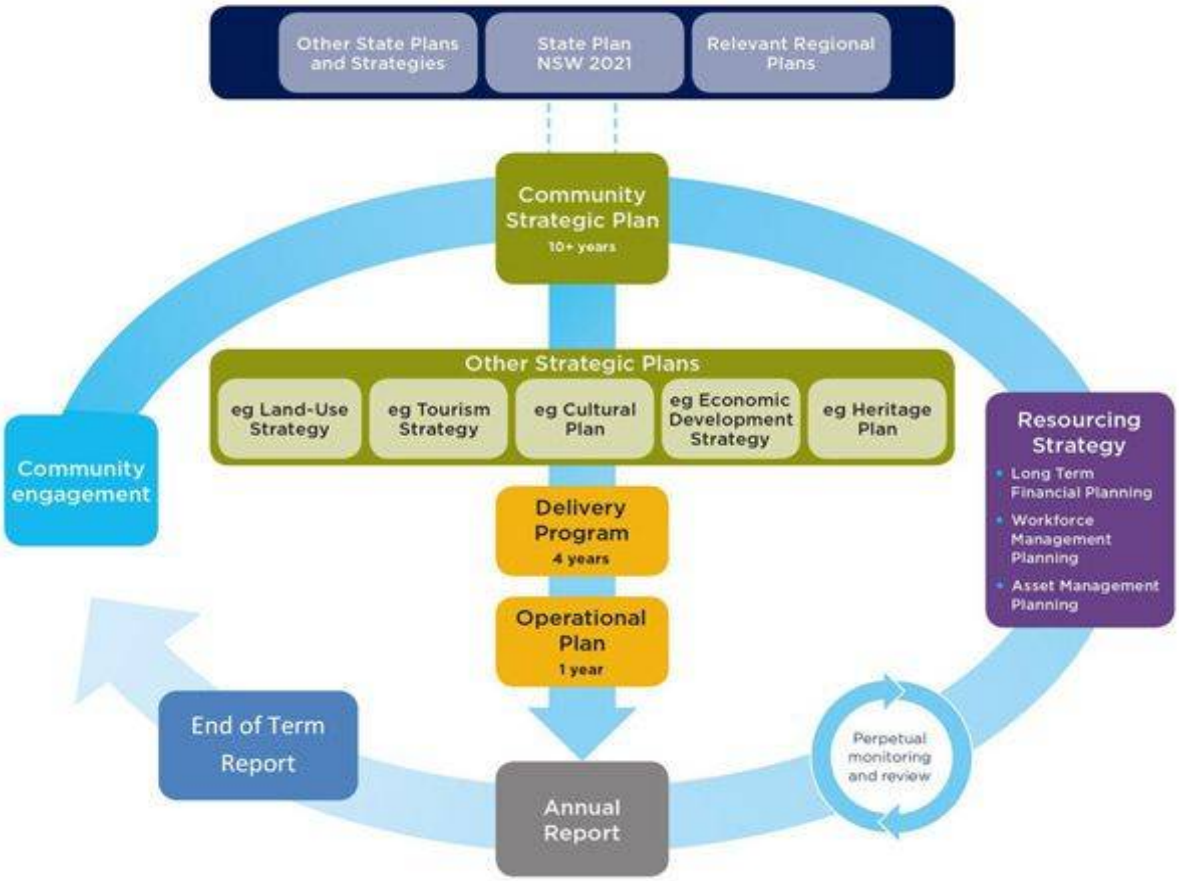


Figure 4 IP&R Framework followed by Council[5]

To facilitate the monitoring required by the IP&R Framework, progress of ECMP management actions against the Business Plan Delivery Table (Table 7) will be tracked by the Estuarine Management Advisory Committee. More specifically, the Committee's role includes:

- Evaluation and delivery of all actions including those which are not included in the IP&R framework.
- Facilitation and oversight of the production of ecosystem health report cards for estuaries based on the NSW Government's Monitoring, Evaluation and Reporting (MER) protocols, including the required data collection.
- Determining the implementation status of all actions, including:
    - Identifying the cause of delay for any actions that have failed to be implemented within projected timeframes and developing compensatory actions to facilitate future implementation.

[5] Sourced from https://www.esc.nsw.gov.au/council/plans-and-reporting/reporting-framework.

    - Updating the Business Plan Delivery Table to reflect any changes in timeframe or funding for delayed actions.
- Evaluating completed actions against the performance measures for that action and the relevant objectives of the CM Act. Did the action perform as expected? What worked? What could be improved upon? Does the action require ongoing monitoring or subsequent actions?
- Identifying potential funding opportunities for upcoming actions and reporting on submitted funding applications.

