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
BLACK BREAM POINT
ROTARY PARK
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

CMP for Eurobodalla Estuaries

GIS File: Z:\BusinessShare\Them\Projects\P00053_CMPsforMoruya\GIS\CoastalManagementSEPPB.qgs

REV	DRAWN	CHECK
A	EN	DIW

Salients

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

GIS File: Z:\BusinessShare\Them\Projects\P0005.2_CMPsforMoruya\GIS\ForestoreestRehabilitationPlans.qgs

Salients

REV	DRAWN	CHECK
A	EN	DRW

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 EES 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.

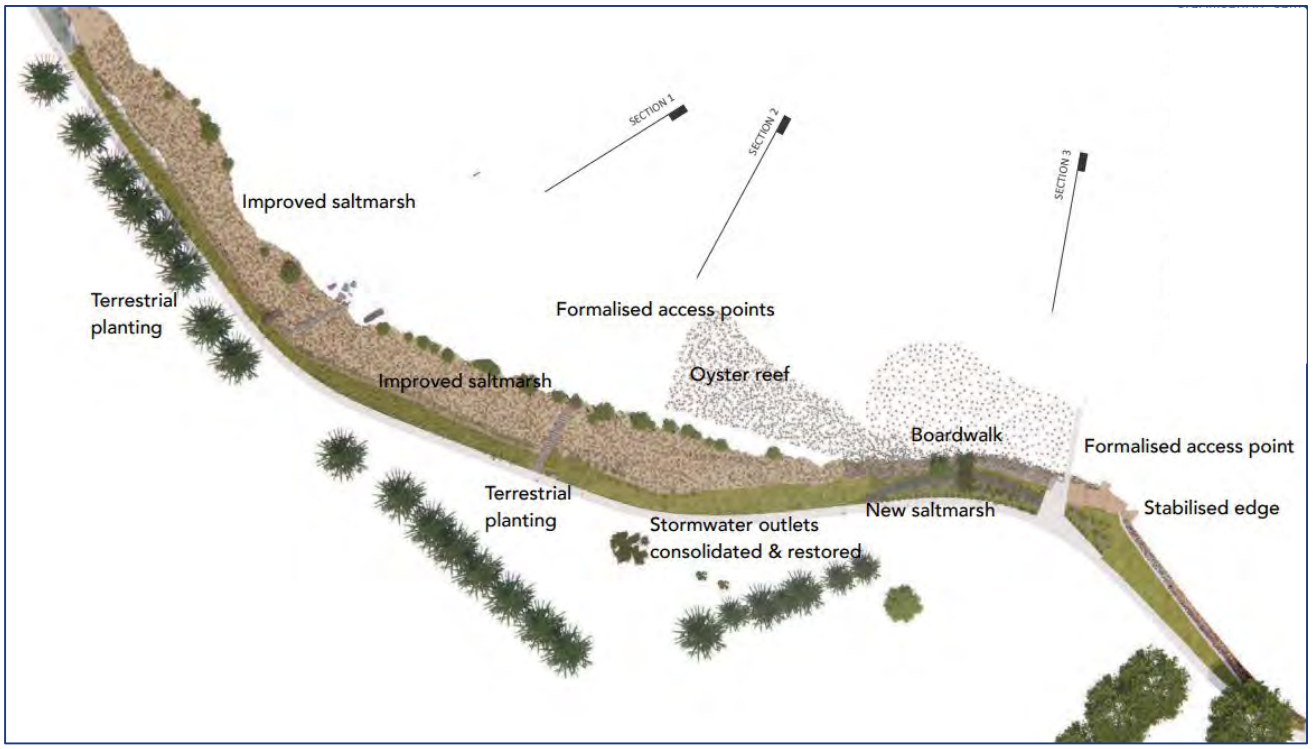

Figure 3 Elements of Wagonga Inlet Living Foreshore Project, Narooma (supplied by Council)

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 EES 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 EES 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-EES			$ -	$ -	$ -	$ -			Funded under subordinate actions (Mo3, Mu1, Wa2). Could be completed as a single package
	EM2: Map Migration Pathways for Coastal Wetlands	$ -	$ -				Council	DPE-EES	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	Funded under subordinate actions.
	EM3: Preliminary Mapping of "At-Risk" Aboriginal Heritage Sites	$ 1,500.00	$ -	$ 1,500.00			Council	DPE	$ 1,500.00								
	EM4: Apppropriately Planning for Growth and Identifying Offsets	$ -	$ -	$ -	$ -	General Agency Operations	Council	DPE-EES, DPE-Planning	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	In-house contribution Council and Agencies
	EM5: Establish Estuarine Management Steering Committee and Meet Regularly	$ -	$ -	$ -	$ -	General Agency Operations	Council	DPE-EES, DPI-Fisheries, Batemans Marine Park, 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-EES							$ -	$ -	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-EES	$ -	$ 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-EES, DPI-Fisheries							$ 83,333.33	$ 166,666.67	
	Mo3: Map Coastal Vulnerability Area for Moruya	$ 10,000.00	$ -	$ 10,000.00			Council	DPE-EES					$ 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-EES							$ 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-EES	$ 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-EES					$ 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-EES			$ 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-EES			$ 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-EES	$ 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-EES					$ 10,000.00	$ 20,000.00			
	Mu7: Entrance Management	$ -	$ 1,000.00	$ 4,000.00			NPWS	Council + DPE-EES	$ 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-EES	$ -	$ 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-EES			$ 6,600.00	$ 13,400.00					
	Wa3: Punkally Creek Attribution and Monitoring Study	$ 100,000.00	$ -		$ 100,000.00	LLS	LLS	Council, DPE-EES	$ -	$ 100,000.00							
	Wa4: Revegetation & Monitoring, Brices Bay	$ -	$ 3,000.00	$ 4,000.00	$ 8,000.00	C&E Grants	Council	DPE-EES	$ 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	$ 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-EES	$ 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-EES, 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-EES	$ 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-EES	$ -								
	Wa12: Bank Stability works	$ 155,000.00		$ 51,666.67	$ 103,333.33	C&E Grants	Council	DPE-EES					$ 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

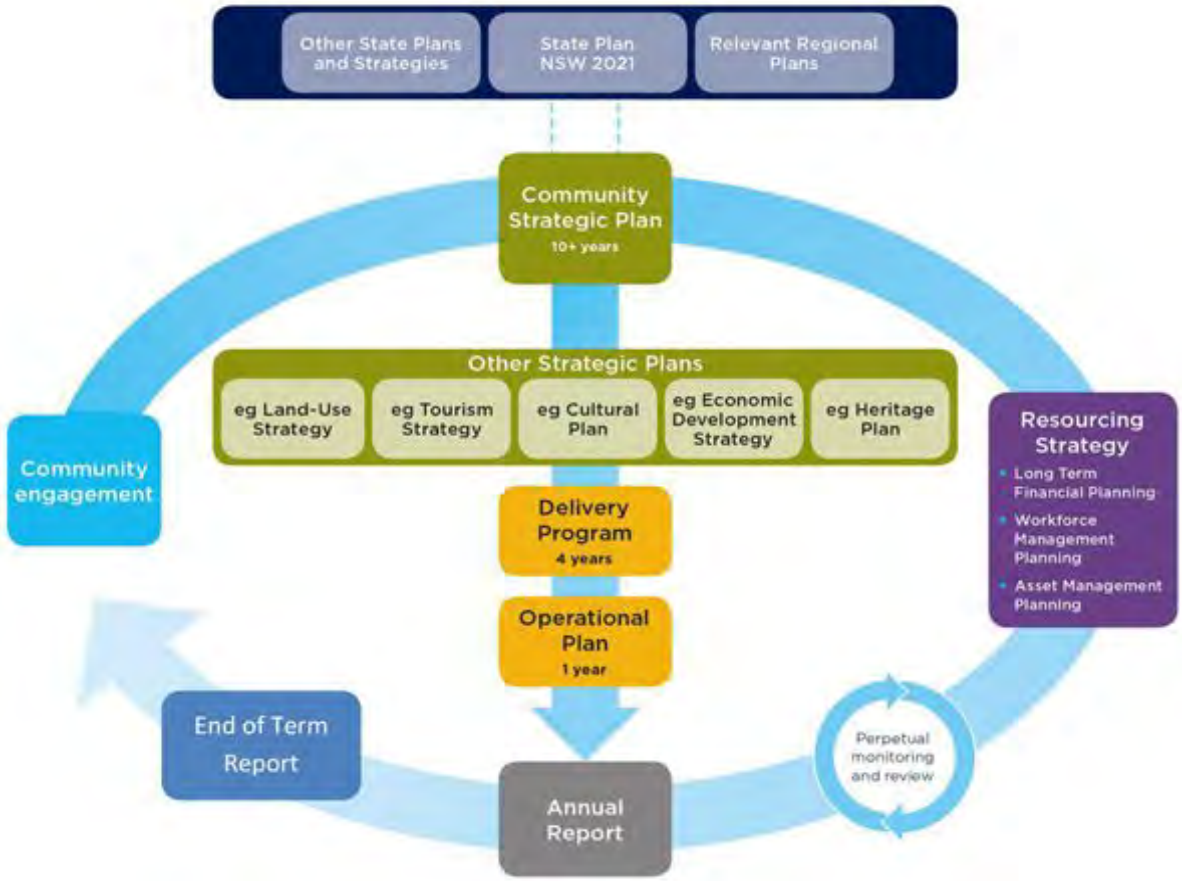

Figure 4 IP&R Framework followed by Council[5]

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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APPENDIX A SCOPING STUDY FOR MORUYA RIVER, MUMMUGA LAKE AND WAGONGA INLET

Moruya River, Mummuga Lake and Wagonga Inlet

Scoping Study

for

Estuarine Coastal Management Program

Final

Prepared by Salients, Coastal Environment and the University of Newcastle for Eurobodalla Shire Council

4th December 2020

MORUYA RIVER, MUMMUGA LAKE AND WAGONGA INLET
SCOPING STUDY FOR ESTUARINE MANAGEMENT PROGRAM

Authors:	David Wainwright, Troy Gaston, Doug Lord
Prepared For	EUROBODALLA SHIRE COUNCIL
Version	FINAL
Date	4/12/2020

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[1] 'E' refers to electronic distribution; numerals refer to number of hard copies.

Executive Summary

E.1 Introduction

Salients, in consultation with Coastal Environment and the University of Newcastle, has been engaged by Eurobodalla Shire Council (Council) to prepare a Coastal Management Program (CMP) for the Moruya River, Mummuga Lake and Wagonga Inlet estuaries. The CMP is to be prepared under the governing framework for coastal management in NSW, which commenced in April 2018. That framework defines four coastal management areas: the coastal wetland (and littoral rainforest); coastal vulnerability; coastal environment and coastal use management areas. These areas are mapped under *State Environmental Planning Policy (Coastal Management) 2018*. There are no identified littoral rainforest areas within the coastal zone surrounding the three subject estuaries and the coastal vulnerability area has not yet been mapped around the estuaries. The *Coastal Management Manual* details a process for developing a CMP. This *Scoping Study* fulfils the first stage of that process for the three estuaries.

Preparation of the Scoping Study commenced prior to final adoption of the current governing framework for coastal management in NSW. The project (including finalisation of this Scoping Study and development of the CMP) has experienced delays due to:

- Uncertainties associated with the new framework and its implementation.
- A severe bushfire emergency on the South Coast of NSW over the Summer of 2019/2020, which stretched Council's resources and meant that expenditure on some of the studies initially recommended by the draft Scoping Study could not be funded.
- The global COVID-19 pandemic which presented complications in progressing with consultation tasks to support stages 2 and 3 of the framework.

Ultimately, Council and DPIE provided comments on the draft Scoping Study around mid-2019 but delays of around one year meant that the remainder of the process was not picked up until around mid-2020. The Scoping Study has evolved to better reflect the contents and approach of the CMP to which it is now appended. Where relevant, changes made in the final Scoping Study are highlighted alongside a description of the reasons for those changes.

E.2 Location

The Eurobodalla LGA is some 220km south of Sydney on the NSW coast. The location of the three estuaries, inside the Eurobodalla Local Government Area (LGA), is shown in Figure E.1. The Moruya River, Mummuga Lake and Wagonga Inlet estuaries are important features of the Moruya, Dalmeny, and Narooma communities, respectively. A closer look at the coastal management areas associated with the three estuaries is provided in the following sections. As the coastal management program process is followed, proposals to modify the maps in the Coastal Management SEPP may arise, but no modifications to the maps are proposed at this stage.

E.3 Moruya River

The extent of the coastal zone surrounding the Moruya River Estuary is mostly defined by the coastal environment area, which has been mapped as an all-inclusive buffer of some 600m from the estuarine waterway foreshores. In contrast, the coastal use area, which is almost entirely contained within the

coastal environment area, comprises a fringing buffer of some 300m around the foreshores of the estuarine waterway. The Moruya Estuary also contains several mapped coastal wetlands.

E.3 Mummuga Lake

Similarly, the coastal zone surrounding Mummuga Lake is mostly defined by the coastal environment area, an all-inclusive buffer of some 600m from the estuarine waterway. The coastal use area, which is almost entirely contained within the coastal environment area, comprises a fringing buffer of some 300m around the foreshores of the estuarine waterway. The Mummuga Estuary contains mapped coastal wetlands associated with the entrance (flood tide) delta and the Lawlers Creek alluvial delta.

E.4 Wagonga Inlet

The extent of the coastal zone surrounding the Wagonga Inlet is again mostly defined by the 600m buffer coastal environment area containing the coastal use area comprising a fringing buffer of some 300m. The Wagonga Estuary contains mapped coastal wetlands within the flood tide delta, upstream of the Princes Highway Bridge, and within alluvial deltas associated with Brices Bay and Punkally Creek.

E.5 Effectiveness of Current Management Practices

Both Wagonga Inlet and Moruya River have existing but outdated management plans. Audits of the implementation of these plans were prepared by Council and these are appended to the Scoping Study. The management of Mummuga Lake has not yet been informed by such a plan.

The audits were reviewed by the study team and two broad observations are made:

- Council has internally reviewed implementation of the plans and updated them as necessary, however, as has been common in NSW, this has occurred at long intervals (5 years or greater). This makes it difficult to ascertain how and when actions are being completed with reference to execution of the plan in question. In some instances, clear reference back to the existing plan appears to be missing. An example of this is bank stabilisation works along the Moruya River, which have been extensive, but largely carried out in an opportunistic manner by Local Land Services (and its predecessor organisations) with no clear records kept.

- It was common for existing plans to contain actions that organisations external to Council were best placed to complete, through either legislative, jurisdictional, or funding mechanisms. It has been difficult for Council to drive action on these items. There are two key reasons for this: (i) there has been previously no mechanism for completion of actions to be enforced; (ii) the legislative, jurisdictional or funding environment changes continuously within state government and responsibilities that are not clearly laid out tend to be forgotten or disregarded as this occurs.

The new framework for coastal management in NSW contains features which should assist in addressing these problems.

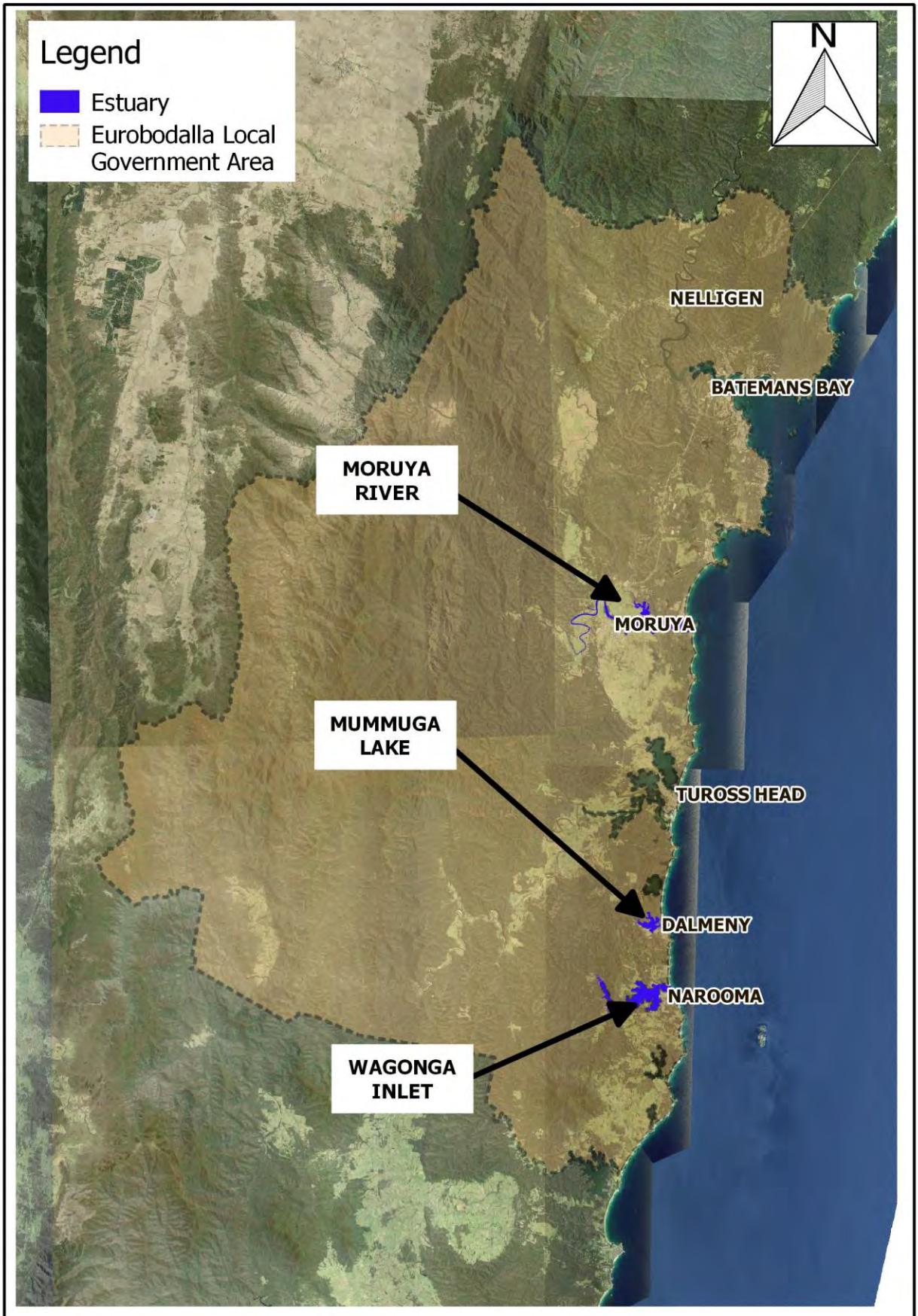

Figure E1: Estuary Locations within the Eurobodalla LGA

0 5 10 15 20 km
APPROX SCALE

COASTAL MANAGEMENT PROGRAM FOR MORUYA RIVER, MUMMUGA LAKE AND WAGONGA INLET

REV	DRAWN	CHECK
A	DJW	DJW

GIS File:\Projects\P00053_CMPsforMoruya\Outgoing\Figures\OverallLocality.qgs

Salients

E.6 Outcomes from First Pass Risk Assessment

Risks were identified through a combined review of background information, site inspection and community workshop/drop-in sessions held during preparation of this Scoping Study. Our risk assessment was based on the objectives outlined in the Coastal Management Act and the identified risks were assessed qualitatively.

The complete preliminary risk assessment tables for all three estuaries are appended to the Scoping Study. The estuaries had similar distributions of high and extreme risks (Table E.1). A relatively larger number of moderate and low risks were identified for Moruya River, apparently resulting from attendance at the Moruya drop-in session of enthusiastic individuals who discussed multiple potential concerns.

Table E.1 Tabulation of Identified Risks

Estuary	Risk Ranking				
	Extreme	High	Moderate	Low	Total
Moruya River	2	6	12	4	24
Mummuga Lake	1	6	6	1	14
Wagonga Inlet	3	5	5	1	14

E.7 Strategic Context and Purpose for CMP

Detailed studies were initially identified for all three estuaries and it was not recommended that CMP preparation be fast-tracked by skipping stages 2 and 3 of the process outlined in the Coastal Management Manual.

It was also not possible to clearly define the overarching "purpose" and "vision", nor dominant "objectives" for the CMP. Additional community consultation was subsequently completed to help clarify CMP "purpose", "vision" and "objectives". The outcomes of that consultation will be appended to the CMP.

Considering the distribution of the "high" and "extreme" risks across the different coastal management areas, the expected degree of focus is outlined in Table E.2. The coastal vulnerability area has been excluded from Table E.2, as the absence of present mapping for this area makes it difficult to incorporate at the present time. Council is intending to develop tidal inundation mapping under the Floodplain Risk Management process. The results of this will be used, as relevant, to inform other actions associated with, for example, coastal wetland and coastal environment areas. Coastal vulnerability will not be a key focus for the proposed CMP but may be incorporated in a more rigorous manner at a later stage.

Table E.2 Expected Focus of Coastal Management Program

ESTUARY	COASTAL MANAGEMENT AREA		
	Wetlands	Environment	Use
Moruya River	Strong	Moderate	Minor
Mummuga Lake	Minor	Moderate	Moderate
Wagonga Inlet	Very Strong	Strong	Moderate

E.8 Additional Studies and CMP Preparation

A preliminary list of studies to fill knowledge gaps associated with the "extreme" and "high" ranked risks was provided to representatives of Council and OEH, for consideration and discussion during preparation of the Scoping Study. At final draft stage of this Scoping Study, five (5) detailed studies were recommended as listed in Table E.3. However, it was not possible for Council to commit to the completion of all studies due to funding limitations. The fees required for all studies could not be justified by Council for the reasons outlined above. Following consultation with Council and DPIE, alternative approaches for these studies were settled upon. Some of these studies have been completed (at least partially), some have been informed further by other means in preparation of the CMP, and some postponed as actions for the CMP.

Table E.3 Preliminary List of Additional Studies Required for CMP Preparation and Subsequent Actions Taken

Recommended Study	Agreed Action[2]
Derive Interim Tidal Inundation Mapping for Moruya River	This task was to be superseded by mapping outputs to be provided by DPIE science unit.
Update CM SEPP (Wetlands) Mapping (Including Field Work for Mummuga Lake)	To be included as an action in the CMP.
Mummuga Entrance Foreshore Management Assessment and Strategy	Feasibility of including this action under Council's responsibilities either through general operations or Plan of Management for the Crown Reserve. To be assessed as part of Stage 3.[3]
Water Quality Risk Assessment Analysis (Mummuga Lake and Wagonga Inlet)	To be completed as per original proposal.
Wagonga Inlet Preliminary Morphodynamic Assessment	Council to request installation of second water level recorder at Barlows Bay, Wagonga Inlet plus a Bathymetric Survey. Detailed assessment of entrance wall impacts potential to be deferred, potentially funded under Marine Infrastructure Delivery Office.

[2] As per email correspondence between Cameron Whiting (ESC), Andrew Williams (DPIE) and David Wainwright (Salients) 26 March 2020 through 1 April 2020.
[3] As per emailed document "*SS review to DW*" sent from Norm Lenehan (ESC) to Andrew Williams (DPIE) and David Wainwright (Salients), 1 July 2019.

E.9 Purpose, Vision and Objectives for Estuarine Coastal Management Program

Additional consultation, completed following Council's review of the Scoping Study Report, has included an online survey for community members and additional face to face interviews with key stakeholder representatives to help establish priorities and responsibilities for actions in the CMP.

Through this process, the following overriding vision and purpose statement was derived:

Council and the local community aim to protect and sustainably manage the estuaries of the Eurobodalla Shire in a responsible manner for both current and future generations. While doing so, we will promote activities that help local communities to thrive socially, culturally, and economically.

Eurobodalla residents have an innate connection to the water. Consultation has identified that good water quality, access for recreation and sporting activities, and maintenance of natural beauty are important to the local community. This Estuarine Coastal Management Program (ECMP) incorporates input from the community and various government stakeholders responsible for estuary management in the Eurobodalla Shire.

Consistent with the requirements of the Coastal Management Act, the overriding purpose of Council's Estuarine Coastal Management Program (ECMP) is to set the long-term strategy for co-ordinated land management within the coastal zone surrounding the Estuaries of the Eurobodalla Shire.

Considering its key focus on estuary management the ECMP concentrates on achieving the following objects of the CM Act:

- **To protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience.**
- **To support the social and cultural values of the coastal zone and maintain public access, amenity, use and safety.**
- **To acknowledge Aboriginal peoples' spiritual, social, customary, and economic use of the coastal zone.**
- **To recognise the coastal zone as a vital economic zone and to supports sustainable coastal economies.**
- **To facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making.**
- **To promote integrated and co-ordinated coastal planning, management, and reporting.**
- **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.**
- **To support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions.**
- **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.**

Furthermore, consistent with the Marine Estate Management Act the following purposes are also supported:

- **To promote the co-ordination of the exercise, by public authorities, of functions in relation to the marine estate.**
- **To provide for the management of the marine estate of New South Wales in a manner that:**

(i) Promotes a biologically diverse, healthy, and productive marine estate.

(ii) Facilitates:

-economic opportunities for the people of New South Wales, including opportunities for regional communities, and. the cultural, social, and recreational use of the marine estate, and

-the maintenance of ecosystem integrity, and

-the use of the marine estate for scientific research and education.

The State Environmental Planning Policy (Coastal Management), which defines the Coastal Zone in NSW, incorporates four Coastal Management Areas. Based on the key risks identified during its preparation, the key management areas for the ECMP are the "*Coastal Wetlands Area*" and the *"Coastal Environment Area"*. A secondary focus is the "*Coastal Use Area*".

There are no mapped littoral rainforests around the estuaries subject to this ECMP, therefore the *"Littoral Rainforest Area"* is not presently relevant. Should littoral rainforests be identified within the LGA, this management area may become relevant in time and incorporated during review of the Program.

This ECMP does not address the *"Coastal Vulnerability Area"*, which exists to facilitate the management of coastal hazards, for the following reasons:

- **Council intends to address coastal hazards associated with the open coast and entrance processes are to be addressed by an Open Coast CMP covering the entire coastline of the Eurobodalla LGA.**
- **Council intends to address coastal hazards associated with inundation inside estuaries from the combined effects of coastal and catchment processes as part of flood studies completed under the NSW Flood Risk Management Process.**

While not a focus, Coastal Vulnerability cannot be completely ignored. The ECMP has been prepared to be consistent with Council's management of coastal vulnerability through those other processes.

Specific goals or 'objectives' were set for each particular estuary considering the focus indicated in Table E.2, and the corresponding objectives set in Part 2 of the Coastal Management Act. These were determined as part of the management options study and were subsequently carried forward as the focus of actions in the Coastal Management Program.

Contents

Figures

Tables

1 Introduction

1.1 Coastal Management In NSW

The framework for Coastal Management in NSW changed with commencement of the *State Environmental Planning Policy (Coastal Management) 2018* and associated maps on April 3, 2018. The associated maps[4] inform application of the *Coastal Management Act 2016.*

The *Coastal Management Manual* (CMM) was released alongside the Coastal Management SEPP to guide local councils in the preparation of Coastal Management Programs. The Coastal Management Program (CMP) for Moruya River, Mummuga Lake and Wagonga Inlet is to be prepared using the CMM as a guide. Eurobodalla Shire Council (Council) has engaged Salients, in conjunction with the University of Newcastle and Coastal Environment, to prepare the CMP.

Stage 1 of the process outlined in the Manual involves identifying the required scope of a CMP. The present document contains the *Scoping Study* which will inform development of an estuarine CMP for Moruya River, Mummuga Lake and Wagonga Inlet.

The coastal management framework requires local councils to consider management of four different "Coastal Management Areas" (CMAs):

1. **Coastal wetlands and littoral rainforest areas,** which display the characteristics of coastal wetlands or littoral rainforests, as previously protected by SEPP-14 and SEPP-26 respectively (both now repealed). Mapped coastal wetlands and littoral rainforests have associated proximity areas which also require consideration.
2. **Coastal vulnerability areas,** including areas subject to coastal hazards such as coastal erosion, coastal entrance instability and tidal inundation.
3. **Coastal environment areas,** broadly covering natural features such as beaches, rock platforms, marine and estuarine waterways (including coastal lakes or lagoons), undeveloped headlands and buffers around those features.
4. **Coastal use areas,** broadly comprising land adjacent to the coast and estuarine waterways.

A CMP is required to address management of either all, or a subset of these CMAs. One objective of the scoping study is to assess which of those CMAs need to be considered. The combined coverage of these four areas define the *Coastal Zone* and are listed above in order of importance; for example, where mapping for coastal wetlands

[4] http://webmap.environment.nsw.gov.au/PlanningHtml5Viewer/?viewer=SEPP_CoastalManagement, accessed 17/10/2018

and littoral rainforests overlies the mapped coastal environment area, relevant wetland and rainforest provisions of the CM SEPP and the *Coastal Management Act 2016* will take precedence over those relating to the coastal environment area.

There are no mapped littoral rainforest areas associated with any of the subject estuaries. Similarly, we note that, at the time of writing, the Department of Planning has not provided mapping for the coastal vulnerability area. The scoping study and CMP process can result in mapping of additional coastal management areas, or proposals to modify mapping of existing areas if required and/or otherwise desired.

1.2 Location

The Eurobodalla Local Government Area (LGA) is located some 220km south of Sydney on the NSW coast. The location of the three estuaries subject to the CMP, with reference to the LGA boundary, are shown in Figure 1. The Moruya River, Mummuga Lake and Wagonga Inlet estuaries are important features of the Moruya, Dalmeny, and Narooma communities, respectively. A closer look at the coastal management areas associated with the three estuaries is provided in the following sections.

1.3 Moruya River

The Moruya River Estuary and its associated CMAs, noting that these may be changed as part of a CMP, are shown in Figure 2. Overall, the extent of the coastal zone surrounding the estuary is mostly defined by the coastal environment area, which has been mapped as an all-inclusive buffer of some 600m from the estuarine waterway. In contrast, the coastal use area, which is almost entirely contained within the coastal environment area, comprises a fringing buffer of some 300m around the foreshores of the estuarine waterway.

The Moruya Estuary has several mapped coastal wetlands, described in order from downstream to upstream as follows:

1. A complex of interconnected wetlands near Moruya Heads, south of the estuary and including areas fringing South Head Road and Quandolo Island. The hydrology of this wetland is significantly controlled by the size and location of gaps through the internal training wall of the Moruya River.
2. A lake contained largely within the bounds of 480 North Head Drive Moruya, north of the downstream reaches of the river. The lake is hydraulically isolated from the river and perched.
3. A moderately sized (~60ha) area contained largely between South Head Road and the river, draining through a small side tributary known as "The Anchorage" around midway between Moruya Heads and Moruya.

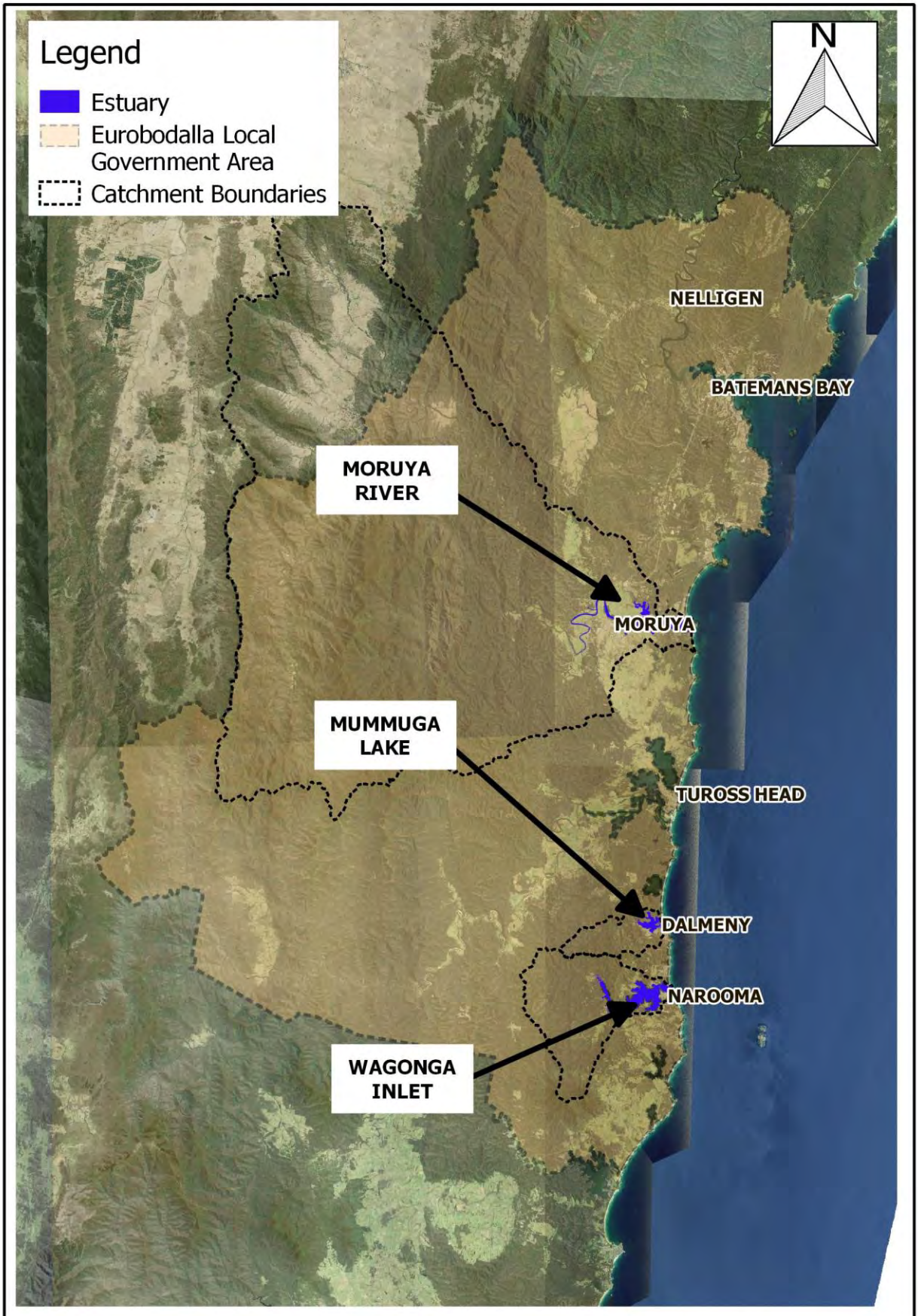

Figure 1: Locality Plan

0 5 10 15 20 km

APPROX SCALE

COASTAL MANAGEMENT PROGRAM FOR MORUYA RIVER, MUMMUGA LAKE AND WAGONGA INLET	REV A	DRAWN DJW	CHECK DJW
GIS File:\Projects\P00053_CMPsforMoruya\Outgoing\Figures\OverallLocality.qgs			

Salients

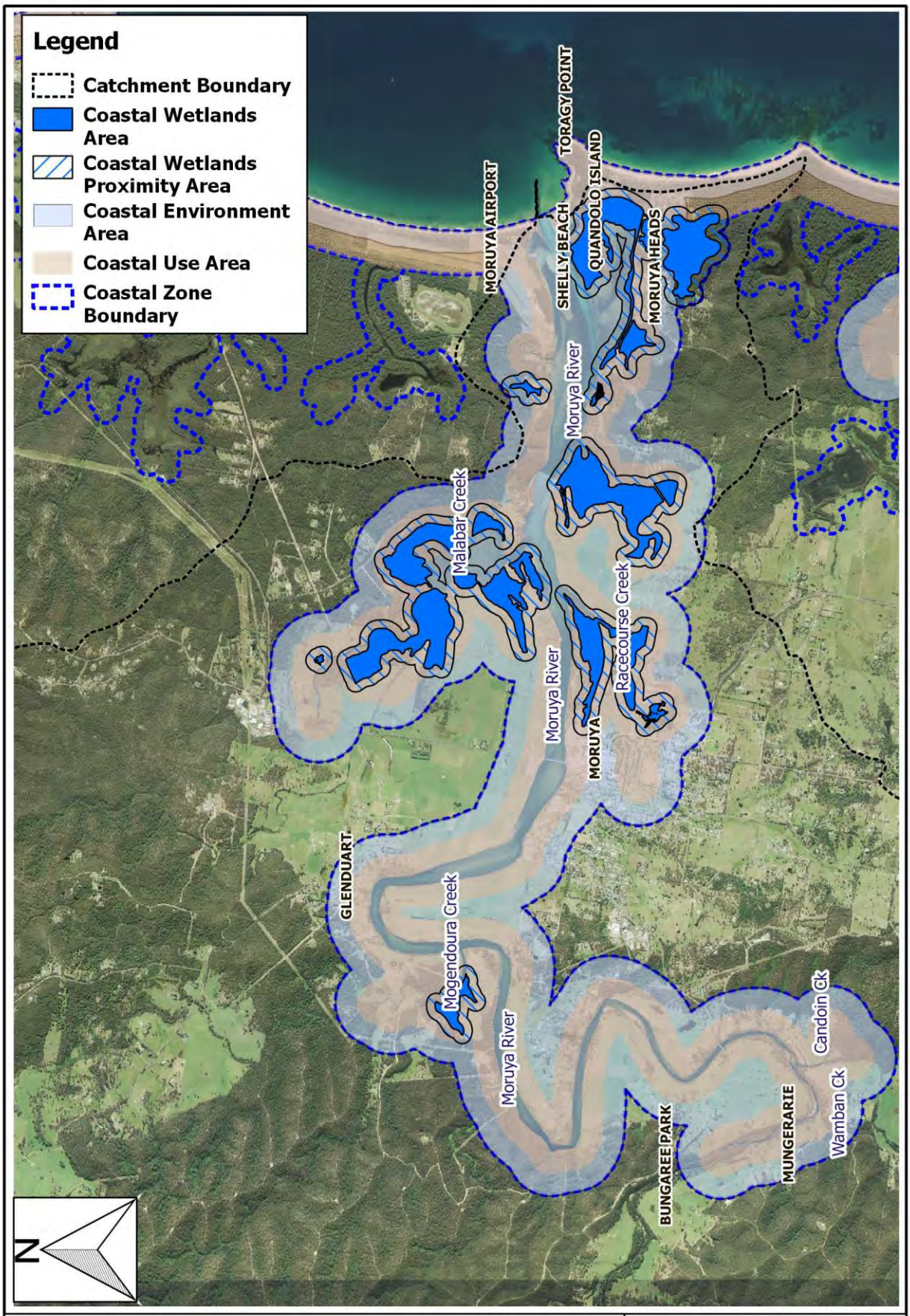

Figure 2: Coastal Management Area Mapping for the Moruya River Estuary

0 0.5 1 1.5 2 2.5 km

APPROX SCALE

COASTAL MANAGEMENT PROGRAM FOR MORUYA RIVER, MUMMUGA LAKE AND WAGONGA INLET

REV	DRAWN	CHECK
A	DJW	DJW

GIS File:\Projects\P00053_CMPsforMoruya\Outgoing\Figures\OverallLocalityFigures234SeppBoundaries.qgs

Salients

4. A locally significant complex of wetlands surrounding Malabar Creek and Lagoon, totalling some 120ha. While a small part of the wetland is downstream of North Head Road, the hydrology is largely controlled by a weir within the culvert which connects Malabar Lagoon to the Moruya Estuary.

5. A complex of wetlands (~45ha) immediately to the east of the Moruya township and south of the Moruya River, which drains through Ryans and Racecourse Creeks into the downstream reaches of the Moruya River. The Moruya Sewage Treatment Plant is located largely within the proximity area surrounding this wetland complex, from which some effluent discharges to Ryans Creek.

6. A small (~9ha), wetland fringing, low-lying area adjacent to Mogendoura Creek, which is a minor tributary flowing into the upper reaches of the Moruya Estuary. The wetlands are contained within private properties located between Hawdon Road, Mogendoura and the river.

1.4 Mummuga Lake

The Mummuga Lake Estuary and its associated CMAs, noting that these may be changed as part of the CMP, are shown in Figure 3. The extent of the coastal zone surrounding the estuary is mostly defined by the coastal environment area, which has been mapped as an all-inclusive buffer of some 600m from the estuarine waterway. In contrast, the coastal use area, which is almost entirely contained within the coastal environment area, comprises a fringing buffer of some 300m around the foreshores of the estuarine waterway.

The Mummuga Estuary contains mapped coastal wetlands as follows:

1. A 7ha wetland associated with Amherst Island and the upstream end of the flood tide delta of the lake's ocean entrance channel (also known as Lawlers Creek). This wetland, and its associated proximity area are completely contained within the Eurobodalla National Park.

2. A 16ha wetland associated with an alluvial delta located where Lawlers Creek discharges into the western end of the lake. This wetland, and its associated proximity area, are largely contained within the Bodalla State Forest. The most downstream reaches are primarily contained within the Eurobodalla National Park, which also contains the open waterway of Mummuga Lake and areas further north along the coast.

1.5 Wagonga Inlet

The Wagonga Inlet Estuary and its associated CMAs, noting that these may be changed as part of the CMP, are shown in Figure 4.

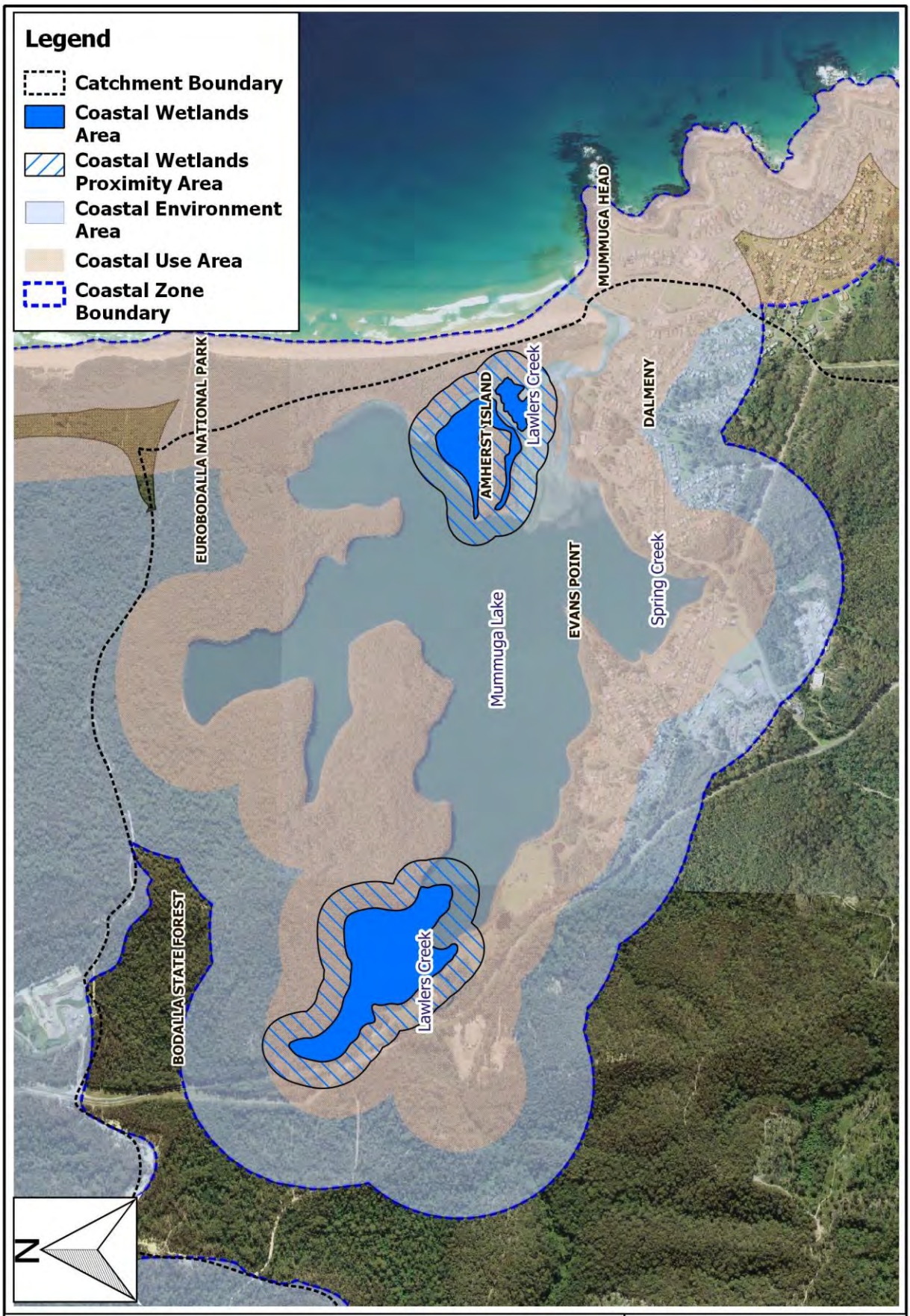

Figure 3: Coastal Management Area Mapping for the Mummuga Lake Estuary

0 200 400 600 800 m

APPROX SCALE

COASTAL MANAGEMENT PROGRAM FOR MORUYA RIVER, MUMMUGA LAKE AND WAGONGA INLET

REV	DRAWN	CHECK
A	DJW	DJW

GIS File:\Projects\P00053_CMPsforMoruya\Outgoing\Figures\OverallLocalityFigures234SeppBoundaries.qgs

Salients

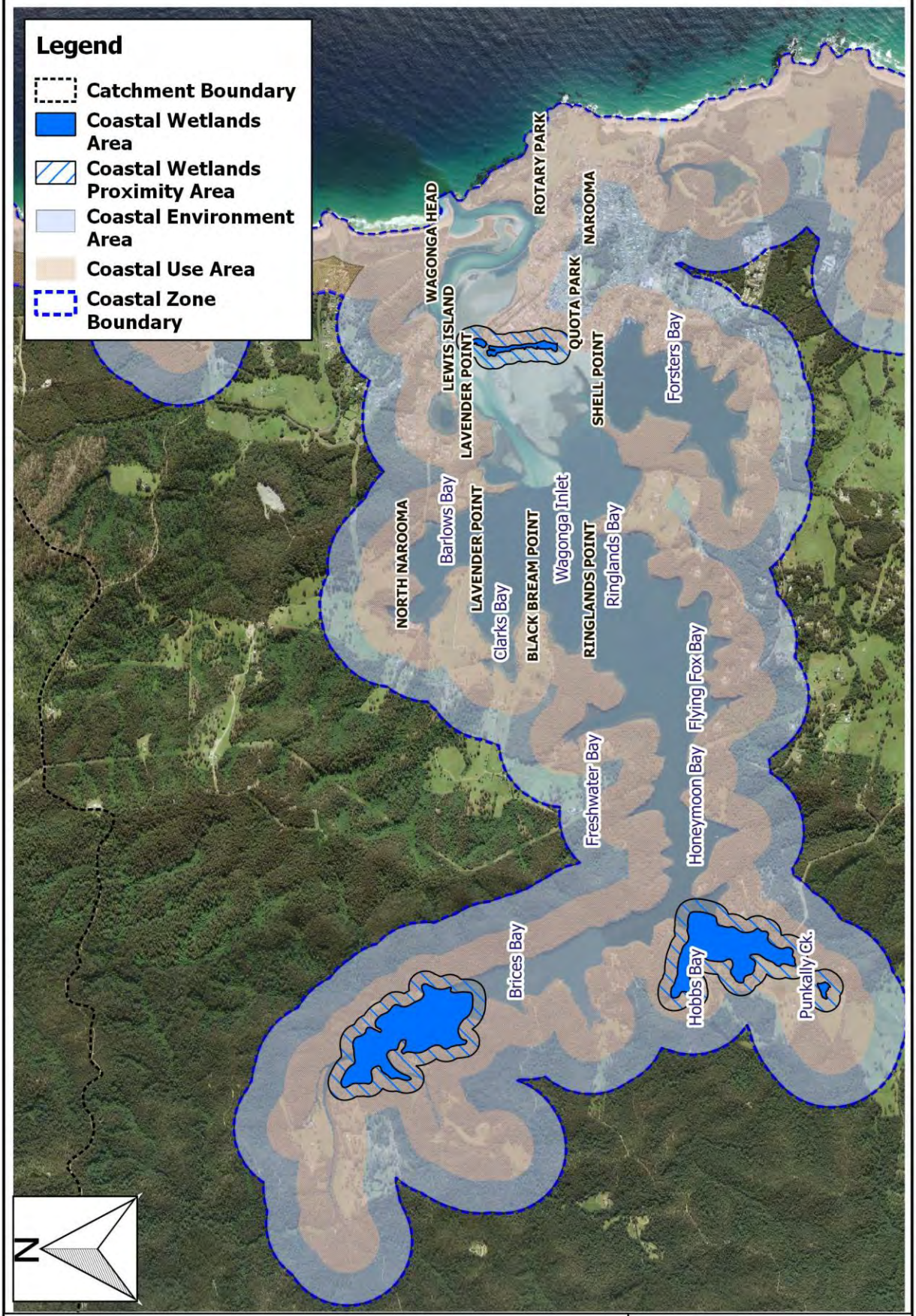

Figure 4: Coastal Management Area Mapping for the Wagonga Inlet Estuary

0 0.4 0.8 1.2 1.6 km

APPROX SCALE

COASTAL MANAGEMENT PROGRAM FOR MORUYA RIVER, MUMMUGA LAKE AND WAGONGA INLET

REV	DRAWN	CHECK
A	DJW	DJW

GIS File:\Projects\P00053_CMPsforMoruya\Outgoing\Figures\OverallLocalityFigures234SeppBoundaries.qgs

Salients

Overall, the extent of the coastal zone surrounding the estuary is mostly defined by the coastal environment area, which has been mapped as an all-inclusive buffer of some 600m from the estuarine waterway. In contrast, the coastal use area, which is almost entirely contained within the coastal environment area, comprises a fringing buffer of some 300m around the foreshores of the estuarine waterway.

The Wagonga Estuary contains mapped coastal wetlands as follows:

1. A stand of mangroves, saltmarsh and tidal flats (~3ha), which extend for some 900m southwards from the Princes Highway Bridge towards Quota Park, along the foreshore to the west of Narooma adjacent to a low-lying area known as the Narooma Flats. The area is fronted by the extensive flood tide delta of the estuary entrance. The extent of mangroves on recent aerial photography is clearly larger than that presently mapped, indicating that the mangrove stand is expanding. This may be partly related to an increasing tidal range following training of the entrance in the late 1970s.

2. A wetland area (~27ha) associated with the alluvial delta within the downstream reaches of Punkally Creek and Hobbs Bay. Hobbs Bay and the mouth of Punkally Creek contain oyster leases.

1. A wetland area (~37ha) associated with the alluvial delta within the upper reaches of Brices Bay. This area is used extensively by oyster leases. There is evidence of oyster farming activity within the boundaries of this wetland.

1.6 Population and Demographics

Together, the three main settlements associated with the three estuaries comprise around a quarter of the Eurobodalla LGA permanent population, estimated as 39,369 (2020) and projected to grow by over 15% to 45,515 in 2036. However, due to the presence of visitors, the number of people present overnight during winder, based on 2016 census data was around 50,000. In comparison, during the summer tourism peak up to 120,000 individuals may be present. Around 15,000 residents are actively employed, with the largest industry being health care and social assistance. The breakdown of population for the main settlements is shown in Table 1.

While Narooma and Moruya are the second and third largest centres in the Eurobodalla LGA, Narooma is more of a destination for retirees and tourists, whereas Moruya provides a function as a rural service town. Moruya Heads is a coastal residential area associated with Moruya that attracts families who work in Moruya.

Table 1 Demographics and Change

Locality	Population 2020 (via Forecast)	Population 2036 (forecast)	Change in Population	Median Age 2016	Median Age 2011
Urban Moruya / Moruya Heads	3687	4732	+28.32%	51	46
Dalmeny	2027	2197	+8.38%	59	53
Narooma/North Narooma	3586	4029	+12.33%	59	53

Around 40% of property owners are not resident in the Eurobodalla LGA, and around 30% of dwellings are not permanently occupied. 5.1% of the local population identifies as being Aboriginal, consistent with regional areas in NSW, and 80% of the population was born in Australia.

The median age in Eurobodalla is 50, which is high for both the local region and NSW. More than a quarter of residents are over 65 years in age and this proportion is expected to grow by around 34% by 2036. In other words, this age cohort is expected to grow at around twice the rate of the general population over the next 20 years.

Unsurprisingly, the population is highly seasonal which introduces substantial challenges. For example, facilities need to be constructed to handle summer peak seasonal loads and capacities. Around 1.2 million individuals visit the area annually, and 96% of nights booked in accommodation are for people from Australia, which is relatively high both regionally and for NSW. Visitors are commonly from Canberra and the ACT, who treat the region as a main holiday destination, and from Sydney, who are generally touring regionally.

1.7 Pre-existing Information

1.7.1 General Background

Reports and guidelines, covering management of the coast in New South Wales generally, have underpinned this Scoping Study. The Coastal Management Manual (NSW Government, 2018a) provides guidance on all stages of preparing a coastal management program. The Marine Estate Management Strategy (MEMS, in draft at the time of review) and underpinning documents have been considered insofar as the MEM process will interact with coastal management (BMT WBM, 2017; Craik et al., 2017; Marine Estate Management Authority, 2017). There are significant links between the objectives of the *Coastal Management Act 2018* and the *Marine Estate Management Act 2014*, and this is discussed further in Chapter 2 and Appendix F of this report. The background environmental information used to support development of the Marine Estate Management Strategy (MEMA, 2017) is of interest, in that it provides a recent summary of background information relating to individual estuaries. Similarly, the

assessment report of Roper et al. (2011) contains useful site specific information. In comparison, the Threat and Risk Assessment (BMT WBM, 2017) and MEMS (Marine Estate Management Authority, 2017) are high level documents that provide limited information on local scale recommendations and implementation strategies.

There is an existing Plan of Management for Eurobodalla National Park (NSW National Parks and Wildlife Service, 2000). The Park covers the bed of Mummuga Lake and areas to the south of the entrance to Moruya River, at Moruya Heads. The Local Strategic Plan for South East Local Land Services (2016) provides some context for the work undertaken by Local Land Services (LLS) in the Region. LLS are active in riverbank and habitat restoration works within the Moruya River and Wagonga Inlet estuaries, and the non-estuarine reaches of associated tributaries.

Several recent studies provide further information about the subject estuaries in the Eurobodalla LGA. Dale Donaldson (2006) contains a compilation of stories from First Nations People relating to different localities within the Eurobodalla LGA. Voyer's (2014) thesis provides information on the community's response to the Batemans Marine Park, which covers all three estuaries. The thesis includes a comparative assessment of community response to the Port Stephens Marine Park. Finally, Rogers and Woodroffe (2016) provided an assessment of the biophysical vulnerability of south coast estuaries to sea level rise, using broad scale assessments of estuarine geomorphic characteristics.

The coordination of the Coastal Management Program with Council's integrated planning and reporting obligations is an important consideration. In that regard, the contents of Council's existing Community Strategic Plan, Delivery Program and Operational Plan (Eurobodalla Shire Council, 2017a, 2017b, 2017c) have been referenced where relevant.

1.7.2 Spatial Data Sets

Many GIS data sets were provided by Council for use in mapping and assessment tasks. Vector data sets (shapefiles) included:

- Boundaries for the Coastal SEPP mapping, including the littoral rainforest, coastal wetlands, coastal environment, and coastal use management area boundaries, plus the coastal zone, comprising the envelope of all four management areas.
- Boundaries of National Parks, State Forests, Crown Land parcels (including areas of Crown Waterway) and zone boundaries within the Batemans Marine Park, which cover the waterways of all three estuaries subject to this study.
- A full set of Land and Property Information parcels, as managed by NSW Land Registry Services.

- Data sets developed by Eurobodalla Shire Council, including the LEP zones surrounding the estuaries, reserves including their conservation status[5], plus subdivision of those open areas into operational and community land. In addition, data sets showing those crown reserves under control of Council and those not under Council's control were also provided.

- Environmental datasets including: (i) polygons delineating areas of high environmental value vegetation from 2015; (ii) two datasets of estuarine macrophyte mapping across all three estuaries (dated 2006 and 2012, but based on aerial photographs and ground truthing from between 1998 and 2005) which appeared to be identical within the bounds of the coverage provided; and (iii) updated estuarine macrophyte mapping from 2017 (based on aerial photographs from 2014 and field mapping in 2017) for both Wagonga Inlet and Moruya River. These datasets are described in more detail in Elgin Associates (2018). In addition, a bank condition survey, recorded as geographical points with comments and some linked photos, was provided for both the Moruya River and Wagonga Inlet. The survey was completed by Council and OEH staff in early 2018.

- Datasets containing the locations of stormwater infrastructure including pipes, nodes (pits and junctions) and Gross Pollutant Traps (GPTs).

Additionally, a range of topographic and bathymetric data are available, covering the land surrounding the estuaries and their catchments from the ELVIS database maintained by Geosciences Australia[6].

Aerial Photographs have been provided by both Council and OEH (South Coast Region and Conservation Programs Branch). These are summarised in Table 2.

1.7.3 Moruya River

Reports of specific interest to the Moruya River Estuary were reviewed to facilitate assessment of any data gaps. As there is an existing coastal zone management plan (CZMP) for the Moruya / Deua River Estuary (Worley Parsons, 2009a), review has focussed on the reports which contributed to the development of that plan (AMOG Consulting, 2003; Crowley, 2005; Donaldson, 2006; Worley Parsons, 2009b). An audit of the implementation of the existing CZMP was undertaken by Eurobodalla Shire Council in 2018 and is provided as Appendix C and discussed, where relevant, throughout this document.

[5] More information can be found in Council's Recreation and Open Space Strategy (Ross Planning, 2018)
[6] http://elevation.fsdf.org.au/

Table 2 Summary of Available Aerial Photographs

Estuary	Years of Rectified Images	Years of Unrectified Images
Moruya River	2014	1969, 1975
Mummuga Lake[1]	2014	1957[1], 1967, 1971, 1972, 1975, 1977,1979, 1981, 1986[1], 1989, 1994[1], 1998, 1999, 2001, 2005, 2007, 2011
Wagonga Inlet	2014	1957, 1967, 1979, 1985, 1986, 1989 (Incomplete Coverage), 1994, 1998, 1999, 2002, 2006

[1]Some Aerial photographs that cover Wagonga Inlet also cover Mummuga Lake

The floodplain management process in NSW has relevance to the definition of the inundation hazard which could assist in defining the coastal vulnerability area. For the Moruya River, an existing floodplain management plan (Patterson Britton and Partners, 2004) was updated to incorporate the effects of climate change in 2010 (Worley Parsons, 2010). Subsequently, a code has been developed to inform the community about requirements when developing potentially flood affected lands. (Eurobodalla Shire Council, 2012).

A search was also undertaken to identify any research that had occurred more recently and therefore unlikely to have been captured by the previous CZMP development process. Additional, site specific information seems quite limited.

The results from catchment scale modelling of erosion from unsealed roads in the Moruya River catchment are presented in Fu et al. (2007). Subsequently, Newham et al. (2008) described progress on the development of a catchment scale water quality model, including sediment and nutrients, although the published conference paper contains limited detail. Post et al. (2012) contains some estimates of projected changes to rainfall in the Moruya River catchment due to climate change which may be of some interest.

In addition to the above reports, water quality data (pH, DO, salinity, temperature, total dissolved solids, turbidity, enterococci, and chlorophyll-a) were provided for five sites in the Moruya Estuary, covering dates between 2010 and 2014.

1.7.4 Mummuga Lake

Mummuga Lake has received relatively limited attention when compared to the other two estuaries. The only systematic treatment of estuarine issues appears to have been in the Review of Environmental Factors document prepared for the artificial opening of coastal entrances within the Eurobodalla National Park (Department of Environment and Conservation, 2007).

The floodplain management process in NSW has relevance to the definition of the inundation hazard which could be used to define the coastal area. For Mummuga, a recent flood study has been completed (WMA Water, 2016) and a floodplain management study is presently being prepared.

The lake does not have an existing CZMP (or estuary management plan). Accordingly, an unconstrained search for existing literature was undertaken. Very little information was uncovered. The only relevant information relates to the use of First Nations Peoples, which continues to the present day, and the overall importance of the area, also known as "Brou". Much available information stems from the work of Dale Donaldson (2006).

1.7.5 Wagonga Inlet

Reports of specific interest to Wagonga Inlet were reviewed to facilitate assessment of any data gaps. There is an existing Estuary Management Plan for Wagonga Inlet (Nelson Consulting, 2001), and that Plan was reviewed and upgraded more recently (Eurobodalla Shire Council, 2010). From the mid-1990s through to the mid-2000s there is evidence of some interest in dredging the navigation channel of Wagonga Inlet upstream of the Princes Highway Bridge. The Review of Environmental Factors for this undertaking provides useful information (Peter Spurway and Associates Pty. Ltd., 2006). An audit of the implementation of the existing Estuary Management Plan was completed by Eurobodalla Shire Council in 2018 and is provided as Appendix D. The audit is discussed where relevant throughout this document.

A recent flood study for Wagonga Inlet has been completed (WMA Water, 2016) and a floodplain management study is presently being prepared. A prior flood assessment was completed by Gary Blumberg and Associates (2002) following flooding of Narooma Flats in January, 1999.

A search was also undertaken to identify any research that had occurred more recently and was therefore unlikely to have been captured by the previous CZMP development process. Relative to the other two sites, Wagonga Inlet has received comparatively more attention.

Overall water and sediment quality in the estuary seem to have been good. Dafforn et al. (2012) indicated that the estuary has quite good sediment quality, although there was some evidence of elevated Nickel. Similarly, Birch et al. (2015) indicated that concentrations of copper and zinc are slightly more elevated at sites closer to the entrance.

The estuary's ongoing response to construction of the entrance breakwaters between 1976-1978 has been investigated. Nielsen and Gordon (2015, 2008) estimated that tides in the main basin of the estuary could evolve to match the tidal range of the ocean, although this would seemingly take over 120 years. They also reported that there had

been a decrease in seagrass of some 57% during a 25-year period after entrance training. Furthermore, there has been a three-fold increase in the rate of ongoing expansion of mangrove stands, with this being prominent in the upper reaches of the estuary. This has been matched by a consequent increase in the rate of salt marsh loss.

Paling and van Keulen (2003) reported on trial seagrass transplantation efforts on the sand flats adjacent to the entrance channel of Wagonga Inlet, indicating encouraging success.

A few reports dealing with a variety of social and heritage issues have also been more recently completed. Rowland and Ulm (2012) reported that around 90% of midden volumes around Wagonga Inlet had been damaged as a result of residential development in Narooma. Norman et al. (2013), as part of a study on coastal adaptation in response to climate change, selected Narooma as one of its case study sites.

1.8 Structure of this Document

The structure of the Scoping Study has considered the relevant requirements outlined in Part B of the NSW Coastal Management Manual, while integrating the need to also consider each estuary separately.

- Chapter 2 summarises key aspects of the legislative, policy and planning context within which the Coastal Management Program will operate. A more comprehensive outline is provided in Appendix F.
- Chapters 3, 4 and 5 deal with each estuary in turn, including an appraisal of the characteristics of the estuaries, the key management issues, the preliminary risk assessment, identification of a "purpose" for the CMP insofar as it deals with that estuary, and a gap analysis and recommendations for further detailed studies prior to preparation of the CMP.
- Chapter 6 discusses the requirement for a planning proposal to alter mapping of different coastal management areas within the Coastal Management (2018) SEPP.
- Chapter 7 describes the consultation activities that should occur during preparation of the CMP.
- Chapter 8 presents the preliminary business case, including the recommended scope of the CMP, the steps required to prepare the CMP, the roles and responsibilities of different parties and the expected cost of additional studies to complete the CMP.
- Chapter 9 summarises the outcomes of the Scoping Study, including a summary of the effectiveness of current management approaches

Table 2 cross references the key components of the Scoping Study with the relevant sections of this report.

Table 3 Location of Key Components of the Scoping Study

Key Component[7]	Relevant Sections of this Report
1. A description of the strategic context of coastal management.	9.1
2. The purpose, vision, and objectives of the CMP.	9.1
3. The scope of the CMP, including management issues and the spatial extent of management areas.	8.2
4. A review of the effectiveness of current management practices and arrangements, including identification of changes required to manage the relevant coastal management areas effectively.	9.3
5. 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.	8.3
6. 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.	3.3 (Moruya), 4.3 (Mummuga), 5.3 (Wagonga) and 9.2 (Summary)
7. A stakeholder and community engagement strategy. If council intends to prepare a planning proposal, the engagement strategy is also advised to consider the requirements set out in relevant guidelines for preparing a planning proposal.	7
8. A preliminary business case to prepare a CMP.	8
9. 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.	8.5

[7] Reference, Section 1.10 of Part B of (NSW Government, 2018b)

2 Framework and Requirements for a Scoping Study

2.1 Introduction

This chapter outlines the context within which a Coastal Management Program, and its associated Scoping Study, needs to be prepared. A far more detailed assessment of the legislative and policy framework is provided in Appendix F. Appendix F also contains information relating to the demographic, economic and cultural context of the community surrounding the estuaries. For brevity, the following abbreviations are used in this chapter:

BC Act:	*Biodiversity Conservation Act 2016*
CM Act:	*Coastal Management Act 2016*, which commenced on 3rd April, 2018
CMM:	Coastal Management Manual, which guides the development of Coastal Management Programs under the CM Act
CMP:	A Coastal Management Program, which aims to support the long-term strategic management of the Coast in accordance with the CM Act
CM SEPP:	*State Environmental Planning Policy (Coastal Management) 2018* which commenced on 3rd April, 2018
CL Act:	*Crown Lands Act 1989* (Now repealed)
CLM Act:	*Crown Lands Management Act 2016*
CP Act:	*Coastal Protection Act 1979,* which was repealed by the CM Act
EP&A Act:	*Environmental Planning and Assessment Act 1979*
FM Act	*Fisheries Management Act 1994*
LG Act:	*Local Government Act 1993*
MEM Act:	*Marine Estate Management Act 2014*
NPW Act	*National Parks and Wildlife Act 1974*

2.2 NSW Coastal Management Manual

The NSW coastal management manual (CMM) outlines the way in which coastal management programs (CMPs) are to be prepared, adopted, and subsequently managed by local councils and public authorities in New South Wales. Part A of the CMM imposes mandatory requirements for the preparation and management of CMPs. Part B provides more detailed guidance on the preparation and management of CMPs, including adherence to an adaptive risk management process, the completion of studies to address information gaps, the role of state government and the NSW Coastal Council, and the integration of a CMP into Council's Integrated Planning and Reporting (IP&R) framework under the *Local Government Act 1993*.

The manual seeks to facilitate ecologically sustainable development and promote sustainable land use planning in the coastal zone. The manual encourages:

- Development that is not inappropriately exposed to hazards.
- Land use where risks can be mitigated, and residual risks are addressed.
- Development which does not increase risks or threats elsewhere.

CMPs are to be long-term, strategic, and coordinated, focusing on achieving the objects of the CM Act. A CMP should provide for the input of councils, public authorities, and local communities in achieving a balanced set of management actions. A CMP should build on previous work completed in preparing a coastal zone management plan under the, now repealed, *Coastal Protection Act 1979*. In preparing a CMP, previous work is expected to be updated to consider changes, amongst other things, to the social character of the local community.

The following sections contain a summary of the most relevant information for consideration by this Scoping Study.

2.3 The CMP Process

A 5-stage process is outlined by the CMM as shown in Figure 5.

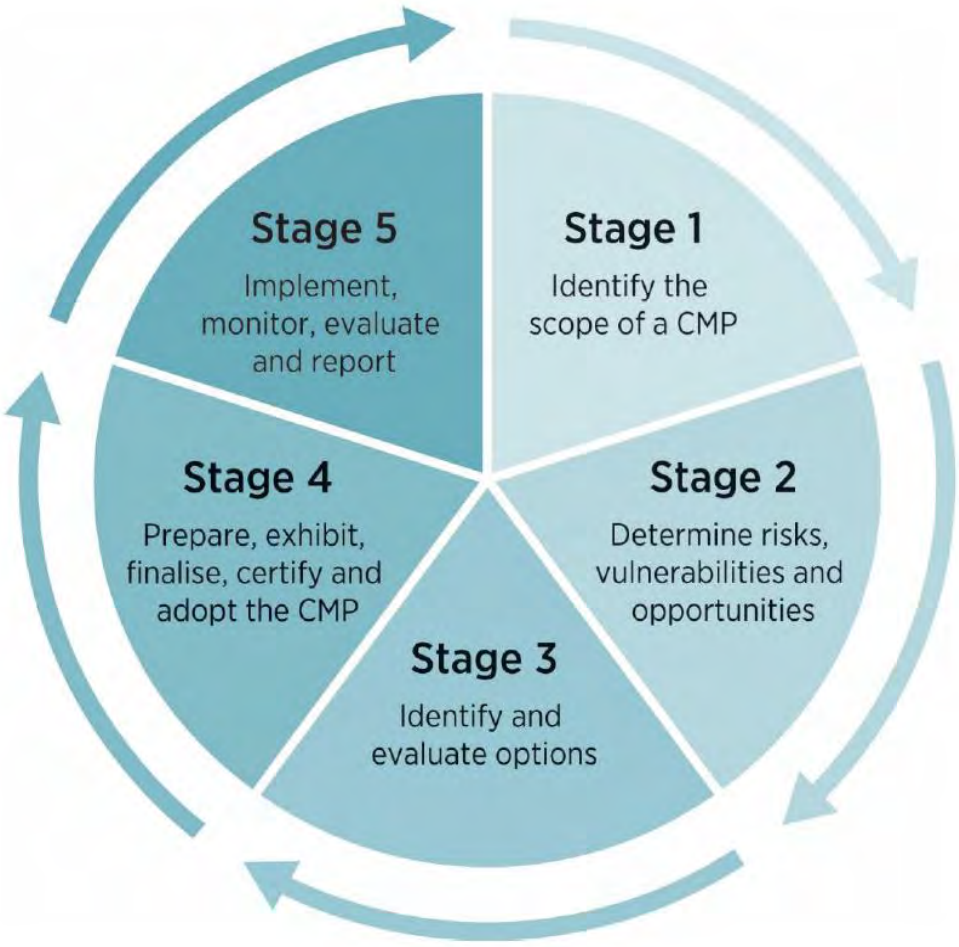

Figure 5 Stages in Preparing and Implementing a CMP (Source: NSW Government, 2018a)

Given the significant amount of effort already expended in the preparation of CZMPs across NSW, it is possible that Stages 2 and 3, which involve detailed studies and analyses could be 'fast-tracked'. Accordingly, the scoping study (Stage 1) is important in setting the scope and process to be followed in preparing the CMP. Fast-tracking would only be appropriate where existing actions are performing well and remain appropriate despite changing circumstances. As part of Stage 5, Councils need to report on the outcomes and ongoing action associated with the CMP as part of their Integrated Planning and Reporting framework. It is possible that a CMP may recommend modification of the boundaries of a coastal management area. In this case the Minister for Planning has the authority to make a Local Environmental Plan that modifies the boundaries in the Coastal Management SEPP, subject to the gateway process.

It is possible that other public authorities (e.g. Roads and Maritime Authority, NSW Department of Primary Industry) are assigned responsibility for different coastal management actions identified in a CMP. If this is the case, it is important that the public authority agrees to take on that responsibility before the CMP is finalised.

2.4 Mandatory Requirements of a CMP

The CM Act imposes requirements on the preparation, adoption, implementation, amendment, and review of CMPs. These mandatory requirements are laid out in the CMM (Part A) with other content in Parts A and B of the Manual comprising *guidance* for the development and operation of CMPs.

The mandatory requirements of relevance to the preparation of a CMP are reproduced in Appendix B. These elaborate on the statutory requirements of the CM Act and deal with:

- The purpose, scope and focus of a CMP.
- The area that a CMP covers.
- How a CMP is to be prepared.
- Key issues to be identified in a CMP.
- Requirements for the business plan in the CMP.
- Requirements for preparing a CMP when it includes a proposed or mapped coastal vulnerability area.
- Requirements for taking coastal change into account when preparing a CMP.
- Format and content required of a CMP.
- Community engagement and consultation.

Other mandatory requirements in the CMM deal with the adoption, certification, gazettal, review, amendment, and replacement of CMPs, and the requirements for monitoring, reporting and record keeping during operation of the CMP.

2.5 Marine Estate Management Act 2014

The MEM Act was introduced in response to an audit which recommended a new approach to the sustainable management of the entire marine estate, including the existing marine parks. It is jointly administered by the Minister for Primary Industries and the Minister for the Environment.

The MEM Act lists its objectives as:

a) to provide for the management of the marine estate of New South Wales consistent with the principles of ecologically sustainable development in a manner that:

(i) promotes a biologically diverse, healthy, and productive marine estate, and

(ii) facilitates:

-economic opportunities for the people of New South Wales, including opportunities for regional communities, and

-the cultural, social and recreational use of the marine estate, and

-the maintenance of ecosystem integrity, and

-the use of the marine estate for scientific research and education,

b) *to promote the co-ordination of the exercise, by public authorities, of functions in relation to the marine estate,*

c) *to provide for the declaration and management of a comprehensive system of marine parks and aquatic reserves.*

The Marine Estate includes the ocean, estuaries, coastal wetlands (saltmarsh, mangroves, seagrass), coastline including Sydney beaches, dunes and headlands, coastal lakes and lagoons connected to the ocean, and islands including Lord Howe Island. It extends seaward out to 3 nautical miles from the coast and offshore islands, and from the Queensland border to the Victorian border.

The MEM Act establishes the Marine Estate Management Authority, which is tasked with, among other things, undertaking the assessment of threats and risks to the marine estate and to prepare a marine estate management strategy. A draft marine estate management strategy was placed on public exhibition between October and December 2017. The final strategy was finalised in 2018. The strategy is a high-level document that doesn't provide site specific management guidance.

2.6 South East and Tablelands Regional Plan 2036

The Regional Plan (RP) was published by NSW Planning and Environment (2017). The RP has a scope which extends beyond the bounds of the LGA and looks at a much wider range of issues. The CMP which arises from the process being followed by Council should be consistent with the RP. In particular, the RP:

- Recognises that the protection of coastal lakes and estuaries is essential to long-term sustainability and prosperity.
- Recognises the importance of shellfish to the local economy, including tourism opportunities.
- Requires that the aquaculture catchments be *"protected from urban development and other activities that can negatively impact water quality"*. This is of importance to Wagonga Inlet.
- Some estuaries (e.g. Mummuga Lake) have been mapped as "high environmental value lands" and are particularly susceptible to the effect of land use development. The catchments are not considered suitable for intense uses such as housing

subdivisions. Where it is not possible to avoid impacts, councils will need to consider managing or offsetting those impacts.

- Recognises that planning of any new urban release or infill needs to consider the impact that sea level rise would have on flooding. This is of importance when considering the coastal vulnerability area. Councils are primarily responsible for planning for flood risk management under the requirements of the NSW Floodplain Development Manual and the development of coastal management programs to identify areas affected by coastal hazards. Councils should make hazard & risk information available to the Community to help them deal with the effects of sea level rise.

- Recognises that First Nations People have strong links to Country and should be involved in protecting and preserving their heritage. This is of some interest where heritage items are threatened by processes associated with estuary management, such as sea-level rise, and relevant studies should be undertaken.

The RP notes that the Eurobodalla LGA population is expected to grow by 2200 people by 2036. Due to trends in decreasing household size, an additional 3,000 dwellings are projected over the same period. The RP notes that there is sufficient land appropriately zoned but that the growth needs to be managed in a manner sensitive to the environment. Moruya and Narooma are expected to grow as local centres, although Batemans Bay will continue to be the main commercial centre.

2.7 What is a Scoping Study?

The primary purpose of a scoping study (Stage 1 of the process) is to identify the required focus for a new CMP, and the steps required in preparing that CMP. A scoping study considers existing information to review progress made in managing issues in coastal areas (for example, via a pre-existing estuary management plan or coastal zone management plan). New analytical studies are not undertaken as part of the scoping study, these are undertaken as part of Stage 2 of the process. The CMM outlines a wide range of aims, tasks, benefits and outcomes that will characterise the scoping study process. These include:

- Gathering an understanding of the community and identifying stakeholders. Developing an engagement strategy for later stages and beginning development of a shared understanding of the existing coastal management situation. Identify the organisations and communities that need to be involved in the CMP process and who holds responsibility for various issues that are likely to be involved.

- Determining the strategic context of coastal management for the area being considered and establishing the purpose, vision, and objectives of the CMP, identifying an appropriate scope, and expected key outcomes from the CMP.
- Determining the spatial extent of management areas (and which of the four management areas) need to be considered by the CMP. It is possible that planning proposals will need to be prepared to amend the extents of coastal management areas.
- Considering where coastal management areas overlap and how the hierarchy of management objectives outlined in the CM Act would operate.
- Reviewing the issues already identified, current coastal management arrangements and progress with existing actions. Determining where further or different action is required via a first-pass risk assessment.
- Identifying the knowledge gaps and preparing the business case for filling those gaps. The business case will also include a forward program for subsequent stages for preparing the coastal management program and may include a fast-tracking pathway.

The CMM elaborates in some detail on the steps which might be undertaken in preparing a scoping study. Where appropriate, the CMM guidance has been applied and the following chapters of this document describes those steps with reference to the subject estuaries.

3 Moruya River

3.1 Background

The present section deals with the various characteristics of the estuary, including the physical characteristics such as the catchment, hydraulic and sediment processes, water quality, ecological processes, and habitat. Also reported are issues relating to community values, land use and the specified coastal management areas.

3.1.1 Catchment Characteristics

The Moruya River (Deua River in its freshwater reaches) catchment is shown in Figure 6. The catchment area is around 1450km$^{2.}$ Most of the upper catchment is contained within Deua National Park, with parts of the lower catchment contained within Wandera State Forest (west of the estuary) and within Mogo State Forest (north of the estuary). The highest point of the catchment is near the south western corner, within Deua National Park, at Dampier Lookout (~1240m). The town of Araluen is located near the north western corner of the catchment within an area cleared for agriculture, which sits outside the Eurobodalla LGA, in Queanbeyan-Palerang.

The Deua River comprises the freshwater reaches of the river beyond the tidal limit, around 20km upstream from the ocean entrance. Around 2km downstream of the tidal limit, Wamban/Candoin Creek discharges into the estuary, draining a small area to the south. A further 8km downstream, Mogendoura Creek flows into the western side of the estuary draining the small Mogendoura agricultural locality. Downstream of Mogendoura, the river exits the foothills of the upper catchment, opening into estuarine floodplains which contain Moruya itself, along with coastal wetlands associated with Malabar Creek, Racecourse (and Ryans) Creek and The Anchorage (see Figure 2 for locations). Downstream of The Anchorage, the topography narrows the floodplain to the width of the river, which constrains the passage of floodwater. Within its downstream 2.5km, the river widens again, before exiting to the ocean at Moruya Heads. Areas contained within Eurobodalla National Park exist along the coastal fringe to the south of the ocean entrance.

3.1.2 Key Habitat Extent, Health and Protection

The extent of estuarine macrophytes (as mapped by Elgin Associates, 2018) and zoning for the Batemans Marine Park (BMP) within the Moruya Estuary are shown in Figure 7. The entire main channel of the estuary, including Mogendoura, Wamban and Candoin Creeks to their tidal limits, is within the *General Purpose Zone* of the BMP. The BMP extends from the estuary into Racecourse/Ryans Creek and the Anchorage. The area surrounding Malabar Creek and Lagoon to the north of the estuary is classified as a *Sanctuary Zone*, providing the highest level of protection.

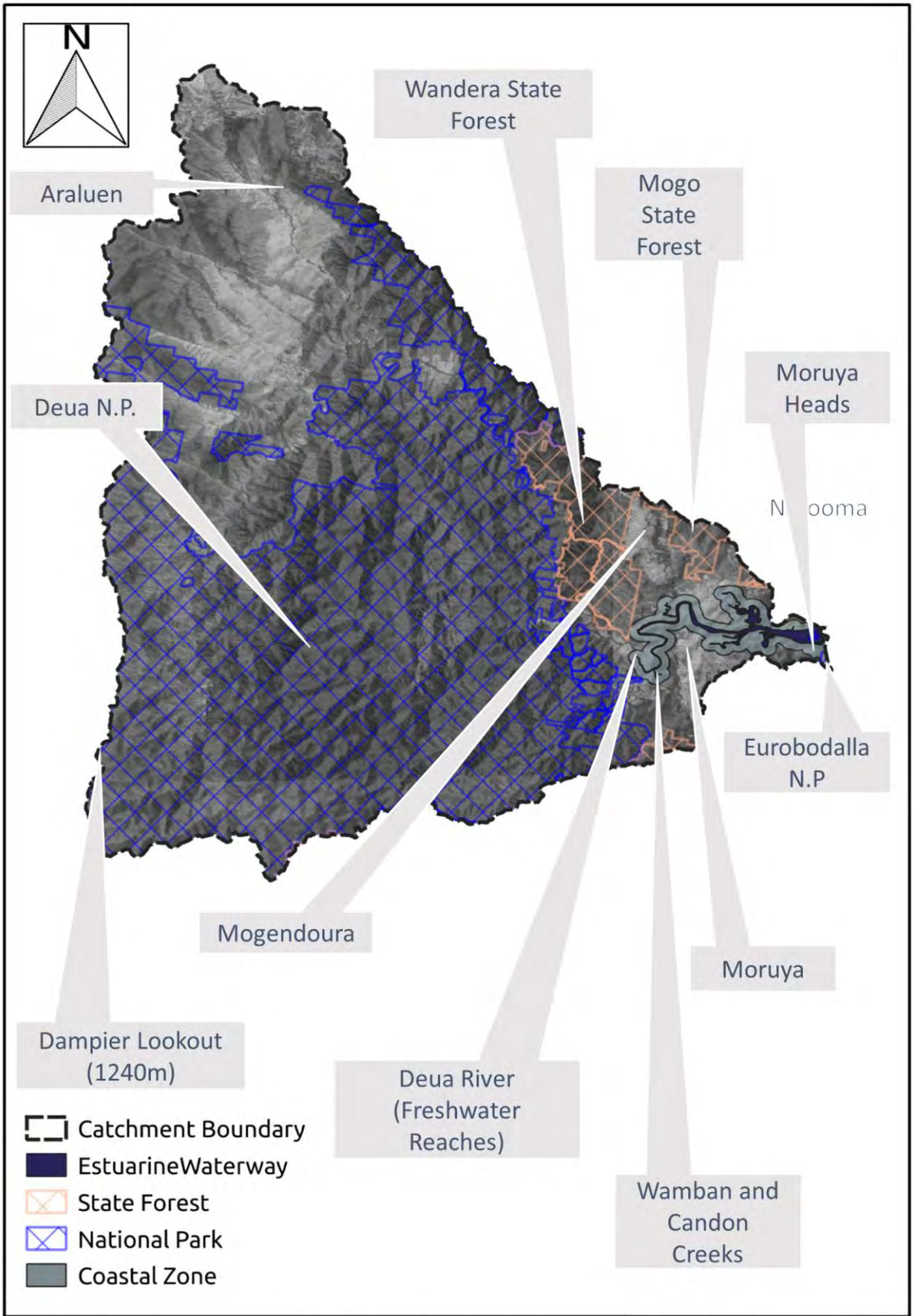

Figure 6: Moruya Catchment Landuse

0 3 6 9 12 km

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet	REV A	DRAWN DJW	CHECK DJW
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Salients

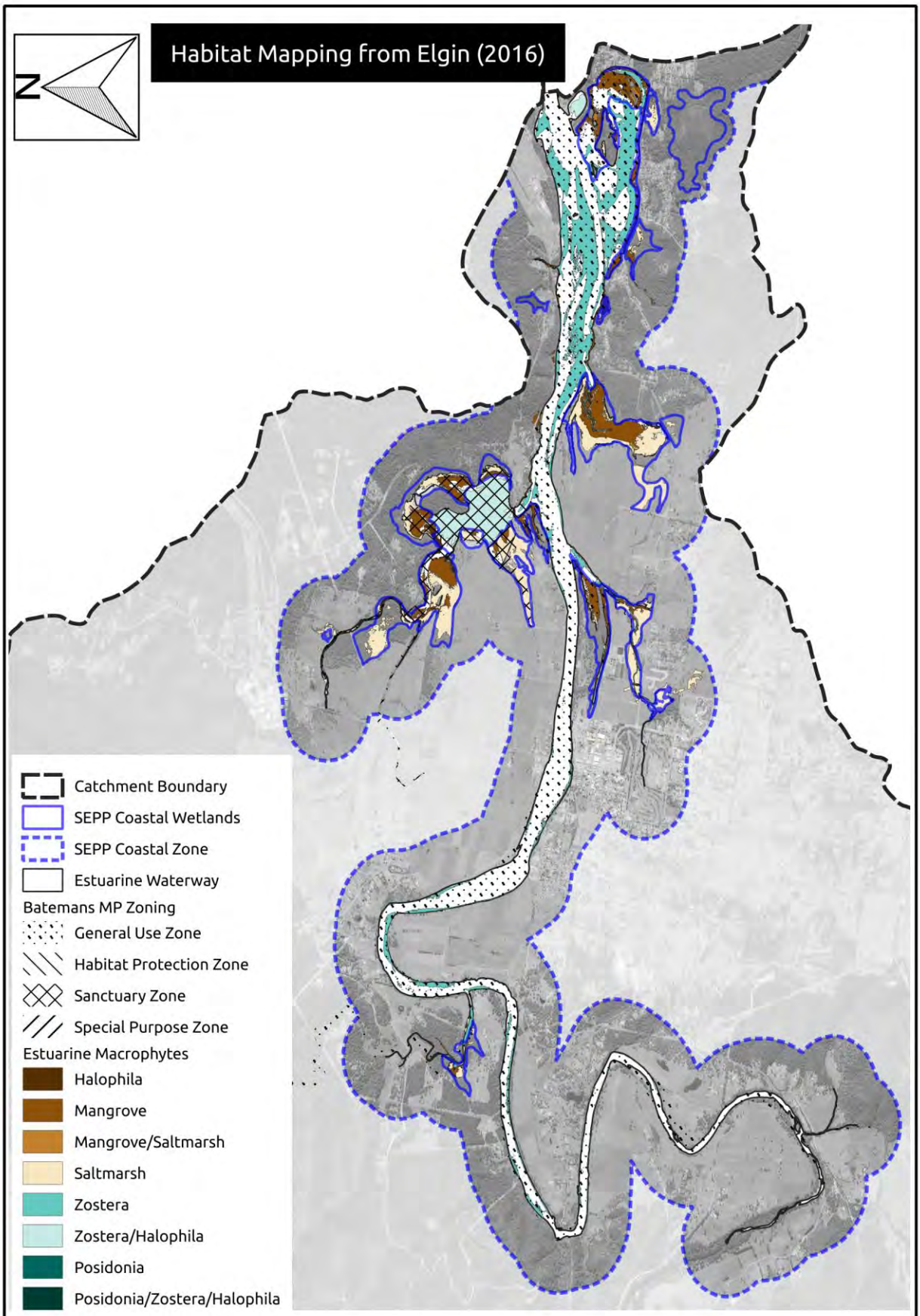

Figure 7: Mapped Estuarine Habitat - Moruya Estuary

0 0.5 1 1.5 2 km

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet

REV	DRAWN	CHECK
A	DJW	DJW

GIS File:/Projects/P00053 CMPsforMoruya/Outgoing/Figures/Figures7 10 13.qgs

Salients

Within the estuarine reaches upstream of Moruya, there are numerous patches of *Zostera* on shoals and adjacent to the foreshores, most commonly along straight sections and along the inside of river bends. There are also isolated and small stands of mangroves along these reaches. Within the middle reaches of the estuary, containing the Moruya floodplain, *Zostera* occurs in isolated, thin margins along the foreshores. However, within the areas downstream of Malabar Creek, the distribution of *Zostera* becomes more expansive, covering a large proportion of the channel between there and the ocean entrance.

A small wetland complex on Mogendoura Creek, just upstream of its confluence with the Moruya River, contains a mixture of *Zostera* in the channel, mangroves adjacent to the channel and saltmarsh fringes. The CM SEPP boundary of this coastal wetland could be expanded to better capture the extent of vegetation, particularly some patches of saltmarsh.

Around the Racecourse/Ryans Creek wetland, areas of mapped macrophytes show *Zostera* within the main tidal channels, patches of mangroves flanking the waterways, and saltmarsh around the fringes in upstream areas that are inundated by the tides less frequently. The BMP zoning tends to follow the main tidal channels through this wetland but misses much of the intertidal zone. The CM SEPP coastal wetland area tends to provide a good match to the recent macrophyte mapping, except for the most upstream extents of Racecourse Creek, where patches of saltmarsh are presently missed.

The zonation of macrophytes within the intertidal area of The Anchorage is like that around Racecourse/Ryans Creek, although the areas of macrophytes are significantly larger here. In this instance, the CM SEPP mapping provides close coverage of the existing macrophyte areas. Of interest is that the mapped Coastal Wetland is divided by South Head Road. It will be important to ensure proper tidal connectivity is provided below this road and that the coastal wetland proximity area covers this region, meaning that this is sufficiently addressed by the provisions of the CM SEPP.

Several smaller patches of coastal wetland vegetation exist further downstream along the southern side of the Moruya Estuary, and these have all been reasonably well covered by the existing CM SEPP mapping. Areas missed include Quandolo Island and patches of *Zostera* and mangroves immediately south of the southern entrance breakwater, although both areas are contained within the Eurobodalla National Park.

Within Malabar Creek/Malabar Lagoon, the wetland vegetation has a more complex mix. The bed of the Lagoon contains a *Zostera/Halophila* mix. The mapped areas of vegetation that fringe the Lagoon are well covered by the CM SEPP boundaries, but there are areas of saltmarsh that are missed in the most upstream reaches of Malabar Creek. Those areas are also not captured by the BMP *Sanctuary Zone* boundaries, which follow the main tidal channels of the creeks and main waterbody of the lagoon.

The most recent assessment of changes in estuarine macrophytes in Moruya River was undertaken by Elgin Associates (2018). They compared mapping from 2017 and 2012 and found that overall seagrass distribution and extent had increased in the Moruya River. They did, however, find that the macrophyte *Ruppia* had completely disappeared from the Moruya River.

Similarly, mangrove distribution was noted to have increased, although this may be attributed to more extensive field validation. Similarly, it was suspected that an increase in saltmarsh was due to more rigorous field work, although Elgin Associates acknowledged that this may also be a result of the exclusion of grazing from some areas.

Elgin Associates (2018) found that, while the areas of *Zostera* and *Halophila* were significant, their condition was poor – most likely due to siltation and elevated turbidity. They recommended:

- Biennial monitoring of condition and siltation rates.
- Working with private landholders to reduce cattle access and revegetation of bare banks.

The background information report which informed the threat and risk assessment for the Marine Estate Management Strategy (MEMA, 2017) also reviewed the historic abundance of estuarine macrophytes in the Moruya River. They found, based on a review of mapping between 1985 and 2013, that:

- The Moruya River Estuary contained around 80ha of saltmarsh and the area had increased since 1985. 80ha represented 6.3% of the total for the southern region (Shellharbour to the Victorian Border) and 1.1% of the total for the state.
- The estuary contained around 59.4ha of mangroves and the area had increased since 1985. 59.4ha represented 3.52% of the total for the southern region and 0.46% of the total for the state.
- The estuary contained around 130.4ha of seagrass and the area had increased since 1985. 130.4ha represented 3.72% of the total for the southern region and 0.84% of the total for the state.

Vegetation fringing the estuary and within the coastal zone, where not included in coastal wetland nor cleared for agriculture, comprises a mixture of dry and wet sclerophyll forests in the upper reaches of the estuary (i.e. upstream of Mogendoura Creek). The middle reaches of the estuary, around the Moruya floodplain are typically cleared. Where the estuary narrows downstream of The Anchorage, vegetation is dominated by wet sclerophyll forests on both sides of the river. Further downstream the northern banks of the estuary, between the waterway and the Airport, contains areas of dry sclerophyll forests.

3.1.3 Physical Features and Processes

MEMA (2017) summarises some key features of the Moruya River Estuary. The estuary has an open water area of around 3.7km^2 and a total water way area of around 6.1km^2. The average depth is around 1.90m. The tidal limit is some 21km upstream of the entrance, and a negligible percentage of the total surface water flow (1.4%) is extracted from the river. Water quality in the Moruya River is consistently better than the acceptable trigger levels for this type of estuary.

The Moruya River was surveyed by the Department of Land and Water Conservation in April 2000. At that time, the river channel thalweg was typically around -3m AHD in areas upstream of Malabar Creek, deepening to -4 to -5m AHD downstream. Localised, significantly deeper scour holes are also present. Shoals are also a common feature, with elevations of between -1 to -2m AHD. Upstream of Glenduart, the survey comprised cross sections, and these indicate a typical distribution of depths getting shallower with distance upstream, with elevations typically at -1.0 to -2.0m AHD, but with significant scour holes (-4.0m to -6.5m AHD) occurring around the outside of bends.

The river is known to have been subject to dredging in the past to maintain clear access for ships to Moruya, which was an important inland port. However, it appears that the need for dredging may have been exacerbated by hydraulic sluicing as part of gold mining operations in the 1800s. Typically, the geomorphic impact of these types of activities can take centuries to fully evolve. It is uncertain to what extent these activities continue to influence depths in the river to this day.

A tidal gauging was undertaken by Manly Hydraulics Laboratory at the same time as the survey. Results from that gauging exercise indicated that, for a tidal range of some 1.45m in the ocean, the tidal range at the entrance to Malabar Creek was around 1.2m. The tidal response remained similar all the way upstream to Mogendoura Creek. The tidal prism calculated near the entrance for this gauging exercise was 4.8 x 10^6 m^3 (4.88 x 10^6m^3) for the flood (ebb) tide.

Manly Hydraulics Laboratory (2012), analysed available tidal records from the Moruya River to derive tidal planes. Two gauges were analysed, from downstream of Moruya Bridge (record from 1997-98 through 2009-10) and from Moruya Hospital, upstream of Moruya Bridge (record from 1991-92 through 2009-10). The resulting, averaged tidal planes were determined as shown in Table 4. These show very similar values (tidal planes downstream of the bridge tend to be ~0.01m above those at the Hospital). The mean spring tidal range at Moruya (~1.03m) is around 90% of that determined offshore of Batemans Bay (~1.15m).

Table 4 Tidal Planes at Moruya (in m AHD) from Manly Hydraulics Laboratory (2012)

Tidal Planes	Moruya Bridge (m AHD)	Moruya Hospital (m AHD)
High High Water Spring Solstices	0.865	0.854
Mean High Water Springs	0.559	0.551
Mean High Water	0.470	0.462
Mean High Water Neaps	0.381	0.374
Mean Sea Level	0.042	0.034
Mean Low Water Neaps	-0.297	-0.306
Mean Low Water	-0.386	-0.395
Mean Low Water Springs	-0.475	-0.483
Indian Springs Low Water	-0.693	-0.700

Patterson Britton and Partners (2004) found that flood behaviour varied significantly between "frequent" (5% to 10% AEP floods or more frequent) and "less frequent" floods. During frequent floods, flows are initially contained within the riverbanks, with inundation beginning through water backing up through the wetlands which fringe the lower reaches of the estuary. As floodwaters rise, the southern riverbank downstream of Moruya is overtopped. The northern floodplain is initially overtopped to the west of Moruya, and the overtopping water combines with backwater flooding from Malabar lagoon to completely inundate the northern floodplain. During "frequent" flood events, around 2% of flow is conveyed across the northern floodplain and 8% is conveyed across the southern floodplain.