The Estuarine Management Advisory Committee will review the Business Plan Delivery on at least an annual basis, with quarterly review and planning of actions within the current and upcoming implementation phases. The results of the quarterly review are to be reported to Council's Coastal and Environment Management Advisory Committee (CEMAC).

The Committee will take responsibility for maintaining sufficient information and records about Councils management of the relevant parts of the coastal zone that will enable it to demonstrate:

- How the CMP has been implemented.
- The achievements of the CMP, including whether coastal management actions have been carried out within the timeframes identified in the CMP.

The entire ECMP must be reviewed at least every 10 years. However, due to the number of studies required to progress this ECMP, a thorough review after around four years will be required, with the timing of that review set to enable provision of new actions into the next round of Delivery Program Planning (around 2025).

A suitable mechanism for completing the review would be to re-visit the ECMP risk assessment to determine if key risks have been addressed or moved to a lower priority through implementation of the CMP actions. Further, whether any new risks have arisen or existing risks escalated in priority, new actions can be considered further.

Table 8 outlines the recommended performance measures and stages associated with different actions that could be used to gauge whether the actions have been successfully implemented. These measures are indicative and will depend largely on decisions made by the Committee and its member agencies regarding how different actions will be most appropriately implemented as delivery of the ECMP progresses.

Table 8 ECMP Action Performance Measures

Overarching Actions	Key Progress Indicators
EM1: Future Tidal Inundation Mapping to Inform other Actions	• Completion of subordinate Actions MO3, MU1 and WA2
EM2: Map Migration Pathways for Coastal Wetlands	• Completion of subordinate Actions Mo2 and Mu2 • Carry forwards to Action EM6
EM3: Preliminary Mapping of "At-Risk" Aboriginal Heritage Sites	• Documentation of Internal Study by Council • Communication of Results to local First Nations People • Provide support in any follow up actions
EM4: Appropriately Planning for Growth and Identifying Offsets	• Records to be kept of meetings where significant developments are considered. • Records of written responses to external agencies regarding developments. • Records of any changes to Planning Instruments arising from ECMP Actions.
EM5: Establish Estuarine Management Steering Committee and Meet Regularly	• Committee Formed • Meeting Minutes Kept
EM6: Submission of Planning Proposal	• Completion of actions to inform planning proposal • Submission of planning proposal including support of Committee

Management Actions: Moruya	Key Progress Indicators
Mo1: Foreshore and Wetland Restoration and Environmental Protection Plan	Records of: • Decisions relating to prioritisation of areas for treatment. • Reports to ensure CM SEPP requirements for Environmental Protection works are met • Environmental assessment as required by the EP&A Act and CM SEPP. • Preparation of maps in GIS showing treated areas and adding areas identified for future treatment and scheduling of works. • Records of all works completed, including photographs, costs and follow up inspection, issues encountered etc. • Timetabling and facilitation of follow up maintenance as required • Records of follow up maintenance.
Mo2: Scientific, Hydraulic, Heritage and Migration Feasibility Study of Malabar Wetland	• Hydraulic and sea level rise assessment completed • Ecosystem assessment completed • Floodplain soils assessment completed • Fringing landowners consulted • Sites of concern and management actions identified
Mo3: Map Coastal Vulnerability Area for Moruya	• Prepare brief • Engage consultant for study • Monitor study progress • Review and finalise report and deliverables • Carry forward to Action EM6
Mo4: Deua River Sediment Delivery Assessment	• South East Catchment and Waterways Recovery Plan received and reviewed • Engage consultant for study • Monitor study progress • Review and finalise report • Consider whether management actions are justified
Mo5: Assess Historical Changes to Tides	• Engage consultant for study • Monitor study progress • Review and finalise report
Mo6: Provide Interpretive and Educational Signage around Quandolo Island / Eurobodalla National Park	• Assess required locations for signs • Install signs • Ensure signs added to asset management system and regular inspection and maintenance
Mo7: Restore rock walls at Brierley's Boat Ramp and Russ Martin Park	• Design reports to ensure requirements of coastal protection works under s27 of CM Act and /or Clause 2.16 of the RH SEPP are met • Environmental impact assessment as required. • Records of as-constructed works provided, including photographs, costs and follow up inspection, issues encountered etc. • Timetabling and facilitation of follow up maintenance as required • Records of follow up maintenance. • Ensure walls added to asset management system, regular inspection and maintenance.