For more severe floods, the depth of flow over the riverbanks can be as much as 3m, and the northern floodplain conveys around 40% of the total discharge. In comparison, the southern floodplain conveys around 15% of the total discharge, with flood depths of two metres or more. The CBD of Moruya is typically flooded through backwater from further downstream.

The most recent flood study of the Moruya River (Worley Parsons, 2010) determined the design flood levels shown in Table 5.

Table 5 Design Flood Levels for the Moruya River (in m AHD from Worley Parsons (2010))

Location	5% AEP	1% AEP	Extreme
Kiora	10.60	12.00	15.08
Mogendoura Creek	6.85	7.78	9.63
Moruya Bridge (U/S)	4.10	5.14	7.60
Moruya Heads	2.17	3.54	5.65

Both flooding and tidal behaviour will be affected by climate change. At the present time, it appears that climate change has only been considered in the context of extreme flooding for the Moruya River.

Council has historically published report cards on water quality for the Moruya River. Report cards are provided for three periods, with water quality monitored at four different locations within the estuary. The results for different parameters were as discussed below:

Ecosystem Health: The overall health of the ecosystem was assessed as being very good in 2010/11, based on readings of chlorophyll-a, turbidity and increases in estuarine vegetation distribution. In 2014-15, the aquatic health was also assessed as being between good to very good.

Recreational Use: In 2014-15, water quality for recreational use was typically suitable for swimming. However, there were occasions where faecal contamination was detected. In 2016-17 water quality was considered suitable for recreational use most of the time. The results of faecal sampling indicated a significant improvement on the preceding 5 years.

Turbidity: Water clarity of the estuary was rated as very good in 2010-11 with 9% of total samples exceeding guideline values. In comparison, turbidity during 2014-15 was somewhat worse, with nearly 20% of samples exceeding guideline values. In 2016-17, turbidity levels were graded from very good to fair throughout the estuary, only exceeding guideline values for less than 10% of the time.

Chlorophyll-a: For chlorophyll-a (an indicator of microscopic algae) the Moruya River received a very good rating in 2010-11 with only 8% of the total samples exceeding guideline values, and these exceedances being only marginal. In comparison, during 2014-15, around 30% of samples exceeded the acceptable levels of chlorophyll-a. In 2016-17, chlorophyll-a levels were graded from very good to good throughout the estuary, which was a significant improvement on the results from 2014-15.

Dissolved Oxygen: During 2014-15 samples of dissolved oxygen showed a marked improvement on previous years, with around 75% of samples being within guideline

values, compared to less than 50% for preceding years. During 2016-17, dissolved oxygen values showed improvement again, with around 80% of samples being within the guideline range.

pH: During 2014-15 pH readings were within the recommended range for nearly 75% of the time, which was around the same level of compliance for the preceding three years. During 2016-17, pH values showed improvement with around 90% of samples being within the guideline range.

Overall, the water quality monitoring results support the findings of MEMA (2017), where it was concluded that the water quality in the Moruya River was reasonable. It should be noted, however, that water quality can fluctuate markedly in response to seasonal rainfall.

3.1.4 Land Zoning

Land zoning from the current Eurobodalla Local Environmental Plan (2012) is shown in Figure 8. Land use within the coastal zone upstream of Moruya is dominated by Primary Production (including small lot primary production) and Environmental Living, further away from the river. Along some reaches, a strip of foreshore land is set aside for Environmental Conservation. As of mid-2019, there are some isolated areas of *Deferred Matter* lands, which continue to be treated as Rural Lands under the *Rural Local Environmental Plan 1987*. By the time the CMP is completed, this matter will have been resolved and the Rural LEP will no longer have relevance.

Within the middle reaches of the river, zoning on the northern side of the river is dominated by Primary Production, except for the Large Lot Residential subdivision at Glenduart. On the southern side of the river, Moruya contains a mix of private (golf course) and public (parklands) recreation, medium and low-density residential areas, the town centre, plus areas for business expansion and environmental protection. Those environmental protection areas do not presently cover the full extent of the mapped CM SEPP wetlands, and it may be desirable to have this altered. The area east of Moruya is again dominated by primary production.

Further downstream, Environmental Protection areas associated with "The Anchorage" and Malabar Lagoon/Creek are similarly inconsistent with the CM SEPP wetlands although they do cover similar areas. To the east of The Anchorage and leading to Moruya Heads, land use is dominated by a mix of Environmental Living, Medium Density Residential and Environmental Conservation, with some *Deferred Matter* Areas. At Moruya Heads, a large area of CM SEPP wetland is presently zoned as waterway.

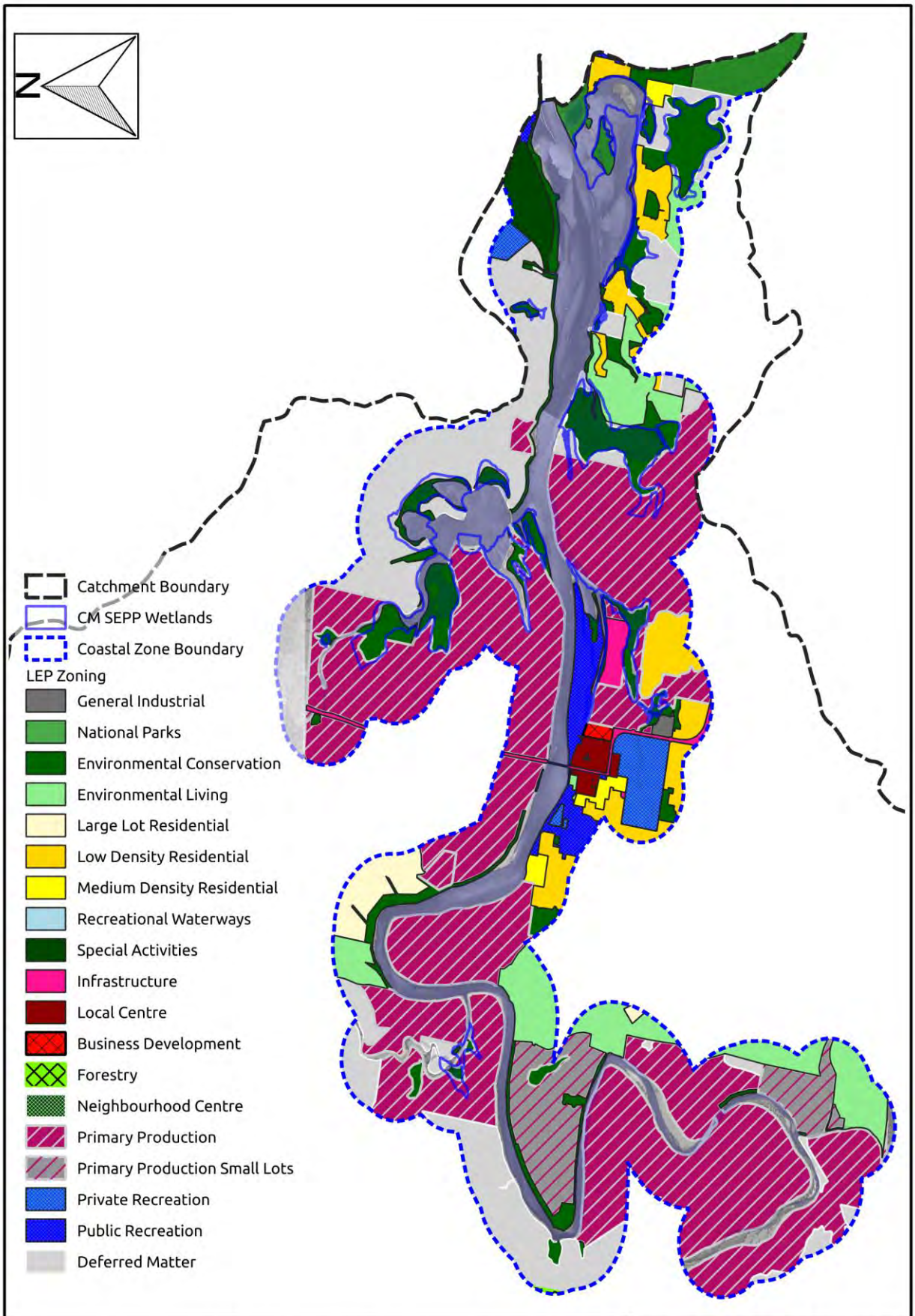

Figure 8: Land Zoning - Moruya Estuary

0 0.5 1 1.5 2 km

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet

REV	DRAWN	CHECK
A	DJW	DJW

GIS File:/Projects/P00053 CMPsforMoruya/Outgoing/Figures/Figures8 11 14.qgs

Salients

To the north of the downstream reaches of the estuary, there exist fringing areas of Environmental Conservation plus a large *Special Activities* area set aside for the Airport. There is a large *Deferred Matter* area between the Airport and Malabar Lagoon, which is presently forested. One parcel of forested land to the west and north of the Airport is zoned for private recreation, associated with the Moruya Racecourse which exists further to the north, but outside of the coastal zone.

3.2 Issues and Actions identified from Preliminary Consultation and Existing Information

3.2.1 Preliminary Consultation

A community workshop/drop-in session was held in the afternoon of June 5, 2018. Due to inclement weather, the venue needed to be changed and attendance was insufficient to be of value. For this reason, a further session was held at the Moruya Farmers Markets on July 10, 2018. In addition to these community workshops, a meeting with government stakeholders was held on June 7th, 2018 in Narooma. That meeting was attended by representatives of the National Parks and Wildlife Service, Batemans Bay Marine Park, OEH, South Coast Local Land Services and members of the study team.

3.2.2 Existing Information

During the review of background information and site inspections undertaken by the study team during the week of June 4-8, several other issues were identified. In some instances, these reflect those issues raised during preliminary consultation, but our review has helped to clarify those issues further.

3.2.3 Issues Identified

Throughout the remainder of this section, findings have been classified in accordance with the four different coastal management areas. The identified issues that may warrant further consideration are as follows:

<u>Issues Relating to Coastal Wetlands</u>

1. What preparations are being made for sea level rise and a potential increase in the intensity of large storms?
2. A concern that proposed changes to the Rural Lands Strategy will impact on coastal wetlands. The mapping associated with that strategy needs to be consistent with Environmental Conservation Zoning and the extent of coastal wetlands in the SEPP.
3. Grazing of cattle in Environmental Conservation or Coastal Management SEPP wetlands should not be allowed.

4. A broad concern that environmental protections are "being reduced".
5. There have been issues in getting property owners to commit to fencing around Malabar Lagoon.
6. Middens are known to be present around Malabar Lagoon, but their precise locations are uncertain. How are these to be managed?
7. There are informal stock crossings in Douga Ck (tributary of Malabar Lagoon) and there may be a need to investigate, assess what can be done.
8. Evidence of some mangrove die back along South Head Road.
9. There have been known issues with acid sulfate soil, particularly to the west of Malabar Lagoon (areas that drain into Malabar Lagoon).
10. The coastal zone wetland mapping probably needs to be adjusted to match the most recent vegetation mapping by Elgin Associates. Mapping around Ryans Creek and Malabar Lagoon do not fully capture important habitats in their upstream reaches.
11. The wetland associated with Malabar Lagoon & Creek is very important, but minimal information is available. It appears that this wetland could justifiably have a standalone study to help inform strategies to fence, exclude stock and allow for the migration of salt marsh into upstream areas. Given the importance of this wetland and considering that the tidal hydraulics of the wetland are not understood, some field data collection may be justified. Finer mapping of the CM SEPP boundaries and a variable width buffer zone may be warranted, accounting for slopes, adjacent topography, and natural depressions. Acid sulfate soils are also reportedly present in upper reaches.
12. There is a coastal wetland mapped at 480 North Head Road which may be a false positive.

<u>Issues Relating to Coastal Environment Areas</u>

13. Concerns were raised relating to the possibility that the estuary has shallowed over the past 20 years, and whether this should be investigated.
14. What preparations are being made for sea level rise and a potential increase in the intensity of large storms?
15. A need to ensure that water quality continues to be protected at a good level.
16. Kayaking is an important recreational use of the waterway.
17. Concerns about the apparent lack of riparian vegetation along stretches of the river. A desire to improve riparian buffers in general. During restoration works, it is

common to have landholders agree to around 5-10 m of protected width, but 30m is far more desirable.

18. Ongoing maintenance is required for riparian restoration works to be successful, but funding is scarce.
19. A broad concern that environmental protections are "being reduced".
20. A desire for protections along the Deua river catchment to continue and to ensure that riverbanks and steep slopes are not cleared. Properties along Araluen Road have been highlighted as issues.
21. There are noted issues with bare areas on banks in Wamban Creek.
22. There is existing riparian land presently leased to a landholder where the lease should be allowed to elapse so that a 30m riparian buffer can be established.
23. Stock access to the riverbank in upstream areas is a problem, particularly if there is a desire to restore riparian vegetation.
24. Some concern expressed that "entrance modifications" are causing high tides to rise.
25. There is significant commercial fishing access to the Moruya Estuary using a range of methods.
26. Concerns relating to the increasing rock lining of downstream reaches of the river, where ecologically friendly bank stabilisation methods are preferable.
27. There has been some experimentation with varied foreshore protection methods upstream of the Moruya Bridge.
28. Community access to foreshores (e.g. fishing platforms) have been put forward as a means of preventing uncontrolled access to riverbanks, which causes erosion.
29. Some concern that on-site wastewater systems are causing problems.
30. Concern that urban stormwater drainage should be "best practice".
31. There is a desire to consider the needs of migratory waders and foraging sites.
32. There appears to be enough concern to warrant the examination of sedimentation throughout the estuary, including the movement of slugs of sand through the upper estuary, and a review of infilling and the movement of shoals at the entrance.
33. An understanding of the ongoing maintenance requirements for the training walls and a strategy for future maintenance/replacement. Responsibility for these training walls will need to be established.

Issues Relating to Coastal Use Areas

34. The Pilot Station at Moruya Heads is important for European cultural heritage. BoM presently has a residential tenancy there.

There are other issues that are associated with the preparation of a CMP, but which are not readily relatable to a particular coastal management area. For example, there is some concern about sources of funding and how the CMP will interact with planning for the Batemans Marine Park (currently under review). Furthermore, there is a native title claim over the entire south coast region at the present time. It should also be noted that activities in the catchment and further upstream in the catchment sit outside the coastal zone but can be considered during the preparation of a CMP as appropriate.

3.2.4 Review and Audit of Existing Estuary Management Study and Plan

The existing EMP and its related management study (Worley Parsons, 2009b, 2009a) were examined, and the implementation of the actions identified by that plan has been audited by Eurobodalla Shire Council (Appendix C).

The audit, as provided, is incomplete. A review of progress is provided for those actions classified as "Planning Controls and Policies" (PCP) and "On-ground Works" (OGW), but no information is provided beyond the tables presented in the EMP (Worley Parsons, 2009a) for actions classified as "Investigation and Research" (IR) or "Education and Community Involvement" (EC). We note that ongoing proactive monitoring of the progress of EMPs (or CZMPs) within NSW has not always been given high priority. Previous guidelines suggested a "review" of progress towards the end of the identified implementation period (noted to typically be between 5 and 10 years in OEH, 2013) or "on a regular basis" (NSW Government, 1992).

The shift in focus of the management instruments away from "plans" towards "programs" implies that a more rigorous and proactive monitoring of progress will be necessary. Furthermore, it is a requirement to implement actions within the new coastal management programs under the IP&R framework (as set out by the *Local Government Act 1993*).

For the review within this Scoping Study, we have considered those actions identified as being either incomplete, ongoing, or abandoned with a discussion of reasons as appropriate. The actions have been categorised considering the extent and objectives of the current coastal management areas for which they are relevant.

Actions relating to the location and Objectives of Coastal Wetland Area

- **PCP-1:** *Incorporate SEPP-14 Wetlands and EECs into land use mapping:* SEPP-14 wetlands were converted to E2 lands under the Eurobodalla LEP. While there was a planning proposal exhibited during the first half of 2018 to make grazing an exempt development in E2 wetlands, this does not seem to have (yet) been

incorporated into the Eurobodalla LEP[8]. The boundaries of the E2 lands should now be updated to reflect boundaries of the CM SEPP wetlands. Furthermore, the CM SEPP explicitly requires development consent if marine vegetation is to be harmed. Mangroves and seagrass are protected from harm under the FM Act 1994 and Coastal Saltmarsh is classified as an endangered ecological community under the BC Act 2016. The protection of mangroves, seagrass and saltmarsh is a high priority given that habitat extent and health is a key driver of ecosystem functioning.

- **PCP-7**: *Investigate rezoning or strategic purchase of land to account for impacts of climate change on estuary processes and development & Incorporate into LEP*. Rising sea levels will encourage the upslope migration of estuarine vegetation such as saltmarsh and mangroves. The mapping contained within the CM SEPP effectively rezones this land. Furthermore, provisions within legislation protect estuarine vegetation. Some refined mapping of the existing habitat extents indicated by the CM SEPP may be required to enable effective migration of individual areas as sea levels rise.

- **OGW-3**: *Construct a boardwalk through Ryans Creek wetland to consolidate pedestrian access*. This project has not commenced and may need to be re-examined in the context of the new CM SEPP.

Actions relating to the location and Objectives of the Coastal Vulnerability Area

- **PCP-7:** *Investigate rezoning or strategic purchase of land to account for impacts of climate change on estuary processes and development & Incorporate into LEP*. Rising sea levels may eventually make some land unsuitable for its present use or uninhabitable due to an increased frequency of tidal inundation. This issue may need to be investigated in the first instance by establishing the extent of the coastal vulnerability area associated with tidal inundation (not yet mapped). The existing action has not been actively pursued. Zoning for acquisition is inappropriate and acquisition on a voluntary basis is probably the only way this will work.

- **OGW-1:** *Maintain rock protection walls along the lower estuary:* Council reports that this is ongoing, and that funding is currently being sought for additional works.

Actions relating to the location and Objectives of the Coastal Environment Area

- **PCP-**4: *Audit erosion and sediment controls for new developments over a previous 4-year period*. It seems that, while well intentioned, a retrospective audit is an impractical way to address this issue. Development related erosion and sediment controls are largely temporary in nature. The issue seems better addressed through compliance and Eurobodalla Shire Council does have a Soil and Water Management Code which should be applied for all development within the coastal zone. That code

[8] https://www.legislation.nsw.gov.au/#/view/EPI/2012/333/sch2, accessed 17 November 2018.

could be enhanced through reference to industry standard practice such as the *Blue Book* (Landcom, 2004).

- **PCP-6**: *Incorporate appropriate stormwater quality management measures for the expanding North Moruya in a revised Urban Stormwater Quality Management Plan.* We have received no indication as to whether this action has been pursued.

- **PCP-8**: *Develop a stormwater operations manual for Council's outdoor staff and machinery operators.* This has been completed, but some follow up may be necessary to consider how well the manual is being adopted.

- **PCP-10:** *Develop a Boating Management Plan for Moruya River:* Information provided by Council implies that this is no longer applicable. While the CMM implies that such an action could be recommended by the CMP, it seems most likely that responsibility for this would sit with either the NSW Roads and Maritime Service and/or the Department of Industry (Crown Lands). Council's role would traditionally extend to providing waterside facilities that encourage access to the waterway (boat ramps, jetties, wharves & pontoons etc.). Council should make sure that any proposed works and additional facilities do not conflict with the new CMP objectives. Except where facilities have been specifically identified as part of the data collated during this Scoping Study, this does not seem to be a particularly concerning issue for the Moruya Estuary.

- **PCP-**11: *Coordinate with Eurobodalla Bush Fire Management Committee to incorporate recommendations relating to riparian corridors in the Bush Fire Risk Management Plan:* It is expected that this will be difficult to achieve. Bush fire management requirements will likely override those of a coastal management plan. Ongoing consultation may help resolve competing program objectives.

- **PCP-12:** *Ensure Council Planning staff are briefed on the Estuary Management Plan:* It appears that this was initially addressed but may have not been followed through more recently. Under the new coastal management regime, the EP&A Act requires that a CMP and/or the CM SEPP are considered in development decisions.

- **PCP-14/OGW-7:** *Acquire a 30m wide strip of riparian land on the Northern bank of the Moruya River between the Bridge and Glenduart / construct a pedestrian walkway:* This action seems to have been abandoned, most likely because of the cost and difficulties involved with purchasing private land. Instead, Council and LLS have been working with individual landowners to continue restricting cattle access. A revised program should reflect the current management intent.

- **OGW-4:** *Formalise foreshore facilities and close informal boat ramp at popular recreation area on North Head Drive 600m west of Malabar Weir:* Council indicates that this action has not commenced, and, during site inspections, there was no indication of any issues at this location. This action may no longer be warranted.

- **OGW-5:** *Seek funding to remediate high priority fish barriers in the Moruya River Catchment:* There is limited information on whether this action has been implemented. However, there are known locations which may benefit from work through a Habitat Action Grant from DPI Fisheries.

- **OGW-7**: *Install vessel pump-out facilities, potentially at Moruya Town Wharf*. There seems to be limited appetite to implement this. Furthermore, faecal contamination appears to have improved in recent years in the absence of this action. This has not been highlighted as an issue during research for this Scoping Study.

- **OGW-8**: *Offer incentives relating to stock control measures in the vicinity of Mogendoura:* LLS is presently acting on these types of issues throughout the estuary.

- **OGW**-9: *Incorporate canoe/kayak launching area into Yarragee Reserve:* Council has assessed that this action is not required as the nature of the beach already provides a suitable environment for launching.

- **OGW-10:** *Install storage facilities for oyster growers at Pilot Station Backwater:* Following investigation, it seems there is limited desire or requirement for such facilities in these locations.

- **OGW-**11: *Install BBQ facilities at Yarragee Reserve and Ryans Creek Parkland:* This action has been assessed as no longer relevant by Council.

Actions relating to the location and Objectives of the Coastal Use Area

- **PCP-**13**:** *Improve compliance with restrictions on camping in the Moruya River riparian zone and near the mouth of Ryans Creek:* It appears that this action is ongoing, with regulations in place at North Head and access to camping adjacent to the mouth of Ryans Creek being limited.

3.3 Discussion of Key Assets, Estuarine Values, Threats and Risks

3.3.1 Introduction

The preceding section provides information on the concerns that have been expressed both in the past and discovered during initial consultation and investigations completed as part of the scoping study. In addition, those actions which have been undertaken as part of previous estuary or coastal zone management plans have been discussed. The present section aims to filter this information using the objectives of the CM Act.

The prior information needs to now be considered in the context of the new coastal management framework for New South Wales. The sections which follow briefly summarise the preliminary risk assessment completed for this Scoping Study (Appendix E outlines the methodology and outcomes). The risk assessment was

framed around the four coastal management areas and the objectives of the CM Act relating to them.

The key findings of the risk assessment have been used to formulate the purpose for the new CMP as discussed in Section 3.4.

The character of the Moruya River and the values held by the community are largely encapsulated by the quiet, rural nature of the floodplain surrounding Moruya. The area is used for primary production (oyster farming, commercial fishing, beef production, an expanding market garden and fresh local produce sector) and the town of Moruya supports small business, tourism, and government services. The health and community services sectors are the fasted growing services in Moruya town centre.

The coastal wetland areas which fringe the lower estuary are important environmental features, including Malabar Creek / Lagoon, which is zoned for Sanctuary as part of the Batemans Marine Park.

Recreational activities along the river are primarily passive, including kayaking, boating, swimming, and recreational fishing. However, water skiing, wakeboarding and personal watercraft have also been reported.

While the river entrance is permanently trained, there continue to be morphological issues associated with shallow shoals near the entrance. At the upstream reaches of the estuary, there is some concern that mobile shoals derived from fluvial sediments are moving into the estuary and that these reaches are shallowing over time.

3.3.2 Coastal Wetlands Area

Coastal wetlands as defined under the SEPP have a high value placed upon them. The mapped wetland at Malabar Creek / Lagoon has the added importance of being a Sanctuary Zone inside the Batemans Marine Park.

While concerns have been raised about the impact of Eurobodalla's Rural Lands Strategy on coastal wetlands, it seems unlikely that this will be a driving issue, as the provisions of the CM SEPP override those of Eurobodalla's LEP. Of potentially more importance is ensuring compliance or cooperation from landowners in appropriately managing wetlands that exist on their property.

Sea level rise will prompt coastal wetland vegetation to migrate upslope to retain a favourable water level environment. This impact will be widespread, and we are confident it is going to occur, albeit at relatively slow rates over an extended timeframe. For that reason, the risk arising from this process is considered "extreme".

Several "high" and "moderate" risks are associated with poor understanding of the environment surrounding Malabar Creek / Lagoon and further study is warranted. Furthermore, there is a strong argument to revisit the mapping of coastal wetland

mapping included in the SEPP based on more contemporary, ground truthed mapping of estuarine macrophytes.

3.3.3 Coastal Environment Area

Of the three estuaries being considered in this Scoping Study, the Moruya Estuary is unique in that it remains open for commercial fishing. Somewhat related to this is that the estuarine floodplain surrounding Moruya is used primarily for agriculture. Moruya was previously an important river port, and for this reason, the entrance to the river is trained and the channel downstream of Moruya has been dredged in the past for navigation.

A key risk associated with the Moruya Estuary is the rehabilitation of riparian zones. While there have been significant efforts to improve the riverbanks, continuing funding sources are uncertain, particularly for maintenance. Currently, there is no overarching strategy which is monitored and updated with time to assess performance of any rehabilitation works and to assist in targeting new areas for rehabilitation.

Protected migratory wader species are commonly sighted within the downstream reaches of the estuary. The possibility that their habitat may be compromised by sea level rise, development or other human activities does not seem to have featured significantly in development of the existing management plan. This warrants further investigation.

Otherwise, changes to the bathymetry and tidal response of the estuary following training of the entrance have been raised as concerns. These issues could be investigated during preparation of the CMP. Similarly, the ongoing maintenance effort, responsibilities and plans for future repairs of the training walls in the lower estuary should be addressed.

Other risks that require some attention relate to access to the estuary for recreational activities and the impact of settlements on water quality in the estuary via runoff, at present and in the future, based on projected growth rates.

3.3.4 Coastal Use Area

Management of the coastal use area is unlikely to represent a key issue for management of the estuary. Key historical sites, such as the Pilots Station and Moruya Quarry appear to be appropriately managed at present.

As part of the CMP preparation, it will be necessary to review areas that are proposed for changes to development intensity, and whether additional development controls are required.

3.4 Identification of CMP "Purpose" for Moruya River

With reference to the risk assessment contained in Appendix E, the key objectives that are to be addressed by the CMP for Moruya River are:

Assuming that the coastal wetland area is to be included in the CMP:

> *"to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity"*

Initially this objective can be addressed by updating the current CM SEPP mapping for coastal wetlands to reflect more recent, field verified mapping.

> *to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests.*

This objective can be partly addressed by updating the current CM SEPP mapping and by continuing cooperation with landowners to exclude stock from wetland areas, such as saltmarsh.

> *to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.*

As part of improved mapping for the CM SEPP, it is proposed that a more rigorous representation of the buffer zone is prepared, which considers topography in assessing migration pathways.

Assuming that the coastal environment area is to be included in the CMP:

> *to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.*
>
> *to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place.*

These objectives can be addressed by continuing efforts to rehabilitate riverine foreshores, educate landowners and excluding stock. However, a more coordinated effort may be required. While that work has occurred on an opportunistic basis reliant on the cooperation of landholders, more rigorous records, monitoring, evaluation, and maintenance will assist. A further concern raised during this Scoping Study is the well-being of migratory waders. Some study is likely warranted to better understand the areas used by those birds protected by legislation, particularly in the vicinity of Moruya Heads. The fate of the habitat they use should be assessed for a future including sea level rise.

We consider it unwarranted that the coastal use area be included in the CMP for the Moruya River Estuary. The reason for this is that development is low intensity and no

significant issues have been identified that significantly impact the coastal use objectives and that are not presently now covered by of the CM Act, and the default NSW guideline document for coastal design (Coastal Council of NSW, 2003).

The above objectives relate to any "extreme" or "high" risk issues that have been identified through the preliminary risk assessment (Appendix E). There are also moderate risk issues that could be addressed if easy or inexpensive. In developing the CMP, each of these should be assessed for ease of implementation.

Considering the above objectives, it is worthwhile comparing these against the identified management objectives of the existing Estuary Management Plan (Worley Parsons, 2009a). Those were:

1. Maintain existing good water quality.
2. Protect and restore riparian vegetation.
3. Protect and preserve aquatic habitats (including seagrasses and saltmarsh).
4. Restrict stock access to foreshore and wetland areas.
5. Rehabilitate eroded sections of the riverbank and damaged sections of existing bank stabilisation works.
6. Consider and manage the impacts of climate change on estuary processes.
7. Improve education and awareness of estuary issues.
8. Increase connectivity of foreshore habitats (wildlife corridors).
9. Reduce and prevent further sedimentation of the estuary.
10. Understand, sustain, and improve fish productivity in the estuary.
11. Improve foreshore access and facilities for recreation.
12. Provide for sustainable development of the estuary.
13. Promote sustainable tourism for the estuary.
14. Tighter enforcement of development controls.
15. Protect and restore Aboriginal and European heritage.
16. Resolve conflicts between development controls and other policies.
17. Maintain and enhance visual aesthetics and quiet rural lifestyle.
18. Promote sustainable industry for the catchment and floodplain.

These objectives are mainly 'high level' but still relevant to the estuary, and covered by the risk assessment outlined in Appendix E. However, the approach of this Scoping Study has been to limit the CMP scope to the objectives for each coastal management area outlined in the CM Act. Accordingly, some of the prior objectives now will only form a secondary concern of the CMP such as:

- Tighter enforcement of development controls.
- Promote sustainable industry for the catchment and floodplain.
- Promote sustainable tourism for the estuary.

Furthermore, there are some actions which are of interest to the CMP but are already adequately covered by the responsibilities of state government, such as "*Understand, sustain and improve fish productivity in the estuary*" – which is clearly a responsibility of NSW DPI (Fisheries) and the Batemans Marine Park. Adding complexity by introducing actions into the CMP is considered counterproductive. At the risk of the CMP seeming light in terms of the quantity of actions, it is considered practicable to focus the CMP on fewer actions which are clearly the responsibility of Council and largely within Council's control. The actions to be listed in the CMP must be affordable, programmed and implemented. This does not eliminate the need for Council to consult with and support the actions of other arms of state government, including NSW Fisheries, Batemans Marine Park, RMS and DoI (Crown Lands) in achieving positive outcomes for the estuary.

3.5 Gap Analysis and Recommended Approach in Development of CMP

Considering the objectives of the previous Estuary Management Plan (Worley Parsons, 2009a) it is clear that work has progressed in achieving the following objectives:

1. Maintain existing good water quality.
2. Protect and restore riparian vegetation.
3. Protect and preserve aquatic habitats (including seagrasses and saltmarsh).
4. Restrict stock access to foreshore and wetland areas.
5. Rehabilitate eroded sections of the riverbank and damaged sections of existing bank stabilisation works.

However, except for the first objective, monitoring, evaluation, and reporting activities have been limited. These objectives continue, but a more strategic and monitored approach is recommended. That monitoring should drive future activity in implementing the program.

Several of the objectives are either no longer valid, impractical, or much better addressed through other processes and programs, these include:

1. Understand, sustain, and improve fish productivity in the estuary.
2. Provide for sustainable development of the estuary.
3. Promote sustainable tourism for the estuary.
4. Tighter enforcement of development controls.
5. Protect and restore Aboriginal and European heritage.
6. Maintain and enhance visual aesthetics and quiet rural lifestyle.
7. Promote sustainable industry for the catchment and floodplain.

The remaining objectives remain relevant to a new CMP but require either more effort or a different approach.

The risk assessment (Appendix E) contains commentary, associated with each risk, with some discussion on potential additional studies and/or actions that could be undertaken to address data gaps during both the preparation and operation of a CMP for Moruya River. A short list of these studies and/or actions, comprising those relating to "high" and "extreme" risks was prepared and provided to representatives of Eurobodalla Council and the Office of Environment and Heritage. That list and the potential costs of for those studies was the subject of discussions between the study team, Council and OEH to consolidate and refine the approach for each of the "high" and "extreme" risks during the CMP process.

However, due to issues outlined in the Executive Summary, none of these additional studies could be funded as part of Stages 2 or 3 during preparation of the CMP. Accordingly, these additional studies have been carried forward to be executed as actions within the CMP.

Table 6 Proposed Approach to Addressing "Extreme" and "High" ranked Estuary Management Risks associated with Moruya River

Relevant Risks (Appendix E) and CM Area	Risk Ranking	Required Additional Study
M1 (Wetlands) M10(Wetlands)	Extreme High	Update CM SEPP (Wetlands) Mapping: Maps should be prepared to better represent the extent of existing Coastal Wetlands, as mapped and assessed by Elgin Associates (2018). Furthermore, the associated proximity area for wetlands should be derived incorporating topographical constraints, not the linear spatial buffer applied in the present mapping. In this way, the buffer will focus on lower lying areas that are important to enable the migration of wetlands with sea level rise. The coastal vulnerability mapping (see next row) will need to be completed to ascertain the potential extent of migration with a future sea level rise scenario.
M13(Vulnerability)	Extreme	Tidal Inundation Mapping: This requires an understanding of how the tidal planes along the river might change given a sea level rise scenario. While there is an existing flood model of the river (developed using the RMA software, Worley Parsons (2010)) results from a prior tidal gauging of the river (5 April 2000) indicates that the tidal range between the Entrance and Mogendoura Creek varied only slightly (typically between highs of 0.7m AHD and lows of 0.3m AHD, with the range varying by less than a few cm). By extension, key present-day tidal planes can be derived by analysis of the water level record at Moruya, and these tidal planes should be reasonably representative along this length of the river. Furthermore, a good first pass estimate of changes to tidal planes can be derived by adding an amount for future sea level rise to the current tidal planes. This will provide a suitable mapping product for assessing potential migration pathways for coastal wetlands (see previous row). Eurobodalla Shire Council proposes completing formal Coastal Vulnerability (Tidal Inundation) Mapping during a forthcoming review of the floodplain risk management plan for the Moruya River. When this occurs, a more detailed representation which better addresses hydrodynamics in the side creeks and upper reaches of the Estuary (upstream of Mogendoura Creek) will be possible, and the analysis proposed here could then be updated.
M5 (Wetlands) M6 (Wetlands) M11(Wetlands)	High High High	Malabar Lagoon Processes Study: It appears that overall estuarine processes in Malabar Lagoon are poorly understood and this is of some concern given its importance as a Sanctuary Zone in the Batemans Marine Park. While a detailed processes study may be warranted, the updated wetlands mapping will provide an important precursor to identify the critical areas for management. It is expected that this information could feed into a subsequent study (as part of the CMP) including: (i) a preliminary assessment of acid sulfate soils generating capacity in the surrounds of the creek and lagoon and consideration as to whether the risk will increase with sea level rise. (ii) installation of a water level recorder (temporarily) to gain an understanding of how the weir under North Head Drive affects hydraulics. (iii) an indigenous cultural assessment to identify locations of middens to ensure adequate management and protection. (iv) inspection of tributary creek lines to assess stability and whether these are contributing sediment to the lagoon and/or whether any ameliorative works are warranted. (v) installation of a temporary water quality recorder to enable a baseline assessment of water quality conditions within the lagoon. It is considered that this processes study would be of most interest to the Batemans Marine Park, and to assist in providing a reasonable level of background understanding

Relevant Risks (Appendix E) and CM Area	Risk Ranking	Required Additional Study
		to negotiate with landowners and promote the fencing of areas to exclude livestock. For these reasons, responsibility for this action will likely rest with the Marine Park.
M24 (Environment)	High	Literature/Data Compilation of Migratory Wader Use: As part of preparation for the CMP, more research must be undertaken to determine the extent to which shorebird habitat at the entrance to Moruya River is presently being managed. It is possible that NPWS presently has such a strategy and it is not desirable that the CMP process overlaps this. Depending on what is available, an action of the CMP may include the background review of existing data, including databases held by state government and any relevant citizen science sources to assess the regional importance of available migratory wader habitat and to provide indicators as to whether there are management strategies that may be considered to enhance / protect / expand upon the available habitat in future, particularly under a sea level rise scenario.

4 Mummuga Lake

4.1 Background

Unlike the Moruya River and Wagonga Inlet, an estuary management plan has not been previously prepared for Mummuga Lake. The existing Plan of Management for Eurobodalla National Park (NSW National Parks and Wildlife Service, 2000) proposed the preparation of an estuary management plan and an interim lagoon opening strategy for Mummuga Lake. To our knowledge, only the opening strategy has been developed, and a Review of Environmental Factors for artificial opening of Mummuga Lake (and other lakes within the Park) has been reviewed (Department of Environment and Conservation, 2007).

4.1.1 Catchment Characteristics

The Mummuga Lake catchment is shown in Figure 9. The catchment is around 27.5km^2 and oriented approximately east-west with a length of 10km and a width of (typically) around 3km. Most of the upper (western) catchment is contained within the Bodalla State Forest. Importantly, the estuarine waterway and areas to the north east of the estuary are contained within Eurobodalla National Park. Catchment elevations are below 200m, with the maximum height occurring adjacent to the southern boundary of the catchment. The main tributary, Lawler's Creek, drains the catchment into the western edge of Mummuga Lake.

Spring Creek drains the catchment to the south of the lake, flowing into Mummuga Lake to the east of Evans Point and dividing the settled areas of Dalmeny, which fringe the southern shoreline of the lake.

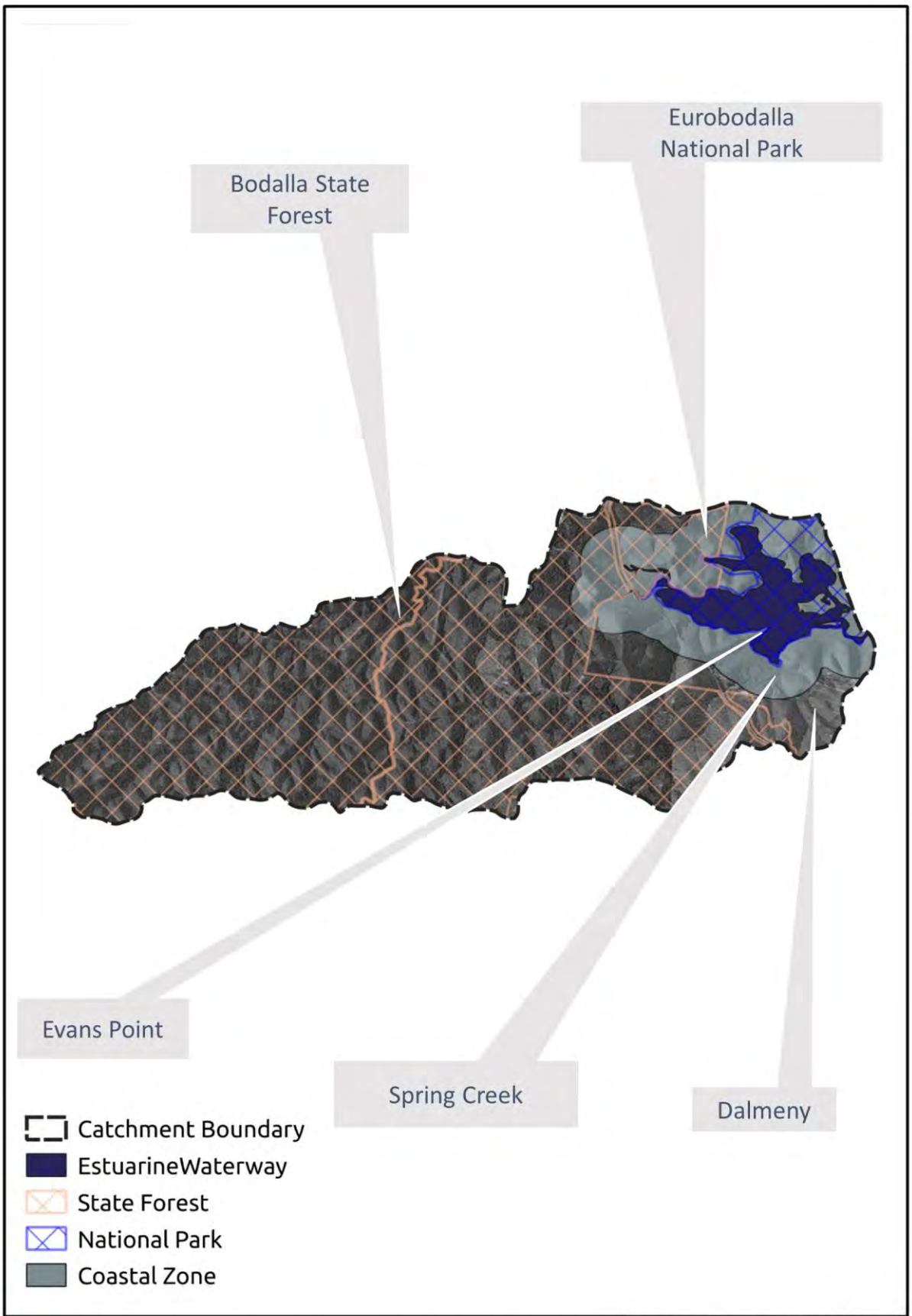

Figure 9: Mummuga Catchment Landuse

0 0.5 1 1.5 2 km

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet	REV A	DRAWN DJW	CHECK DJW
GIS File:/Projects/P00053 CMPsforMoruya/Outgoing/Figures/Figures6Through14.qgs			

Salients

4.1.2 Key Habitat Extent and Health

The mapped extent of estuarine macrophytes, provided to us by Council for 2012, is the most recent data available for Mummuga Lake. We understand that this mapping was completed by the NSW Department of Primary Industries (Fisheries). The extent of estuarine macrophytes and zoning for the Batemans Marine Park (BMP) within Mummuga Lake are shown in Figure 10. The BMP covers almost all the estuary, *as a habitat protection zone,* except for the creek lines which feed the alluvial delta at the western side of the lake.

An almost continuous fringe of *Zostera* is present around the main body of the lake. It is narrow in many locations but becomes more expansive near locations where creeks flow into the estuary (Lawlers Creek from the west, Spring Creek from the south) and within the upstream reaches of the flood tide delta. Mapped coastal wetland areas associated with Amherst Island largely miss the areas of saltmarsh mapped in 2012, although an area of combined mangrove and saltmarsh is present. Mapping of macrophytes in Mummuga Lake should be upgraded to confirm the appropriateness of existing coastal wetland boundaries. There also exist areas of saltmarsh directly offshore of the southern shoreline of the entrance channel. Site inspection of these areas during the preparation of this study indicated that some of these are highly disturbed by uncontrolled public access.

The background information report which informed the threat and risk assessment for the Marine Estate Management Strategy (MEMA, 2017) also reviewed the historic abundance of estuarine macrophytes in Mummuga Lake. They found, based on a review of mapping between 1985 and 2013, that:

- Mummuga Lake contained around 2.14ha of saltmarsh, which reduced alarmingly by around 65% (loss of 3.35ha) between 1985 and 2006. 2.14ha represented 0.17% of the total for the southern region (Shellharbour to the Victorian Border) and 0.03% of the total for the state.
- The lake contained around 1.34ha of mangroves and the area, having increased from zero since 1985. 1.34ha represented 0.08% of the total for the southern region and 0.01% of the total for the state.
- The lake contained around 32.5ha of seagrass and the area had increased since 1985 (29.4ha). 32.5ha represented 0.93% of the total for the southern region and 0.21% of the total for the state.

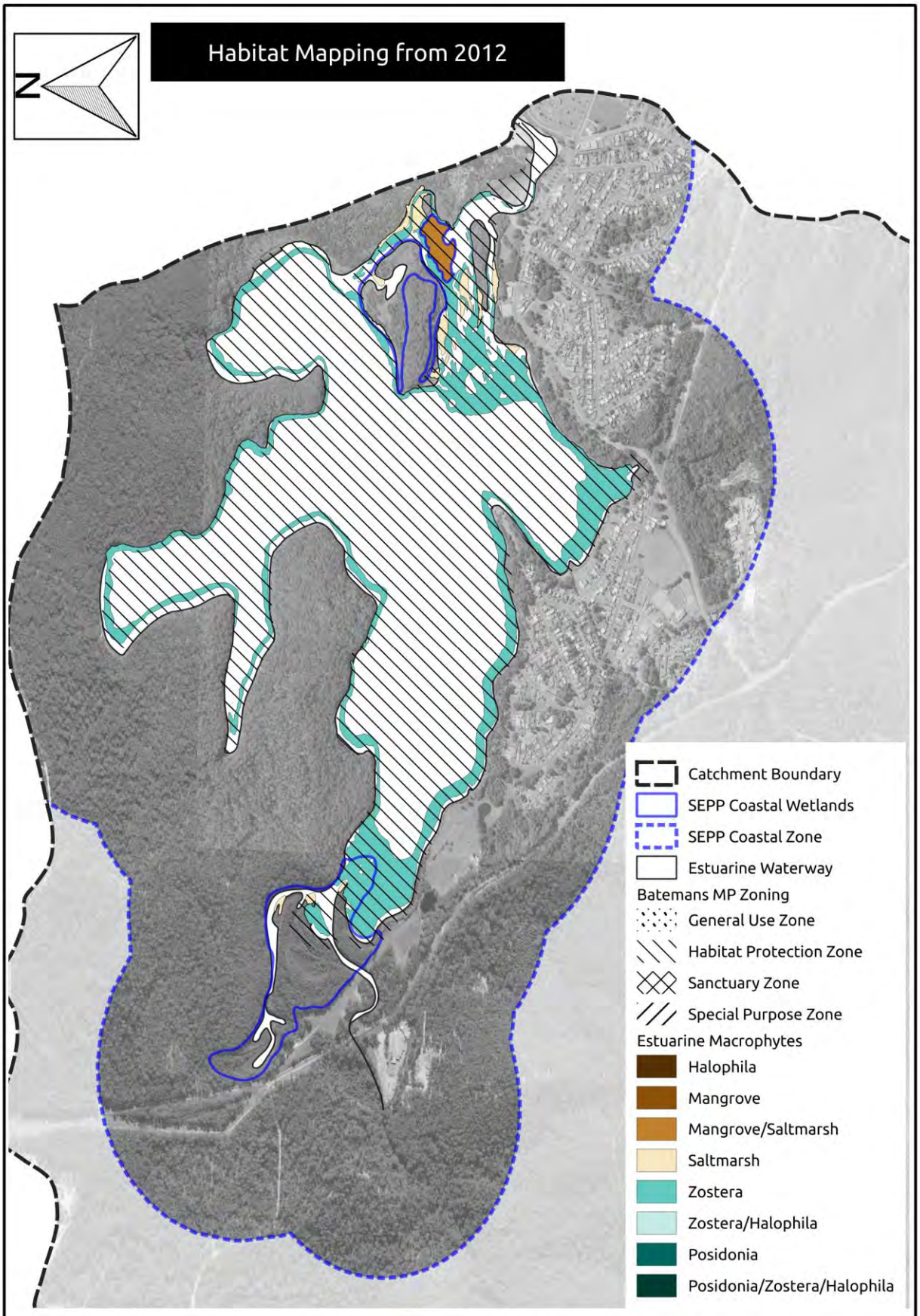

Figure 10: Mapped Estuarine Habitat - Mummuga Lake

0 150 300 450 600 m

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet

REV	DRAWN	CHECK
A	DJW	DJW

GIS File:/Projects/P00053 CMPsforMoruya/Outgoing/Figures/Figures7 10 13.qgs

Salients

Much of the terrestrial vegetation surrounding the northern and western edges of the estuary is within Bodalla State Forest or Eurobodalla National Park. In some areas to the south, and near the ocean entrance, vegetation has been cleared for public recreation. Otherwise, where not comprising estuarine macrophytes, the vegetation typically comprises wet sclerophyll forest, particularly behind the residential areas of Dalmeny.

4.1.3 Physical Features and Processes

Overall, Mummuga Lake has received little detailed attention, and data collected regarding the estuarine features of the lake are sparse.

MEMA (2017) summarises some key features of Mummuga Lake. The lake has an open water area of around 1.3km^2 and a total water way area of around 1.7km^2. The average depth is around 1.0m. The tidal limit is some 3.6km upstream of the entrance.

The lake is an intermittently opening saline lagoon. While the lake is intermittently open, at the time of an inspection in June 2018, it had been reportedly open for around 5 years.

The form of the lake is consistent with it being an intermediately evolved intermittently opened lagoon. The entrance channel of the lake (Lawlers Creek) is shallow, particularly in its upstream reaches. It winds through the flood tide delta and there are several minor channels which spread from the main channel and wrap around features including Amherst Island and a smaller, minor island adjacent to the southern foreshore of the entrance compartment. The sedimentation patterns at the dropover into the main body of the lake are consistent with sand being continuously delivered from the coast to infill the lake. Most of the lake waterway comprises the main estuarine basin which is somewhat deeper. Exceptions to this occur notably at the locations where Lawlers Creek flows into the western side of the lake, and Spring Creek into the southern side. In these locations, sediment from the catchment is being supplied as these deltas slowly expand into the lake. A hydrosurvey of Lake Mummuga was completed by the Office of Environment and Heritage in April 2013, covering the entire entrance channel and main body of the waterway.

The entrance channel exits to the ocean immediately to the north of Mummuga Head. It is very common for entrances to intermittent saline lakes to locate against the northern side of a rocky headland in this way within New South Wales, as this produces the most stable entrance and sheltering from the dominant south south easterly wave climate. Historical aerial photographs indicated the presence of a wash over fan, in 1967, some distance to the north of the entrance, but this feature was temporary and has gradually revegetated.

Historically, water level records have not been recorded within Mummuga Lake. Management of entrance opening was discussed in the review of environmental

factors for entrance management within the Eurobodalla National Park (Department of Environment and Conservation, 2007). The REF provides two indicators for entrance management: (i) When the water level in the lake begins to inundate properties in Mort Avenue, Dalmeny, monitoring of the situation intensifies and entrance opening may occur in certain circumstances – including ecological monitoring; and (ii) When the water level reaches, or is likely to imminently reach, the level of a marker on the footbridge across the entrance channel, set at 1.175m AHD, the entrance is opened as a matter of urgency.

WMA Water (2016) prepared a comprehensive flood study of Dalmeny and Mummuga Lake. The way in which an intermittent entrance is treated in a flood model can have a significant effect on simulated flood levels in the lake. For the historical model simulations, the entrance was modelled as closed, with that entrance configuration apparently not simulated as changing throughout the opening event, except for one event from 2014, when the entrance was assumed to be open. Inspection of aerial and satellite imagery available through Google Earth, and covering the period between 2002 and 2018, indicated that the entrance was closed in three out of eight photographs. The limited data indicates that the entrance is open more often than closed, but that historically, a closed entrance exacerbates flooding levels.

Sensitivity testing by WMA Water (2016) indicated that, if the entrance was considered to open dynamically during the simulated event, the amount of time taken to breakout could affect peak water levels. For the most severe historical event (14-15 February 2010, which was considered either greater than or equal to a 1% AEP event) simulated water levels in the lake were affected by around 0.1m.

Design flood levels within Mummuga Lake, as determined by WMA Water, are presented in Table 7.

Table 7 Design Flood Levels for Mummuga Lake (in m AHD from WMA Water (2016))

Location	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	0.5% AEP	PMF
Pedestrian Footbridge	2.0	2.2	2.4	2.6	2.8	3.0	3.8
Spring Creek at Mort Ave	2.0	2.2	2.5	2.7	2.9	3.1	4.0
Lawlers Ck at Princes Hwy	3.1	3.2	3.4	3.5	3.7	3.8	4.8

Both flooding and tidal behaviour will be affected by climate change. At the present time, it appears that climate change has only been considered in the context of extreme flooding for Mummuga Lake. In the case of Mummuga Lake, if a tidal inundation coastal vulnerability zone is to be derived, it will be necessary to consider the influence of climate change on entrance barrier heights.

It appears that readily available water quality information from Mummuga Lake is sparse and limited to seasonal sampling of bacteriological monitoring to assess safety for primary contact activities.

MEMA (2017) indicated that water quality in Mummuga Lake is consistently better than the acceptable trigger levels for this type of estuary for chlorophyll-a, and typically good overall and for turbidity. These assessments appear to be based on data from OEH which is not freely available.

The MEMA report notes that the lake has a low level of catchment disturbance and that a negligible amount of surface flow (0.1%) is extracted.

4.1.4 Land Zoning

Land zoning from the current Eurobodalla Local Environmental Plan (2012) is shown in Figure 11. Land use comprises National Park in the north eastern corner and within some parcels around the margins of the lake. Parcels between the Bodalla State Forest and Eurobodalla National Park are classified as Environmental Conservation Lands. The alluvial delta of Lawlers Creek is also classified for Environmental Conservation, but the zoned area does not cover the same extent as the CM SEPP boundaries in this area.

To the south of the lake, near the entrance compartment, land along the foreshore fringe is zoned for Public Recreation, including foreshore parklands, vegetated foreshore areas, car parking and a campground. Further east, a strip of Environmental Conservation extends along the foreshore, across Spring Creek, around Evans Point and in front of the western residential area of Dalmeny. The remaining residential areas comprise a mix of low and medium density residential, interspersed with patches of Environmental Conservation, public and private recreation (Including Dalmeny Sporting Club).

The Princes Highway intersects the westernmost parts of the Mummuga Lake coastal zone. To its west, there exists a significant parcel of "*Deferred Matter*" land, which continues to be treated as "*Rural Lands*" under Eurobodalla's *Rural Local Environmental Plan 1987*. As of early 2019, Council is presently in the process of rezoning the Deferred Matter lands and the process is nearing completion. By the time the CMP is prepared, this matter will have been resolved and the Deferred Matter will no longer apply.

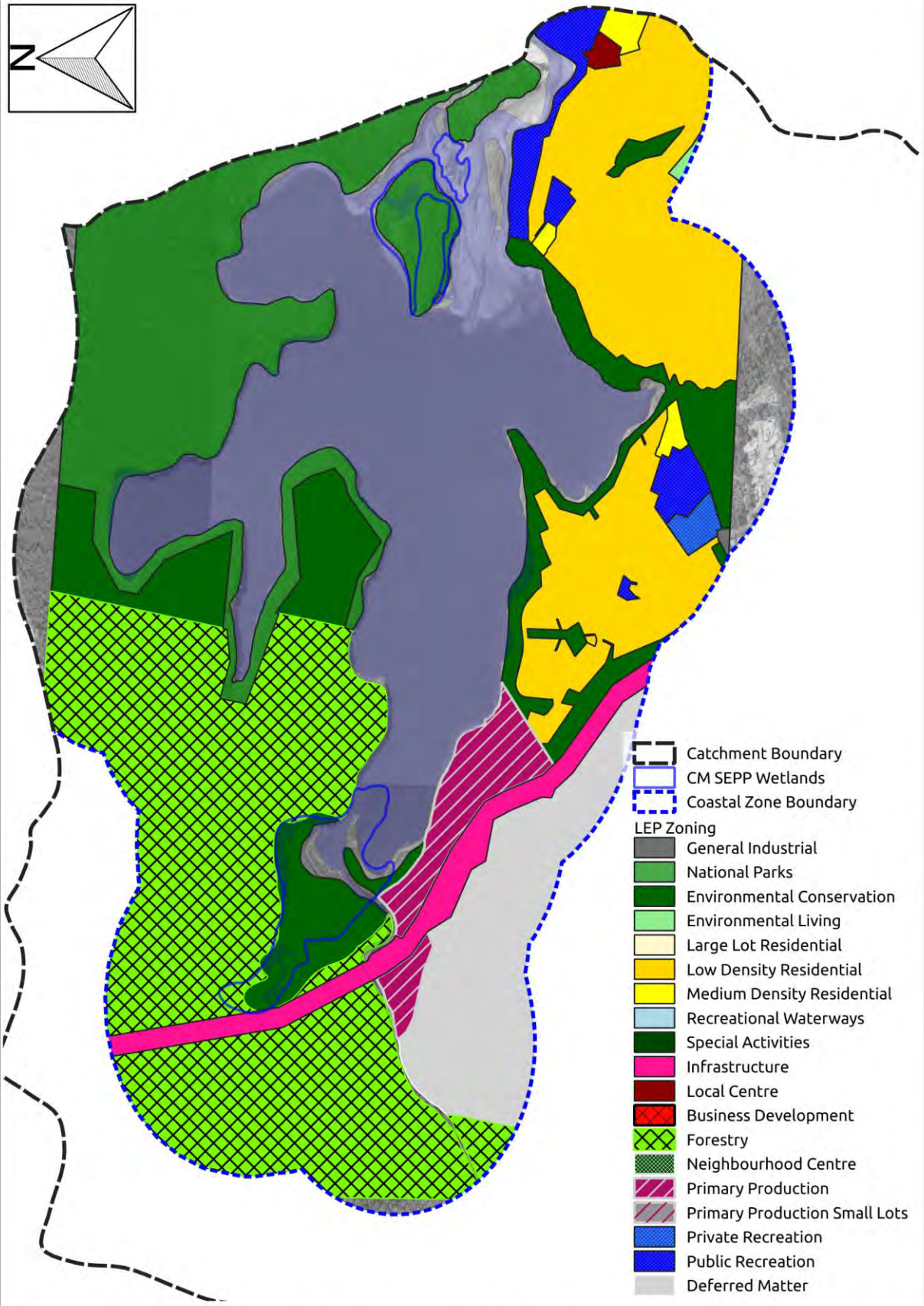

Figure 11: Mapped Estuarine Habitat - Mummuga Lake

0 150 300 450 600 m

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet

REV	DRAWN	CHECK
A	DJW	DJW

GIS File:/Projects/P00053 CMPsforMoruya/Outgoing/Figures/Figures8 11 14.qgs

Salients

At its western edge, but east of the Princes Highway, Dalmeny's residential area abuts a region zoned for Primary Production. Across the Highway, but to the south of Lawlers Creek, a smaller parcel of land is similarly zoned, and presently used for a sawmill.

4.2 Issues and Actions identified from Preliminary Consultation and Existing Information

4.2.1 Preliminary Consultation

A community workshop/drop-in session was held in the afternoon of June 6, 2018, at the Narooma Library. In addition to the community workshop, a meeting with government stakeholders was held on June 7th, 2018 in Narooma. That meeting was attended by representatives of the National Parks and Wildlife Service, Batemans Bay Marine Park, OEH, South Coast Local Land Services and members of the study team.

4.2.2 Existing Information

During the review of background information and a site inspection undertaken by the study team on June 5, several other issues were identified. In some instances, these reflect those issues raised during preliminary consultation, but our review has helped to clarify those issues further.

4.2.3 Issues Identified

Throughout the remainder of this section, findings have been classified in accordance with different coastal management areas. The issues identified issues are as follows:

<u>Issues Relating to Coastal Wetlands</u>

1. A need to update mapping of estuarine macrophytes to better represent conditions as they are today.
2. A need to update the extents of the coastal wetland area, and Environmental Conservation zoning to better reflect the extents identified by mapping of estuarine vegetation.

<u>Issues Relating to Coastal Environment Area</u>

3. Recent (~last decade) works to establish/restore saltmarsh to the rear of properties on Myuna and Attunga Streets. Initially, there were substantial problems with landowners mowing the saltmarsh. This activity is illegal for a range of reasons; the land is public land, and saltmarsh is legally classified as an endangered ecological community (EEC). More recently the action has met with some success and most, but not all, property owners help by not mowing the area set aside for this purpose. However, there is an issue of maintenance and lawn grasses are

invading the established saltmarsh beds in some locations. This needs to be investigated.

4. That stormwater runoff is causing pollution and erosion.
5. That prawning with drag nets should be banned as it damages the environment. As Mummuga Lake is both a "Habitat Protection Zone" and "Recreational Fishing Haven", prawning by drag net is allowed. There are some concerns regarding compliance in Mummuga Lake, where no commercial fishing is allowed.
6. A concern that siltation in Mummuga Lake is caused by premature opening (i.e. opening when the water level gets high, but there is no follow up rainfall to help carve a channel.
7. A perception in the community that the present mouth of the estuary was created by Council blasting the rock out and that opening used to occur a few hundred metres up the beach.
8. A concern that artificial opening has ruined prawning in Mummuga Lake.
9. A range of concerns associated with illegal fishing and a drop in crayfish numbers.
10. A concern that there is too much freshwater runoff after storms, killing off crayfish and abalone, with some dead animals washing ashore. This includes concern that the amount of freshwater runoff will increase with further development.
11. A concern that informal access of the waterway by boats is causing erosion.
12. A general concern for estuarine health.
13. There are areas of salt marsh that require better protection. A significant patch of saltmarsh exists off Mort Avenue and uncontrolled vehicular access is preventing this patch from thriving. Furthermore, around the boat ramp, areas where saltmarsh species exist is overzealously mown and or used for overflow parking.
14. In Mummuga Lake there is some conflict between development, the expansion of tourism and achieving more environmentally sustainable solutions.
15. There are potential issues with rubbish from stormwater outlets.
16. Due to multiple layers of management, there is a lack of certainty around responsibility for various aspects of estuarine management. For example, aspects of the southern waterway and fringes of the lake come under the jurisdiction of Eurobodalla National Park, Batemans Bay National Park, NSW Maritime, NSW Fisheries and Eurobodalla Shire Council.

17. Along the southern boundary of the entrance channel, to the west of the footbridge across the creek, it appears that selected trees may have been poisoned to enhance views.

Issues Relating to Coastal Use Area

18. A desire for water skiing and jet skis to be banned from Mummuga Lake and moved to Corunna Lake, arguing that the small size of the lake means that these activities can dominate and effectively "shut down" the lake. It is argued that the size of the lake makes recreational fishing a more appropriate use. There is presently uncertainty associated with difficulties in understanding how water skiing is presently allowed in the lake, with permission presently available from both RMS and National Parks. This may need investigation.

19. A desire for the boat ramp at Evans Point to be upgraded (concrete ramp and pontoon) to replace the existing gravel ramp. At present, the boat ramp is poor and there is limited manoeuvring space, forcing vehicles to traverse unsealed areas causing bare earth and erosion.

20. There is an equity issue associated with apparent clearing of bush between three properties along Attunga St, down to the waterline, reportedly approved by Council as a fire hazard reduction strategy, whereas adjacent properties have not been allowed to clear behind their properties. This needs to be confirmed with Council records. During site inspection, the foreshore was littered with a mixture of seagrass wrack and lawn clippings in that area.

21. A desire for more access to the foreshore in the vicinity of Mummuga Lake Drive, including clearing weeds from foreshore areas and a reduction in feral pests. Important habitat such as nesting sites for sea eagles, should be carefully retained.

22. A desire for more picnicking facilities at the boat ramp has been expressed.

23. Dogs are not allowed in the National Park and signage may be required to advertise this fact. There are generally difficulties in defining jurisdictions near the interface of land and water and between the water in the waterway and the actual bed of the waterway. This makes compliance difficult. Furthermore, NSW Fisheries may own the seagrass beds and saltmarsh vegetation.

24. Private, non-engineered jetties (without permits) presently extend over the national park.

25. While access is provided to the rocky foreshore at the entrance, there has been a need to protect middens in this area. Informal access down the face of the slope near the entrance may pose a safety risk and likely threatens any other middens present.

26. Stormwater discharges directly into the entrance channel adjacent to areas used for sheltered primary contact recreation. There is an opportunity to rationalise and improve this stormwater discharge.

27. Some concern has been expressed regarding the discharge from the recently developed industrial area south of the western residential area of Dalmeny, and that this might be contributing sediment to the alluvial delta of Spring Creek.

4.3 Discussion of Key Assets, Estuarine Values, Threats and Risks

4.3.1 Introduction

The preceding section provides information on the concerns that have been expressed both in the past and discovered during initial consultation and investigations completed as part of the Scoping Study. The present section aims to filter this information using the objectives of the CM Act.

One of the difficulties in interpreting the prior information is that it needs to now be considered in the context of the new coastal management framework for New South Wales. The sections which follow comprise a summary of the preliminary risk assessment completed for this Scoping Study (Appendix E outlines the methodology and outcomes). The risk assessment was framed around the four coastal management areas and the objectives of the CM Act relating to them.

The key findings of the risk assessment have been used to formulate the purpose for the new CMP as discussed in Section 4.4.

The character of Mummuga Lake and the values held by the community are largely encapsulated by the quiet, primarily residential settlement of Dalmeny along the southern foreshore, which has an outlook across the water to the largely forested northern catchment. The bed of the lake is within Eurobodalla National Park and the lake is a Habitat Protection Zone within the Batemans Marine Park. Commercial fishing is not allowed within Mummuga Lake (since 2002), although jet skis and powered vessels are. The entrance is artificially opened by the National Parks and Wildlife Service to keep water levels in Dalmeny low. The lake is known to have significance to First Nations People.

There are few directly concerning risks that could be identified as requiring attention in the short term. However, the small size of the waterway has meant that available data are scarce. The absence of an existing management plan also means that there are no established criteria to ascertain whether the lake is being appropriately managed at the present time.

Areas of the settlement of Dalmeny are already flood prone and this is likely to increase with time as sea levels rise. It seems important that this issue is investigated,

potentially alongside the mapping of a coastal vulnerability zone associated with tidal inundation.

The estuary has some value for recreational use, with boating and kayaking occurring on the waterway itself, and the entrance channel used by families for swimming and fishing.

4.3.2 Coastal Wetlands Area

The CM SEPP coastal wetlands area associated with Mummuga Lake is almost entirely contained within either the Eurobodalla National Park or the Bodalla State Forest. Accordingly, management of those areas is better covered by management arrangements for the national park and state forest.

However, in terms of assessing the health of the estuary, there is some value in completing updated macrophyte mapping of the lake, and the designated CM SEPP areas, to determine how vegetation has changed over the past 6-7 years. A decision can then be made as to whether the SEPP boundaries need to be adjusted. This may need to be completed in cooperation with the National Parks and Wildlife Service. Council will need to clarify the extent of CM SEPP over which they can have influence. This is expected to be limited to a small portion of the wetland across the western alluvial delta of Lawlers Creek.

4.3.3 Coastal Environment Area

For a small system, Mummuga Lake has a disproportionate number of extreme and high risks. This likely results from there being a limited amount of data available for the system. Water quality and water level data from within the lake are limited, meaning that a monitoring and evaluation strategy for these two items should be implemented.

Saltmarsh habitat along the southern foreshore is considered to have an intrinsic value that needs to be maintained. This includes an area of existing rehabilitation requiring ongoing maintenance to the rear of Myuna and Attunga Streets, and a relatively large expanse of saltmarsh accessible from Mort Avenue which needs the exclusion of vehicular traffic.

The southern foreshores along the ocean entrance to the lake are eroding in places and a cohesive strategy for managing the erosion is required. Management of the entrance opening is also a concern and, while the entrance opening strategy needs to be revisited, this is primarily the responsibility of the National Parks and Wildlife Service. Similarly, concerns regarding illegal fishing in the lake are managed through the compliance activities of NSW Fisheries.

Formal boat access to the estuary is limited, although the size of the waterway and shallow entrance channel means that it is probably unsuitable for intensive boating activities. Where evidence of informal boat access to the waterway is present, this should be addressed, and the existing boat ramp at Evans Point should be improved to formalise parking, seal areas of bare earth and prevent driving and/or mowing of areas of saltmarsh.

4.3.4 Coastal Use Area

There are a few concerns relating to coastal use, with two key themes arising:

- Water quality and the role of the stormwater system in delivering pollutants and fresh water to the lake is not well understood, with this understanding required to better manage stormwater runoff.
- The management of access to the lake's edge and waterway for both powered and non-powered watercraft, pedestrians, residents (via illegal structures) and dogs (which are not allowed). These issues arise from having a residential area immediately adjacent to a Lake which is in the National Park. An access plan could be considered to address these issues jointly by the National Parks and Wildlife Service and Eurobodalla Council.

4.4 Identification of CMP "Purpose" for Mummuga Lake

With reference to the risk assessment contained in Appendix E, the key objectives that are to be addressed by the CMP for Mummuga Lake are:

<u>The need to include the coastal wetland area in a CMP for Mummuga Lake is limited:</u>

This arises from the coastal wetlands being mostly contained within the Eurobodalla National Park and Bodalla State Forest – lands which are not controlled by Council and/or distant from the residential area of Dalmeny. The only potential action that might be considered is to upgrade mapping of the estuarine macrophytes in the estuary, although this should probably be completed in consultation with either State Forests or the National Parks and Wildlife Service.

<u>Assuming that the coastal environment area is to be included in the CMP:</u>

> *to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.*

Key actions to address these issues relate to protecting and enhancing areas of saltmarsh vegetation. Strengthened compliance to combat the illegal mowing of saltmarsh areas could be considered.

> *to maintain and improve water quality and estuary health.*

Actions to understand the baseline water quality and factors which influence that water quality within Mummuga Lake are likely to be required. Without understanding these, the ability to undertake suitably informed actions which achieve this objective are limited.

Assuming that the coastal use area is to be included in the CMP:

> *to protect and enhance the scenic, social and cultural values of the coast (including) ensuring that urban design, including water sensitive urban design, is supported and incorporated into development activities, and*

The coastal use area is of relatively greater importance for Mummuga Lake, given the relative dominance of Dalmeny, compared to the size of the estuary. To support the water quality objectives, it is important that the impact of stormwater runoff on the estuary is better understood.

Furthermore, there is an existing conflict between use of the waterway for jet skiing and towable water sports, and more passive recreational pursuits that are enjoyed by many who use and live around Mummuga Lake. Actions which address this conflict are largely beyond the control of Council (within the National Park), but public education and other management actions (for example, recommendation of an alternate site such as Corunna Lake for these activities) may interact with this issue to ensure a cooperative and holistic approach is applied. Future use of the lake for motorised water sports needs to be considered.

The above objectives relate to any extreme or high-risk issues that have been identified through the preliminary risk assessment (Appendix E). There are also a wide range of moderate risk issues that could also be addressed if easy or inexpensive. In developing the CMP, each of these should be assessed for ease of implementation.

Given the limited funding available, it is important that the CMP focusses on actions that are clearly the responsibility of Council and largely within Council's control. This does not eliminate the need for Council to support the actions of other arms of state government, including NSW Fisheries, Batemans Marine Park, RMS and NPWS in achieving positive outcomes for the estuary.

4.5 Gap Analysis and Recommended Approach in Development of CMP

No existing management plan exists for Mummuga Lake, and management has tended to be in a piecemeal, as required basis. The risk assessment (Appendix E) contains commentary, associated with each risk, with some discussion on potential additional studies and/or actions that could be undertaken to address data gaps during both the preparation and operation of a CMP for Mummuga Lake. A short list of these studies and/or actions, comprising those relating to high and extreme risks,

was prepared, and provided to representatives of Eurobodalla Council and the Office of Environment and Heritage. That list and the potential costs of those studies was the subject of discussions between the study team, Council and OEH to consolidate and refine the approach for each of the high and extreme risks during the CMP process and the approach agreed upon is presented in Table 8.

However, due to issues outlined in the Executive Summary, none of these additional studies could be funded as part of Stages 2 or 3 during preparation of the CMP. Accordingly, these additional studies have been carried forward to be executed as actions within the CMP. It was considered that all studies to support moderate risks could be postponed and included in actions that form part of the CMP.

Table 8 Proposed Approach to Addressing "Extreme" and "High" ranked Estuary Management Risks associated with Mummuga Lake

Relevant Risks (Appendix E) and CM Area	Risk Ranking	Recommended Additional Study
Mu3 (Environment)	High	Mummuga Entrance Foreshore Management Assessment and Strategy: A detailed assessment of erosion processes along the southern foreshore of the Mummuga Entrance Channel is warranted. This study would involve (i) a review of historical aerial photography to map notable changes; (ii) detailed engineer's inspection of existing protective works, stormwater outlets and informal access (iii) development of a holistic strategy for managing the erosion issue along the southern foreshore – including conceptual cross sections, cost estimates and recommended staging. At present, Council is in the process of updating Plans of Management for Crown reserves across the LGA. The crown reserve at the entrance to Mummuga Lake extends upstream to the tennis courts and is likely to address issues associated with foreshore access, protection of middens and stormwater etc. The strategy to be developed as part of the CMP would deal primarily with protection for erosion and will involve the development of basic cross section concepts that could be adopted along the foreshore to provide safety.
Mu5 (Environment) Mu12 (Use)	High High	Water Quality and Catchment Runoff Study: OEH is presently preparing a broad scale analysis of diffuse source pollution risk, from which subcatchments maps are to be developed. For each subcatchment, the level of present risk to estuarine health is being determined and preliminary maps have been prepared. However, key to understanding and interpreting these findings will be understanding how the modelling to derive risk levels was undertaken. At present, only limited documentation on the methods applied, in the form of a 'framework' document (OEH, 2017) are available. The next step in this process will be to gather understanding of the input data, and how the modelling has been completed for the Mummuga Estuary to enable the specification of informed actions that target key areas and likely issues regarding water quality risk. A minor study to investigate these issues should be undertaken during Stage 2 of the project. It is expected that targeted studies may be recommended as actions under the CMP.

5 Wagonga Inlet

5.1 Background

The present section deals with the characteristics of the estuary, including the physical characteristics such as the catchment, hydraulic and sediment processes, water quality, ecological processes, and habitat. Also reported are issues relating to community values, land tenure and the specified coastal management areas.

5.1.1 Catchment Characteristics

The Wagonga Inlet catchment is shown in Figure 12. The catchment is around 100km^2 in size. Most of the upper catchment is contained within the Bodalla State Forest, with a minor portion of the southernmost extent of the catchment contained within Gulaga National Park. The National Park also contains the highest point of the catchment, at Mt Gulaga (~800m). Except those areas within Gulaga National Park, the catchment elevations are typically below 250m.

Around 6km upstream from the ocean entrance, the estuary splits into two arms: Punkally Creek, which drains the southern parts of the catchment, including Mount Gulaga, and Brice's Bay which ultimately splits into its two main tributaries; and Billa Bilba and Burrimbidgee Creeks. These creeks drain the western portions of the catchment. The township of Narooma straddles the entrance of Wagonga Inlet, where the Princes Highway bridge crosses the waterway.

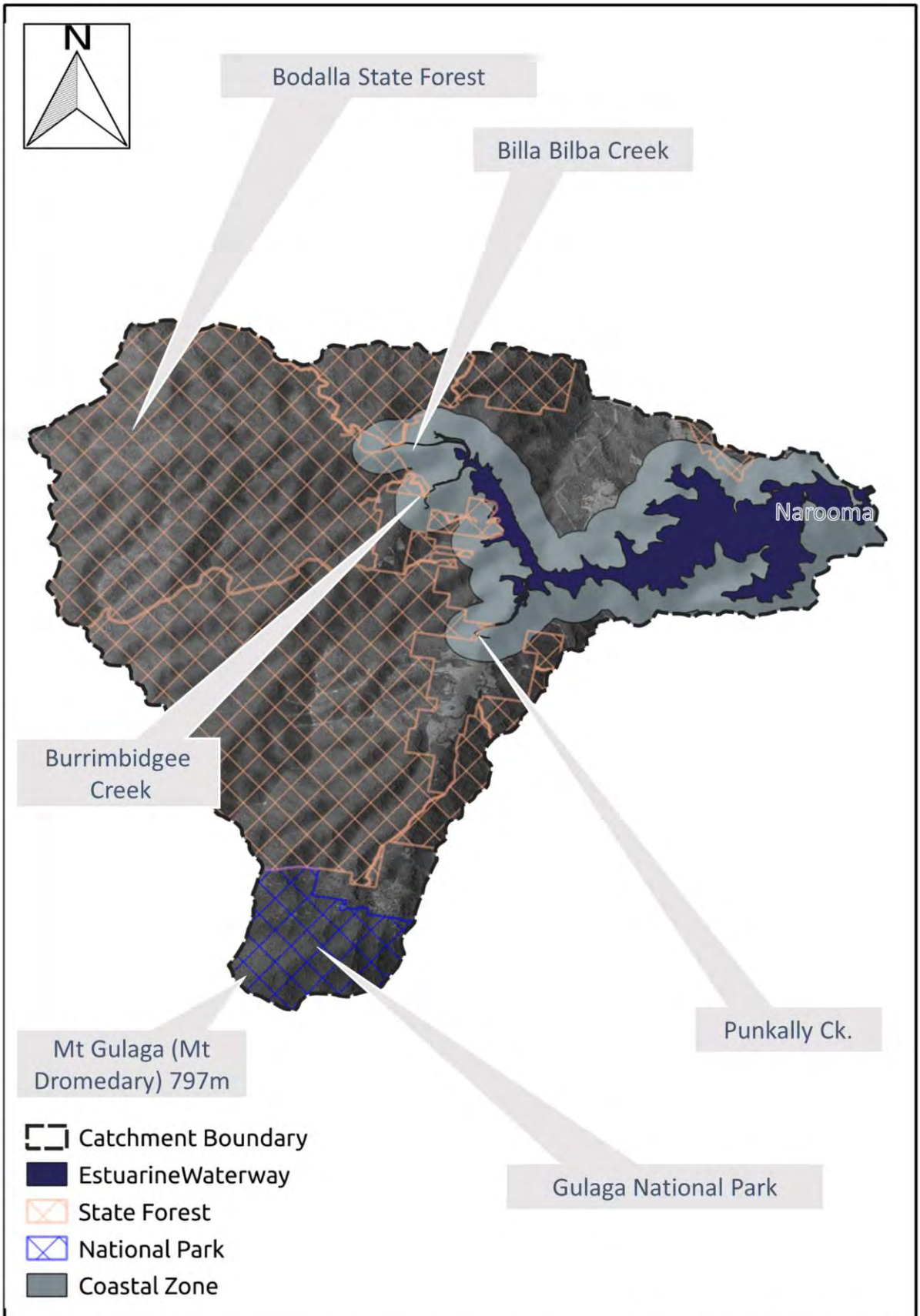

Figure 12: Wagonga Catchment Landuse

0 1 2 3 4 km

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet	REV A	DRAWN DJW	CHECK DJW

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Salients

5.1.2 Key Habitat Extent and Health

The extent of estuarine macrophytes (as mapped by Elgin Associates (2018)) and zoning for the Batemans Marine Park (BMP) within Wagonga Inlet are shown in Figure 13. The entire main waterbody of the estuary, including the main channels of Punkally, Billa Bilba and Burrimbidgee Creeks, is contained within the boundaries of the BMP. The estuary contains several *Sanctuary Zones:*

- The entire estuarine reach of Punkally Creek, including Hobbs Bay. At the downstream end of the creek, the boundaries of the sanctuary zone do not match the present-day plan form of the creek, indicating that there has been significant morphological change since the boundaries were determined. Similarly, the CM SEPP wetland area does not fully capture the downstream nor upstream reaches of vegetation, as mapped in 2017, and associated with coastal wetlands. Oyster leases exist both within the Sanctuary Zone (and the coastal wetland) and just beyond its northern extents. This wetland includes a diverse complex of mangrove, mixed mangrove/saltmarsh, and saltmarsh.
- An area adjacent to the northern foreshore, stretching between Freshwater and Clark's Bays (inclusive). The area contains a continuous fringe of *Posidonia*, and mangroves at the head of small embayments, sometimes associated with small patches of saltmarsh.
- The south-western arm of Forsters Bay, which includes a subaqueous fringe of *Posidonia* with patches of mangroves in small embayments and along the shoreline.

The estuary also contains three *Special Purpose Zones* associated with:

- The Narooma Wharf.
- An area spanning the foreshore either side and north of the Princes Highway bridge, containing maritime infrastructure such as pontoons and oyster sheds.
- An area extending from the western side of the southern end of the Princes Highway bridge, to the west and south along the eastern foreshore for some 1.5km. The northern 800m of this reach contains a stand of mangroves, which are mostly covered by a mapped area of CM SEPP coastal wetland.

Beyond the CM SEPP coastal wetland described in the previous dot point, and the one associated with Punkally Creek, there is a third wetland in the upstream reaches of Brices Bay. The mapped area includes mangroves, mixed mangrove/saltmarsh, and small patches of saltmarsh at its furthest upstream reaches. The wetland encompasses all the mapped areas of saltmarsh and mangrove (Elgin Associates, 2018). Immediately downstream of the mapped area, there exist patches of *Halophila* and mixed *Zostera/Halophila.*

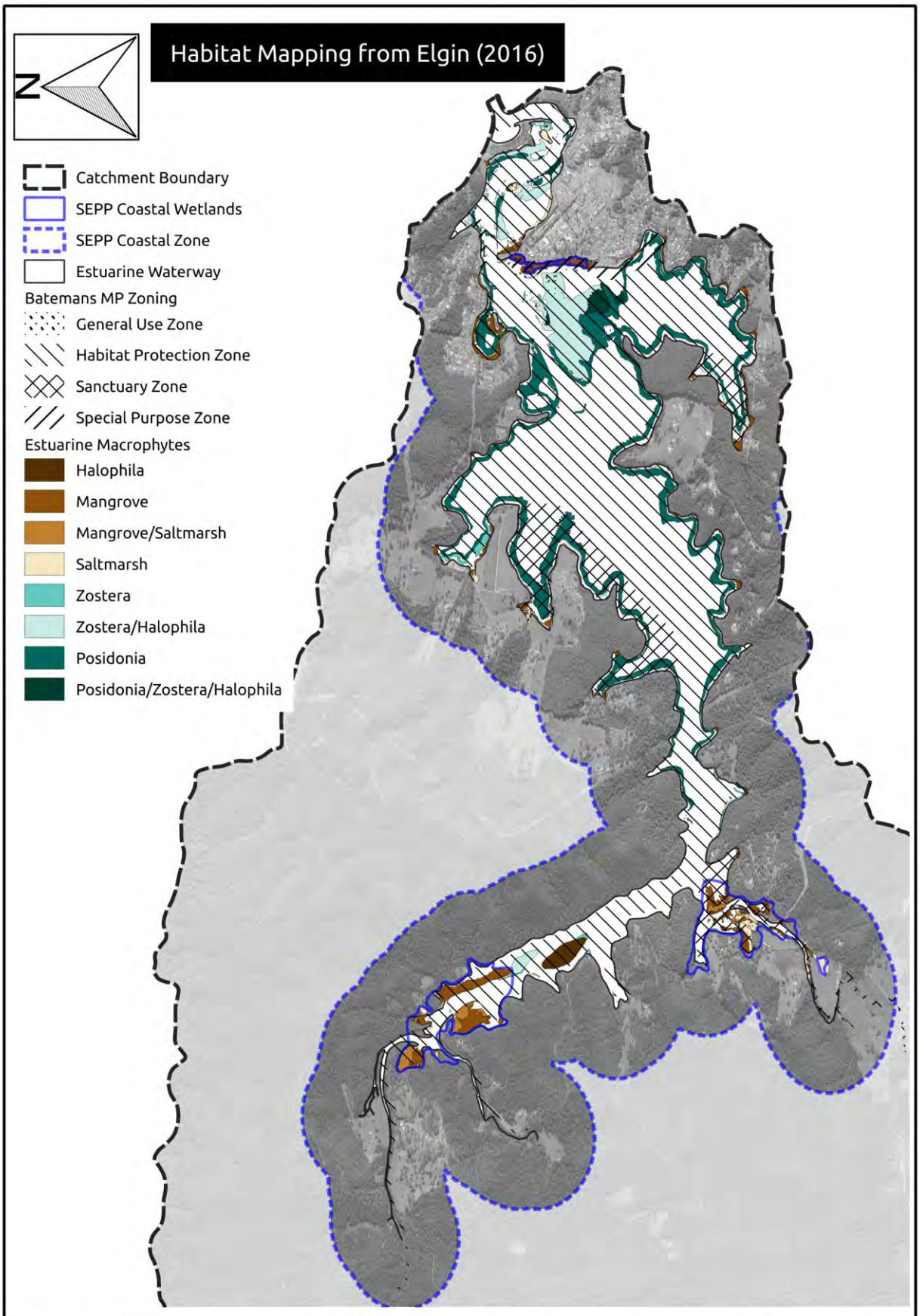

Figure 13: Mapped Estuarine Habitat - Wagonga Inlet

0 0.4 0.8 1.2 1.6 km

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet

REV	DRAWN	CHECK
A	DJW	DJW

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Salients

One of the more remarkable features of the estuary is the presence of *Posidonia* which extends from around Honeymoon and Freshwater Bays in unbroken fringes along the northern and southern foreshores of the estuary. These extend almost all the way to the Princes Highway bridge, including the entire foreshore of Forsters Bay, and there are large patches in embayments to the north of the entrance flood tide delta (including behind Lewis Island) and along the western/southern edge of the flood tide delta (northern part of Forsters Bay). Across the flood tide delta to the west and south of the bridge, there are also large, mixed beds of *Halophila/Zostera* and *Halophila/Zostera/ Posidonia*.

Often associated with the fringe of *Posidonia* are small patches of mangroves, particularly at the head of small embayments and, occasionally, an adjacent fringe of *Zostera* is present, immediately at the shoreline, such as in Barlows Bay and in Forsters Bay. Patches of saltmarsh are present but typically small, reflecting the steep topography of the adjacent foreshore. For this reason, saltmarsh in Wagonga Inlet is particularly threatened by changes to the water level environment, including sea level rise and ongoing growth of the tidal range in response to training of the entrance in the 1970s.

Stands of mangroves exist in the embayment behind Lewis Island, adjacent to the Island itself, and along the foreshore fringing Riverview Road.

Downstream of the Princes Highway, the fringe of *Posidonia* is more fragmented, and large patches of mixed *Zostera/Halophila* are present, particularly within the intertidal areas behind the internal training walls of the entrance. Also present are some patches of saltmarsh, even further landward. Of note is a long, accessible fringe of saltmarsh along the foreshore reserve adjacent to the Narooma "Easts" Caravan Park. This length of foreshore is gradually being colonised by both saltmarsh and mangroves, with a notable stand of mangroves colonising the western edge of the foreshore, adjacent to the Princes Highway and the southern end of the Princes Highway bridge.

As noted above, Wagonga Inlet is used for oyster farming with leases present near the confluence of Brices Bay and Punkally Creek, at the western end of the estuary.

The most recent assessment of changes in estuarine macrophytes in Wagonga Inlet has been undertaken by Elgin Associates (2018). They compared mapping from 2017 and 2012 and found that overall seagrass distribution and extent had increased in Wagonga Inlet. They found that there had been a large increase in the amount of mapped *Halophila*. *Halophila* is the first species that would be expected to recolonise after sand flats are stabilised or water quality improves. Further monitoring may reveal that *Zostera* begins to also colonise these areas.

Similarly, mangrove distribution was noted to have increased (at least between 2013 and 2018), although this may be attributed to more extensive field validation. A decline

in saltmarsh occurred in Wagonga Inlet, noting that there is an ongoing colonisation of saltmarsh habitat by mangroves within estuaries along the NSW coast. There was close to a 2000% increase in mangrove/saltmarsh habitat area in Wagonga Inlet. Mowing, trampling, and driving over saltmarsh were also seen as key threatening processes to saltmarsh.

The background information report which informed the threat and risk assessment for the Marine Estate Management Strategy (MEMA, 2017) also reviewed the historic abundance of estuarine macrophytes in Wagonga Inlet. They found, based on a review of mapping between 1985 and 2013, that:

- Wagonga Inlet contained around 2.33ha of saltmarsh and the area had reduced by close to 60% since 1985. 2.33ha represented 0.18% of the total for the southern region (Shellharbour to the Victorian Border) and 0.03% of the total for the state. The protection of saltmarsh is a priority for Wagonga Inlet.
- The estuary contained around 19.71ha of mangroves and the area had decreased by some 20% since 1985. 19.71ha represented 1.17% of the total for the southern region and 0.15% of the total for the state.
- The estuary contained around 80.9ha of seagrass and the area had decreased by close to 50% since 1985. 80.9ha represented 2.31% of the total for the southern region and 0.52% of the total for the state. When considered in isolation, the amount of *Posidonia* had decreased by around one third between 1985 and 2013, with the losses occurring prior to 2002. The estuary contained 60ha in total (6.4% of that in the southern regions and 2.66% of that occurring in the state).

The changes to vegetation extents are not readily explained without further study, although sedimentation and an increasing tidal range inside the estuary have been advanced as possible causes. The loss of estuarine macrophytes is a concern for the estuary.

Vegetation fringing the estuary, where not included in coastal wetland nor cleared for agriculture, comprises a mixture of dry and wet sclerophyll rainforests in the upper reaches of the estuary, with some patches of rainforest interspersed within the areas of wet sclerophyll rainforest. Wet sclerophyll forests are typically found on steeper slopes with dry sclerophyll forests more commonly found on ridge lines. A band of rainforest patches also exist to the east of Honeymoon Bay, both to the north and south of the Inlet and interspersed with wet sclerophyll forests.

In the eastern parts of the coastal zone, remnant vegetation is dominated by wet sclerophyll forest. Similarly, remaining vegetation is more fragmented and patchier with distances further east, culminating with the town of Narooma, which has been extensively cleared.

Peter Spurway and Associates (2006) reported that the inlet contained a variety of attached alga including Neptune's necklace, bubble weed and kelp, with patches of sargassum attached to subtidal rocks forming the training walls.

5.1.3 Physical Features and Processes

MEMA (2017) summarises some key features of Wagonga Inlet. The estuary has an open water area of around 5.9km^2 and a total waterway area of around 7.0km^2. The average depth is around 5.7m (below mean sea level). The tidal limit is some 11.5km upstream of the entrance.

Wagonga Inlet was surveyed by the Department of Land and Water Conservation in May 1997. While the entrance channel is still responding dramatically to the construction of training walls and breakwaters in the 1970s, the survey is still reasonably representative of conditions today. Between the entrance breakwaters, bed elevations of between -6 to -7m below AHD were surveyed, and it was found that the channel gradually shallowed with distance upstream, reaching a minimum depth with bed elevations at around -2m AHD just downstream of the bridge. At this location, the survey also picked up a sill of submerged rock, spanning across the channel. A scour hole at -6.0m AHD was recorded underneath the bridge. Further upstream, the channel was recorded as shallowing rapidly. Bathymetry opposite Lewis Island is complicated and particularly shallow. It appears that the path taken by the ebb tides (adjacent to Lewis Island) differs from the path taken by the flood tide channel. Maximum depth at mid-tide in this region would have been around 1.0m below AHD. Further upstream of this area, the bathymetry again deepened to around -5m AHD, before shallowing rapidly at the point where the flood tide delta discharged into the main estuarine basin. Extensive shoaled areas exist adjacent to the entrance channel both upstream of the Bridge (south of the channel) and downstream of the bridge (south and east of a bend in the channel, behind a training wall).

The deepest part of the estuarine basin (~-16.0m AHD) existed just upstream of the flood tide delta dropover. Depth of the estuary slowly decreases with distance westward along its main arm, deepening slightly where the estuary narrows between Paradise and Honeymoon Points. Maximum depths at the confluence of Brices Bay and Punkally Creek are typically around -4.0 to -3.0m AHD.

Forsters Bay is a separate arm of the estuary, located to the south of the flood tide delta and Shell Point. Tidal exchange between the main estuary and Forsters Bay is constrained by a narrow gap between the flood tide delta and Shell Point. Bed elevations in Forsters Bay are as low as -14.0m AHD, just south of the flood tide delta, and the bay narrows gradually with distance south (further upstream) into the bay.

The ongoing impact of entrance training has been discussed extensively by Nielsen and Gordon (2015, 2008), who noted that the spring tide range in the main basin of the

estuary increased from around 52% of the ocean range in 1997 to around 56% of the ocean range in 2009. This increase in tidal range was linked to the ongoing upslope migration of mangroves and their invasion of saltmarsh habitat. However, this issue is likely to be exacerbated by ongoing sea level rise along the New South Wales coast. Nielsen and Gordon indicated that it may take more than 120 years before the entrance channel stabilises.

There have been ongoing issues with shallow water in the entrance channel. A review of environmental factors for proposed dredging works in the entrance was prepared by Peter Spurway and Associates (2006). The work included the dredging of sand from shallow areas and placement of that sand into shallow channels to redirect tidal flows. The project also involved lowering of the pile of rocks downstream of the bridge.

The dredging aimed to, apparently, increase the capacity of both the ebb and flood tide channels in the vicinity of Lewis Island, in the shallowing area outlined above. The proposed dredging works were small scale (a total of 12,000m^3). The dredging program was managed by Council in 2006 with grant funding provide by the then Department of Natural Resources (DNR). While no monitoring has followed the work, our initial assessment is that any benefits would have been short lived. We know from discussions on site, at Lewis Island, that issues with this part of the channel continue.

The REF does contain some sediment data that may prove useful. The sediment samples taken from the flood tide delta in the vicinity of the works indicated clean marine sands with D_{50} grain sizes varying between 0.31 and 0.44mm.

A tidal gauging was undertaken by Manly Hydraulics Laboratory on 3rd December 1986. However, it is expected that this would no longer be indicative of the response of the estuary at the present time.

Manly Hydraulics Laboratory (2012), analysed available tidal records from the Wagonga Inlet to derive tidal planes. Two gauges were analysed, from Narooma Wharf (record from 1996-97 through 2007-8) and from Barlows Bay, upstream of the flood tide delta (record from 1991-92 through 2009-10). The resulting, averaged tidal planes were determined as shown in Table 9. These show the expected patterns (tidal range inside the waterway is smaller than that close to the entrance and mean sea level inside the waterway is superelevated above that closer to the entrance). The mean spring tidal range inside Wagonga Inlet (~0.67m) is around 60% of that determined offshore of Batemans Bay (~1.15m, representative of the ocean range). In comparison, the spring tidal range at Narooma Jetty (0.851) was around 74% of the Batemans Bay range.

Table 9 Tidal Planes in Wagonga Inlet (in m AHD from Manly Hydraulics Laboratory (2012)

Tidal Planes	Narooma Jetty	Barlows Bay
High High Water Spring Solstices	0.667	0.640
Mean High Water Springs	0.399	0.376
Mean High Water	0.325	0.324
Mean High Water Neaps	0.251	0.272
Mean Sea Level	-0.026	0.040
Mean Low Water Neaps	-0.304	-0.192
Mean Low Water	-0.378	-0.245
Mean Low Water Springs	-0.452	-0.297
Indian Springs Low Water	-0.643	-0.485

WMA Water (2016) prepared a comprehensive flood study of Narooma and Wagonga Inlet. Based on their modelling results, they found that the 20% AEP event is mainly contained within the main waterway areas, excepting properties in Barlows Bay. Shallow overland inundation also occurs through Narooma Flat area. For increasingly rare events, the extent and depth increases. In the 5% AEP event, properties around Lynch Street become inundated.

For the 2% AEP event, widespread inundation occurs across Narooma Flat, averaging 0.3m. Depths for the PMF exceed 1-2m throughout Narooma Flat area. Design flood levels for Barlows Bay and Narooma Wharf are presented in Table 10

Table 10 Design Flood Levels for Wagonga Inlet (in m AHD from WMA Water (2016))

Location	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	0.5% AEP	PMF
Barlows Bay	1.1	1.1	1.2	2.0	2.1	2.2	3.3
Narooma Public Wharf	1.0	1.0	1.1	1.9	2.0	2.1	3.0

Both flooding and tidal behaviour will be affected by climate change. At the present time, it appears that climate change has only been considered in the context of extreme flooding for Wagonga Inlet. In the case of Wagonga Inlet, if the tidal inundation coastal vulnerability area is to be derived, it will be necessary to consider the influence of climate change on tides, alongside increasing tidal ranges due to ongoing changes to the entrance and channel.