Management Options: Mummuga	Key Progress Indicators
Mu1: Map Coastal Vulnerability Area for Dalmeny	• Prepare brief • Engage consultant for study • Monitor study progress • Review and finalise report and deliverables • Carry forward to Action EM6
Mu2: Investigate Historical and Future Coastal Wetland Extents for Mummuga Lake	• Prepare brief • Engage consultant for study • Monitor study progress • Review and finalise report and deliverables • Carry forward to Action EM6
Mu3: Foreshore and Headland Access Management Plan	• Engage with local First Nations People • Engage consultant for study • Monitor study progress • Review and finalise report and deliverables • Plan for implementation of Actions
Mu4: Prevent Vehicular Access to Saltmarsh Area near Tennis Courts	• Install bollards and turf over access • Regular inspections and mapping of saltmarsh extents, confirm that vehicles are being excluded • If necessary, install more robust access prevention, or formalise access
Mu5: Engage with Community on Saltmarsh Management, Myuna and Attunga Streets	• Establish multi-agency strategy for consultation • Execute engagement strategy • Community education and determination of bollard locations • Install bollards • Regular compliance management • Maintenance works scheduled and completed to prevent grass infiltration into saltmarsh
Mu6: Water Quality Risk Management Study	• Assess maturity of knowledge bank for application of risk-based framework • When appropriate, Prepare Brief • Engage Consultant for Study • Monitor Study Progress • Review and Finalise Report and Deliverables • Consider how recommendations may be implemented
Mu7: Entrance Management	• Install water level recorder • Ensure records are made available online and backed up • Maintenance of water level recorder and QC of records

Management Options: Wagonga	Key Progress Indicators
Wa1: Foreshore and Wetland Restoration and Environmental Protection Plan	Records of: • Decisions relating to prioritisation of areas for treatment • Reports to ensure CM SEPP requirements for Environmental Protection works are met • Environmental Impact assessment as required for development consent. • Preparation of maps in GIS showing treated areas and adding areas identified for future treatment and scheduling of works • Records of all works completed, including photographs, costs and follow up inspection, issues encountered etc. • Timetabling and facilitation of follow up maintenance as required • Records of follow up maintenance
Wa2: Map Coastal Vulnerability Area for Wagonga	• Prepare brief • Engage consultant for study • Monitor study progress • Review and finalise report and deliverables
Wa3: Punkally Creek Attribution and Monitoring Study	• Field inspection complete and brief developed • Engage consultant for study • Monitor study progress • Review and finalise report and deliverables Consider outcomes and whether further action is required
Wa4: Revegetation & Monitoring, Brices Bay	• Regular site monitoring undertaken (water quality, Cultural heritage, maintenance of vegetation buffers) • Public education, signage (if required)
Wa5: Implementation of Foreshore Treatments in Narooma	• Design reports to ensure requirements of coastal protection works under S27 and /or Clause 2.16 of the RH SEPP of CM Act are met • Environmental Impact assessment as required for development consent. • Records of as-constructed works provided, including photographs, costs and follow up inspection, issues encountered etc. • Timetabling and facilitation of follow up Maintenance as required • Records of follow up Maintenance • Ensure works added to asset management system, regular inspection and maintenance
Wa6: Management of Wetland Areas, Narooma Flats	• Site ecological survey complete • Markers established, and field staff educated/work method modified • Follow up inspections • Maintenance and weeding as required

Management Options: Wagonga	Key Progress Indicators
Wa7: Dynamics Study of Wagonga Entrance Channel	• Hydrosurveys completed across Wagonga Inlet entrance • Develop brief • Engage consultant for study • Monitor study progress • Review and finalise report and deliverables • Consider outcomes and where further actions are justified
Wa8: Engage with Community on Lewis Island	• Establish multi-agency strategy for consultation • Execute engagement strategy • Community education and determination of preferred strategy • Implement strategy • Regular compliance management
Wa9: Water Quality Management Study and Estuary Ecosystem Report Health Cards – Wagonga Inlet	• Assess maturity of knowledge bank for application of risk-based framework • When appropriate, Prepare Brief • Engage Consultant for Study • Monitor Study Progress • Review and Finalise Report and Deliverable • Consider how recommendations may be implemented • Continue Council's Estuary Ecosystem Health report cards
Wa10: Determine future of Ringlands Jetty	• Planning pathway for demolition determined • Crown Lands Tenure (CLD Account 308385) discontinued • Work with the community to determine the future of Ringlands Jetty
Wa11: Assess and Map Rainforest at Flying Fox Bay	• Records reviewed for plus inspection for compliance with Scientific Determination • Update mapping and carry forwards to action EM6 if justified
Wa12: Bank Stability works	• Design reports to ensure requirements of coastal protection works under S27 of CM Act and /or Clause 2.16 of the RH SEPP are met • Environmental Impact assessment as required for development consent. • Records of as-constructed works provided, including photographs, costs and follow up inspection, issues encountered etc. • Timetabling and facilitation of follow up Maintenance as required • Records of follow up Maintenance • Ensure walls added to asset management system, Regular inspection and Maintenance

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