Council has historically published report cards on water quality for Wagonga Inlet. Report cards are provided for three periods, with water quality monitored at six different locations within the estuary. The results for different parameters were as discussed below:

Ecosystem Health: The overall health of the ecosystem was assessed as being good in 2010/11, based on readings of chlorophyll-a and turbidity but a reduction in saltmarsh had occurred over time. In 2013-14, the aquatic health was also assessed as being between good to very good.

Recreational Use: In 2013-14, water quality for recreational use was typically suitable for swimming. However, there were occasions when faecal contamination was detected. In 2015-16 water quality was considered suitable for recreational use most of the time. The results of faecal sampling were similar to previous periods.

Turbidity: Water clarity of the estuary was rated as very good in 2010-11, with 4% of total samples exceeding guideline values and only marginally. In 2013-14 clarity was again very good to good. In 2015-16, turbidity levels were graded very good to fair throughout the estuary, only exceeding guideline values for less than 10% of the time.

Chlorophyll-a: For chlorophyll-a (an indicator of microscopic algae), Wagonga Inlet received a very good rating in 2010-11, with only 13% of the total samples exceeding guideline values. The exceedances were most common in two sampling sites within Forsters Bay. In comparison, during 2013-14, around 20% of samples exceeded the acceptable levels of chlorophyll-a. In 2015-16, chlorophyll-a levels were comparable to previous years, with around 20% of samples exceeding guideline values.

Dissolved Oxygen: During 2013-14, samples of dissolved oxygen showed similar behaviour when compared to previous years, with around 60% of samples being within guideline values. Similar results were obtained in 2015-16.

pH: During 2013-14, pH readings were within the recommended range for around 60% of the time, which was comparable to previous years. During 2015-16, pH values were comparable to those recorded in previous years, falling within the guideline range for around 50% of the time.

Overall, the water quality monitoring results indicate that water quality is reasonable in Wagonga Inlet. However, there are indications that water quality in Forsters Bay could be improved. It should be noted, however, that water quality can fluctuate markedly in response to seasonal rainfall.

5.1.4 Land Zoning

Land zoning from the current Eurobodalla Local Environmental Plan (2012) is shown in Figure 14.

As of mid-2019, within the western portions of the coastal zone, land use is presently dominated by "*Deferred Matter*" parcels, meaning that these are to be dealt with as *Rural Lands* under the Eurobodalla *Rural Local Environment Plan 1987*. Council is presently in the process of rezoning the *Deferred Matter* lands and the process is nearing

completion. By the time the CMP is prepared, this matter will have been resolved and the *Rural LEP* will no longer have relevance.

There also exist parcels of land within the Bodalla State Forest (zoned for forestry) and parcels zoned for primary production. Strips of land also exist adjacent to the foreshore. These do not necessarily correspond to the mapped CM SEPP wetland areas in Punkally Creek and Brices Bay.

To the south of the estuary, and east of Flying Fox Bay, land use is characterised by Environmental Living and Large Lot Residential (the minimum lot size is 40ha), before transitioning to areas set aside for low and medium density residential associated with the township of Narooma. There is limited potential for new dwellings within the catchment. The fringing coastal and southern margins of the waterway are often zoned for Environmental Conservation. There is a region of "Recreational Waterway" corresponding to the Special Use Zone of the Marine Park extending southwards from the Princes Highway bridge. Similarly, there are corresponding Recreational Waterway zonings associated with the other two Special Use Zones (refer to Section 5.1.2 for locations). The areas of Narooma to the south of the entrance channel, in addition to residential areas, include parcels of public and private recreation, environment conservation, Local Centre and Infrastructure (Community Facilities and Administration Buildings).

Along the northern foreshore, the mix of Primary Production, Forestry and *Deferred Matter* lands (often with Environmental Conservation along the foreshore) continues eastwards, until the area north of the entrance channel is reached. Of interest is an area of primary production which sits seaward of the Environmental Conservation Area in Barlow's Bay and is used for industries that support the oyster industry. The settled areas north of the entrance include a significant area of low density residential to the rear of Lewis Island, and associated areas of Environmental Conservation. To the east of the Princes Highway bridge, land uses include low density residential, environmental living, and areas of environmental conservation. There is also an area of public recreation associated with a boat ramp on the northern side of the channel.

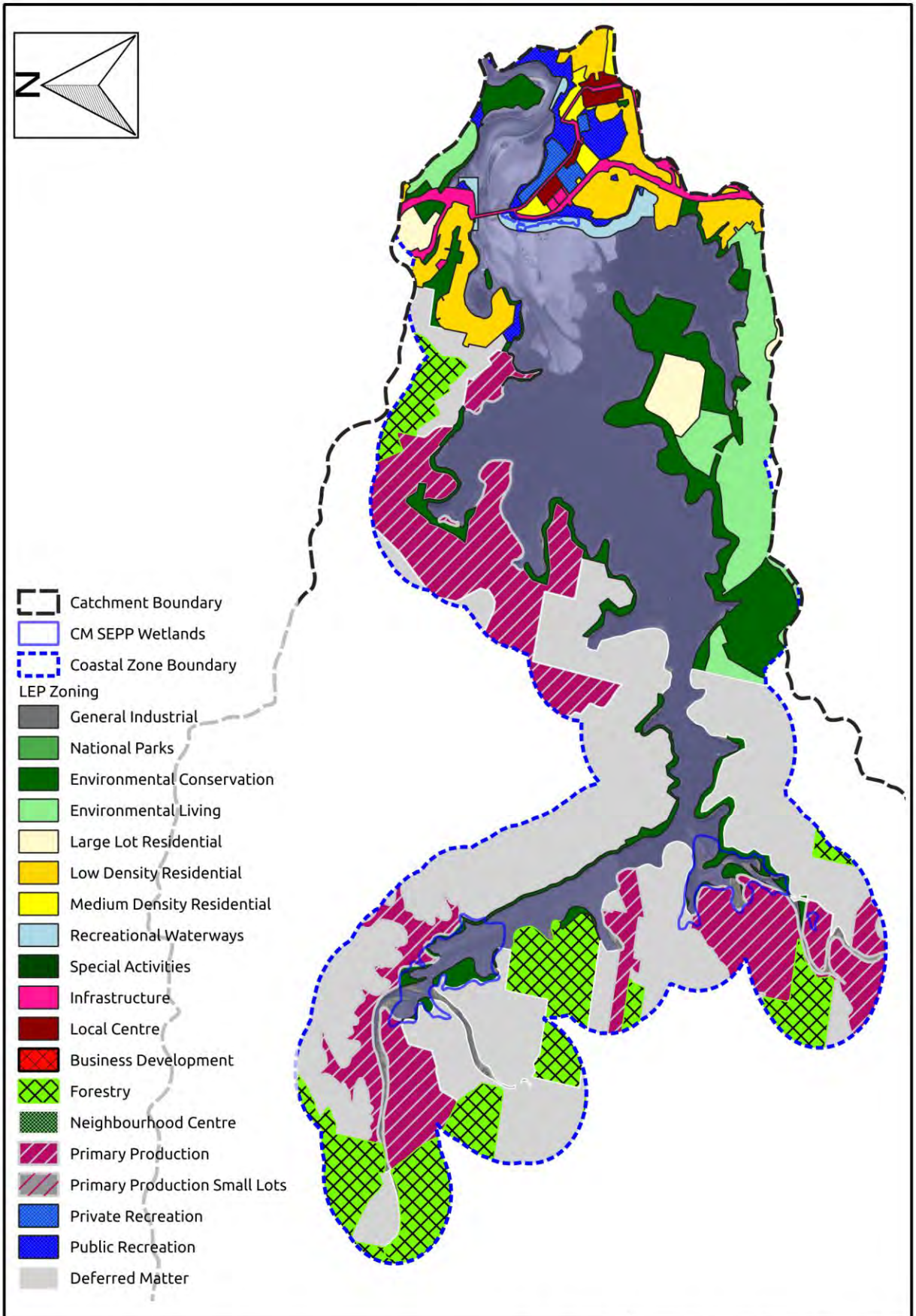

Figure 14: Land Zoning - Wagonga Inlet

0 0.4 0.8 1.2 1.6 km

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet

REV	DRAWN	CHECK
A	DJW	DJW

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Salients

5.2 Issues and Actions identified from Preliminary Consultation and Existing Information

5.2.1 Preliminary Consultation

A community workshop/drop-in session was held in the afternoon of June 6, 2018, at the Narooma Library. In addition to the community workshop, a meeting with government stakeholders was held on June 7th, 2018 in Narooma. That meeting was attended to by representatives of the National Parks and Wildlife Service, Batemans Bay Marine Park, OEH, South Coast Local Land Services and members of the study team.

5.2.2 Existing Information

During the review of background information and several site inspections undertaken by the study team during the week of June 4-8, several other issues were identified. In some instances, these reflect those issues raised during preliminary consultation, but our review has helped to clarify those issues further.

5.2.3 Issues Identified

Throughout the remainder of this section, findings have been classified in accordance with the four different coastal management areas. The issues identified issues are as follows:

<u>Issues Relating to Coastal Wetlands:</u>

1. A need to update the extents of the coastal wetland area, and Environmental Conservation zoning to better reflect the extents identified by mapping of estuarine vegetation.
2. There are concerns relating to the shrinking of saltmarsh habitat as water levels in the main body of the waterway continue to increase.
3. An opportunity exists to introduce saltmarsh habitat along the foreshore reserve adjacent to the Easts Caravan Park. This is already occurring in and around foreshore protection works which are typically dilapidated and need repair/clean up. Foreshore access could be substantially improved.
4. Mapping of the coastal wetland adjacent to Narooma Flat appears inconsistent with its designation as a *"Special Use Zone"* in the Batemans Marine Park. This classification may need to be revisited.

Issues Relating to Coastal Environment Areas:

5. Coastal Entrance dynamics are a significant issue in the entrance channel, particularly in the vicinity of Lewis Island and upstream of the Princes Highway Bridge. Erosion of Lewis Island is an ongoing problem.

6. There is an opportunity to resurvey the entrance channel of the Inlet, which is known to be changing in response to entrance training and has not been surveyed for more than 20 years. This information is important in terms of monitoring how the entrance is evolving and in trying to find ways of resolving shallow areas and erosion upstream of the Princes Highway bridge.

7. The re-establishment of a water level recorder in the main body of the waterway may be desirable to continue monitoring the evolution of tidal response inside Wagonga Inlet. This is important for areas prone to flooding, such as Narooma Flats.

8. That prawning with drag nets should be banned as it damages the environment. Wagonga Inlet is zoned for either "Habitat Protection" or "Sanctuary" but is not a "Recreational Fishing Haven", therefore prawning by drag net is prohibited. This may indicate an issue with compliance.

9. That historic training of the entrance may be related to problems with siltation. We note that the entrance channel, overall, is getting wider and deeper. However, at some locations along its length as sand moves upstream, areas may be subject to shallowing and navigation problems.

10. That, if dredging occurs in Wagonga Inlet, it be taken away and not dumped in deep holes in the waterway. This seems to reflect what was proposed in the 2000s (Peter Spurway and Associates Pty. Ltd., 2006).

11. A desire for a "sensible strategy" to maintain navigation between the bridge and the main body of Wagonga Inlet. There are significant shallow areas opposite Lewis Island and near the dropover into the main basin.

12. While funding is now available on a 50/50 basis from RMS via Crown Lands, local government is reticent to buy into an issue that has, historically not been their responsibility.

13. A concern that the increase in seal numbers (resulting from a reduction in their natural predators) is influencing estuarine fish stocks, with mulloway and calamari numbers apparently declining. Further research was recommended by an attendee at the community workshop.

14. Navigation markers are poorly positioned at Lewis Island, as are markers offshore of Shell Point.

15. Concerns were raised by a community member relating to sedimentation within Clarks Bay, and the newly colonising area of mangroves. This may be associated with the cleared land around the fringes of this Bay or sediment washing off from unsealed roads. That community member also expressed concerns regarding pollution from septic tanks.

16. There are several issues at the end of Punkally Creek. It is considered possible that agricultural activity in the catchment (buffalo, chickens and pigs have been mentioned) may be contributing nutrients and faecal contamination to the area. Similarly, there is ongoing sedimentation. Both factors are impacting on oyster farming at the lower end of the creek.

17. An opportunity exists to better manage mowing which is restricting saltmarsh habitat from expanding adjacent to Narooma Flats.

18. Historically, poor water quality has been assumed to be occurring in Forsters Bay. It appears likely that this was true, and little has been done in recent years to try and improve that. An overall study of stormwater might be required, noting that stormwater outlet tidal flap gates are reported as typically non-operational.

Issues Relating to Coastal Use Areas:

19. A concern regarding the safety (and noise) of sea plane operations in Forsters Bay and the possibility that there will be a collision with a boat. A suggestion that operations be relocated to a less busy location such as Corunna Lake.

20. A general concern for boating facilities around the inlet, including a lack of facilities at boat ramps, such as pontoons, jetties, and refuelling options around Wagonga Inlet in general. The use of the pilot station jetty by the public was raised as a potential option and several boat ramps were noted to be in a poor state of repair.

21. A concern that there are no public moorings for visiting vessels and the damage anchoring may cause to seagrass beds. Furthermore, there is no berthing available at the town wharf.

22. Related to the lack of facilities, it has been argued that the waterway is underutilised generally, and for tourism.

23. There were reports that the RMS purchases fuel from the Marina (Forsters Bay), which is hindered by shallow depths in the channel upstream of the Princes Highway Bridge.

24. Similarly, any plans for expansion of the Marina are limited by issues with the shallow navigation channel.

25. The public pontoon at the historic Wharf (Brices Bay) needs maintenance. This should probably be completed concurrently with stabilisation of the roads draining to the waterway in this area, as they are reportedly delivering sediment to the waterway and the pontoon is now bottoming out at low tide.

26. A dilapidated jetty at Ringlands Point could be removed.

5.2.4 Review and Audit of Existing Estuary Management Study and Plan

The original Estuary Management Plan (Nelson Consulting, 2001) identified several issues, including:

1. **Entrance Bar:** Water depths over the entrance bar were relatively shallow and under certain conditions, navigation becomes hazardous. Problems were associated with the south east channel becoming shoaled, and accidents tended to occur on an outgoing tide with swell waves of around 1.8m or higher.

2. **Shoaling:** The main area of concern regarding shoaling was upstream of the Princes Highway bridge and hindered boat access into Forsters Bay (at Shell Point). Shallowing of the western end of the main entrance channel was also causing problems. Overall, problems were noted at various locations along the entrance channel, indicating that the entrance was dynamic and continuing to adjust to construction of the training walls in the 1970s.

3. **Erosion and Sedimentation:** Some erosion was noted along the downstream reaches of creeks entering the inlet. Sedimentation along the upper reaches of Wagonga and Punkally Creeks was identified, and it was considered that activities associated with oyster leases may have resulted in channel realignments in these areas.

4. **Water Quality:** Water quality within Wagonga Inlet was noted to be generally good, although there were some indications of localised nutrient enrichment. The importance of good water quality to shellfish production was noted and the data collected at the time deemed inadequate for a proper assessment. With regards to persistent contaminants in sediments, arsenic (potentially from those chemicals used to treat timbers for oyster farming) was highlighted. Stormwater pollution, sewer overflows, onsite wastewater systems, rural runoff and boat refuse were all identified as potential pollutants. Forsters Bay was identified as the area most affected by local stormwater inputs.

5. **Flooding:** Flooding was identified as an issue for the "Narooma Flats", on the eastern foreshore of Forsters Bay. While the potential for flooding is more appropriately examined under the floodplain management process in NSW, low lying areas are more exposed to nuisance inundation and other effects that will be exacerbated by sea level rise.

6. **Waterway Facilities:** Two broad categories of waterway facilities were identified as issues. Firstly, a shortage of boat mooring facilities was noted to the east of the Pacific Highway bridge, including at the Town Wharf. Secondly, a limit on waterway access for public recreation was highlighted. The provision of public access was somewhat constrained by private ownership of foreshore land and the proximity of oyster leases around much of the shoreline. A variety of recommendations for a public jetty, boat ramps, and improvements to existing facilities had been investigated.

Considering these issues, a range of actions were promoted to manage Wagonga Inlet. These actions are outlined below, wherein the numbers refer to the original actions within Nelson Consulting (2001).

Actions Relating to the Location and Objectives of Coastal Wetland Areas:

- **Actions 6.9 and 3.2:** *Install a mangrove boardwalk off Riverside Drive and Include information on the value of mangroves and seagrass in interpretive signage:* These actions have not been completed but have merit. The mangroves off Riverside Drive are now classified as a CM SEPP coastal wetland and the implications of this classification need to be considered.

- **Action 3.4:** *Install survey markers to identify changes in the extent of mangroves:* It may be that other agencies (Marine Park, DPI Fisheries) are looking into this. Furthermore, it is possible that gross changes could now be better captured through review of satellite imagery and/or aerial photography. Macrophyte Mapping was completed in 2017 (Elgin Associates, 2018).

Actions Relating to the Location and Objectives of the Coastal Vulnerability Area:

- **Actions 2**.4 **and 2.5:** *Increase awareness of flood hazard in the Narooma flat area:* These actions are being addressed by Council under the floodplain risk management process for Wagonga Inlet at the same time as drafting of this Scoping Study.

Actions Relating to the Location and Objectives of the Coastal Environment Area:

- **Action 1.1:** *Develop and implement water quality monitoring program to assess changes to water quality within Forsters Bay:* This work is ongoing, and Council reports the results of this to the community.

- **Action 1.2:** *Support initiatives to make holding tanks mandatory for commercial vessels:* Under the *Marine Pollution Regulation 2014,* commercial vessels must either have a holding tank installed or a plan of management as approved by the Minister.

- **Action 1.3:** *Include information on boat pumpout facility in Forsters Bay when the relevant boating map is revised:* It appears that mapping has not been revised since 2009. However, the pumpout facility is advertised on RMS's website.

- **Action 1.5:** *Include sampling sites to identify any changes to run-off/water quality due to the development of Ringlands Estate:* Council has advised that regular testing is being carried out and there has not been a measured decline in water quality.

- **Action 1.6:** *Complete environmental audit to identify practices adversely impacting on water quality:* It is unclear whether this action has been pursued.

- **Action 1.9:** *Investigate improvements to maintenance of Tourist Drive 4 (Wagonga Scenic Drive) and Riverview to reduce sediment wash off:* This action is noted to be ongoing, although site inspection witnessed turbidity associated with runoff from the historic wharf in Brices Bay, which may need to be addressed.

- **Action 1.12:** *Include erosion and sediment controls within a checklist for DCPs and Residential Development Guidelines:* While this has not been specifically completed, Council does check for compliance on development sites regarding erosion and sedimentation controls. Council does have a code for soil and water management, which could be bolstered with reference to industry standard guidelines such as the Blue Book (Landcom, 2004).

- **Action 3.6:** *Control Infestations of the Pacific Oyster*: The management of threats to aquaculture is not a key objective of the CM Act, but productivity of the marine estate is an object of the MEM Act. A CMP may, in some cases support actions that benefit aquaculture. We note, however, that the local oyster growers of Wagonga Inlet and DPI Fisheries have developed a management plan for the Pacific Oyster in Wagonga Inlet. Management of this issue should not be duplicated in the CMP.

- **Action 3.7:** *Undertake recreational fishing survey, potentially as a student project*: It seems unlikely that any data specific to Wagonga Inlet has been collected (MEMA, 2017), although the DPI website reports that a state-wide survey is presently being conducted[9].

- **Action 3.8:** *Encourage clean-up of areas around oyster leases*: This action is reported as being ongoing with a variety of clean-ups being undertaken by various groups. The clean-up of the remains of oyster leases and associated infrastructure needs to be undertaken by growers.

- **Action 3.9:** *Ensure cockle collection does not adversely impact on aquatic habitats.* The main concern of this appears to have been impacts on *Posidonia*. However, Council is uncertain whether this has been pursued. Council has a limited role in compliance with this issue, as responsibility is held by DPI fisheries.

[9] https://www.dpi.nsw.gov.au/fishing/recreational/resources/recreational-fishing-survey, accessed 22/11/2018

- **Action 3.10:** *Investigate harsher penalties for clearing of bushland on Ringlands Estate*: This action is listed as ongoing but is not regarded as a significant issue at present. Over 1,000 trees have been planted with maintenance activities to occur. Car access has been limited to some areas of Ringlands Estate.

- **Action 3.11:** *Prevent private vehicle access to crown reserve adjoining Ringland's estate, maintain as bushfire access and walking track*. Council has planted more than 1,000 trees to regenerate the site and requires follow up maintenance. Car access has been limited to some areas of Ringlands estate.

- **Action 3.12:** *Develop management plan for rainforest at Flying Fox Bay and northern end of Mill Bay.* This action is listed as ongoing.

- **Action 3.13 through 3.17:** *Increase the extent of foreshore buffer zones.* Council continues to work on this matter, although it appears that only limited progress has been made on these Actions. There is a reported swap of a parcel of road reserve for foreshore land. Most of the public foreshore land is presently zoned E2 as are the (previous) SEPP-14 wetland extents.

- **Action 5.1:** *Monitor channel depths near the bridge and provide regular reports*. While this was identified as a high priority, we are unaware of any survey being undertaken in the past 20 years. The NSW Roads and Maritime Service is responsible for navigation but provides money to the Department of Industry's Crown Lands Division to undertake dredging in priority waterways. Priority waterways are those which require ongoing dredging to maintain navigation to state owned ports or harbours. Discussions with Crown Lands staff has confirmed that only the entrance channel downstream of the public wharf would qualify for priority funding. However, funding for navigation dredging at non-priority locations will be funded jointly with local councils on a 50/50 basis. To provide an idea of funding, a total of $8 million (over 4 years) was announced for funding by the NSW government in 2017. Of that amount, $2 million was for priority locations and $6 million for 50/50 funding under the "Rescuing our Waterways" program. At present, the state-wide funding is heavily constrained, and the provision of safe navigation and the support of navigation is not within Council's broad responsibilities.

- **Actions 5.2, 5.3 and 5.5:** *Survey areas including channel at Shell Point and along the foreshore in Forsters Bay and review need for dredging*. While these were assessed as being high priorities, it appears that little has happened apart from consultation with Crown Lands and RMS. Given the limited state-wide funding available, the state government is seemingly reluctant to spend money on these items. Once maintenance dredging is undertaken, there is often a community expectation that it will be ongoing.

- **Action 5.4**: *Remove rocks downstream of highway bridge*. This was one subject of a review of environmental factors by Peter Spurway and Associates (2006). Council has advised that these works were completed and we note that there is no longer an indication of a "danger buoy" on the Boating Map for the Area (NSW Maritime, 2009) which implies that this issue is no longer of concern.

- **Action 6.1**: *Maintain open water areas for visual amenity and recreational boating by discouraging intensification of oyster leases and appropriately relocating silted leases*. Responsibility for this action was assigned to NSW Fisheries and it appears that this has not been completed.

- **Action 6.2**: *Prepare mooring plan for Wagonga Inlet.* Responsibility for this action was assigned to NSW Maritime (RMS) and it appears that this has not commenced.

- **Actions 6.4 and 6.5:** *Manage Boating to Avoid Conflicts.* This includes activities such as speed restrictions and preventing anchoring in *Posidonia* beds. Some of these activities have been completed, but the extent to which this relates to active implementation of the CZMP is unclear.

- **Action 6.11**: *Reconstruct existing Jetty at Ringlands Point.* Based on site inspection, this jetty is now completely dilapidated, and a lack of interest would seem to indicate that this structure could now be removed from the foreshore.

- **Action 6.12**: *Construct jetty associated facilities plus formalise and seal car park for southern boat ramp at Forsters Bay.* Car parking seems to have been sealed with a rubbish bin provided. A fish-cleaning table, wash down hose, and lighting do not seem to have been provided yet.

- **Action 6.13**: *Widen sand ramp near NSW Fisheries Building*. This has not happened and seems unlikely as access is difficult for reversing. A boat ramp some 500m away has recently been upgraded. Given that there is a close, viable alternative for boat launching, it is no longer considered worthwhile pursuing this action.

Actions Relating to the Location and Objectives of the Coastal Use Area:

- **Action 2.1:** *Provide visually unobtrusive viewing points around the Inlet.* The provision of access to the foreshore is important under the CM Act and considering the ageing community at Narooma, accessibility is an important issue. The boardwalk has been extended and pathways have been constructed around the foreshore at Quota Park.

- **Actions 2.2 and 2.3:** *Encourage attractive building design compatible with the visual qualities of the inlet*. It appears that these two actions can be largely addressed through reference and compliance with the Coastal Design Guidelines for NSW (Coastal Council of NSW, 2003), which is extensively referenced in the CMM. Furthermore, the CM Act provides controls over the bulk, scale, and nature of

development in the coastal use area. The existing controls should be enough to ensure that Council planning staff consider these issues under the normal development approval process.

- **Action 4.1:** *Prepare Narooma Town/Bar Rock brochure.* There is no indication whether this was completed. The value of this should probably be revisited given that brochures have been largely superseded by more modern modes of information delivery such as social media.

- **Action 4.**4: *Investigate means to address erosion of the midden at the Wagonga Picnic Area and other sites as necessary.* It is unclear whether this action has been pursued.

- **Action 4.5**: *Liaise with property owner to gain access to Wagonga Cemetery to undertake repairs*. It appears that this action is largely superseded by a management plan for the cemetery developed in 2014[10]. This action need not be pursued further.

- **Actions 5.6, 5.7 and 5.8***: Actions relating to Entrance Bar Management and Safety*. A close read of the CM Act and the CMM indicates that these issues do not readily fall within the scope of a CMP, except in the case where watercourse entrance stability is an overriding concern and it interacts with public safety. These actions were assigned to parties such as Waterways (Now RMS) and the Royal Volunteer Coastal Patrol. It appears that no progress has been made with these actions.

- **Actions 5.9:** *Explore possibility of Historic Pilots Wharf being used by Royal Volunteer Coastal Patrol.* At the present time, it appears that the RVCP's vessel is moored at Mills Bay. The RVCP may need to be contacted to ensure that this arrangement is still satisfactory.

- **Action 6.3:** *Extend town wharf towards swimming pool including pumpout facilities.* Based on review of recent aerial photographs, this action has not been addressed.

- **Action 6.8**: *Encourage Responsible Dog exercising:* This action is now covered by an overall strategy for designated off leash areas across the shire[11]

5.3 Discussion of Key Assets, Estuarine Values and Threats

5.3.1 Introduction

The preceding section provides information on the concerns that have been expressed both in the past and discovered during initial consultation and investigations completed as part of the scoping study. In addition, those actions which have been

[10] http://www.esc.nsw.gov.au/living-in/about/culture-and-heritage/strategies-and-plans/wagonga-cemetery-management-plan/Wagonga-Cemetery-Management-Plan.pdf

[11] http://www.esc.nsw.gov.au/living-in/about/for-pet-owners/dogs-on-beaches

undertaken as part of previous estuary or coastal zone management plans have been discussed. The present section aims to filter this information using the objectives of the CM Act.

One of the difficulties in interpreting the prior information is that it needs to now be considered in the context of the new coastal management framework for New South Wales. The sections which follow comprise a summary of the preliminary risk assessment completed for this Scoping Study (Appendix E outlines the methodology and outcomes). The risk assessment was framed around the four coastal management areas and the objectives of the CM Act relating to them.

The key findings of the risk assessment have been used to formulate the purpose for the new CMP as discussed in Section 5.4.

The character of Wagonga Inlet and the values held by the community are diverse. The entrance area, including the trained entrance, public wharf and surrounding residential area and town, demonstrates a focus on boating activities, tourism, and the emerging needs of an ageing population. Further inside the entrance, including waterside developments in Forsters Bay and Barlows Bay, the focus shifts towards supporting agricultural activity, particularly the oyster farming industry. There is some concern that the estuarine basin of Wagonga Inlet is therefore underutilised with respect to tourist activities, although this may also be related to the navigability of the entrance channel.

Commercial fishing is not permitted in Wagonga Inlet, and there are several sanctuary zones where recreational fishing is also prohibited. The Inlet is also used for tow sports and jet skis, alongside sail boats and other non-powered craft. Wagonga Inlet is one of the key oyster producing estuaries on the south coast.

These competing uses of the estuary must be balanced in preparing a CMP.

5.3.2 Coastal Wetlands Area

Key risks associated with coastal wetlands revolve around trying to retain the presence of salt marsh inside the Inlet as water levels rise due to both climate change and training of the entrance. The risk associated with disappearing saltmarsh has been assessed as extreme. To properly manage these assets, it will be important for the coastal wetland mapping to be updated to reflect the most recent estuarine macrophyte vegetation mapping undertaken in Wagonga Inlet.

There are also issues with inconsistent classification / zoning of a coastal wetland along the foreshores of Narooma Flats which needs to be resolved.

5.3.3 Coastal Environment Area

Key risks within the coastal environment area surrounding Wagonga Inlet relate to the morphodynamics of the entrance channel. Following construction of twin breakwaters at the entrance to the Inlet in the mid-late 1970s, sand within the Inlet has been activated, with the entrance channel scouring. There has subsequently been a flood tide dominated transport of sand along the channel, with sediment depositing at the dropover into the main estuarine basin to the west of the Princes Highway. The process is one that has been experienced at numerous coastal lake entrances in NSW, including Lake Macquarie, Wallis Lake and, more recently, Lake Illawarra.

While the channel is eroding overall, this does not mean that erosion is uniform along the channel. In fact, the erosion process typically comprises the movement of a series of sand waves upstream along the channel with some reaches deepening, and others shallowing at any given point in time. Most recently, the issues have been experienced in the vicinity of Lewis Island (foreshore eroding) and the adjacent channel (shallowing). The issue is clearly of concern to sections of the community and has flow on effects to the local economy and for boating safety.

Management of navigation in the channel is not a key responsibility of Council and is better managed by RMS (responsible for boating safety) alongside Crown Lands (which owns the bed of the channel). Regardless, the issue was raised previously and appears to have not been rigorously addressed. It is likely that a detailed morphological study will eventually be required to answer whether dredging of the channel is justified and, if so, who would be the main beneficiaries and who should pay for the work (cost-benefit). Once undertaken, the community is likely to expect repeated dredging campaigns to maintain the channel. An updated hydrographic survey of the entrance would provide useful data to support a study alongside a permanent water level recorder(s), with suggested locations being Barlows Bay and Forsters Bay.

A second key risk is associated with activities within the Punkally Creek catchment. At the present time, there are known issues with bacteriological contamination and sedimentation in the lower reaches of the creek. Targeted investigations to ascertain the source of pollutants and to identify potential management strategies are warranted. It seems likely that responsibility for this work would reside with Council and Local Land Services, and we understand that work to assess this situation has recently commenced.

Other risks also relate to the impact of activities in the catchment. Firstly, water quality within Forsters Bay has been identified as an issue previously, and it appears that relatively poorer water quality may still be experienced in Forsters Bay from time to time. The precise reasons for this are not well understood at the present time and investigation of this issue may be warranted. Secondly, there is evidence of issues from

unsealed roads delivering sediment to the waterway in Clarks Bay and at the site of the Historic Wharf in Brices Bay.

A concern regarding the impact of the seal population has also been noted, but it is difficult to see how this could be addressed through a CMP. Seals are protected from harm under NSW law.

5.3.4 Coastal Use Area

Within the coastal use area, the only identified high risk is related to the use of the sea plane in Forsters Bay. We have limited information regarding this issue, and it will require a small amount of investigation to assess whether this is a high-risk activity or not. A suitable management strategy (if any) should be able to be easily determined as part of the CMP. Implementation of any recommendations may fall outside of Council's jurisdiction (Department of Lands, CASA).

Other issues relate to boating infrastructure within Wagonga Inlet. Users and commercial interests report a lack of infrastructure, particularly in the eastern part of the Inlet. While facilities at existing structures might readily be improved, the introduction of new facilities would require careful consideration to determine whether an intensification of boating on Wagonga Inlet is desirable. This is an issue which may be best answered in consultation with RMS, NSW Fisheries and Crown Lands. Council has expressed a preference to consolidate and improve existing facilities.

Improvement works for the landing pontoon at the historic wharf in Brices Bay should also be investigated, as it sits on the bed and is warped at low tide levels. The present condition is deteriorating with fender strips missing.

5.4 Identification of CMP "Purpose" for Wagonga Inlet

With reference to the risk assessment contained in Appendix E, the key objectives that are to be addressed by the CMP for Wagonga Inlet are:

<u>Assuming that the coastal wetland area is to be included in the CMP:</u>

> *to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity*

This objective can be addressed by updating the current CM SEPP mapping for coastal wetlands to reflect more recent, field verified mapping. Furthermore, some work is required in ensuring that there is consistency regarding the treatment of a CM SEPP wetland adjacent to Narooma Flats.

> *to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests.*

to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.

In addition to updating the CM SEPP mapping, actions which enable saltmarsh to thrive in areas behind the training walls at Wagonga Inlet should be considered, to assist in maintaining the presence of saltmarsh in the Inlet and to compensate for losses that are occurring as a result of high tides reaching higher levels in Wagonga Inlet.

As part of improved mapping for the CM SEPP, it is proposed that a more rigorous representation of the buffer zone, which considers topography in assessing potential migration pathways. A future snapshot could be completed relatively easily with appropriate tidal modelling results from the FRMS process.

Assuming that the coastal environment area is to be included in the CMP:

to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value"

A targeted investigation to examine the source of pollutants to the downstream reaches of Punkally Creek is warranted. The primary concern regarding this is the impact on oyster leases and responsibility may be best managed by the Batemans Marine Park and Local Land Services.

"to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons, biological diversity and ecosystem integrity."

Morphological change in the entrance to Wagonga Inlet is not yet well understood. As a first step, a survey of the entrance compartment and reinstallation of a water level recorder (or recorders) within the main body of the entrance is required before a study to assess whether dredging/reconfiguration of the entrance and/or intensification of boat use throughout the estuary is desirable. While the water level recorder has some additional benefit with regards to flooding around the fringes of the waterbody, navigation and management of the training walls including any morphological impact from their construction is more commonly managed by Crown Lands, possibly using funding provided by RMS.

A study to investigate the processes contributing to erosion at Lewis Island is warranted to manage this island adjacent to the entrance channel.

Assuming that the coastal use area is to be included in the CMP:

to protect and enhance the scenic, social, and cultural values of the coast by ensuring that:

(i) the type, bulk, scale, and size of development is appropriate for the location and natural scenic quality of the coast

The only high-risk issue identified related to the operation of a sea plane from Forsters Bay. While this needs to be investigated, it is probably debatable as to whether this is a concern that the CMP should be managing. If concerns are shown to be justified, then Council may choose to bring this to the attention of the other government instrumentalities involved. However, some of the moderate risks identified, relating to boating infrastructure, may warrant additional consideration.

The above objectives primarily relate to any extreme or high-risk issues that have been identified through the preliminary risk assessment (Appendix E). There are also a wide range of moderate risk issues that could also be considered if easily addressed and/or inexpensive. In developing the CMP, each of these should be assessed for ease of implementation.

Considering the above objectives, it is worthwhile comparing these against the identified management objectives of the existing Estuary Management Plan (Eurobodalla Shire Council, 2010). Those were:

- Improvement of the quality of run-off from urban and rural areas.
- Maintenance of the scenic views and vistas to and from Wagonga Inlet.
- Ensuring development is compatible with natural hazards.
- Increasing awareness of the values of natural communities in general and the habitat values of wetlands.
- Appropriate management of aquatic resources.
- Provide a vegetated buffer zone around the entire inlet.
- Increasing awareness of Aboriginal and European sites and local history.
- Prevention of deterioration of Aboriginal middens and other archaeological sites.
- Maintenance of navigation channels.
- Improving boat safety awareness.

There is substantial overlap between these pre-existing objectives and the purpose outlined in the preceding paragraphs. However, the approach of this Scoping Study has been to limit the CMP scope to the objectives for each coastal management area outlined in the CM Act. Accordingly, some of the prior objectives now will only form a secondary concern of the CMP such as:

- Increasing awareness of Aboriginal and European sites and local history (which is largely the domain of the National Parks and Wildlife service), including understanding the threats that might arise from erosion and recession in future (i.e. if within coastal vulnerability areas).

- Improving boat safety awareness (the responsibility of the NSW Roads and Maritime Service).
- Appropriate management of aquatic resources (largely the responsibility of NSW DPI Fisheries and the Batemans Marine Park).

Adding complexity by introducing actions into the CMP that are already the responsibility of other state government agencies is considered counterproductive. At the risk of the CMP seeming light in terms of the quantity of actions, it is considered practicable to focus the CMP on fewer actions which are clearly the responsibility of Council and largely within Council's control. The primary outcomes of the CMP must be affordable and implemented. This does not eliminate the need for Council to support the actions of other arms of state government, including NSW Fisheries, Batemans Marine Park, RMS, and Crown Lands in achieving positive outcomes for the estuary.

5.5 Gap Analysis and Recommended Approach in Development of CMP

Considering the objectives of the previous estuary management plan (Eurobodalla Shire Council, 2010) it is clear that some effort has gone into achieving the following objectives:

1. Improvement of the quality of run-off from urban and rural areas.
2. Ensuring development is compatible with natural hazards.
3. Appropriate management of aquatic resources.
4. Increasing awareness of Aboriginal and European sites and local history.
5. Maintenance of navigation channels.
6. Provide a vegetated buffer zone around the entire inlet.
7. Prevention of deterioration of Aboriginal middens and other archaeological sites.

However, monitoring, evaluation and reporting activities have been limited. These objectives will continue but, in some cases, they are better managed through processes that already exist in the absence of a CMP and are the responsibility of state agencies.

Some objectives, such as improved boat safety awareness, are much better addressed through other processes and programs. The remaining objectives remain relevant to a new CMP but require either more effort or a different approach.

The risk assessment (Appendix E) contains commentary associated with each risk, with some discussion on potential additional studies and/or actions that could be

undertaken to address data gaps during both the preparation and operation of a CMP for Wagonga Inlet. A short list of these studies and/or actions, comprising those relating to high and extreme risks was prepared and provided to representatives of Eurobodalla Council and the Office of Environment and Heritage. That list and the potential costs of for those studies was the subject of discussions between the study team, Council and OEH to consolidate and refine the approach for each of the high and extreme risks during the CMP process and the approach agreed upon is presented in Table 11.

However, due to issues outlined in the Executive Summary, none of these additional studies could be funded as part of Stages 2 or 3 during preparation of the CMP. Accordingly, these additional studies have been carried forward to be executed as actions within the CMP.

It was considered that studies to support moderate risks could be postponed and included in actions that form part of the CMP.

Table 11 Proposed Approach to Addressing "Extreme" and "High" ranked Estuary Management Risks associated with Wagonga Inlet

Relevant Risks (Appendix E) and CM Area	Risk Ranking	Required Additional Study
W1 (Wetlands) W2 (Wetlands)	Extreme Extreme	Update CM SEPP (Wetlands) Mapping: Maps should be prepared that better represent the extent of existing coastal wetlands, as mapped and assessed by Elgin Associates (2018). The associated proximity area for wetlands should be derived incorporating topographical constraints, not the linear spatial buffer applied in the present mapping. In this way, the buffer will focus on lower lying areas that are important to enable the migration of wetlands with sea level rise and increasing tidal range. The coastal vulnerability mapping (see next row) will need to be completed to ascertain the potential extent of migration with a future sea level rise scenario.
W5 (Vulnerability) W2 (Wetlands)	Extreme Extreme	Derive Coastal Vulnerability (Tidal Inundation) Mapping: This requires an understanding of how the tidal planes within the waterway will change, given a sea level rise scenario. This mapping is presently being undertaken as part of the Floodplain Risk Management Study being completed for the Narooma Waterways. Modelling used to derive the maps should include a robust assessment of how the entrance channel will continue to change in response to construction of the entrance breakwaters in the 1970s. The extents assessed will then need to be put forward as part of a planning proposal.
W4 (Vulnerability) W7 (Environment)	High High	Wagonga Inlet Entrance Morphodynamic Study: The entrance channel is evolving relatively rapidly following training and requires data collection to properly assess. It is recommended that a hydrosurvey of the entrance channel, which has not been completed for over 20 years, be completed. Two water level recorders should be installed at Barlows and Forsters Bays for at least a few months and possibly long term, to assess how tidal response in the inlet is evolving. The hydrosurvey should extend across the shallows and into Forsters Bay to assess how bathymetry has evolved opposite Shell Point. These two sets of data would

Relevant Risks (Appendix E) and CM Area	Risk Ranking	Required Additional Study
		enable a more detailed appreciation of recent inlet evolution and corresponding impacts to be determined. Following preliminary review of these requirements by OEH, we understand that the possibility of having a survey completed soon is to be investigated. For preparation of the CMP, if possible, a comparison between the two hydrosurveys will be made alongside the provision of a discussion of ongoing processes and the way in which this is manifesting in areas such as Lewis Island. This will enable the specification of more targeted actions as part of the CMP, potentially including: (i) Using the existing flood model of Wagonga Inlet to assess tidal and flood velocities adjacent to Lewis Island. (ii) Wind wave and boat wake calculations to assess the foreshore wave climate at Lewis Island. (iii) Use of the outcomes from (i) and (ii) to design foreshore protection works for Lewis Island (if warranted) and/or the conceptual assessment of dredging options for the inlet upstream of Princes Highway bridge (if warranted). Responsibility for these types of studies and the ensuing works is problematic along the NSW coast, with Council, RMS and DoI all having an interest in these works. Available government funding is limited. However, it seems important that this receives attention, as it has been highlighted as an issue for the community for some time and has received limited consideration to date.
W11 (Environment)	High	Punkally Creek Catchment Assessment: An assessment of sediment, nutrient and pathogen sources contributing to poor water quality at the downstream end of Punkally Creek is required. This will require an audit of agricultural uses, an aerial photographic assessment of recent changes in channel morphology and an assessment of bare/unfenced foreshores where livestock may be contributing to bank erosion. During the preparation of this Scoping Study, LLS has initiated some investigation into these issues. During preparation of the CMP we will revisit this issue, liaising with LLS to determine progress and whether additional management strategies are warranted.

6 Planning Proposal: Expected Changes Required to Coastal Management Area Mapping

6.1 Description of the Planning Proposal Process

One role of this Scoping Study is to determine whether a planning proposal should be prepared to amend both the coastal management area maps and the Local Environment Plan; and to facilitate such planning proposal/s and CMP preparation to proceed. Planning proposals follow the "Gateway" processes of the NSW Department of Planning. A planning proposal which alters the boundaries of the coastal management area would require the following steps:

1. Preparation: Council prepares the planning proposal.
2. Gateway: The Planning Minister decides whether the planning proposal can proceed.
3. Consultation: The planning proposal is publicly exhibited as directed by the Minister. A public hearing may be held.
4. Assessment: Submissions from exhibition of the planning proposal are reviewed and a draft change to the local environment plan is made.
5. Publication: With the Minister's approval, the revised LEP is 'made' via publication on the NSW legislation website.

A planning proposal is required to propose amendments to maps contained within:

- Council's LEP.
- the CM SEPP.

The planning proposal is required to explain the intended effect of the instrument and set out the justification. The planning proposal should include:

1. A statement of objectives for the instrument (or modifications thereof).
2. An explanation of the provisions to be included.
3. The justification for (1) and (2) and the process for their implementation.
4. The maps to be adopted.
5. The community consultation that is to be undertaken before the modified planning instrument is "made". A default public exhibition of 28 days is indicated in Section 3.34 of the *EP&A Act 1979.*

The requirements for a planning proposal are outlined in more detail within NSW Department of Planning and Environment (2016).

During "Stage 2" of the process outlined in the CMM, studies of risks and vulnerabilities should be undertaken to assess and justify (establish the "strategic merit") of any changes required in the maps. These will enable a planning proposal to be submitted to the minister for "Gateway Determination" when the CMP is submitted.

There are identified potential shortcomings in the Coastal SEPP mapping for the three estuaries subject to this scoping study, most notably the absence of coastal vulnerability mapping for the tidal inundation hazard. As there were limited follow up funds to complete the necessary studies to inform any modification of the SEPP mapping, it was decided that those studies would form actions within the CMP. Accordingly, a planning proposal is not proposed until those studies are completed.

7 Recommended Strategy for Ongoing Consultation

This Scoping Study has been prepared as part of an overall project to prepare a Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet. As such, it was necessary for Salients to estimate the amount of consultation that would be required throughout the study, before having a thorough understanding of the issues associated with the three subject estuaries. The degree of consultation originally proposed by Salients is summarised in Section 7.1.

7.1 Initially Proposed

Consultation was to comprise two versions of an online survey, delivered through Google Forms. The structure and format of questions would be made available to Council and OEH staff, for comment, prior to it going live.

The proposed first version of the survey was geared towards community members and required selection of a single focus estuary. Community members would have registered with an email address to receive an invitation to complete the survey with Council advertising the availability of the survey more broadly and providing a link for registration on their web page.

The second version of the survey was to be designed for stakeholder representatives who, by default, would have completed the survey for all three estuaries. In addition, questions regarding appropriate sources of funding were proposed in this version of the survey.

Proposed survey questions would have been geared towards dealing with the management of risk, levels of risk tolerance, prioritisation of management issues, and suggestions relating to how management issues might be addressed. The outcomes of the survey instrument would have been analysed to augment the findings of Stages 2 and 3.

7.2 Further Consideration and Consultation Requirements

As we have progressed through the preparation of this Scoping Study, particularly following the requirements of the finalised Coastal Management Manual, it became apparent that some changes to the way the consultation should occur would be more appropriate. The approach ultimately adopted should comprise the following:

- A simplified survey instrument geared solely for the community but generally following the approach outlined in the preceding section.
- Consultation with government stakeholders would proceed on a one-to-one basis. This was considered more effective given the need to initiate discussions about

funding and ultimately to achieve agreement on funding arrangements and responsibilities for different management actions as part of the CMP.

- Additional face to face, on-site consultation with non-state government stakeholder organisations, particularly Local Aboriginal Land Councils.

8 Preliminary Business Case

8.1 Introduction

The purpose of this business case is to support those activities which need to be completed in preparing a coastal management program (CMP) for three estuaries in the Eurobodalla Local Government Area: Moruya River, Mummuga Lake and Wagonga Inlet. The successful proposal for preparing the CMP was dated February 5, 2018. That proposal was based on a consultation draft of the Coastal Management Manual (CMM), prepared in 2015. At the time, that document was the best indicator available to assess what the CMP preparation process would comprise. The contract was awarded to Salients in early March 2018. The CMM was released on April 3, 2018, and this Scoping Study was prepared using the guidance of that document. The CMP preparation process is presented in Figure 5.

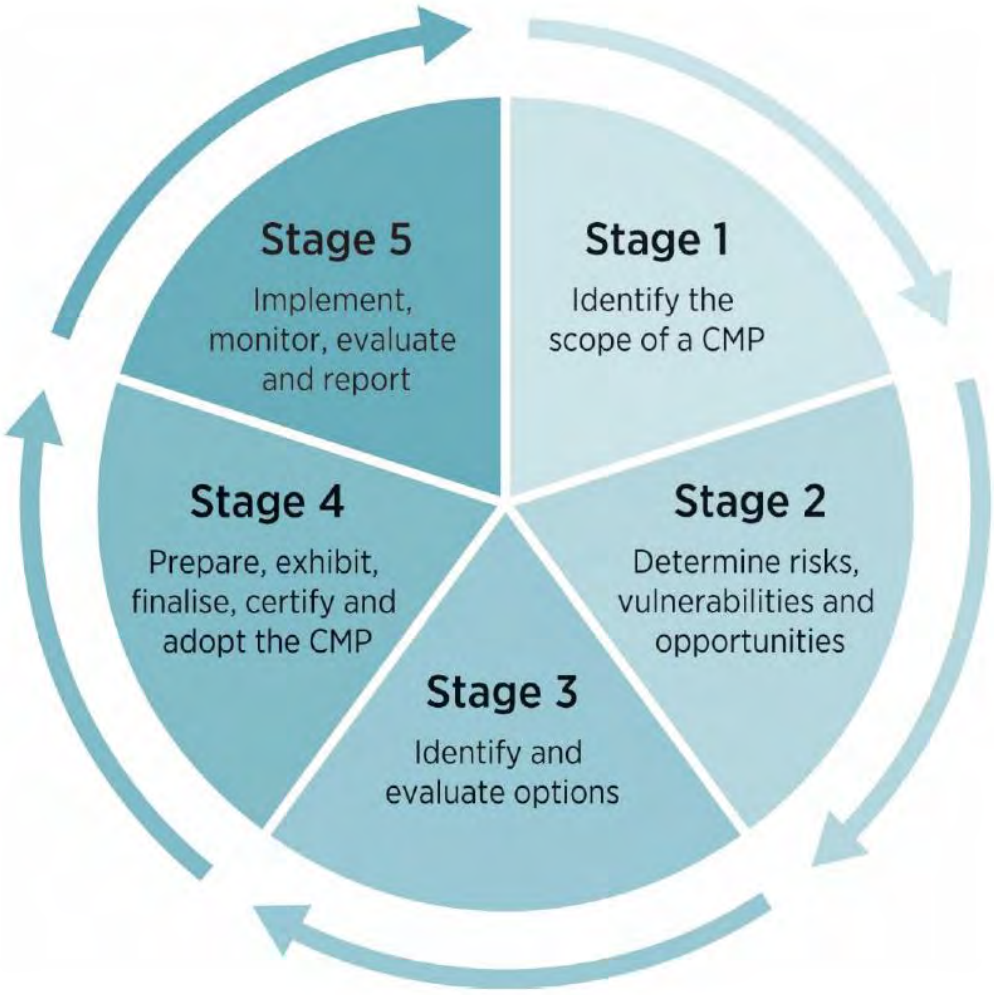


Figure 15 Stages in Preparing and Implementing a CMP (Source: NSW Government, 2018a)

There are some important points that need to be highlighted to inform this business case:

- The project covers Stages 1-3 and parts of Stage 4 of the process. Salients could not be certain of the requirements for Stages 2 and 3 (in particular) at the time the proposal was written. The tasks required for Stage 2 and 3 depend on the findings of Stage 1 (this study). At the time of the proposal, Council and OEH had prepared draft scoping studies for both the Moruya River and Wagonga Inlet. Based on those documents (which were noted to be incomplete) and the presence of pre-existing plans for those two estuaries, it was assumed that the CMP preparation could be "fast-tracked" with respect to those two estuaries. Some allowance was made for additional studies related to Mummuga Lake, with those studies to be confirmed by the scoping study.
- The Scoping Study has been prepared in accordance with the finalised CMM (April 2018), which differs markedly from the consultation draft version of the CMM that was used as a basis for the original study brief. For that reason, substantial work has been required to add to the draft scoping studies prepared by Council, and the focus and scope of studies required during Stages 2 of the CMP preparation also differ from what would have been completed under the consultation draft.
- At proposal stage, it was expected that the coastal vulnerability area would be mapped and released when the CMM was finalised (and the Coastal Management SEPP maps became active). This has not occurred.

For these reasons, a series of detailed studies were outlined and recommended for completion during the preparation of this Scoping Study. Those requirements are outlined in Sections 3.5, 4.5, and 5.5 for Moruya River, Mummuga Lake and Wagonga Inlet respectively. The scope of those "detailed studies" exceeds that originally proposed, and the possibility of completing these studies as part of "Stage 2" of the CMP process needed to be considered.

Following discussions with DPIE and Council, it was determined to not be feasible to commit to the completion of all studies due to funding limitations arising largely driven by the bushfire emergency on the South Coast of NSW over the summer of 2019/20 and the global COVID-19 pandemic which followed soon after. Only limited additional studies were completed, associated with understanding and documenting analyses completed by the NSW state government, relating to:

(i) Catchment water quality risk.

(ii) Estuarine tidal inundation and sea level rise.

Where expenditure on these studies could not be justified during preparation of the CMP, the additional work is essential and needs to be addressed by actions in the CMP or through some other process. This needs to be considered as the CMP is developed.

8.2 Recommended Scope of CMP

Under the CM Act, Council has an obligation to prepare CMPs to cover its entire coastal zone. An implied time frame for transitioning older style plans to CMPs, under the CM Act, is 31 December 2021.

Furthermore, the grants funding package which accompanied the coastal management reforms in NSW will only extend to the 2020-21 financial year. At the present time, it is advantageous for Councils to complete required studies as part of their CMP preparation, so that grant applications for the implementation of works can be submitted before the end of this period.

Eurobodalla Council has expressed a desire to have a single, comprehensive CMP covering all estuaries in the LGA, with the CMP for these three estuaries being the base document which will be added to for other estuaries. The approach seems eminently sensible and has the potential to speed progress through the preparation of the CMP. To be comprehensive, the CMP should ideally cover the entire coastal zone (all four coastal management areas) associated with the three estuaries. However, based on our background review, the focus will vary from estuary to estuary. This is based on our preliminary risk assessment (Appendix E) and, considering the extreme and high level risks identified therein, the focus of the CMP is likely to be as shown in Table 12.

Table 12 Expected Focus of Coastal Management Program

ESTUARY	COASTAL MANAGEMENT AREA		
	Wetlands	Environment	Use
Moruya River	High	Moderate	Minor
Mummuga Lake	Minor	Moderate	Moderate
Wagonga Inlet	Very High	High	Moderate

As discussed, the coastal vulnerability area relating to tidal inundation has not been defined, and at present it is therefore not possible to realistically assess the full suite of risks that might be associated with this issue.

Council wishes to formally define the coastal vulnerability (tidal inundation) area through the NSW Floodplain Risk Management Process. This will be partly achieved

during the time frame over which the CMP is prepared, but it is not expected that the coastal vulnerability area will be properly prepared, along with necessary up-front community consultation, in time for this to be given complete treatment during CMP preparation.

The CMP will need to consider a range of risks, many of which include the potential for changes, such as those related to sea level rise and population growth over periods of 20, 50 and 100 years. The CMP will build upon the preliminary risk assessment completed as part of this Scoping Study.

Following our review of background information, the issues associated with each of the estuaries, the history of implementation, and the age of existing plans and studies, we do not recommend that progress through the process of Figure 15 be fast tracked for any of the three estuaries.

We consider that there are "extreme" and "high" level risks associated with all three estuaries, which should have further detailed studies completed as part of the CMP process. Due to limited funding for CMP development, these studies will need to comprise actions in the CMP.

8.3 Roles and Responsibilities

Considering the way in which the coastal management framework is now constructed, and our review of those activities which were not completed as part of previous management plans, we will aim to take a particularly focussed approach to the CMP. It seems practical that the CMP, a document over which Council is responsible, should focus on those activities and management responsibilities over which Council exerts the dominant control.

While there is scope within CMPs to have other organisations "sign on" to provide funding and assistance, we suspect that this may be difficult to achieve in practice. The reasons for this difficulty are that the state governance environment is constantly changing, with funding priorities shifting and department and agency structures and responsibilities adapting. This makes it difficult to guarantee funding, particularly when funding is filtered through a system of contestable grants. Most funding programs are run on an annual cycle with no guarantee of future funding.

A pragmatic approach would aim to have agencies, at the local level, confirm that they will take control over those broad activities for which they have legislative control, but to cooperate closely with other agencies to manage the estuary holistically.

As an example, a memorandum of understanding between all agencies could be signed that:

- Confirms their responsibilities (e.g. RMS & Crown Lands are responsible for managing boating, dredging navigable channels and managing the bed of Crown Waterways; DPI Fisheries and the Batemans Marine Park are responsible for research relating to the productivity of fisheries and compliance).
- Commits to participating in regular meetings (say on a bimonthly interval) of a stakeholder committee group, to be convened by Council. These meetings would provide a forum for sharing information, ensuring collaboration and, when needed, to adjust the memorandum of understanding. It is not envisaged that community members would be included in this committee.

A key aim of this approach is to limit the number of extraneous actions included in a CMP which may increase the weight of the document, but mainly operate to cause confusion over who should be taking responsibility for ensuring that actions are completed. Again, the emphasis must be on a CMP that can and will be implemented.

8.4 Expected Benefits and Costs

The purpose of this business case is to support preparation of the CMP for the three estuaries. In terms of benefits, it is not yet possible to quantify the benefits associated with the additional activities proposed herein. The activities outlined here are those needed to develop a baseline understanding of what could be required to manage the coastal zone and achieve the objectives of the CM Act. The benefits are therefore those that are intrinsic in following the coastal management framework – gaining a better understanding of the coastal zone so that it can be better managed now and into the future.

We have outlined those studies that we recommend are required to make informed decisions about the types of management actions that will be required to address "high" and "extreme" risks from our assessment. In comparison, if "moderate" risks require additional studies, those studies can be included as actions in the CMP.

The studies required to prepare the CMP are discussed in detail in sections 3.5, 4.5, and 5.5, respectively for the Moruya River, Mummuga Lake and Wagonga Inlet Estuaries. A preliminary cost estimate for completion of those studies is outlined in Table 13.

Table 13 Recommended Stage 2 Studies and Costs for Completion

Required Study and Key Steps	Indicative Consultancy Cost ($ ex. GST)
Derive Interim Tidal Inundation Mapping for Moruya River: - Harmonic analysis of Moruya water level record to determine tidal planes. - Determine zones of reliability (e.g. Upstream of Mogendoura Creek, the water level recorder may not be representative). - Prepare GIS layers to show extent of inundation for tidal planes of relevance for estuarine macrophytes, for both existing condition and with future sea level rise.	$3,200
Update CM SEPP (Wetlands) Mapping (Including Field Work for Mummuga Lake): - Field exercise at Mummuga Lake, including initial examination of aerial photography. - GIS analysis of location parameters (elevation, slope, connectivity) for various macrophyte communities, determination of conditions conducive to macrophyte communities. - Determine relevant future sea level rise tidal plane inundation benchmarks (relating to 20, 50 and 100 years). - Importation of relevant future inundation mapping from prior tasks. - Application of rules to future conditions to project future expansion potential. - Preparation of report and maps to support planning proposal.	$17,250
Mummuga Entrance Foreshore Management Assessment and Strategy: - Review / consult with Council on PoM for Crown Reserve Management. - Confirm boundaries and management responsibilities. - Detailed field investigation with measurements, photographs, and GPS records. - Break foreshore into different precincts for foreshore protection. - Determine design conditions. - Develop representative design sketches and report.	$8,750
Water Quality Risk Assessment Analysis: - Discuss methodology used in risk assessment mapping process with OEH (Mummuga Lake and Wagonga Inlet only), obtain input data if possible, for interrogation. - Prepare documentation of the results, explaining the key driving factors for sub-catchments assessed as being high risk and recommending areas that may need further consideration.	$3,600
Wagonga Inlet Preliminary Morphodynamic Assessment: - Review key documentation pre. 2001 (Date of Nelson Consulting EMP) - Import selected historical aerial photography into GIS and undertake aerial photograph interpretation - Import two historical hydrosurveys into GIS and compare - Prepare interpretive report on history, likely future changes, and possibilities for management.	$6,250

***Includes analysis of bathymetric change. Assume that updated hydrosurvey to be provided by OEH.**

The total for additional studies ($39,050 GST exclusive) is significantly greater than the $9,100 allowed for in the proposal. The reasons for the increase are outlined in the dot points in Section 8.1.

As noted above, due to severe constraints on Council funding, these studies will be postponed and included as actions in the CMP.

8.5 Recommended Steps for CMP Completion

8.5.1 Further Consultation

Consistent with Section 7.2, the following consultation activities are to be undertaken:

- A simplified survey instrument geared solely for the community but generally following the approach outlined in the preceding section.
- Consultation with government stakeholders would proceed on a one-to-one basis. This was considered more effective given the need to initiate discussions about funding and ultimately to achieve agreement on funding arrangements and responsibilities for different management actions as part of the CMP.
- Additional face to face, on-site consultation with non-state government stakeholder organisations, particularly Local Aboriginal Land Councils.

8.5.2 Stage 2: Determine Risks, Vulnerabilities and Opportunities

Stage 2 of the process outlined in the manual revolves around the identification and assessment of risk. The approach to be adopted will follow the guidance of ISO 31000, building on Appendix E with the results being updated to incorporate the findings of the limited additional study, associated with understanding and documenting analyses completed by the NSW state government relating to:

- catchment water quality risk.
- estuarine tidal inundation and sea level rise.

As per Salients original proposal, a qualitative approach will be adopted for risk assessment. This assumes that no *"high risk, high complexity"* issues will need to be assessed. Such issues would warrant more detailed analysis (and detailed cost benefit analyses during Stage 3) if the guidance provided in the CMM is to be followed, and this has not been allowed for in Salients proposal.

8.5.3 Stage 3: Identify and Evaluate Options

Tasks in Stage 3 will comprise:

- Compiling a list of potential management options for inclusion in the new CMP, including any relevant and achievable options outstanding from the existing plans alongside any potential new options, particularly those that could be used to assess new and emerging issues.
- Completing a risk assessment for the different management options wherein we will upgrade the risk assessment developed over the course of the study, to take account of the impact that potential options would have on the risk profile.

- Estimating the costs for implementation and maintenance and completing a simplified cost benefit analysis for any options where this has not already been completed.

Based on the outcomes from both the cost-benefit and risk assessment, a list of preferred options would be recommended for carriage through the CMP.

8.5.4 Stage 4: Prepare, Exhibit, Finalise, Certify and Adopt the CMP

Stage 4 of the process is considered in two Parts. The first (Part A) comprises those aspects to be completed by Salients under the present contract, and Part B the remaining tasks of Stage 4.

Part A tasks comprise the following:

- **Compile Summarised Background Information for CMP.** This will comprise initial compilation of the program, utilising work previously completed and following, where relevant, the format outlined in the Manual.
- **Assess and Assign Responsibilities.** The CMP actions are to be assessed to determine which parties are best placed to take responsibility for various actions, considering who the beneficiaries of various actions will be, who has legal responsibility and who is best placed to fund and/or implement those actions. This will involve communications with relevant organisations to seek in principle, written agreement that the organisation is willing to carry out the responsibilities assigned to them.
- **Prepare Implementation Details and Business Plan**. A summary timeline and cost estimates for program implementation should then be developed along with a business plan. This will include maps and a Gantt chart illustrating timing, responsibilities, integration within Council's IP&R framework and a strategy for monitoring and review.
- **Internal Review of CMP.** Council would then undertake an internal review of the CMP. Following revision, the CMP will be ready for exhibition.
- **Exhibition.** The draft CMP will then be reviewed, and submissions considered, with that process detailed in a submissions report which will discuss how any changes have been made.
- **Finalisation.** Following internal review of the submissions report, the CMP will be finalised to carry forward to certification.

Part B will comprise activities associated with certifying and adopting the CMP. As there is limited experience with this process under the new coastal management framework in NSW, it is not possible to estimate how long this might take. Similarly,

the timeline expected for any tasks associated with Stage 5 of the new process (Implement, Monitor, Evaluate and Report) cannot be ascertained until the actions of the CMP are finalised.

9 Scoping Study Summary

9.1 Summary of Effectiveness of Current Management Practices

Both Wagonga Inlet and Moruya River have existing, but outdated management plans (respectively: Eurobodalla Shire Council, 2010; Worley Parsons, 2009a). Audits of the implementation of those plans were prepared by Council, and these are presented in Appendices C (Moruya) and D (Wagonga). In comparison, estuarine issues at Mummuga Lake have been managed in a piecemeal manner.

The audits were reviewed by the study team and two broad observations are made:

- While there has been a tendency for Council to internally review implementation of the plan and update the plan as necessary, past practice in NSW has been to complete this at long intervals (5 years or greater). This makes it difficult to ascertain how and when actions are being completed with reference to execution of the plan. In some instances, clear reference back to the existing plan appears to be missing. An example of this is bank stabilisation works along the Moruya River, which have been extensive, but largely carried out in an opportunistic manner by LLS with no clear records kept.

- It was common for existing plans to contain actions that organisations external to Council were best placed to complete, through either legislative, jurisdictional, or funding opportunities. Unfortunately, many of these have proven very difficult for Council to force action upon. There are two key reasons for this: (i) there has been previously no mechanism for completion of actions to be enforced; and (ii) the legislative, jurisdictional or funding environment changes continuously within state government, and responsibilities that are not clearly laid out tend to be forgotten or disregarded as this occurs.

The new framework for coastal management in NSW has the potential to address these problems through the seeking of written concurrence for actions assigned to organisations external to Councils and by enforcing more regular monitoring, evaluation and reporting, by placing new CMPs under the umbrella of Council's Integrated Planning and Reporting framework.

9.2 Outcomes from First Pass Risk Assessment

Risks were identified through a combined review of background information, site inspection and community workshop/drop-in sessions held at Narooma (for Mummuga Lake and Wagonga Inlet) and at the Moruya Riverside Markets (Moruya River). These risks were assessed qualitatively.

The complete preliminary risk assessment tables for all three estuaries are presented in Appendix E. Table 14 tabulates the assessment of those risks, divided into each risk

category for each estuary. Each estuary had a similar distribution of high and extreme risks. A larger number of moderate and low risks were identified for Moruya River. We have surmised that the key reason for this was the attendance at the Moruya workshop of enthusiastic individuals who discussed multiple potential concerns.

Table 14 Tabulation of Identified Risks

Estuary	Risk Ranking				
	Extreme	High	Moderate	Low	Total
Moruya River	2	6	12	4	24
Mummuga Lake	1	6	6	1	14
Wagonga Inlet	3	5	5	1	14

9.3 Strategic Context and Purpose for CMP

As outlined in the next section, more study is required for each subject estuary, and it is not recommended that CMP preparation be fast-tracked (by skipping Stages 2 and 3 of the process). Consequently, it is not yet possible to finalise the "purpose", "vision" and "objectives" for the CMP. It will be important that the results of a proposed community survey be considered and incorporated before the overarching principles governing the CMP are finalised. Initially, our risk assessment has considered all the objectives outlined in the CM Act, which are also listed in Appendix A.

Considering the distribution of the "high" and "extreme" risks of Table 14 across the different coastal management areas defined by the CM Act, the expected degree of focus of the CMP across the coastal wetlands, coastal environment and coastal use areas is outlined in Table 15. The coastal vulnerability area has been excluded from Table 14, as the current absence of mapping for this area makes it difficult to incorporate at the present time. Council is intending to develop mapping under the Floodplain Risk Management process and the results of this will be used, as relevant, to inform other actions associated with, for example, coastal wetland and coastal environment areas. While coastal vulnerability is not expected to be a key focus at the present time, the possibility for its incorporation into the CMP in a more rigorous manner at a later stage will need to be considered.

Table 15 Expected Focus of Coastal Management Program

ESTUARY	COASTAL MANAGEMENT AREA		
	Wetlands	Environment	Use
Moruya River	High	Moderate	Minor
Mummuga Lake	Minor	Moderate	Moderate
Wagonga Inlet	Very High	High	Moderate

9.4 Additional Studies Required

A draft, preliminary list of studies required to fill knowledge gaps associated with the "extreme" and "high" ranked risks was provided to representatives of Council and OEH for consideration and discussion. Ultimately, most of these could not be incorporated into Stage 2 of the CMP process, and only limited additional study is proposed. This additional study is associated with understanding and documenting analyses completed by the NSW state government relating to:

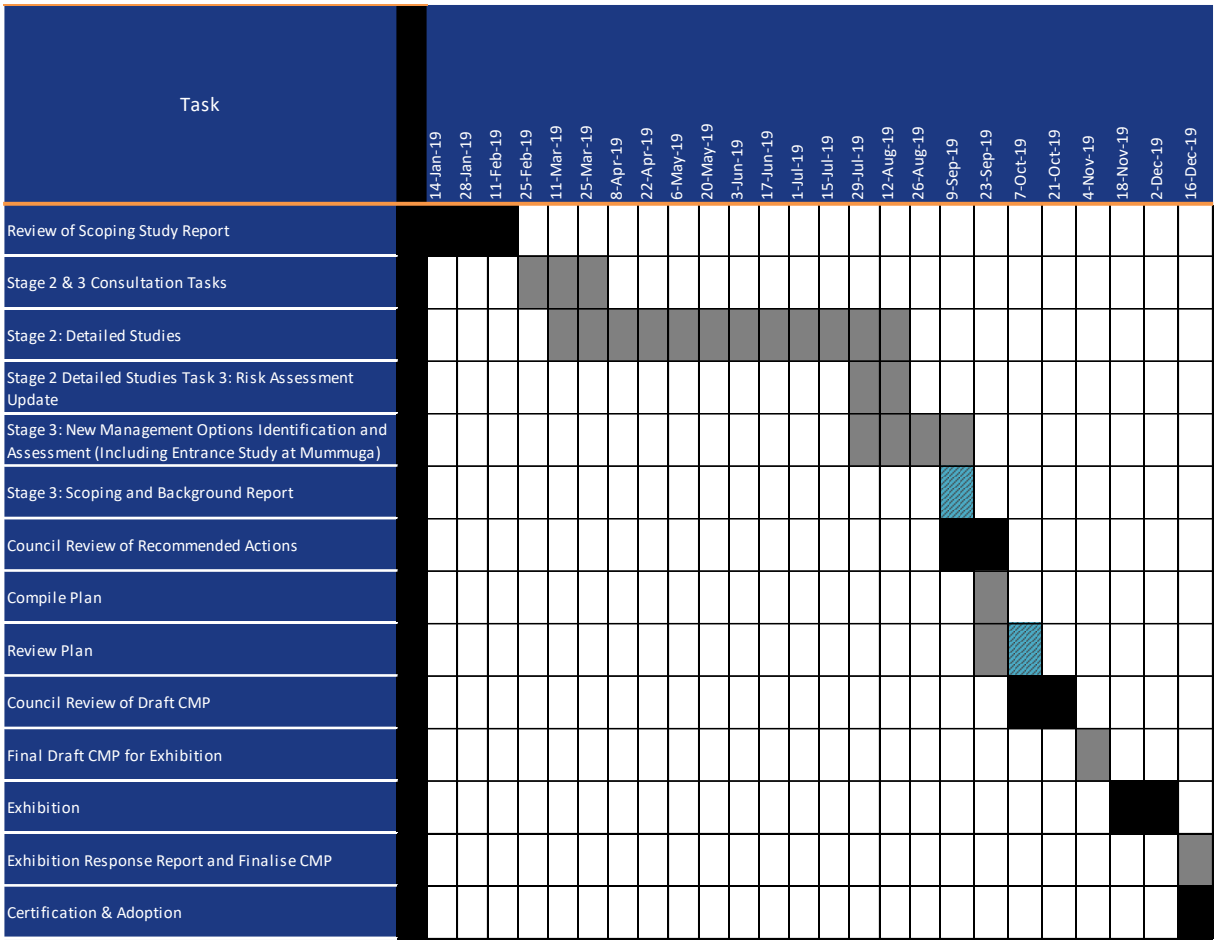
- Catchment water quality risk.
- Estuarine tidal inundation and sea level rise.

These analyses will inform some of the associated management options.

9.5 Moving Forward

The recommended steps for CMP finalisation (prior to certification and adoption) are outlined in Table 16. These steps, and a discussion of roles and responsibilities of different organisations are included in the business plan provided in Section 8.

Table 16 Program for CMP Preparation – At Final Draft Scoping Study Stage



Additional consultation, to be completed as the first task subsequent to Council's review and acceptance of the Scoping Study Report, including finalisation of the way forward, will include an online survey for both community members and stakeholder organisations, and additional, one-on-one discussions between the study team members and representatives of stakeholder organisations to help establish priorities and likely responsibilities for actions in the final CMP.

<u>September 2020 Addendum</u>: Following the delays outlined elsewhere in this scoping study, it is clear that the tasks in Table 16 were not going to be achieved within the indicated timeframe. Work had, as of September 2020 progressed towards the consultation and additional study tasks. A Draft ECMP was expected to be delivered by Early December 2020.

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Appendix A Coastal Management Act, 2016: Management Objectives for Coastal Management Areas

Management Objectives for Coastal Wetlands and Littoral Rainforests Area
(a) to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity.
(b) to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests.
(c) to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.
(d) to support the social and cultural values of coastal wetlands and littoral rainforests.
(e) to promote the objectives of State policies and programs for wetlands or littoral rainforest management.

Management Objectives for Coastal Vulnerability Area
(a) to ensure public safety and prevent risks to human life.
(b) to mitigate current and future risk from coastal hazards by taking into account the effects of coastal processes and climate change.
(c) to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place.
(d) to maintain public access, amenity and use of beaches and foreshores.
(e) to encourage land use that reduces exposure to risks from coastal hazards, including through siting, design, construction and operational decisions.
(f) to adopt coastal management strategies that reduce exposure to coastal hazards: (i) in the first instance and wherever possible, by restoring or enhancing natural defences including coastal dunes, vegetation and wetlands, and (ii) if that is not sufficient, by taking other action to reduce exposure to those coastal hazards,
(g) if taking that other action to reduce exposure to coastal hazards: (i) to avoid significant degradation of biological diversity and ecosystem integrity, and (ii) to avoid significant degradation of or disruption to ecological, biophysical, geological and geomorphological coastal processes, and (iii) to avoid significant degradation of or disruption to beach and foreshore amenity, and social and cultural values, and (iv) to avoid adverse impacts on adjoining land, resources or assets, and (v) to provide for the restoration of a beach, or land adjacent to the beach, if any increased erosion of the beach or adjacent land is caused by actions to reduce exposure to coastal hazards,
(h) to prioritise actions that support the continued functionality of essential infrastructure during and immediately after a coastal hazard emergency
(i) to improve the resilience of coastal development and communities by improving adaptive capacity and reducing reliance on emergency responses.

Management Objectives for Coastal Environment Area
(a) to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.
(b) to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change.
(c) to maintain and improve water quality and estuary health.
(d) to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons.
(e) to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place.
(f) to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.

Management Objectives for Coastal Use Area
(a) to protect and enhance the scenic, social and cultural values of the coast by ensuring that: (i) the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast, and (ii) adverse impacts of development on cultural and built environment heritage are avoided or mitigated, and (iii) urban design, including water sensitive urban design, is supported and incorporated into development activities, and (iv) adequate public open space is provided, including for recreational activities and associated infrastructure, and (v) the use of the surf zone is considered.
(b) to accommodate both urbanised and natural stretches of coastline.

Appendix B Mandatory Requirements of a Coastal Management Program

The purpose, scope and focus of a CMP (Mandatory Requirements 2 & 3)
A CMP is to consider a range of timeframes and planning horizons including immediate, 20 years, 50 years, 100 years and (if council considers it relevant based on expert advice) beyond.
A CMP is to consider a broad range of coastal management issues and management actions with a focus on achieving the objects and objectives of the CM Act.
The area that a CMP Covers (Mandatory Requirements 4 & 5)
A CMP must include the rationale for selecting the area to be covered by a CMP and identify whether it applies to: (i) all or part of the coastal zone of one local government area; or (ii) all or part of the coastal zone of adjoining local government areas that share a coastal sediment compartment or estuary (where adjoining local government areas share a coastal sediment compartment or estuary - refer to Schedule 1 of the CM Act - a CMP that addresses an area comprising that coastal sediment compartment or estuary must reflect this regional context).
A CMP must identify: (i) any proposed amendments to mapping of the relevant coastal management areas; (ii) evidence to support any proposed amendments or additions to the area of the four coastal management areas in the relevant area; and (iii) information about these proposed amendments that can support the preparation of a planning proposal and, in particular, that could be forwarded along with a planning proposal to the Greater Sydney Commission (if the planning proposal relates to the Greater Sydney Region) or the Minister (for elsewhere) to inform a Gateway determination under section 3.34 of the EP&A Act.

Preparing a CMP (Mandatory Requirements 6 & 7)

During preparation of a CMP, a council is to:

(i) identify the scope of the CMP;

(ii) determine and assess coastal risks, vulnerabilities and opportunities (including without limitation risks to environmental, social and economic values and benefits); and

(iii) evaluate and select coastal management options.

Note: These requirements correspond to the first three stages of the five-stage risk management process for the preparation and implementation of a CMP. These requirements are in addition to the specific requirements during preparation in the CM Act. Guidance for preparation is provided in Part B of the manual.

A council may choose not to repeat steps (or parts of steps) in subparagraphs (ii) or (iii) of mandatory requirement 6 for the area the subject of the proposed CMP (or parts of that area) if those tasks have already been undertaken for the coastal management of that area, provided that council first considers:

(i) whether the existing assessment of coastal risks, vulnerabilities and opportunities, or the existing evaluation of coastal management options, that council proposes to rely on enables council to prepare the CMP in accordance with mandatory requirement 8 below and sections 14 and 15 of the CM Act;

(ii) the effectiveness of the existing coastal management of that area; and

(iii) whether any circumstances concerning the coastal management of that area have changed.

Key issues to be identified (Mandatory Requirement 8)

A CMP must:

(i) provide a description of how the objects of the CM Act have been considered and promoted in preparing the CMP;

(ii) provide a description of how the objectives of the coastal management areas covered by the CMP have been given effect to in preparing the CMP;

(iii) identify the key coastal management issues affecting the areas to which the CMP is to apply and how these have been considered;

(iv) identify any coastal management actions required to address those key coastal management issues in an integrated and strategic manner;

(v) identify how the coastal management actions in (iv) have been considered and evaluated (including, without limitation, how council has evaluated the coastal management actions in light of the functions and responsibilities council has under legislation other than the CM Act);

(vi) identify any environmental protection works, on land identified as 'coastal wetlands' or 'littoral rainforests' on the Coastal Wetlands and Littoral Rainforests Area Map under the CM SEPP, that are proposed to be carried out by or on behalf of a public authority;

(vii) identify any coastal protection works that are proposed to be carried out by or on behalf of a public authority;

(viii) set out the recommended timing for the proposed coastal management actions;

(ix) identify a proposed monitoring, evaluation and reporting program in relation to the CMP, including by identifying key indicators, trigger points and thresholds relevant to the CMP; and

(x) include a business plan.

Requirements for the business plan in the CMP (Mandatory Requirement 9)
The business plan included in the CMP must identify: (i) all proposed coastal management actions identified elsewhere in the CMP; (ii) the full proposed capital, operational and maintenance costs, and recommended timing, of proposed coastal management actions; (iii) any proposed cost-sharing arrangements and any other viable funding mechanisms for the proposed coastal management actions to ensure delivery of those actions is consistent with the timing for their implementation under the CMP; and (iv) the distribution of costs and benefits of all proposed coastal management actions
Requirements for preparing a CMP which includes a proposed or mapped coastal vulnerability area (Mandatory Requirements 10 and 11)
Where coastal hazards have been identified in a coastal management area, a CMP must identify proposed coastal management actions for those hazards.
If the CM Act requires that a coastal zone emergency action subplan be prepared, it must identify any requirements for how emergency coastal protection works, within the meaning of the CM SEPP, are to be carried out. Note: Emergency Coastal Protection Works are defined in Clause 19(4) of the CM SEPP
Requirements for taking coastal change into account when preparing a CMP (Mandatory Requirements 12 and 13)
A CMP must demonstrate how a council has considered: (i) projected population growth and demographic changes; and (ii) projected use of coastal land for infrastructure, housing, commercial, recreational and conservation purposes.

A CMP must demonstrate how a council has considered:

(i) current and future risks, at timeframes of immediate, 20 years, 50 years, 100 years and (if council considers it relevant based on expert advice) beyond;

(ii) (if council considers it relevant) current and future risks of potentially high consequence, low probability events that may affect the relevant area;

(iii) the effects of projected climate change and how it may affect the relevant area;

(iv) the local and regional scale effects of coastal processes; and

(v) the ambulatory and dynamic nature of the shoreline and how it may affect the relevant area.

Format and content required of a CMP (Mandatory Requirement 14)

A CMP is to include the following sections:

(i) Executive summary.

(ii) Introduction.

(iii) A snapshot of issues.

(iv) Actions to be implemented by the council or by public authorities.

(v) Whether the CMP identifies recommended changes to the relevant planning controls, including any proposed maps.

(vi) A business plan.

(vii) Coastal zone emergency action subplan, if the CM Act requires that subplan to be prepared.

(viii) Monitoring, evaluation and reporting program.

(ix) Maps.

(x) Reference list.

Community Engagement and Consultation (Mandatory Requirement 15)
A draft CMP must be exhibited for public inspection at the main offices of the councils of all local government areas within the area to which the CMP applies, during the ordinary hours of those offices, for a period of not less than 28 calendar days before it is adopted. This mandatory requirement does not prevent community consultation, or other consultation, in other ways.

Appendix C Audit of Moruya / Deua River Estuary Management Plan (Eurobodalla Shire Council, 2018)

TABLE 3: PLANNING CONTROLS AND POLICIES - IMPLEMENTATION SCHEDULE (REFER FIGURE 5)

ITEM	RECOMMENDED STRATEGY	OBJECTIVES TARGETED	PRIORITY RANKING	ACTIONS	**Progress and Comments**
PCP-1	Incorporate all areas of SEPP 14 Wetlands and Endangered Ecological Communities into land use mapping as part of review of the Local Environmental Plan (*LEP*).	- Protect and restore riparian vegetation - Restrict stock access to foreshore and wetland areas - Increase connectivity of foreshore habitats (wildlife corridors) - Provide for sustainable development of the estuary - Resolve conflicts between development controls and other policies	H	1. Review latest mapping for SEPP 14 Wetlands and Validated and Potential EECs (refer Strategy IR-4) in reference to existing land use mapping to identify Environmental Protection areas that are currently not accommodated by existing Rural and Urban LEPs. 2. Updated land use mapping for revised LEP to incorporate sensitive communities into environmental protection areas, as required by the South Coast Regional Strategy (2007). 3. Where appropriate, incorporate recommendations from the recent study by Eco Logical Australia (ESC, 2007c) into land use mapping for Urban Expansion Zones. These include constraints on development of areas of EECs in 'moderate to good' condition and potential 'biolinks'. 4. Council staff from Moruya / Deua River Estuary Management Committee to review draft land use mapping produced for the revised LEP. 5. Council planning staff to report potential changes in mapping to Moruya / Deua River Estuary Management Committee during public exhibition of the LEP.	Where do I start? This was completed with wetlands being zoned E2. These zones remain but a recent planning proposal has amended the allowable use to allow grazing of wetlands.
PCP-2	Incorporate requirements of Council's Acid Sulfate Soils (ASS) Policy into revised Local Environmental Plan (*LEP*).	- Maintain existing good water quality - Protect and preserve aquatic habitats (including seagrasses and saltmarsh) - Provide for sustainable development of the estuary	H	1. Incorporate details currently contained in Council's ASS Policy into revised LEP, including latest extent mapping for all classes of ASS. 2. Council planning staff to advise when LEP completed.	Done - local clause and mapping overlay
PCP-3	Incorporate requirements and recommendations from Riparian Corridor Objective Setting (*RCOS*) report (*2006*) into revised Local Environmental Plan (*LEP*).	- Protect and restore riparian vegetation - Increase connectivity of foreshore habitats (wildlife corridors) - Provide for sustainable development of the estuary - Resolve conflicts between development controls and other policies	H	1. Extract relevant recommendations regarding the management of Core Riparian Zones and vegetated buffers from 2006 report prepared by DNR, including the appropriate positioning of all future services such as footpaths and cycleways. 2. Incorporate RCOS recommendations into revised LEP. 3. Committee member from DECC to review draft version of LEP and advise of any changes required. 4. Council planning staff to advise when LEP completed.	Done – Stream categories mapped in LEP.
PCP-4	Undertake an audit every 2 years of erosion and sediment controls for all new developments constructed in the previous 4 year period.	- Reduce and prevent further sedimentation of the estuary - Maintain existing good water quality - Tighter enforcement of development controls - Protect and preserve aquatic habitats (including seagrasses and saltmarsh)	H	1. Establish auditing program, including auditing methods and training for Council staff. 2. Determine list of new developments constructed in the last 2 or 4 years. 3. Undertake audits of identified sites according to development consent conditions regarding permanent and temporary (if applicable) Erosion & Sediment Control requirements. 4. Issue warnings / penalties for where Erosion & Sediment Controls have not been satisfactorily maintained or implemented.	Not commenced
PCP-5	Develop a Water Sensitive Urban Design Policy for Eurobodalla Shire.	- Maintain existing good water quality - Reduce and prevent further sedimentation of the estuary - Provide for sustainable development of the estuary - Consider and manage the impacts of climate change on estuary processes	H	1. Appropriate Council officer to report to the Committee every 6 months regarding progress of development of WSUD Policy. 2. Moruya River Estuary Management Committee to provide input to develop and review WSUD Policy if required. 3. WSUD policy to aim to minimise pollutants to the estuary and consider the potential impacts of climate change (e.g., changes in catchment hydrology).	Done – Eurobodalla Integrated watercycle mgt plan
PCP-6	Incorporate appropriate stormwater quality management measures for the expanding North Moruya Industrial Estate into the next revision of the Urban Stormwater Quality Management Plan for Eurobodalla Shire.	- Maintain existing good water quality - Reduce and prevent further sedimentation of the estuary - Provide for sustainable development of the estuary	H	1. Develop stormwater quality management measures for industrial areas to be included in the revised USQMP in conjunction with requirements of the new Development Control Plan for Industrial Developments (as recommended in the Moruya Structure Plan, 2007). 2. Infrastructure Planning Engineer to periodically report to Committee regarding status of new USQMP.	
PCP-7	Investigate the rezoning or strategic purchase of land to account for potential impacts of climate change on estuary processes and development, and incorporate findings into revised Local Environmental Plan (*LEP*).	- Consider and manage the impacts of climate change on estuary processes - Protect and restore riparian vegetation - Protect and preserve aquatic habitats (including seagrasses and saltmarsh) - Provide for sustainable development of the estuary	H	1. Monitor developments in sea level rise predictions from the Intergovernmental Panel on Climate Change (IPCC) and associated research from CSIRO and the Australian Greenhouse Office. 2. Investigate appropriate flood planning levels for development considering climate change projections. 3. Investigate and identify areas suitable for relocation/migration of coastal vegetation, saltmarshes and Endangered Ecological Communities (EECs) that may be threatened by sea level rise. Indicative areas that may be susceptible to inundation are shown in Figure 6. It is envisaged that adjacent landward strips of the foreshore could be identified as suitable for vegetation migration. 4. Investigate and confirm areas of existing urban development and future urban expansion that may be threatened by sea level rise. Refer to Figure 6 for suggested areas. 5. Revise land use mapping or investigate strategic purchase of land to provide buffer zones for vegetation migration and to ensure that future development is outside of areas potentially impacted by sea level rise. 6. Incorporate revised land use mapping and recommendations into new LEP in accordance with the findings of the investigations outlined above. 7. As required, update relevant development controls to account for sea level rise, including design freeboards for sewerage and stormwater infrastructure, dwellings, sea walls and recreational facilities.	Not commenced
PCP-8	Develop a stormwater operations manual for Council's outdoor staff and machinery operators.	- Reduce and prevent further sedimentation of the estuary - Maintain existing good water quality - Improve education and awareness of estuary issues - Maintain and enhance visual aesthetics and quiet rural lifestyle	H	1. Lobby for funding to create operations manual, with support from Roads and Recreation department. 2. Incorporate requirements for proper implementation of erosion and sediment control measures for construction and roadworks sites. 3. Conduct a training workshop every 12 months to account for turn over in staff.	

TABLE 3: PLANNING CONTROLS AND POLICIES - IMPLEMENTATION SCHEDULE (REFER FIGURE 5)

ITEM	RECOMMENDED STRATEGY	OBJECTIVES TARGETED	PRIORITY RANKING	ACTIONS	ESTIMATED COST
PCP-9	Implement Landscape Concept Plan for Glenduart Riverside Reserve.	- Protect and restore Aboriginal and European heritage - Protect and restore riparian vegetation - Improve foreshore access and facilities for recreation - Maintain and enhance visual aesthetics and quiet rural lifestyle	H	1. Landscape Concept Plan is to incorporate access locations and fire mitigation measures. 2. Modify and develop concept designs for rehabilitation based on results of Aboriginal sites assessment. 3. Prepare detail designs for rehabilitation works, if required.	Done
PCP-10	Develop a Boating Management Plan for Moruya River.	- Improve foreshore access and facilities for recreation - Protect and preserve aquatic habitats (including seagrasses and saltmarsh) - Promote sustainable tourism for the estuary - Maintain and enhance visual aesthetics and quiet rural lifestyle - Consider and manage the impacts of climate change on estuary processes	H	1. NSW Maritime to continue to monitor any conflict between users of the estuary and report to Committee on any developments. 2. Moruya River to be the next estuary within the Batemans Bay NSW Maritime Patrol Area to be considered for a Boating Management Plan. NSW Maritime to report regularly to Committee. 3. NSW Maritime to report to the Committee on the status of development and implementation of the Clyde River Boating Management Plan. 4. NSW Maritime to monitor any long term changes in the location and extent of shoals that may arise due to climate change. The impact on navigation within the estuary, if any, is to be considered when preparing the Boating Management Plan. 5. Investigate impact of wakeboarding on shoreline erosion. If required, implement measures to manage wakeboarding activity to minimise further erosion.	NA
PCP-11	Coordinate with Eurobodalla Bush Fire Management Committee to update the Eurobodalla Bush Fire Risk Management Plan to incorporate recommendations contained in the Draft Rural Lands Strategy (November 2005) by Council and the report, "Riparian Corridor Objective Setting for Selected Streams between Batemans Bay and Moruya" prepared by DNR and ESC (in Draft, September 2005).	- Protect and restore riparian vegetation - Increase connectivity of foreshore habitats (wildlife corridors) - Provide for sustainable development of the estuary - Resolve conflicts between development controls and other policies	M	1. Update the Plan to exclude the Core Riparian Zone and Vegetated Buffer from the Asset Protection Zone for new developments meaning that vegetation clearing is not permitted for asset protection or strategic fire management within: - 100 metres of the shore of Moruya River (Category 1); - 50 metres of the shore of Wamban Creek (Category 1); - 40 metres of the shore of Malabar, Dooga, Gilmores, Candoin, Mogendoura, or Racecourse Creeks and other unnamed creeks (Category 2); and, - 20 metres of the shore of other minor streams (Category 3). 2. Representative from Eurobodalla Bush Fire Management Committee to report to Estuary Management Committee when Plan has been updated.	
PCP-12	Ensure Council planning staff are briefed on the contents of the Moruya / Deua River Estuary Management Plan and are aware of the impacts of planning decisions on estuary water quality and recent changes in legislation and policies for urban development along the estuary.	- Maintain existing good water quality - Provide for sustainable development of the estuary - Promote sustainable industry for the catchment and floodplain - Improve education and awareness of estuary issues	M	1. Strategy to target new staff arriving at Council. 2. Undertake training activities every 6 months, including a one-day seminar and distribution of a brief training manual.	Done but not monitored or updated
PCP-13	Increase enforcement of restrictions on camping in the Moruya River riparian zone. Program to target areas adjacent to North Head Camping Area and the rehabilitated reserve near the mouth of Ryans Creek.	- Reduce and prevent further sedimentation of the estuary - Protect and restore riparian vegetation - Maintain existing good water quality - Tighter enforcement of development controls - Promote sustainable tourism for the estuary	M	1. Undertake survey and site inspections to determine and document the most popular sites for illegal camping. 2. Erect up to 30 new signs at identified sites to warn campers of penalties against illegal camping activities and illegal overnight stays. 3. Incorporate camping exclusion zone along the foreshore in the vicinity of North Head on Council's existing brochure: 'Bush Camping by the Beach'. 4. Increase patrolling by Council Rangers at the documented target sites, particularly during warmer months and in the evenings. 5. Refer Strategy BFR-1 in Bank and Foreshore Rehabilitation Plan.	Ongoing
PCP-14	Purchase / obtain access to 30 metre wide strip of riparian land on the foreshore of Moruya River upstream from the River Breeze Caravan Park. Acquirement of land would allow connectivity of the foreshore reserve between Moruya Bridge and Glenduart Reserve, thereby allowing Strategy OGW-7 to be implemented.	- Protect and restore riparian vegetation - Increase connectivity of foreshore habitats (wildlife corridors) - Improve foreshore access and facilities for recreation - Restrict stock access to foreshore and wetland areas	L	1. Investigate options to establish easement across land or negotiate access without changing land tenure. 2. If required, negotiate with landholders to determine a suitable price for purchase of the land and the provision of any works to move stock fencing. 2. Purchase / acquire land and undertake any required works.	Not commenced and unlikely to proceed

* Cost estimates are based on Patterson Britton & Partner's experience and judgement as a firm of practising professional engineers familiar with the construction industry.
Cost estimates can NOT be guaranteed as we have no control over Contractor's prices, market forces and competitive bids from tenderers.
Cost estimates may exclude items which should be considered in a cost plan. Examples of such items are design fees, project management fees, authority approval fees, contractors risk and project contingencies (*e.g. to account for construction and site conditions, weather conditions, ground conditions and unknown services*).
Cost estimates by Patterson Britton & Partners are not to be relied upon. If a reliable cost estimate is required, then an appropriately qualified Quantity Surveyor should be engaged.

TABLE 4: ON-GROUND WORKS - IMPLEMENTATION SCHEDULE (REFER FIGURES 7 AND 8)

ITEM	RECOMMENDED STRATEGY	OBJECTIVES TARGETED	PRIORITY RANKING	ACTIONS	Progress	PROJECTED DATE FOR COMMENCEMENT
OGW-1	Maintain rock protection walls along the lower estuary.	- Rehabilitate eroded sections of the riverbank and damaged sections of existing bank stabilisation works - Reduce and prevent further sedimentation of the estuary - Protect and restore riparian vegetation - Improve foreshore access and facilities for recreation - Consider and manage the impacts of climate change on estuary processes	H	1. Develop procedures and determine locations for assessment of the condition of rock protection walls. 2. Undertake survey and assessment of existing rock walls. 3. Identify and prioritise sites for rehabilitation works. 4. Develop concept and detail designs for high priority rehabilitation works. Impacts on riparian vegetation should be considered. 5. Seek funding to undertake high priority rehabilitation works. 6. Future maintenance works are to consider the potential impacts of climate change on the structural stability of the walls and management response is to be adjusted accordingly.	Ongoing – flood program funding has been applied adjacent to bridge on Nth shore	2009
OGW-2	Repair or replace Quarry Wharf.	- Improve foreshore access and facilities for recreation - Promote sustainable tourism for the estuary - Protect and restore Aboriginal and European heritage	H	1. Council to assess Development Application by Dept of Lands to demolish Quarry Wharf. 2. If DA is approved, Council to take ownership of the site once wharf has been demolished. Apply to NSW Maritime for funding assistance to construct pontoon wharf for recreational boating. 3. If DA is denied on the grounds of heritage value, negotiate with Dept of Lands for restoration of the wharf prior to Council taking ownership.	complete	2009
OGW-3	Construct a boardwalk through Ryans Creek wetland to consolidate pedestrian access and protect riparian vegetation.	- Improve foreshore access and facilities for recreation - Protect and restore riparian vegetation - Promote sustainable tourism for the estuary - Protect and restore Aboriginal and European heritage	M	1. Develop concept design for boardwalk alignment and construction features. Incorporate future plans to extend the cycleway from South Head to Moruya which would involve a bridge over Ryans Creek (refer Strategy IR-7). 2. Consult with community and Local Aboriginal Land Councils regarding concept design. 3. Undertake environmental assessment of the proposed works and seek funding and approvals. 4. Prepare detail design and construct boardwalk.	Not commenced	2010
OGW-4	Formalise foreshore facilities and close informal boat ramp at popular recreation area on North Head Drive, 600 metres west of Malabar Weir.	- Improve foreshore access and facilities for recreation - Promote sustainable tourism for the estuary - Reduce and prevent further sedimentation of the estuary	M	1. Develop concept design to formalise facilities for the area between North Head Drive and the existing natural beach on Moruya River. 2. Liaise with recreational users of the beach, particularly waterskiing families, to obtain feedback regarding the concept design. 3. Undertake works to formalise the gravel parking area beside North Head Drive and to provide garbage bins near the foreshore. Bollards or boulders to be installed to restrict access the existing beach by vehicles that currently use it for launching boats.	Not commenced	2012
OGW-5	Seek funding to remediate high priority fish barriers in the Moruya River catchment, as identified in the report by NSW DPI titled, *'Reducing the impact of road crossings on aquatic habitat in coastal waterways - Southern Rivers, NSW'* .	- Understand, sustain and improve fish productivity in the estuary - Protect and preserve aquatic habitats (including seagrasses and saltmarsh) - Maintain existing good water quality - Consider and manage the impacts of climate change on estuary processes	M	1. Obtain details of the causeway assessments and recommendations for each priority site from Department of Primary Industries. 2. Prepare concept designs for additional culverts or a bridge at the Neringla Road causeway at Telowar Creek. 3. Prepare concept designs for increasing the size of culverts at the Dwyers Creek Road crossing of Candoin Creek. 4. Designs are to consider the impacts of climate change on fish passage, including migration of fish habitat as a result of changed flow regimes and sea level rise. 5. Seek funding to undertake detail design and construction of proposed remediation works.		2012
OGW-6	Install vessel pump-out facilities, potentially at Moruya Town Wharf.	- Promote sustainable tourism for the estuary - Maintain existing good water quality - Improve foreshore access and facilities for recreation	M	1. Determine the best location and layout for facilities, including wastewater pump-out, fuel supply and water supply. 2. Undertake a comprehensive environmental impact assessment for the potential facilities, including the impact of accident scenarios and spills on water quality and aquatic life. This is also to include consideration of the increased vessel traffic along Moruya River resulting from the facilities. 3. Undertake consultation with local community regarding the proposed facilities. 4. Subject to environmental approval and community feedback, prepare designs for the proposed systems. 5. Construct facilities and associated infrastructure such as footpaths and amenities.	Not commenced – unlikely to occur	2012
OGW-7	Construct a combined pedestrian walkway and cycleway along north bank of Moruya River between River Breeze Caravan Park and Glenduart Riverside Reserve (2.4 km).	- Improve foreshore access and facilities for recreation - Protect and restore riparian vegetation - Promote sustainable tourism for the estuary - Maintain and enhance visual aesthetics and quiet rural lifestyle	L	1. Construction of walkway/cycleway will require permission from the Crown and will be subject to obtaining access to private property along the foreshore (refer Strategy PCP-14) or will require permission from landholders. 2. Investigate methods and materials to construct walkway/cycleway along foreshore with alignment not further than 5 metres landward from the existing fence between riparian vegetation and privately owned / leased land. 3. Provide formalised access to viewing platforms at the foreshore every 500 metres. 4. Undertake works in conjunction with vegetation management activities in the riparian zone (refer Strategy BFR-9). Ensure that works do not impact on existing or future riparian vegetation.	Not commenced – relies on purchase of private land. Unlikely to happen..	2013
OGW-8	Offer incentives to landholders at Mogendoura to provide stock control measures to prevent stock access to the foreshore and natural beach on the north bank of Moruya River upstream from the confluence with Mogendoura Creek.	- Restrict stock access to foreshore and wetland areas - Protect and restore riparian vegetation - Reduce and prevent further sedimentation of the estuary - Improve foreshore access and facilities for recreation	L	1. Determine whether stock access is causing significant degradation of the riparian vegetation and the natural beach. 2. If required, encourage landholders to enter into Property Vegetation Plans with SRCMA under the Eurobodalla Biodiversity Program (refer Strategy ECI-4). 3. If suitable, install stock fencing to prohibit stock access to the foreshore and natural beach.	Previously CMA and now LLS have worked with some of these landholders	2013
OGW-9	Incorporate canoe / kayak launching area into Yarragee Reserve Plan of Management (September 2006).	- Improve foreshore access and facilities for recreation - Protect and restore riparian vegetation - Promote sustainable tourism for the estuary	L	1. Update the works schedule detailed in the Plan of Management to provide a foreshore pathway with sufficient width to allow pedestrian transport of recreational water craft to the beach. 2. Prevent vehicular access to the beach by installing bollards at the widened pathway. Undertake revegetation works as shown in the landscaping plan from the Yarragee Reserve Plan of Management. 3. Council's Environment Team to report to Committee to provide updates on the status of work at Yarragee Reserve.	Not needed. Beach area is good launching site.	2013

TABLE 4: ON-GROUND WORKS - IMPLEMENTATION SCHEDULE (REFER FIGURES 7 AND 8)

ITEM	RECOMMENDED STRATEGY	OBJECTIVES TARGETED	PRIORITY RANKING	ACTIONS	ESTIMATED COST	PROJECTED DATE FOR COMMENCEMENT
OGW-10	Install storage facilities for oyster growers at Pilot Station Backwater.	- Maintain and enhance visual aesthetics and quiet rural lifestyle - Promote sustainable industry for the catchment and floodplain - Protect and preserve aquatic habitats (including seagrasses and saltmarsh) - Improve foreshore access and facilities for recreation	L	1. Undertake consultation with oyster spat farmers at Pilot Station Backwater to determine the likely demand for small-scale storage facilities for oyster growing materials. 2. Undertake general consultation with the community at Moruya Heads to gauge public support for the installation of storage facilities. 3. If required, apply for funding to erect up to five small storage structures. It is envisaged that the dimensions of facilities would not exceed 2 metres in length/width and 1.5 metres in height. Facilities should be permanently fastened to the ground to avoid theft, vandalism and loss of materials.	Discuss with growers. Most are not punt based and don't require storage and sheds.	2014
OGW-11	Install BBQ facilities at Yarragee Reserve and Ryans Creek Parkland adjacent to proposed carpark and wetland areas.	- Improve foreshore access and facilities for recreation - Promote sustainable tourism for the estuary - Protect and restore Aboriginal and European heritage	L	1. Investigate feasibility of installing appropriate gas BBQ facilities. 2. Install up to three BBQs at each location to compliment low key level of amenities such as bins and park furniture, to be installed at Yarragee Reserve and Ryans Creek Parkland in accordance with the relevant Plans of Management.	No longer relevant	2014

* Cost estimates are based on Patterson Britton & Partner's experience and judgement as a firm of practising professional engineers familiar with the construction industry.
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Cost estimates may exclude items which should be considered in a cost plan. Examples of such items are design fees, project management fees, authority approval fees, contractors risk and project contingencies (*e.g. to account for construction and site conditions, weather conditions, ground conditions and unknown services*).
Cost estimates by Patterson Britton & Partners are not to be relied upon. If a reliable cost estimate is required, then an appropriately qualified Quantity Surveyor should be engaged.

TABLE 5: INVESTIGATION AND RESEARCH - IMPLEMENTATION SCHEDULE (REFER FIGURE 9)

ITEM	RECOMMENDED STRATEGY	OBJECTIVES TARGETED	PRIORITY RANKING	ACTIONS	ESTIMATED COST	SUGGESTED RESPONSIBILITY	PROJECTED DATE FOR COMMENCEMENT
IR-1	Investigate the potential impacts of climate change on the Moruya River estuary.	- Consider and manage the impacts of climate change on estuary processes - Provide for sustainable development of the estuary	H	1. Monitor information from IPCC, CSIRO, DECC and other information relating to climate change predictions for the South Coast of NSW. 2. Work with state and federal governments, universities and industry groups to fund investigations into the potential impacts of climate change on the natural and built assets within and around the estuary.	$50,000	ESC and DECC	2009
IR-2	Undertake an audit of all foreshore structures on Moruya River and its tributaries, addressing the condition and legality of structures.	- Maintain and enhance visual aesthetics and quiet rural lifestyle - Improve foreshore access and facilities for recreation - Protect and restore riparian vegetation	H	1. DoL to undertake audit internally or commission independent party to undertake audit. 2. If required, independent party to undertake audit and report to Council and Dept of Lands. 3. Use results of audit to identify illegal structures, including any disused and derelict oyster leases. 4. Request that landholders appropriately modify or remove any illegal foreshore structures on their properties. 5. Remove illegal structures on public foreshore land with funding assistance from the Dept of Lands.	$12,000	ESC and Department of Lands	2009
IR-3	Undertake audit of stock fencing surrounding SEPP 14 Wetlands, Endangered Ecological Communities (*EECs*), mangroves and saltmarsh areas. Investigations to focus on wetlands and EECs at Malabar Lagoon, The Anchorage, Ryans Creek and Mogendoura Creek.	- Restrict stock access to foreshore and wetland areas - Protect and restore riparian vegetation - Reduce and prevent further sedimentation of the estuary - Maintain existing good water quality	H	1. Audit fencing and stock access at rural properties surrounding wetland areas. 2. If stock fencing found to be in need of repair or replacement on private land, encourage landholder to enter into a Property Vegetation Plan with SRCMA (refer Strategy ECI-4). 3. Repair or install appropriate stock fencing on public land if found to be inadequate. Seek funding assistance from SRCMA.	$25,000	ESC and SRCMA	2009
IR-4	Compile GIS mapping and information from all previous investigations and works to clearly identify existing Endangered Ecological Communities (*EECs*) within the Moruya River catchment.	- Increase connectivity of foreshore habitats (wildlife corridors) - Protect and restore riparian vegetation - Provide for sustainable development of the estuary	H	1. Council's GIS team to update all mapping for EECs, including the compilation and merging of previously estimated EEC extents and recently ground-truthed vegetation extents (ESC 2007c). 2. Council's GIS system to be updated to incorporate and display all works previously undertaken by Council and SRCMA to protect and rehabilitate areas of EECs. 3. Prepare report to show all current mapping for EECs and location of previous rehabilitation works. Report to also identify locations where ground-truthing is required for estimated EEC extents, and to prioritise the location and type of future on-ground works for Council and SRCMA to undertake.	$10,000	ESC and SRCMA (with assistance from DECC)	2010
IR-5	Undertake an audit of infrastructure within the Moruya River catchment, such as unsealed roads and tracks in order to identify point sources of sediment and pollutants.	- Reduce and prevent further sedimentation of the estuary - Maintain existing good water quality	H	1. Compile an inventory of all Council owned, National Parks and State Forests unsealed roads and tracks within the Moruya River catchment. 2. Develop criteria for assessment of infrastructure, such as soil type, site slope and potential for sediment mobilisation and proximity to waterways. 3. Undertake site inspections to audit and assess sites. 4. Use results of audit to develop a list of priority sites for erosion and sediment control works along roads and tracks. 5. As suggested by Fu, Field and Newham (2006), investment of funds for sediment control may be more effective within the Donalds Creek sub-catchment. 6. Apply for funding assistance from SRCMA to design and implement appropriate sediment control measures.	$30,000	ESC (with assistance from SRCMA and DECC)	2010
IR-6	Undertake audit of stock fencing along riparian zone between Princes Highway and tidal limit of Moruya River.	- Restrict stock access to foreshore and wetland areas - Protect and restore riparian vegetation - Reduce and prevent further sedimentation of the estuary - Maintain existing good water quality	H	1. Commission independent party to undertake audit of fencing for properties fronting Moruya River or the riparian zone. 2. If stock fencing found to be inadequate on private land, encourage landholder to enter into a Property Vegetation Plan with SRCMA (refer Strategy ECI-4). 3. Identify encroachments into and illegal use of public foreshore land. 4. Order cessation of illegal uses of public land. 5. Repair or install appropriate stock fencing on public land if found to be inadequate. Seek funding assistance from SRCMA.	$30,000	ESC and SRCMA	2010
IR-7	Investigate the feasibility of constructing a pedestrian / cycleway between Ryans Creek and Preddys Wharf as part of the cycleway linking South Head to Moruya Township.	- Improve foreshore access and facilities for recreation - Promote sustainable tourism for the estuary - Maintain and enhance visual aesthetics and quiet rural lifestyle	M	1. Prepare a preliminary concept design for the cycleway alignment. Take into account any previously cleared corridors through the Ryans Creek wetland, special design features such as a bridge over Ryans Creek and bank and foreshore management options identified in the Bank and Foreshore Rehabilitation Plan (refer Appendix A). 2. Investigate the social benefit of constructing the cycleway link by undertaking community consultation to gauge interest and support for the concept design. 3. Undertake a detailed assessment of the environmental impact of the cycleway and of the cost for construction, including for the bridge over Ryans Creek. 4. If found feasible, apply for further funding to undertake detail design and construction of the cycleway.	$25,000	ESC and DECC	2012
IR-8	Undertake investigations to determine the feasibility of installing additional boat moorings at North Head, and if appropriate, install moorings.	- Promote sustainable tourism for the estuary - Improve foreshore access and facilities for recreation	L	1. Develop basic concept design for mooring layout and access requirements. 2. Undertake environmental impact assessment for the proposed facilities, including the impact of moorings and increased boat traffic on valuable seagrass beds and water quality in the vicinity of North Head. 3. Undertake assessment of the impact of additional moorings from a planning perspective. 4. Undertake consultation with local community regarding the proposed facilities. 5. If there are no significant environmental impacts and community feedback is supportive, prepare detail designs for the proposed moorings. 6. Install moorings and construct associated infrastructure such as the access-way, gates and amenities.	$60,000	ESC and NSW Maritime (with assistance from DECC)	2013
IR-9	Undertake a detailed survey of the extent and concentration of benthic flora and fauna in the estuary downstream from Kiora Bridge.	- Understand, sustain and improve fish productivity in the estuary - Protect and preserve aquatic habitats (including seagrasses and saltmarsh)	L	1. Approach local Universities for any opportunities to undertake investigations as part of a undergraduate or post-graduate research project. 2. Use results from survey in conjunction with results from fisheries data gained through work for Strategy M-3 to determine any potential impacts of benthic flora and fauna on fish habitats and therefore fish populations.	$20,000	DPI and ESC (with assistance from Universities, and DECC)	2014

* Cost estimates are based on Patterson Britton & Partner's experience and judgement as a firm of practising professional engineers familiar with the construction industry.
Cost estimates can NOT be guaranteed as we have no control over Contractor's prices, market forces and competitive bids from tenderers.
Cost estimates may exclude items which should be considered in a cost plan. Examples of such items are design fees, project management fees, authority approval fees, contractors risk and project contingencies (*e.g. to account for construction and site conditions, weather conditions, ground conditions and unknown services*).
Cost estimates by Patterson Britton & Partners are not to be relied upon. If a reliable cost estimate is required, then an appropriately qualified Quantity Surveyor should be engaged.

TABLE 6: EDUCATION AND COMMUNITY INVOLVEMENT - IMPLEMENTATION SCHEDULE (REFER FIGURE 10)

ITEM	RECOMMENDED STRATEGY	OBJECTIVES TARGETED	PRIORITY RANKING	ACTIONS	ESTIMATED COST	SUGGESTED RESPONSIBILITY	PROJECTED DATE FOR COMMENCEMENT
ECI-1	Prepare and distribute community education material that outlines the importance of estuary processes and details of permitted activities for Crown and Council land on the foreshore of Moruya River and its tributaries.	- Improve education and awareness of estuary issues - Maintain existing good water quality - Improve foreshore access and facilities for recreation - Protect and restore riparian vegetation - Consider and manage the impacts of climate change on estuary processes	H	1. Prepare information material containing a brief summary of estuary processes and the potentially adverse impacts of stormwater pollution, vegetation clearing and unapproved development on the health of the Moruya River Estuary. 2. Include examples of permitted and prohibited activities for public land at the foreshore to Moruya River and tributaries. Include graphics and photographs where appropriate. 3. Material is to include details of the penalties that offenders may face if they undertake prohibited activities and development works on public land, such as the construction of dams and fencing, without approval. 4. Material is to include commentary on the potential impacts of climate change and sea level rise on estuary processes, to raise awareness of climate change issues. 5. Deliver material in a variety of ways, including brochures and digital information on Council's website, when and where appropriate. 6. Conduct targeted education campaigns to specific audiences where appropriate, including at the North Moruya Industrial Estate and local schools.	$12,000	ESC MPA DECC SRCMA	2009
ECI-2	Develop a community education program targeted at riparian landowners to raise awareness of the importance of riparian vegetation.	- Improve education and awareness of estuary issues - Protect and restore riparian vegetation - Increase connectivity of foreshore habitats (wildlife corridors) - Consider and manage the impacts of climate change on estuary processes - Maintain existing good water quality	H	1. Prepare fact sheets and brochures that show examples of acceptable and prohibited vegetation clearing in the riparian zone. Include details of the penalties applicable for illegal activities and contact information to report illegal vegetation clearing. Periodically distribute fact sheets to riparian landholders. 2. Prepare and distribute a foreshore planting guide to inform riparian landholders of appropriate native species for the riparian zone. Digital copy to be made available on Council's website. 3. Prepare and distribute an information brochure to encourage riparian landowners to enter into Voluntary Conservation Agreements (VCA), Property Vegetation Plans or other conservation agreements, specifically targeted towards providing foreshore areas for landward migration of saltmarsh and other riparian vegetation in response to sea level rise (refer susceptible areas shown in Figure 6). 4. Conduct field days at demonstration sites to educate riparian landholders (and the greater community) on appropriate vegetation species and planting techniques.	$12,000 + $10,000 / year	ESC SRCMA Landcare DECC	2009
ECI-3	Review the format and terms of reference of the Moruya / Deua Estuary Advisory Committee with a view to create a Coastal Advisory Committee that incorporates the management of the Moruya / Deua River Estuary as well as the surrounding coastline.	- Proper implementation of the Estuary Management Plan will target all objectives	H	1. Appoint a Coastal Advisory Committee Coordinator under a part-time agreement, subject to work load. 2. Committee to meet annually to assess the progress of implementation of the Estuary Management Plan and determine works for the immediate future. 3. Committee Coordinator and relevant Committee members are to report on the status of specific projects and works.	$25,000 / year	SRCMA ESC	2009
ECI-4	Develop a targeted campaign to encourage rural landholders to enter into Property Vegetation Plans with Council and the Southern Rivers Catchment Management Authority as part of the Eurobodalla Biodiversity Program.	- Promote sustainable industry for the catchment and floodplain - Improve education and awareness of estuary issues - Reduce and prevent further sedimentation of the estuary - Restrict stock access to foreshore and wetland areas - Maintain existing good water quality - Consider and manage the impacts of climate change on estuary processes	H	1. Work with SRCMA to develop and distribute an information brochure that clearly outlines the process of developing and implementing a Property Vegetation Plan, including the level of funding and other incentives offered through SRCMA and Council. 2. Invite rural landholders within the Moruya/Deua River catchment to attend information nights and field days to demonstrate the benefits of entering into a Property Vegetation Plan. 3. Encourage landholders to enter into 10-year management agreements with Council and SRCMA.	$10,000 / year	SRCMA ESC Landcare	2009
ECI-5	Distribute copies of the Final Moruya / Deua Estuary Management Plan to local community groups and businesses to attract funding, sponsorship and volunteers.	- Improve education and awareness of estuary issues	H	1. Distribute copies of the final Estuary Management Plan (EMP) document to local community groups such as Landcare groups, Apex, Rotary and Scouts to call for volunteers to assist in semi-skilled works and non-technical investigations as part of the strategies detailed above. 2. Distribute copies of the EMP to local businesses to attract funding support or sponsorship to undertake the above strategies (or part thereof). 3. Make a digital copy of the EMP available on Council's website for any interested parties to download.	$3,000	ESC	2009

* Cost estimates are based on Patterson Britton & Partner's experience and judgement as a firm of practising professional engineers familiar with the construction industry.
Cost estimates can NOT be guaranteed as we have no control over Contractor's prices, market forces and competitive bids from tenderers.
Cost estimates may exclude items which should be considered in a cost plan. Examples of such items are design fees, project management fees, authority approval fees, contractors risk and project contingencies (*e.g. to account for construction and site conditions, weather conditions, ground conditions and unknown services*).
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Appendix D Audit of Wagonga Inlet Estuary Management Plan (Eurobodalla Shire Council, 2018)

5.1 Goal: to protect water quality within the inlet for human health and to maintain a healthy ecosystem

Objective: To gain a better understanding of water quality and compliance with guidelines

Strategy		Action	Priority	Responsibility	
Assess changes to water quality within Forsters Bay	1.1	Develop and implement water quality monitoring program (see **Section 6.1** for more details) including testing for chlorophyll-a (to assess ecosystem health) and bacteria (to assess compliance with ANZECC & NH&MRC guidelines for primary contact recreation – a sampling and analysis program currently exists for oysters as part of the NSW Shellfish Quality Assurance Program (SQAP).	high	**ESC**, DLWC, Wagonga SQAP	Ongoing program. Also estuary health reports

Objective: To minimise discharge of effluent from commercial and recreational vessels

Strategy		Action	Priority	Responsibility	
Increase awareness of appropriate means	1.2	Support initiatives to make holding tanks mandatory for commercial vessels.	high	EMC	RMS
of disposal of effluent from boats	1.3	Include information on boat pumpout facility in Forsters Bay when Waterways Map is revised.	medium	Waterways	

Objective: To improve the quality of run-off from urban and rural areas

Strategy		Action	Priority	Responsibility	
Ensure the inlet is not affected by seepage from septic tanks	1.4	Continue to carry out environmental audits of septic tanks within the catchment of the inlet to identify poor performance and any illegal discharges. Notify owners of required actions, eg desludging, pumpout.	high	ESC	Council has ongoing OSMS inspection program. Orders can be served to fix and maintain faulty systems.
	1.5	As part of the water quality monitoring program for Forsters Bay (see **Section 6.1**) include sampling sites to identify any changes to run-off/water quality due to the development of Ringlands Estate.	high	ESC	
Identify and address possible pollutant sources	1.6	Carry out an environmental audit of businesses around the inlet to identify practices which adversely impact on water quality – prepare educational package on appropriate site management practices (see **Section 6.1**).	medium	ESC	
	1.7	Continue actions to minimise sewer overflows at Narooma, eg pressure cleaning mains of tree roots, pump draw down tests.	ongoing	ESC	

Strategy		Action	Priority	Responsibility	
Manage land use/development to prevent accelerated input of sediments from the catchment	1.8	Encourage the formation of a Landcare group to assist in developing vegetated buffer zones around tributary creeks, as well as promoting erosion control, planting programs, exclusion of stock, protection of SEPP No. 14 wetlands, noxious weed control and feral animal control.	medium	**DLWC**, ESC, RLPB, EMC	Narooma Landcare group extended to new areas; Lewis Island group formed. LLS funded projects with private properties.
	1.9	Investigate improvements to maintenance/design of Tourist Drive 4 and Riverview Road including sealing sections of these roads where they cross major creeks to reduce sediment wash-off during storm events (already included in Council's roadworks program).	medium	ESC	Ongoing This is the source we noted near the old jetty
	1.10	Report any incidences of sediment laden run-off (and other water pollution) to ESC or EPA.	as they arise	members of EMC	Ongoing
Improve fish cleaning facilities	1.11	Upgrade existing tables and, depending on availability of services, provide lighting, wash down hose and rubbish bins for the disposal of fish offal and litter at Town Wharf and Apex Park.	high	ESC	Done. Boat ramp and facilities updated
Include additional guidelines relating to water quality in DCPs	1.12	When DCPs and Residential Design and Development Guidelines are updated include reference to erosion and sediment controls in 'Checklist' section for the lodgment of development applications.	medium	ESC	Not within scope of a DCP but council does inspect devt sites for compliance of sed controls.
	1.13	Prepare DCP which includes guidelines relating to development impacts on water quality.	medium	ESC	Done. WSUD incorporated in council guidelines

5.2 Goal: to ensure future development does not detract from the values of the inlet and is appropriately designed

Objective: To maintain the scenic views and vistas to and from Wagonga Inlet

Strategy		Action	Priority	Responsibility	
Provide visually unobtrusive viewing points around the inlet	2.1	As per *Narooma Foreshore and Townscape Masterplan* provide additional boardwalks/platforms to increase opportunities to view the inlet while minimising impacts on foreshore vegetation (see actions under **6.9** and **6.10**). Consult with LALC on route selection and siting of structures.	medium	ESC	
Encourage attractive building design compatible with the visual qualities of the inlet	2.2	Continue to promote existing residential design and development guidelines. Consideration could also be given to introducing annual Shire wide design awards.	ongoing	ESC	
	2.3	Develop DCP for Coastal Villages which includes attractive building design guidelines for foreshore areas.	high	ESC Coastal design guide	

Objective: To ensure development is compatible with natural hazards

Strategy		Action	Priority	Responsibility	
Increase awareness of flood hazard in the Narooma 'flat area'	2.4	Review design floor levels and development controls in view of the results of the *Wagonga Inlet Flooding Investigation* (GBA 1999).	high	ESC	Done and underway. FS complete. FRMSP
	2.5	When DCPs and Residential Design and Development Guidelines are updated include reference to flood protection.	medium	ESC	

5.3 Goal: to conserve the natural ecological communities and their component flora and fauna

Objective: To increase awareness of the values of natural communities in general and, in particular, the habitat values of wetlands

Strategy		Action	Priority	Responsibility	
Provide information on natural communities and component species	3.1	Develop community education program that includes information on the protection of shorebirds, migratory species and wetlands and management of vegetation communities.	medium	**NPWS**, **ESC**	Ongoing community education through Landcare events, enviro education stalls and workshops
Publicise the link between mangroves and seagrasses and fish numbers	3.2	Include information on the fish nursery and habitat values of mangroves and seagrasses in interpretive signage for proposed boardwalk off Riverside Drive at Forsters Bay (see **6.9**).	high	**ESC**, Fisheries	
	3.3	Where mangrove clearing is evident, letter-box drop foreshore residents with information from NSW Fisheries habitat management and fish conservation guidelines and details of penalties for illegal clearing.	as required	Fisheries	Not done (Was this an issue?)Illegal clearing issues dealt with through ESC and EPA processes
Monitor changes in mangroves and seagrasses	3.4	Install survey markers to identify changes in the extent of mangroves (possible student project).	medium	**EMC**, ESC, Fisheries	Need to liaise with MPA. May have been commnenced?
	3.5	Repeat seagrass surveys (Forsters Bay beds a priority) to monitor health (as an indicator of nutrient levels) and changes in distribution. See **Section 6.1** for more details.	medium	**EMC**, ESC, Fisheries	Macrophyte mapping completed 2016

Objective: To appropriately manage aquatic resources

Strategy		Action	Priority	Responsibility	
Control infestations of the Pacific Oyster	3.6	Continue to regularly inspect leases and rocky foreshores and remove Pacific Oysters to protect the existing aquaculture industry from the problems experienced in other NSW estuaries. Liaise with Navy divers to provide assistance.	medium	**Fisheries**, Wagonga Oyster Farmers	volunteers have cleared but the program may not have continued

Strategy		Action	Priority	Responsibility	
Collect base-line data on recreational fishing	3.7	Undertake recreational fishing survey to gain an understanding of the magnitude of the recreational finfish catch and harvesting of intertidal animals. Liaise with universities as possible student project.	low	**Fisheries**, EMC, SGFC	Check with Sham
Encourage clean-up of areas around oyster leases	3.8	Include particular problem areas (eg walking track from Ringlands Point) in 'Clean up Australia' day program and liaise with oyster farmers to gain their participation.	high	**ESC**, Fisheries, Wagonga Oyster Farmers	Marine Debris clean ups undertaken by various groups, ongoing
Ensure cockle collection does not adversely impact on aquatic habitats	3.9	Continue to employ gathering practices which do not impact adversely on strapweed beds. Continue to assess the feasibility and sustainability of cockle collection within the estuary.	high	**Fisheries**, commercial fisher	**?**

Objective: To provide a vegetated buffer zone around the entire inlet

Strategy		Action	Priority	Responsibility	
Preserve bushland around Wagonga Inlet	3.10	Investigate mechanisms to impose harsher penalties for breaches of development consent and Council's Tree Preservation Order relating to clearing of bushland on Ringlands Estate.	high	ESC	Ongoing
Control damage to vegetation resulting from vehicle access	3.11	Close track on Crown Reserve adjoining Ringlands Estate to private vehicles. Maintain as emergency bushfire access, access for weed control and walking track.	high	ESC	Ongoing
Actively manage remnant bushland of conservation significance	3.12	Develop bushland management plan and weed control program for the rainforest at Flying Fox Bay and remnant vegetation at the northern end of Mill Bay.	medium	ESC	Initial work done, and bush regen ongoing maintenance
Increase the extent of foreshore buffer zones	3.13	As per Council's Policy, continue to pursue opportunities to transfer foreshore land into public ownership through conditions of development/subdivision consent, for: - land zoned 2ec around Forsters Bay - land zoned Rural 1(a) around Barlows and Clarks Bays, Freshwater Bay/Paradise Point, and between Honeymoon Point and Hobbs Point - land zoned "Further Investigation for Rural C" between Brices Bay and Punkally Creek.	ongoing	ESC	1 swap of road reserve for foreshore land
	3.14	Change zoning of unused road reserves around inlet to 6(a) eg: - road reserve on south-western side of Forsters Bay.	low	ESC	Not done
	3.15	Rezone SEPP 14 wetland No. 126 (between Punkally and Burrimbidgee Creeks) to 7(a) Environmental Protection - Wetland	high	ESC	

Strategy		Action	Priority	Responsibility	
Increase the extent of foreshore buffer zones (continued)	3.16	Map riparian buffer zones in Rural 1(c) small holdings zones for better protection.	high	ESC	
	3.17	In conjunction with current/future review of LEPs consider introduction of an environmental protection zone for riparian buffers, shorebird nesting and feeding areas, regionally uncommon vegetation and wildlife corridors.	as arises	ESC	Foreshore land in public ownership is predominantly E2. Parks and open space are RE1 Public Open space.

Objective: To encourage community participation in the management of foreshore reserves

Strategy		Action	Priority	Responsibility	
Establish volunteer bush regeneration group(s)	3.18	Develop a program for weed control along the Princess Highway/Centenary Drive (as per *Masterplan*) and advertise/approach existing community groups for volunteers to become involved. Resources may also be available through the Green Corps and Natural Heritage Trust. Extend program to other areas as interest develops.	medium	ESC	Done and ongoing

5.4 Goal: to protect and increase recognition of Aboriginal and European heritage

Objective: To increase awareness of Aboriginal and European sites and local history

Strategy		Action	Priority	Responsibility	
Continue to develop and seek sponsorship for walking track brochures	4.1	Prepare Narooma Town/Bar Rock brochure (funding has been received).	high	**HS**, ESC	
Develop design guidelines and program for the installation of interpretive signs	4.2	Install interpretive signs at: - points of interest along *Mitchell's Mill Walk and Ringland's Rotary Walk* - log ramp (skids) at Wagonga Picnic Area - at points of interest along proposed Narooma Town/Bar Rock walk – develop major interpretive signage for Rotary Park covering both Aboriginal and European heritage (including *Lady Darling* wreck).	medium	**ESC**, HS Forests HS, LALC, **ESC**, NPWS	Underway – Eurobodalla signage strategy

Objective: To prevent deterioration of Aboriginal middens and other archaeological sites

Strategy		Action	Priority	Responsibility	
Maintain involvement of LALC in foreshore/catch-ment works	4.3	Refer to recommendations contained in Navin Officer (1997) and continue to involve Aboriginal sites officer in the planning for, and construction of, foreshore paths and other recreational facilities (eg proposed access from Mill Bay to Apex Park), as well as logging operations/management of Bodalla State Forest.	ongoing	**ESC**, NPWS, **Forests**	**Ongoing**
Protect middens and other sites	4.4	Investigate means to address erosion of the midden at the Wagonga Picnic Area and other sites as necessary.	as needed	**LALC**, **Forests**	LALC may have done this. Need to follow this up with OEH Narooma.

Objective: To conserve the remains of early European settlement and industry

Strategy		Action	Priority	Responsibility	
Ensure access is available to heritage relics for conservation, and where appropriate, interpretation	4.5	Liaise with property owner to gain access to Wagonga Cemetery to repair fence and headstones as and when required.	high	**ESC**, HS	

5.5 Goal: to improve boat navigation and safety

Objective: To maintain navigation channels

Strategy		Action	Priority	Responsibility	
Assess adequacy of navigation channel depths and impacts of shoaling	5.1	Monitor channel depths (by depth sounder) upstream and downstream of the bridge and provide regular reports to the EMC.	high	RMS	ESC has contacted RMS/Crown about dredging. 50% grants available but Crown will dredge to extent of servicing their own wharf.
	5.2	Provide detailed channel surveys (including channel at Shell Point) and depth comparisons at appropriate intervals.	high	DLWC	

	5.3	Monitor continuing sand intrusion into Forsters Bay and its impacts on Taylors Boatramp and adjacent private jetties. This is to include details on the frequency and volume of sand removed from the boatramp by Council.	high	DLWC, ESC	Not done
Maintain adequate depths for commercial and recreational vessels to enter Forsters Bay	5.4	Remove rocks at danger buoy, downstream of the highway bridge.	high	**Waterways**, **DLWC**, ESC	RMS/Crown approached.
	5.5	Review need for dredging navigation channels. If required, prepare environmental impact assessment report. See **Section 6.2** for more details.	high (ongoing)	**ESC**, DLWC	**See above.**

Objective: To improve boat safety awareness

Strategy		Action	Priority	Responsibility	
Improve dissemination of information on bar conditions and boat safety	5.6	Continue to include articles on correct procedures for putting to sea and crossing the bar in the *Narooma News*, *This Month on the Sapphire & Eurobodalla Coast* and other tourist/fishing publications.	ongoing	**RVCP**, ENC, Fisheries, **Waterways**, CoC	**Not our scope or problem**
	5.7	Prepare and distribute information on boating safety tips (such as those prepared by the RVCP in the past) so that they are available at caravan parks, motels and other tourist accommodation.	high	**RVCP**, CoC, **Waterways**	
	5.8	Explore opportunities for the implementation of a trial 'bar watch' system including dissemination of information via digital display boards and hazard ranking lights. See **Section 6.1** for more details. Funding assistance for this system may be available under Waterway's Asset Development and Management Program (WADAMP).	high	ESC, RVCP, **Waterways**	
	5.9	Explore opportunities for repair of Old Pilots Wharf for use by RVCP, subject to funding availability (works to be sympathetic to heritage significance of structure and could include interpretive signage).	high	**RVCP**, Waterways	

5.6 Goal: in keeping with conservation values, ensure equitable use of the inlet's waterway and recreational resources

Objective: To balance the commercial and recreational uses of the inlet

Strategy		Action	Priority	Responsibility	
Maintain open water areas within the inlet for recreational boating and visual amenity	6.1	Continue current closure on new leases. Assessment of applications to the Minister for relocation of silted leases to take account of areas of ecological significance (see **Figures 3.1a** and **3.1b**), navigation channels and access to/from boat launching and foreshore picnic areas.	as arises	Fisheries	Not done
	6.2	Prepare mooring plan for Wagonga Inlet (with input from EMC and with reference to areas of ecological significance, see **Figures 3.1a** and **3.1b**) identifying existing/future mooring areas (public/private) and the maximum number of moorings per area.	high	Waterways	Not commenced

Objective: To promote foreshore facilities that cater for commercial, tourism and public use

Strategy		Action	Priority	Responsibility	
Extend Town Wharf	6.3	Prepare design report for the extension of Town Wharf towards the swimming pool. Include boat pumpout facilities, see **Section 6.1** for more details. A preliminary concept showing public/commercial space is shown in **Figure 5.1**. Funding may be available through the Federal Government's Regional Assistance Program. DLWC and Waterways funding is available for public wharves.	high	ESC, DLWC, commercial operators, Waterways	

Objective: To address potential conflicts between recreational users and between recreational use and ecological values/commercial use of the inlet

Strategy		Action	Priority	Responsibility	
Manage boating to avoid conflicts	6.4	Review existing boating controls and impacts of vessel operation with reference to **Figures 3.1a** and **3.1b**, areas of ecological significance.	in hand	**Waterways**, EMC, ESC	
	6.5	Implement appropriate boating controls (and associated advisory/educational signage at boat launching areas) based on the following principles: - reduced boat speeds upstream of Honeymoon Point to minimise boat wash, effects on oyster leases, SEPP No.14 wetlands and other sensitive foreshore lands - no anchoring in seagrass beds - reduced boat speeds over large beds of strapweed *Posidonia australis* (see **Figure 3.1a** and **3.1b**) - reduced boat speeds (ie noise levels) adjacent to areas of ecological significance consistent with use as passive recreational areas.	medium	Waterways	Some of these have been done – noticed restrictions when we did surveys
Manage foreshore reserves in accordance with their ecological values	6.6	Development of reserves identified as being of ecological significance to be restricted to low impact recreational and educational activities, eg bushwalking, nature study and only basic facilities to be provided, ie unsealed walking tracks, 'bushland' picnic areas.	medium	ESC	Recreational and Open Space Strategy completed
	6.7	Consider exclusion of dogs from areas of high native animal habitat value (eg shorebird breeding and feeding areas) and exercise of dogs on-leash only, in other areas of ecological significance.	high	ESC	Companion Animals Management Plan in development
Encourage responsible dog exercising	6.8	Monitor impacts of off-leash dog exercise on passive use of reserves. Consider installation of 'dog litter bins'.	ongoing	ESC	

Objective: To improve public facilities and foreshore access to the inlet

Strategy		Action	Priority	Responsibility	
Provide viewing/fishing platforms and boardwalks	6.9	As per the *Narooma Foreshore & Townscape Masterplan* install mangrove boardwalk off Riverside Drive.	medium	ESC	Not commenced – leave in.
	6.10	As per *Masterplan* construct walkway under bridge and extend *Masterplan* to north-western side of bridge (old ferry approach) to address bank erosion, formalise area for fishing/viewing and provide interpretive sign. See **Section 6.1** for indicative costs per metre for boardwalks.	low	ESC	Done on Northern shore (walkway under bridge)
Provide more public jetties	6.11	Reconstruct existing jetty at Ringlands Point (note that open mesh decking would be required to minimise impacts on strapweed beds (Posidonia australis)	high	ESC	Change to Remove Jetty. Currently junk.
	6.12	Construct jetty, provide fish cleaning table, wash down hose, lighting and bins and formalise and seal carpark to southern boat ramp at Forsters Bay Funding is available through DLWC and Waterways programs for public wharves and jetties. Indicative costs per metre are provided in **Section 6.1**.	low	ESC	Boatramp and carpark is good but will need to field validate other actions
Improve access for launching sailboats etc	6.13	Widen sand ramp near NSW Fisheries building so more than one boat can be launched at a time.	high	**ESC**, SC	This won't happen. Difficult access for reversing**.** Alternative at sth end of Forsters Bay.

Appendix E Preliminary Risk Assessment

NOTE: The Preliminary Risk Assessment Completed at Scoping Study Stage Has been subsumed and superseded by the Revised Risk Assessment completed during drafting of the Coastal Management Program

Appendix F Summary of Legislative, Policy and Guideline Context for Coastal Management in NSW

F.1 Introduction

This chapter outlines the legislative, policy and planning context insofar as it relates to the preparation and contents of a Coastal Management Program for the three subject estuaries. For brevity, the following abbreviations are used in this chapter:

BC Act:	*Biodiversity Conservation Act 2016*
CM Act:	*Coastal Management Act 2016*, which commenced on 3rd April, 2018
CMM:	Coastal Management Manual, which guides the development of Coastal Management Programs under the CM Act
CMP:	A Coastal Management Program, which aims to support the long-term strategic management of the coast in accordance with the CM Act
CM SEPP:	*State Environmental Planning Policy (Coastal Management) 2018* which commenced on 3rd April, 2018
CL Act:	*Crown Lands Act 1989 (Now Repealed)*
CLM Act:	*Crown Lands Management Act, 2016*
CP Act:	*Coastal Protection Act 1979* which was repealed by the CM Act
EP&A Act:	*Environmental Planning and Assessment Act 1979*
FM Act	*Fisheries Management Act 1994*
LG Act:	*Local Government Act 1993*
MEM Act:	*Marine Estate Management Act 2014*
NPW Act	*National Parks and Wildlife Act 1974*

F.2 Coastal Management Act, 2016 (CM Act)

F.2.1 Introduction

The CM Act commenced on 3 April 2018, replacing the CP Act from 1979. The CM Act is administered by the Minister for the Environment. It establishes the framework, and outlines the overarching objects, for coastal management in NSW. Part 3 of the CM Act contains the legislative basis for preparing Coastal Management Programs.

F.2.2 Objects of the Act and Coastal Management Areas

The overarching object or purpose of the CM Act is:

> *"to manage the coastal environment of New South Wales 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"*

For reference, the four principles of ecologically sustainable development are defined in section 6(2) of the *Protection of the Environment Administration Act 1991* as follows:

> *(a)* ***the precautionary principle*** *– namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*
>
> *In the application of the precautionary principle, public and private decisions should be guided by:*
>
> > *(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
> >
> > *(ii) an assessment of the risk-weighted consequences of various options,*
>
> *(b)* ***inter-generational equity*** *– namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*
>
> *(c)* ***conservation of biological diversity and ecological integrity*** *– namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*
>
> *(d)* ***improved valuation, pricing and incentive mechanisms*** *– namely, that environmental factors should be included in the valuation of assets and services, such as:*
>
> > *(i) polluter pays – that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

More specific objects outlined by the CM Act are as follows:

(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 (MEM Act).

The objects of the MEM Act are outlined in Section F.7.

The CM Act recognises that the coastal environment is dynamic, with beaches and estuaries changing in form and being affected from time to time by hazards driven by coastal processes. The Act specifies seven coastal hazards:

> *(a) beach erosion,*
>
> *(b) shoreline recession,*
>
> *(c) coastal lake or watercourse entrance instability,*
>
> *(d) coastal inundation,*
>
> *(e) coastal cliff or slope instability,*
>
> *(f) tidal inundation,*
>
> *(g) erosion and inundation of foreshores caused by tidal waters and the action of waves, including the interaction of those waters with catchment floodwaters.*

For CMPs that address the management of Estuaries, hazards (c), (f) and (g) are particularly relevant.

Part 2 of the CM Act identifies four "coastal management areas" which, in order of hierarchical importance are the:

(a) coastal wetlands and littoral rainforests area, comprising land which displays the hydrological and floristic characteristics of coastal wetlands or littoral rainforests and land adjoining those features;

(b) coastal vulnerability area, comprising land which is defined as being subject to coastal hazards;

(c) coastal environment area, comprising land containing features such as coastal waters, estuaries, coastal lakes, coastal lagoons and adjoining land, including headlands and rock platforms; and

(d) coastal use area, comprising land adjacent to coastal waters, estuaries, coastal lakes, and coastal lagoons where development is or may be carried out (at present or in the future).

The hierarchical importance means, for example, that the management objectives outlined for coastal wetlands and littoral rainforests will prevail over those of the coastal vulnerability area, where the mapped areas of these overlap. The maps defining the four areas are contained in the CM SEPP. The combined, mapped extent of the four coastal management areas is defined as the "coastal zone". The CM Act states that the CM SEPP can be amended by a Local Environmental Plan (LEP)

prepared under the *Environmental Planning and Assessment Act 1979,* but that any such LEP would need to be recommended by the Minister for the Environment prior to adoption.

The management objectives for the four coastal management areas are presented in Appendix A.

F.2.3 Coastal Management Programs

Where a Local Government Area (LGA) is partly within the coastal zone, the relevant Council (or Councils) may prepare a coastal management program (CMP), which establishes a long-term strategy for coastal management that focuses on achieving the objects of the CM Act and gives effect to the management objectives of the coastal management areas that are to be covered by the CMP (listed in Appendix A). That program may be made in relation to the whole, or any part of the coastal management areas included in the coastal zone within the LGA. The Coastal Management Manual outlines how CMPs are to be prepared.

The CM Act states that a CMP must:

(a) identify the coastal management issues affecting the areas to which the program is to apply, and

(b) identify the actions required to address those coastal management issues in an integrated and strategic manner, and

(c) identify how and when those actions are to be implemented, including those to be implemented by local councils under Chapter 13 of the Local Government Act 1993, those to be implemented under environmental planning instruments and development control plans under the Environmental Planning and Assessment Act 1979 and those to be implemented by public authorities (other than the local council), and

(d) identify the costs of those actions and proposed cost-sharing arrangements and other viable funding mechanisms for those actions to ensure the delivery of those actions is consistent with the timing for their implementation under the coastal management program, and

(e) if the local council's local government area contains land within the coastal vulnerability area and beach erosion, coastal inundation or cliff instability is occurring on that land, include a coastal zone emergency action subplan.

The CMP may also include other matters if authorised or permitted by the Coastal Management Manual. Where a CMP proposes actions or activities to be undertaken

by any public authority or on land owned or managed by that public authority, the public authority must agree to the inclusion of those actions or activities. The CMP must not include matters relating to the response to emergencies where those already exist in a plan made under the State Emergency and Rescue Management Act.

The CM Act specifies that consultation on a draft CMP must be undertaken with the community and potentially with other councils or public authorities. For example, where an estuary spans two or more local government areas, or where proposed actions will occur on land owned by a public authority. Consultation is to be undertaken in accordance with relevant provisions of the coastal management manual.

For the present scoping study, all three estuaries are contained entirely within the Eurobodalla LGA. Therefore, consultation with adjacent councils is not required.

Other matters dealt with in the CM Act include the responsibilities of the Minister regarding the CM Act; the establishment and role of the NSW Coastal Council; the mechanics of adoption, certification, gazettal and review of CMPs and the publication, review and amendment of the Coastal Management Manual. The present Coastal Management Manual is described below, and the guidance therein has been followed in the preparation of this Scoping Study and will guide the preparation of the CMP.

Once finalised, a local council is required to give effect to the CMP, including integration of the CMP into (i) the plans, strategies, programs and reports to which Part 2 of Chapter 13 of the *Local Government Act 1993* applies; and (ii) the preparation of planning proposals and development control plans under the EP&A Act. The Minister may request that the NSW Coastal Council conduct a performance audit of the implementation of a CMP. If a local Council is thus found to be significantly non-compliant with a CMP, the NSW Coastal Council may make recommendations on appropriate remedial actions.

F.3 State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP)

State Environmental Planning Policy (Coastal Management) 2018 commenced on April 3, 2018. As a result, three existing state environmental planning policies (SEPP14-Coastal Wetlands, SEPP26-Littoral Rainforests, and SEPP71-Coastal Protection) were repealed.

The CM SEPP aims to promote an integrated and coordinated approach to coastal zone land use planning consistent with the CM Act and the management objectives of each coastal management area by:

(a) managing development in the coastal zone and protecting the environmental assets of the coast, and

(b) establishing a framework for land use planning to guide decision-making in the coastal zone, and

(c) mapping the 4 coastal management areas that comprise the NSW coastal zone...

At the time of policy commencement, and during the preparation of this Scoping Study, the Coastal Vulnerability Area Map had not been adopted and, therefore, no coastal vulnerability area had been identified. The adopted maps are presently available through the NSW Planning Portal.[12]

The CM SEPP also specified development controls that are to apply within the four coastal management areas. These are summarised in the following paragraphs.

For the **coastal wetlands and littoral rainforests area**: where the subject works would otherwise be allowable under other planning instruments, development consent is required for clearing native vegetation or marine vegetation, undertaking earthworks, draining the land, constructing a levee, undertaking environmental protection works or undertaking any other development. Unless the subject works are for environmental protection, the works are considered designated development, meaning that an environmental impact statement would need to be prepared. The works can be undertaken, without consent, on behalf of a public authority if they comprise environmental protection works that are identified in (i) a certified coastal management program, (ii) a plan of management prepared under the LG Act (Division 2, Part 2, Chapter 6); or (iii) a plan of management in force under Division 6, Part 5 of the CL Act. If development consent is required, consent must not be granted by an authority unless it is satisfied that the biophysical, hydrological, and ecological character of the area will be protected.

Specific exclusions to these development controls exist for the damage or removal of a priority weed (under the *Biosecurity Act 2015*) or development consistent with a plan of management under the *National Parks and Wildlife Act 1974*.

For lands within the **proximity area for coastal wetlands and littoral rainforests**: development consent for works must not be given unless the consent authority is satisfied that they will not significantly impact on (i) the biophysical, hydrological or ecological integrity of the adjacent wetland or rainforest; or (ii) the quantity and quality of surface and groundwater flows to and from the adjacent wetland or littoral rainforest.

[12] https://www.planningportal.nsw.gov.au/

For lands within the **coastal vulnerability area**: development consent must not be granted unless the consent authority is satisfied that (i) any proposed building or works are engineered to withstand coastal hazards, both current and as projected over the design life; (ii) any proposed development is not likely to alter coastal processes in a way that is detrimental to adjacent land or the environment; (iii) any proposed development will not reduce access, public amenity or use of any beach, foreshore, rock platform or headland; (iv) the development incorporates appropriate provisions to manage risk to life and public safety from coastal hazards; (v) there are appropriate measures in place to manage the effects of anticipated coastal processes, including current and future hazards.

For lands within the **coastal environment area:** Development consent must not be granted unless the consent authority has considered whether there is likely to be an adverse impact on (i) the integrity and resilience of the biophysical, hydrological and ecological environment, (ii) coastal environmental values and natural coastal processes, (iii) water quality of the marine estate particularly any sensitive coastal lakes, (iv) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms, (v) public open space and access to the coastal environment including disabled access, (vi) Aboriginal heritage, and (vii) use of the surf zone. Furthermore, with respect to the aspects in the previous sentence, the consent authority must be satisfied that the development is appropriately designed and sited and will be managed appropriately to avoid adverse impacts. If the adverse impacts cannot be reasonable avoided, the impact should be minimised. If the impacts cannot be minimised, the development would need to be managed to mitigate the impact.

For lands within the **coastal use area:** Development consent must not be granted without consideration of potential adverse impacts on (i) public access, (ii) overshadowing, wind funnelling and the loss of views, (iii) visual amenity, including scenic qualities of coastal headlands, (iv) Aboriginal cultural heritage, (v) cultural and built environmental heritage. Furthermore, with respect to the aspects in the previous sentence, the consent authority must be satisfied that the development is appropriately designed and sited and will be managed appropriately to avoid adverse impacts. If the adverse impacts cannot be reasonable avoided, the impact should be minimised. If the adverse impacts cannot be minimised, the development would need to be managed to mitigate the impact. Consent must also consider the bulk, scale and size of the proposed development and its appropriateness in the context of surrounding development.

Generally, development consent must not be granted unless the consent authority is satisfied that the development will not cause an increased risk from coastal hazards on the subject or other land. Any development consent within the coastal zone must also take into consideration the provisions of any relevant certified management program.

At the same time as the CM SEPP commenced, the Department of Planning issued a local planning direction under Section 117(2) of the EP&A Act, addressing the development of planning proposals applying to land within the coastal zone. Under that directive, planning proposals must be consistent with the CM Act, Coastal Management Manual and associated Toolkit, the Coastal Design Guidelines (2003) and any relevant certified CMP. The directive states that planning proposals must not rezone land in a way that enables intensification of land use within a coastal vulnerability area or other area that has been appropriately identified as being affected by current or future coastal hazards. If the planning proposal aims to amend the maps within the CM SEPP, it must be supported by evidence from a relevant certified CMP (or pre-existing coastal zone management plan prepared under the CP Act). A planning proposal that is inconsistent with the directive may still be considered by the Director General of the Department of Planning under certain circumstances.

F.4 Coastal Management Manual (CMM)

F.4.1 Introduction

The NSW Coastal Management Manual (CMM) outlines the way in which coastal management programs (CMPs) are to be prepared, adopted, and subsequently managed by local councils and public authorities in New South Wales. Part A of the CMM imposes mandatory requirements for the preparation and management of CMPs. Part B provides more detailed guidance on the preparation and management of CMPs, including adherence to an adaptive risk management process, the completion of studies to address information gaps, the role of state government and the NSW Coastal Council and the integration of a CMP into Council's Integrated Planning and Reporting (IP&R) framework under the *Local Government Act 1993*.

The manual seeks to facilitate ecologically sustainable development and promote sustainable land use planning in the coastal zone. The manual encourages:

- Development that is not inappropriately exposed to hazards.
- Land use where risks can be mitigated, and residual risks are addressed.
- Development which does not increase risks or threats elsewhere.

CMPs are to be long-term, strategic, and coordinated, focusing on achieving the objects of the CM Act. A CMP should provide for the input of councils, public authorities, and local communities in achieving a balanced set of management actions. A CMP should build on previous work completed in preparing a coastal zone management plan under the now repealed *Coastal Protection Act 1979*. In preparing a CMP, previous work is expected to be updated to consider changes to the social character of the local community.

The following sections contain a summary of the most relevant information for consideration by this Scoping Study.

F.4.2 The CMP Process

A 5-stage process is outlined by the CMM as shown in Figure F.1.

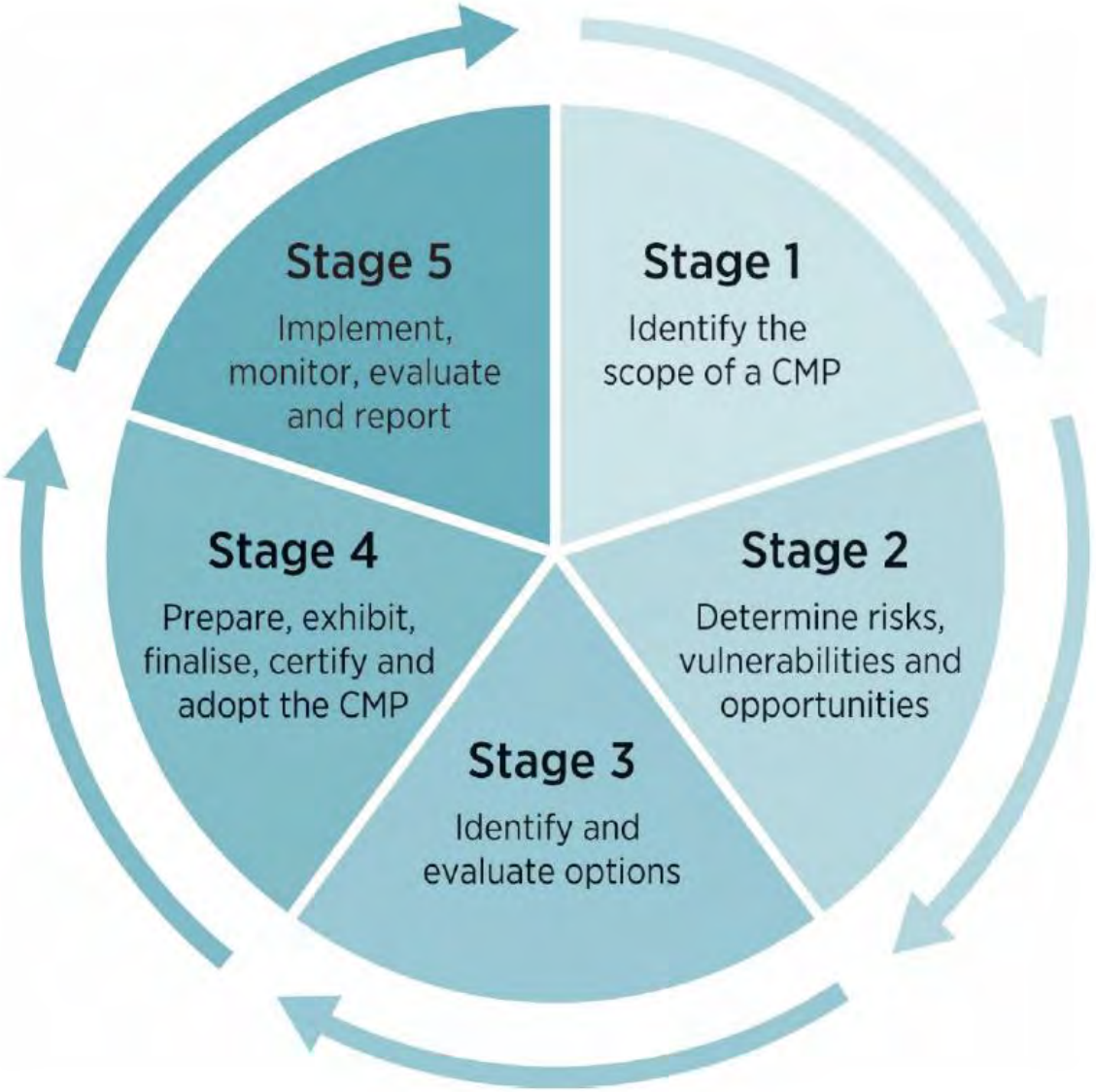

Figure F.1 Stages in Preparing and Implementing a CMP (Source: NSW Government, 2018a)

Given the significant amount of effort already expended in the preparation of CZMPs across NSW, it is possible that Stages 2 and 3, which involve detailed studies and analyses could be 'fast-tracked'. Accordingly, the scoping study (Stage 1) is important in setting the scope and process to be followed in preparing the CMP. Fast-tracking would only be appropriate where existing actions are performing well and remain appropriate despite changing circumstances. As part of Stage 5, Councils need to report on the outcomes and ongoing action associated with the CMP as part of their

Integrated Planning and Reporting framework. It is possible that a CMP may recommend modification of the boundaries of a coastal management area. In this case the Minister for Planning has the authority to make a Local Environmental Plan that modifies the boundaries in the Coastal Management SEPP, subject to the gateway process.

It is possible that other public authorities (e.g. Roads and Maritime Authority, NSW Department of Primary Industry) are assigned responsibility for different coastal management actions identified in a CMP. If this is the case, it is required that the public authority agrees to take on that responsibility before the CMP is finalised.

F.4.3 Mandatory Requirements of a CMP

The CM Act imposes requirements on the preparation, adoption, implementation, amendment, and review of CMPs. These mandatory requirements are laid out in the CMM (Part A) with other content in Parts A & B of the Manual comprising *guidance* for the development and operation of CMPs.

The Mandatory Requirements of relevance to the preparation of a CMP are reproduced in Appendix B. These elaborate on the statutory requirements of the CM Act and deal with:

- The purpose, scope and focus of a CMP.
- The area that a CMP covers.
- How a CMP is to be prepared.
- Key issues to be identified in a CMP.
- Requirements for the business plan in the CMP.
- Requirements for preparing a CMP when it includes a proposed or mapped coastal vulnerability area.
- Requirements for taking coastal change into account when preparing a CMP.
- Format and content required of a CMP.
- Community engagement and consultation.

Other mandatory requirements in the CMM deal with the adoption, certification, gazettal, review, amendment, and replacement of CMPs, and the requirements for monitoring, reporting and record keeping during operation of the CMP.

F.4.4 What is a Scoping Study?

The primary purpose of a scoping study (Stage 1 of the process) is to identify the required focus for a new CMP, and the steps required in preparing that CMP. A

scoping study considers existing information to review progress made in managing issues in coastal areas (for example, via a pre-existing *estuary management plan* or *coastal zone management plan*). New analytical studies are not undertaken as part of the scoping study; these are undertaken as part of Stage 2 of the process. The CMM outlines a wide range of aims, tasks, benefits and outcomes that will characterise the scoping study process. These include:

- Gathering an understanding of the community and identifying stakeholders. Developing an engagement strategy for later stages and beginning development of a shared understanding of the existing coastal management situation. Identify the organisations and communities that need to be involved in the CMP process and who holds responsibility for various issues that are likely to be involved.
- Determining the strategic context of coastal management for the area being considered and establishing the purpose, vision, and objectives of the CMP. Identify an appropriate scope and expected key outcomes from the CMP.
- Determining the spatial extent of management areas (and which of the four management areas) need to be considered by the CMP. It is possible that planning proposals will need to be prepared to amend the extents of coastal management areas.
- Considering where coastal management areas overlap and how the hierarchy of management objectives outlined in the CM Act would operate.
- Reviewing the issues already identified, current coastal management arrangements and progress with existing actions. Determining where further or different action is required via a first-pass risk assessment.
- Identifying the knowledge gaps and preparing the business case for filling those gaps. The business case will also include a forward program for subsequent stages for preparing the coastal management program and may include a fast-tracking pathway.

The CMM elaborates in some detail on the steps which might be undertaken in preparing a scoping study.

F.5 Local Government Act, 1993 (LG Act)

F.5.1 Introduction

The purpose of the LG Act is to provide a legal framework for local government in NSW, including setting out responsibilities and powers of councils, and facilitating the engagement with and accountability to the community. Under the LG Act, local councils in NSW have a variety of regulatory, administrative, and service functions.

Councils also have a role in enforcement and the raising of revenue (through rates and charges, for example). Councils regulatory responsibilities include planning and development control under the *Environmental Planning and Assessment Act 1979*.

The Act (§24) allows Council to provide service functions including *"provision of goods, services and facilities, and carry out activities"* appropriate to the needs of its community and the wider public. These service functions include environmental protection and providing for the recreation of the local community.

Local councils both own land and control, care for and manage other land such as Crown Land. Common service scenarios when considering estuaries for the benefit of its community would be council undertaking artificial lagoon breaching activities on an area classified as Crown Land or managing waterfront reserves for recreation purposes.

§7(e) of the LG Act requires that councils:

> *have regard to the principles of ecologically sustainable development in carrying out their responsibilities*

F.5.2 Exemption from Liability

With respect to land in the coastal zone, §733 of the Act provides an exemption from liability regarding:

> *(a) any advice furnished in good faith by the council relating to the likelihood of any land in the coastal zone being affected by a coastline hazard (as described in the coastal management manual under the Coastal Management Act 2016) or the nature or extent of any such hazard, or*
>
> *(b) anything done or omitted to be done in good faith by the council in so far as it relates to the likelihood of land being so affected*

§733 specifically notes that these conditions apply to:

- The making of environmental planning instruments planning proposals, or development control plans.
- The granting or refusal of development consent.
- The preparation and adoption of a CMP.
- The carrying out of coastal protection works.
- Anything done or omitted to be done regarding beach erosion or shoreline recession on crown land, a crown reserve or land owned or controlled by a council.
- Failure to undertake action to enforce removal of illegal or unauthorised structures that result in erosion of a beach or adjacent land.

- The provision of information relating to climate change or sea level rise.

Herein, "good faith" is presumed, unless proved otherwise, if Council has acted *substantially in accordance with the principles and mandatory requirements set out* in the Coastal Management Manual.

F.5.3 Accountability of Councils

Part 2 of Chapter 13 of the LG Act establishes the integrated planning and reporting requirements relating to the strategic planning of local councils. These are:

1. A **Community Strategic Plan** which identifies the main priorities and aspirations for the future of the local government area for a period of at least 10 years. The plan should establish strategic objectives and address civic leadership, social justice, environmental and economic issues. The community strategic plan must be reviewed following an ordinary councillor election.
2. A **Resourcing Strategy** which includes long-term financial, workforce management and asset management planning to implement the community strategic plan
3. A **Delivery Program** which outlines the activities to be undertaken to deliver the community strategic plan using the resources of the resourcing strategy. It must include means of assessing effective delivery. A new delivery program is to be established after each ordinary council election and council staff are to provide progress reports to the council at least every 6 months.
4. An **Operational Plan** which is an annual plan that details the program of activities to be undertaken during a given year to fulfil the requirements of the delivery program.

The department of Local Government has established guidelines regarding integrated planning and reporting listed above and community engagement strategy, annual report, and state of the environment report of a council.

F.5.4 Levying Rates for Coastal Protection Works

§496B of the LG Act allows councils to make and levy an annual charge for the provision of coastal protection services. The annual charge must reasonably reflect the cost for providing coastal protection services, including maintenance and repair, and to manage the impacts of the coastal protection works.

However, for an annual charge to be levied in relation to *existing* coastal protection works, §553B indicates that the owner of that parcel of land, or any previous owner, must have consented in writing to the land being subject to such charges. Herein, *existing* means works which predated the commencement of §553B of the LG Act,

which occurred in late 2010. This limitation does not apply, however, if the owner or occupier of the subject land contributed to the upgrade or expansion of the coastal protection works after commencement of §553B. In this case, a pro-rata amount based on the effect of the upgrade or expansion can be levied.

Council can make maintenance of the works and management of impacts a condition of consent. If that is the case, and the resulting maintenance or management is not being carried out by or on behalf of the council, an annual charge cannot be levied.

F.6 Environmental Planning and Assessment Act, 1979 (EP&A Act)

There have been significant changes to the *EP&A Act* in the past 12 months. Councils within the Greater Sydney Region and the City of Wollongong have been required to constitute a local planning panel, which will take over the role of determining development applications. The affected Councils span the coast between the Hawkesbury River and Lake Illawarra. The EP&A Act has also undergone decimal renumbering and rearrangement of the prior 8-part structure into 10 parts as follows:

1. Preliminary.
2. Planning Administration.
3. Planning Instruments: Including the making of environmental planning instruments such as SEPPs, LEPs and the associated planning proposal and gateway determination process.
4. Development Assessment and Consent: including the nature and role of the consent authority, state significant and integrated development.
5. Infrastructure and Environmental Impact Assessment.
6. Building and Subdivision Certification.
7. Infrastructure Contributions and Finance.
8. Reviews and Appeals.
9. Implementation and Enforcement.
10. Miscellaneous.

Broadly, clauses addressing development assessment under the old Parts 4 and 5 of the old Act are still contained within the corresponding parts of the new act:

- *Development* where consent is required by an Environmental Planning Instrument (EPI), which needs to be carried out under Part 4 of the *Act*. This is the pathway most commonly applied to private development, and sometimes to activities by public authorities;

- *Activities* which do not require development consent under Part 4 of the *Act*. These activities include those undertaken by a local council or authority and not prohibited by an EPI. Environmental Assessment is required in accordance with Part 5 of the *Act*. This would commonly take the form of a Review of Environmental Factors (REF). An REF aims to demonstrate that the Council has considered the environmental impact of the proposed activity. For some activities, a full environmental impact statement is required, including the requirements for public exhibition.

§5.5 of the EP&A Act indicates that, if following the Part 5 pathway, a local Council would need to, as a minimum:

> *"examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity"*

The ruling in *Goldberg v Waverley [2007] NSWLEC 259* suggests that a *"concept of reasonableness"* should be applied when interpreting the phrase *"fullest extent possible"* in §5.5.

Also of interest are:

- Ministerial directions (previously §117) are now covered by §9.1.
- Planning certificates (previously §149) are now covered by §10.7.

Over the next few years, it is expected that *Environmental Planning and Assessment Regulations, 2000* will make provisions relating to the standardisation of the form, structure and subject-matter of DCPs, to avoid the proliferation of different clauses across the state. The mechanism for this is contained in §3.45(2A) of the EP&A Act.

F.7 Marine Estate Management Act, 2014 (MEM Act)

F.7.1 Introduction

The MEM Act was introduced in response to an audit which recommended a new approach to the sustainable management of the entire marine estate, including the existing marine parks. It is jointly administered by the Minister for Primary Industries and the Minister for the Environment.

The MEM Act lists its objectives as:

d) to provide for the management of the marine estate of New South Wales consistent with the principles of ecologically sustainable development in a manner that:

(i) promotes a biologically diverse, healthy and productive marine estate, and

(ii) facilitates:

-economic opportunities for the people of New South Wales, including opportunities for regional communities, and

-the cultural, social and recreational use of the marine estate, and

-the maintenance of ecosystem integrity, and

-the use of the marine estate for scientific research and education,

e) to promote the co-ordination of the exercise, by public authorities, of functions in relation to the marine estate,

f) to provide for the declaration and management of a comprehensive system of marine parks and aquatic reserves.

The Marine Estate includes the ocean, estuaries, coastal wetlands (saltmarsh, mangroves, seagrass), coastline including Sydney beaches, dunes and headlands, coastal lakes and lagoons connected to the ocean, and islands including Lord Howe Island. It extends seaward out to 3 nautical miles from the coast and offshore islands, and from the Queensland border to the Victorian border.

The MEM Act establishes the Marine Estate Management Authority, which is tasked with, among other things, undertaking the assessment of threats and risks to the marine estate and to prepare a marine estate management strategy. A draft marine estate management strategy was placed on public exhibition between October and December 2017. The final strategy is expected to be released sometime in 2018 and updated on a decadal basis thereafter.

The MEM Act also covers the purpose, declaration and management of marine parks and aquatic reserves, and the preparation of associated management plans. The draft Marine Estate Management Strategy is underpinned by the state-wide threat and risk assessment report (or "TARA", BMT WBM, 2017). This assessment is a high-level document that doesn't provide site specific management guidance.

F.7.2 Outcomes of Threat and Risk Assessment (TARA)

The TARA process was described as "essentially a tool for the prioritisation of threats" with outputs to be used in the development of a state-wide scale management response. The assessment recognised that social and economic benefits are closely linked to the health of the environment. There were some local outcomes from the process, including the resolution to develop a new marine park management plan for the Batemans Marine Park, which contains the three estuaries subject to this study.

The TARA divided the NSW coast into three regions, including the Southern Region which extends southwards from Shellharbour to the border with Victoria and includes the three subject estuaries. On a state-wide scale, estuaries were found to have a much greater proportion of moderate and high threats, when compared to coastal and

marine areas. This was particularly notable for the more densely populated regions (e.g. the "Hawkesbury Shelf Marine Bioregion").

Regarding estuaries, the TARA recognised the presence of significant knowledge gaps and the need for additional consideration of cumulative risk issues, given their role as a receiving water quality environment with multiple stressors such as:

- Agricultural, urban and point source pollution.
- Microplastics.
- Sediment contamination.
- The need to take a "systems-based" management approach.

Priority threats for the Southern Region were ranked in the categories of "Threats to Environmental Assets" and "Threats to Social, Cultural and Economic Benefits". The top 10 threats for each are reproduced.

Table F.1 NSW Southern Region Priority Threats as Determined by the state-wide TARA

Environmental Assets	Social, Cultural and Economic Benefits
1 Agricultural diffuse source runoff (in estuaries)	1 Water pollution on environmental values - urban stormwater discharge
2 Estuary entrance modifications	2 Water pollution on environmental values - Agricultural diffuse sources
3 Urban stormwater discharge	3 Water pollution on environmental values - litter, solid waste marine debris and microplastics.
4 Modified freshwater flows (in estuaries)	4 Inadequate social and economic information
5 Clearing riparian and adjacent habitat including wetland drainage (in estuaries)	5 Lack of compliance and regulations or lack of compliance effort
6 Climate Change (20yrs)	6 Reductions in abundances of species and trophic levels
7 Recreation and tourism - Boating and boating infrastructure (in estuaries)	7 Limited or lack of access infrastructure to the marine estate
8 Foreshore development	8 Climate change stressors (20 years)
9 Navigation & entrance management and modification, harbour maintenance, dredging etc. (in estuaries)	9 Loss of public access (either by private development or Government area closures)
10 Stock grazing of riparian land	10 Anti-social behaviour and unsafe practices

While the TARA contains limited detailed site-specific information, the underpinning Background Environmental Information Report (MEMA, 2016) does. Where appropriate, that information has been incorporated into this review of information (Sections 3.1, 4.1 and 5.1 for Moruya River, Mummuga Lake and Wagonga Inlet respectively

F.7.3 Draft Marine Estate Management Strategy (2018-2028)

The overall stated vision of the draft Marine Estate Management Strategy (Draft MEMS) is:

"*A healthy coast and sea, managed for the greatest wellbeing of the community, now and into the future*"

Following from identification of the environmental, social, cultural and economic values and benefits, and an assessment of the threats and associated risks to those, the draft MEMS aimed to propose a set of initiatives that are the most effective for addressing the priority threats.

The draft MEMS outlines 10 "underpinning principles" to achieve its vision, namely:

1. Effective community engagement to identify and prioritise benefits and threats.
2. Identification of priority actions will be based on threat and risk assessment.
3. Values will be assigned to enable trade-off decision between alternative uses of the marine estate.
4. Best available information will be used in trade-off decisions, but judgement will still be required.
5. The wellbeing of future generations will be considered.
6. Existing access arrangements will be respected.
7. The precautionary principle will be applied.
8. Efficient and cost-effective management to achieve community outcomes.
9. Management decisions will be transparent and adjusted in response to new information.
10. Management performance will be measured, monitored, and reported and information pursued to fill critical knowledge gaps.

The draft MEMS aims to deal with priority threats on a state-wide basis. It does note, however that the order of priorities differs slightly between regions. Building from these principles, a set of eight "management initiatives" are defined by the strategy to address the priority threats. These initiatives are tabulated against a range of management options that could be adopted to implement those initiatives.

MANAGEMENT INITIATIVE	Regulation/ compliance/ incentives	Policy/ program/ planning	Education/ awareness	Research/ monitoring/ mapping	Onground works	Data / reporting	Collaboration
1. Improving water quality and reducing litter	✔	✔	✔	✔	✔	✔	✔
2. Sustainable coastal use and development for healthy habitats	✔	✔	✔	✔	✔		✔
3. Planning for a changing climate		✔	✔	✔	✔		✔
4. Protecting the cultural values of the marine estate		✔	✔	✔	✔		✔
5. Reducing impacts on wildlife	✔	✔	✔	✔	✔	✔	✔
6. Sustainable fishing and aquaculture	✔	✔	✔	✔		✔	✔
7. Enabling safe and sustainable boating	✔	✔	✔	✔	✔	✔	✔
8. Improving governance and enhancing social and economic benefits	✔	✔	✔	✔		✔	✔

Table F.2 Mechanisms to Address the Priority Threats in each Management Initiative (Table 3 of Marine Estate Management Authority, 2017)

The draft MEMS document proceeds to outline high level management actions. The mechanism for implementation of management actions is not yet clear from the Strategy. However, a recent paper delivered by the Chair of the Authority (Craik et al., 2017) indicated that the Authority will guide the implementation of the strategy although it appears that much of the responsibility for delivery of management actions will lie with other bodies. For example, coastal management programs are raised as a mechanism for regional delivery of some of the management actions.

There are two critical developments that are required and expected to accompany the finalised MEMS. These are an implementation plan, which will outline timeframes, lead agencies and key performance indicators; and a monitoring program to evaluate the success of the MEMS.

F.8 National Parks and Wildlife Act, 1994 (NPW Act)

The *National Parks and Wildlife Act, 1974* (NPW Act) gives the Chief Executive of the Office of Environment and Heritage care, control, and management over a range of reserves including national parks, historic sites, nature reserves and Aboriginal areas. In addition, the Chief Executive is also responsible for the protection and care of Aboriginal places and objects in NSW. Parts 7, 7A, 8, 8A and 9 of the Act, which dealt with flora, fauna, and threatened species, were repealed by the Biodiversity Conservation Act in 2016.

As noted above, parcels of Crown Land can be reserved for purposes under the NPW Act.

The purpose of a national park is to

> *"identify, protect and conserve areas containing outstanding or representative ecosystems, natural or cultural features or landscapes or phenomena that provide opportunities for public appreciation and inspiration and sustainable visitor or tourist use and enjoyment"*

And this purpose is to be supported by the following management principles:

> *(a) the conservation of biodiversity, the maintenance of ecosystem function, the protection of geological and geomorphological features and natural phenomena and the maintenance of natural landscapes,*
>
> *(b) the conservation of places, objects, features and landscapes of cultural value,*
>
> *(c) the protection of the ecological integrity of one or more ecosystems for present and future generations,*
>
> *(d) the promotion of public appreciation and understanding of the national park's natural and cultural values,*
>
> *(e) provision for sustainable visitor or tourist use and enjoyment that is compatible with the conservation of the national park's natural and cultural values,*
>
> *(f) provision for the sustainable use (including adaptive reuse) of any buildings or structures or modified natural areas having regard to the conservation of the national park's natural and cultural values,*
>
> *(g) provision for appropriate research and monitoring.*

For the subject Coastal Management Program, Eurobodalla National Park covers the following areas of interest:

- Areas south of the entrance to the Moruya River, but north of settled areas of Moruya Heads, including Toragy Point, Shelly Beach and Quandolo Island (which is reserved to mean high water mark).
- The entire waterway of Mummuga Lake including the foreshore, entrance, and the coastal barrier to the north of the waterway. The Bodalla State Forest is present in the western parts of the Mummuga Lake Catchment.

The Minister for the Environment can grant a lease or licenses over land within a National Park with limits on the purpose for which the lease or license can be granted outlined in §151A of the NPW Act. However, any license granted under this section should be consistent with the management principles for national parks as outlined

above. The NPW Act requires a management plan for the nature reserve to be prepared, consistent with those management principles.

F.8.1 Eurobodalla National Park Plan of Management

The plan of management (NSW National Parks and Wildlife Service, 2000) contains some information of direct relevance to the three estuaries being considered here. The plan notes that no operations may be carried out in the park unless they are in accordance with the plan. Overall, the park is noted to be very fragmented and highly disturbed by past use. The plan mentions many sites demonstrating the extensive and lengthy use of the area by Aboriginal people and the South Head Moruya Pilot station, along with its nearby cemetery as being a significant European heritage site. The plan also highlights the range of opportunities for recreation in a largely unmodified coastal environment.

Among the specific objectives of the plan of management are:

- Maintenance of good water quality within coastal lagoons.
- The protection of the areas scenic landscape.
- The protection of intertidal areas.
- The management of vegetation, encouraging regeneration of disturbed areas, maintaining natural floristic and structural diversity, conservation, and maximising habitat.
- Maintaining faunal diversity, with priority given to endangered and vulnerable species.
- The protection of Aboriginal sites and encouraging the Aboriginal community to be involved in management.
- The management of historic places and structures.
- Encouragement of a range of water and land-based recreational pursuits.
- Promotion of public awareness and appreciation.

The plan recognises the need to closely liaise with the community, state, and local government in managing the park, particularly with relation to the management of waterbodies, where a catchment management approach was promoted. While public use is to be promoted only a limited number of sites were to be managed to accommodate seasonally high levels of use.

In a discussion on the natural heritage of the park, the plan highlights that there are extensive areas of highly erodible quaternary sand and alluvium along the coasts and estuaries, with those sands being poorly structured and infertile. Erosion is recognised

as naturally occurring, and control measures were only proposed where this process had been accelerated or was threatening "*significant habitats or other values*". A grassland community of significance was identified at South Head Moruya.

Quandolo Island is noted as significant as a refuge for migratory birds and other wildlife. The plan reports that regular monitoring of Mummuga Lake is undertaken by Eurobodalla Shire Council, with laboratory analysis expenses being shared with the National Parks and Wildlife Service. The Plan notes that there are often demands for coastal lagoons to be artificially opened "*to overcome real or perceived problems*". Such problems include alleviating (or preventing) flooding of land, ameliorating smell, improving water quality, and encouraging fish recruitment. However, it is also noted that artificial openings are associated with adverse impacts on fish and other aquatic organisms, the destruction of nesting areas and degradation of recreational opportunities. The plan states that the NPWS supported minimal intervention in lagoon dynamics.

Actions proposed by the plan included the preparation of an estuary management plan and an interim lagoon opening strategy for Mummuga Lake. While NPWS does have a strategy for lagoon opening, no estuary management plan was ever prepared.

The plan reported on known recreational activities within Lake Mummuga, including windsurfing, water skiing, jet skiing, fishing, swimming, and power boating. It noted the boat ramp at Evans Point, which extends into the southern end of the lake. The boat ramp is regarded as not being within the Park. The plan proposed that windsurfing and recreational power boats (not PWC's) would be allowed within Mummuga Lake.

At the time of plan preparation, there was a limited amount of licensed estuary haul fishing within Mummuga Lake, characterised by intense fishing efforts over short time periods. The plan aimed to conduct research and to limit the activities of these haul fishers. Furthermore, the plan proposed consultation with NSW Fisheries to prohibit kelp collection and the collection of invertebrates.

F.9 Fisheries Management Act, 1994 (FM Act)

The *Fisheries Management Act, 1994* (FM Act) is the primary act covering the management of fish and their habitat in NSW. Therein, /'fish' includes oysters, crustaceans, echinoderms, beachworms, and other polychaetes. The act is administered by the NSW Department of Primary Industries which issues permits and has an approval body role for development in some circumstances.

The *FM Act* also provides a parallel role to the *Biodiversity Conservation Act* with the conservation of threatened species, population and ecological communities of fish and marine vegetation.

Depending on the nature of actions that are involved in coastal management, and the tenure of land upon which it is undertaken, it is possible that one or more permits will be required under Part 7 of the Fisheries Management Act. These may comprise some or all the following:

- A permit for dredging, due to the potential impact on estuarine habitats;
- A permit for reclamation, for example, relating to the reinstatement of access ways in areas when entrance channels have migrated; and
- A permit to harm marine vegetation, if seagrass beds are to be removed or smothered with sand.

As of 18th September 2016, the NSW Department of Primary Industries web site[13] advises that permission for dredging and reclamation could be granted for essential navigation or environmental rehabilitation. Regardless, permission is likely to be withheld if the activity would reduce water quality; damage or destroy marine vegetation or riparian vegetation, gravel beds, reefs, or snags; or interfere with commercial or recreational fishing. Furthermore, the web site advises that, under most circumstances a permit to damage live seagrasses would only be permitted for replanting and scientific research purposes.

However, there is an exception to the requirement for a permit outlined in §200(2)(a). If work is authorised under the *Crown Lands Act, 1989,* the need to acquire a permit is removed.

F.10 Biodiversity Conservation Act, 2016 (BC Act)

The BC Act repealed the *Threatened Species Conservation Act, 1995* in 2017 and was introduced alongside amendments to the *Local Land Services Act 2013* which were enacted at the same time.

Commensurate with the previous *Threatened Species Conservation Act* the BC Act provides for the conservation of threatened species and ecological communities. It generally covers:

- Procedures and criteria for the identification and listing of threatened species and ecological communities and their related critical habitats.
- The making of management plans for protected animals and plans.
- Provisions relating to biodiversity assessment and approvals.

[13] https://www.dpi.nsw.gov.au/fisheries/habitat/protecting-habitats/activities-requiring-a-permit

- The establishment of the Biodiversity Conservation Trust (which has replaced the Nature Conservation Trust, with the *Nature Conservation Trust Act* also being repealed by the BC Act).
- Regulatory compliance, investigation powers, criminal and other proceedings relating to offences under the BC Act.

The reforms aimed to maintain the protection of plants and animals (including marine mammals) to support ecologically sustainable development and to deliver a sustainable and productive agricultural sector. The BC Act also establishes a regulatory framework for a biodiversity offset scheme, including the calculation of biodiversity credits using the *Biodiversity Assessment Method* (BAM)[14]. The BAM also applies to the clearing of land under the *Local Land Services Act 2013.*

Under the new Act, non-State significant development under part 4 of the EP&A Act cannot be approved if the consenting authority believes the development is likely to have serious and irreversible impacts on biodiversity values. The assessment of biodiversity impacts via the BAM is to be presented in a Biodiversity Assessment Report (BDAR) which is to accompany the development application. If impacts are not "serious and irreversible", developers may offset impacts by:

- Generating biodiversity credits through a Biodiversity Stewardship Agreement.
- Purchasing biodiversity credits.
- Paying money into the Biodiversity Conservation Fund.

Serious and irreversible impacts on biodiversity values are defined in the *Biodiversity Conservation Regulation 2017* as contributing significantly to the risk of a threatened species or ecological community becoming extinct by:

- Causing further decline with the species or community which is suspected to be in a rapid rate of decline.
- Reducing the size of the species population or ecological community that is suspected or known to have a very small size.
- Impact on the species habitat or ecological community that is reasonably suspected to have a limited geographic distribution.
- The species or ecological community being unlikely to respond to measures to improve the situation.

[14] outlined in the supporting document: www.environment.nsw.gov.au/resources/bcact/biodiversity-assessment-method-170206.pdf with an online calculator available at https://www.lmbc.nsw.gov.au/bamcalcd

F.11 Local Land Services Act, 2013 (LLS Act)

The LLS Act and associated regulations commenced in 2014, establishing eleven local land services regions with a local board. The regions absorbed the functions of different Catchment Management Authorities and the *Catchment Management Authorities Act 2003* was repealed. The LLS act defines Local Land Services as including:

- Agricultural production.
- Biosecurity.
- Management of animal and plant pest and disease emergencies and other emergencies impacting on primary production.
- Animal welfare.
- Chemical residue management.
- Natural resource management and planning.

Under the LLS Act, eleven LLS regions are established, including the South East region which covers the entire Eurobodalla LGA. The local board is required to develop a local strategic plan to set the vision, priority, and strategy in respect of the delivery of local services, focussing on appropriate economic, social, and environmental outcomes. The Current South East Region Local Strategic Plan (South East Local Land Services, 2016) lists *"healthy, diverse and connected natural environments"* as one of its goals with that goal balanced against corresponding social and economic goals.

The South East Local Land Services has a customer focus, with those customers being land managers, including public and private land managers. Broadly, the LLS region provides technical expertise to land managers in controlling agricultural productivity, controlling pests, retaining a 'clean and green' image for local agricultural products, and managing natural resources. The actions outlined in the plan focus on delivering customer services, the provision of data and information and collaboration with stakeholders and research and development organisations. The south east region also has funding available to support landholders undertake works on coastal wetlands including salt marsh, mangroves, riparian areas, coastal floodplains, and estuarine areas. Funding can be used, for example to provide fencing to control stock and unauthorised recreational access, the removal and control of pests, revegetation to maintain buffers, address erosion or improve habitat and the removal of barriers to flow[15].

Within the Eurobodalla LGA, natural resource management strategies include:

[15] https://southeast.lls.nsw.gov.au/our-region/grants-and-funding/managing-coastal-wetlands, accessed 15/05/2018

- Improving soil health to manage erosion and protect priority industries and aquatic assets.
- Maintain good condition native vegetation, riparian vegetation, and landscape corridors.
- Maintain good condition estuaries, coasts, and marine areas.
- Maintain priority surface water, wetland, and groundwater assets.

In conjunction with introduction of the BC Act, the LLS Act was amended by the *Local Land Services Amendment Act 2017.* The changes involved repeal of the *Native Vegetation Act 2003* which changed the regulation of native vegetation clearing on rural land (excluding LGA's in the Sydney Metropolitan Area, State Forests or National Parks). Rural Land in NSW is now categorised as follows:

Category 1: Exempt Land, where native vegetation can be cleared without approval from Local Land Services, including land cleared of native vegetation as of 1990 or lawfully cleared afterwards.

Category 2: Sensitive Regulated Land, where clearing is not permitted (important habitats, e.g. coastal wetlands, and littoral rainforests).

Category 2: Vulnerable Regulated Land, where native vegetation clearing may not be permitted (e.g. steep or highly erodible land, or riparian areas).

Category 2: Regulated Land, includes land not cleared as of January 1990 or unlawfully cleared after 1 January 1990. Authorisation for native vegetation clearing may be required from Local Land Services.

F.12 Crown Lands Act,1989, (CL Act) and Crown Lands Management Act, 2016 (CLM Act)'

Following four years of engagement with the community regarding Crown Land, the *Crown Land Management Act 2016* is set to repeal the existing *Crown Lands Act 1989*. Parts of the new Act have already commenced, and it is expected that the remainder of that act will commence before the end of 2018, at which time the CL Act will be repealed. The objects of the CL Act are:

> *(a) to provide for the ownership, use and management of the Crown land of New South Wales, and*
>
> *(b) to provide clarity concerning the law applicable to Crown land, and*
>
> *(c) to require environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown land, and*

(d) to provide for the consistent, efficient, fair and transparent management of Crown land for the benefit of the people of New South Wales, and

(e) to facilitate the use of Crown land by the Aboriginal people of New South Wales because of the spiritual, social, cultural and economic importance of land to Aboriginal people and, where appropriate, to enable the co-management of dedicated or reserved Crown land, and

(f) to provide for the management of Crown land having regard to the principles of Crown land management.

The principles of Crown land management include environmental protection, conservation of natural resources wherever possible, encouraging appropriate public use and enjoyment, encouraging multiple use where appropriate, use and management that sustains the land and its resources in perpetuity and that Crown land be used, sold, leased, licensed or dealt with in the best interests of the State.

Commensurate with the previous act, the CLM Act allows for:

- The dedication or reservation of land.
- The granting of leases, licences, permits, easements or right of way.
- The appointment of managers for Crown land reserves.
- The appropriate sale or disposal of Crown land.

The Crown lands reform program will also specifically examine use and management of coastal Crown land to improve public benefits for current and future users.

The occupation of Crown land is managed through a system of leases, licenses, and permits. Leases and licenses which exist under the old Act will continue under the CLM Act. A lease enables exclusive use of a piece of land for a specified term and purpose. Leases can be for a term of up to 100 years. Licenses are contractual agreements that allow the licensee a right to occupy and use Crown land for a purpose, such as mineral extraction, mining, or dredging.

Local councils are often appointed responsibility for the care, control, and management of Crown land along the coast and adjacent to estuaries. The management of that land must be in accordance with the appointment instrument, the *Crown Land Management Regulation 2018*, any other applicable Crown land management rules, any applicable plan of management and any applicable community engagement strategy.

A local council managing Crown land is authorised to classify and manage Crown land as if it were public land as defined in the LG Act 1993. This means that a council can manage Crown land as if it were community land (the default classification) or

operational land (with the consent of the minister). This is a significant difference from the previous system, whereby council managed Crown reserves under the Crown Lands Act but managed their own public land under the LG Act. The removal of this distinction should streamline land management, although Crown land will still be owned by the state. The intention is to give Councils more autonomy in the management of Crown land with less oversight by the state. This also places greater responsibility on local councils, for example, in complying with the Commonwealth *Native Title Act 1993.* There is also an increased requirement for transparency and community engagement in the management of Crown lands.

Councils will be required to create new plans of management for Crown land within three years of the CLM Act commencing, unless a plan of management already exists under the old Act.

Importantly, any land reserved by either the CLM Act or the NPW Act will also be subject to the provisions of any relevant environmental planning instruments (EPIs). However, the provisions of these two Acts hold precedence over the EPIs. In other words, the EPIs cannot authorise any activities or projects that would not be authorised under these two acts.

F.13 Integrated Planning and Reporting

F.13.1 Community Strategic Plan

Following Council elections in September 2016, a new Community Strategic Plan (CSP) for Eurobodalla was prepared (Eurobodalla Shire Council, 2017b). That document is, necessarily, a high-level document which considers what the community is like, where it wants to be, and how it wants to get there.

The CSP notes that the Eurobodalla community has a strong rural, coastal, heritage and indigenous culture. It also highlights that the mixture of land uses is influenced by environmental constraints and that much of the urban development related infrastructure dates from the 1950's and 1960's and now requires significant upgrade.

The towns of Moruya (Moruya R.) and Narooma (Wagonga Inlet) are the second and third largest townships within the LGA. Council has made provision for an increase in employment lands in Dalmeny (Mummuga Lake) to generate opportunities.

The median age of residents in Eurobodalla is 50 with around a quarter of residents aged over 65. In comparison, the median age for NSW is 38. The population is expected to continue ageing into the future. A relatively high proportion of the community (5.1%) identify as Aboriginal or Torres Strait Islander. 64% of the population consider the environment and beaches to be the most valuable aspect of the LGA.

The CSP vision centres around the four desired characteristics of "Friendly, Responsible, Thriving and Proud". Under the "Responsible" theme, the CSP promotes decisions that support a sustainable community appreciative of the unique natural environment, including maintaining biodiversity to benefit both current and future generations. This is balanced against the other three themes which promote a healthy engaged community with a resilient economy.

The CSP recognises that local tourism and business rely on a healthy environment as does the quality of life of the local community. The Eurobodalla community considers the environment to be its most valuable asset and most important future issue (Eurobodalla Shire Council, 2017a). A future sea level rise of 0.30m by 2060 and 0.72m by 2100 (relative to mean sea level of 0.0 at 2015, which is around 8cm above Australian Height Datum) has been projected for Eurobodalla. Under the umbrella of "Protected and valued natural environment", the CSP describes a desire to:

> *"protect…. rivers, creeks, waterways, mountains, bushland and ecological communities"*

the following broad actions are listed:

1. Respond to our changing environment and build resilience to natural hazards.
2. Value, protect and enhance our natural environment and assets.
3. Maintain clean healthy waterways and catchments.
4. Develop community awareness of environmental opportunities, issues, and impacts.

Estuarine CMPs within the Eurobodalla LGA should be consistent with these broad concepts. Council's role is seen as including bush and wetland regeneration (including invasive species management), planning for the impacts of climate change, and providing education and support for the community and volunteer organisations. The community has a role to play in participating and cooperating as do a range of state government bodies, including South East Local Land Services, OEH and the National Parks and Wildlife Service.

F.13.2 Delivery Program and Operational Plan

The combined delivery program and operational plan document (Eurobodalla Shire Council, 2017c) outlines the services that Council plans on delivering over four year (2017-2021) and one year (2017-2018) periods respectively. These documents partly fulfil the requirements of the *Local Government Act, 1993*.

The Operational Plan lists expenditure across a range of service areas including *Environmental Management (0.94%), Public and Environmental Health (0.75%), Property Management (0.72%), Recreation (8.62%), Stormwater (1.88%)* and *Strategic Planning*

(1.91%). The largest three service areas for expenditure are *Sewer Services (22.62%), Water Services (19.77%)* and *Transport -Including Roads (16.09%)*. 57% of Council's total income (~$70M out of ~$108M) is derived from rates, with around 1.3% of those rates derived from an Environmental Levy. In total, around $115,000 of the environmental fund is earmarked for Coastal and Estuary Management.

Under these service areas, the following actions were included in the 2017-18 operational plan (Council section responsible in brackets):

- Prepare Eurobodalla Coastal Management Program *(Strategic Planning).*
- Manage lake openings *(Stormwater).*
- Plan and Implement Environmental Protection and Restoration Program *(Environmental Management).*
- Coordinate the Coastal and Environmental Management Advisory Committee (CEMAC) and associate projects *(Strategic Planning).*
- Review the Tuross/Coila Estuary Management Program *(Strategic Planning).*
- Undertake estuary management projects *(Environmental Management).*
- Undertake estuary health monitoring *(Public and Environmental Health).*
- Review development planning controls *(Strategic Planning).*
- Advocate for NSW Government boating and marine infrastructure and ongoing dredging of navigation channels *(Transport).*
- Build, renew and maintain the stormwater network *(Stormwater).*
- Maintain, renew, upgrade and seek additional funding for local boating and marine infrastructure *(Recreation).*
- Manage leases and licenses *Property).*

The Operational Plan includes the preparation of coastal management programs under Council's *Strategic Planning* service area.

F.14 Other Policies and Plans

The *Eurobodalla Local Environment Plan 2012* [16] guides how land is used in the Eurobodalla LGA and is the primary environmental planning instrument that shapes the future of communities within Eurobodalla. The LEP follows the requirements of the *Standard Instrument – Principal Local Environmental Plan*[17]. The zoning of different

[16] https://www.legislation.nsw.gov.au/#/view/EPI/2012/333, accessed 30/10/2018.
[17] https://www.legislation.nsw.gov.au/#/view/EPI/2006/155a/part1, accessed 30/10/2018

land parcels within the LGA have been provided as a GIS layer and the distribution of land zoning within the Coastal zone for each estuary is discussed in sections 3.1.4, 4.1.4, and 5.1.4.

The Batemans Marine Park is presently being reviewed as a Pilot project to guide review of all Marine Parks state-wide. Regardless, the existing zoning map (Department of Primary Industries, 2018) delineates the existing zone boundaries.

The key zone designations are:

- **Sanctuary Zone:** Where no recreational fishing, commercial fishing or associated collecting activities are allowed.
- **Habitat Protection Zone:** Recreational fishing is allowed, but there are significant restrictions on the types of commercial fishing that can be undertaken. Some collecting activities are also required.
- **General Use Zone:** Recreational fishing and associated collecting activities are allowed. Commercial fishing is allowed, excepting Trawl, dredge, or long line methods.

Throughout the Park, "Research", "Competitions and Organised Events", "Commercial Operations" and "Infrastructure Development" are allowed with a Permit from the Marine Park.

Three **Special Purpose Zones** also exist inside Wagonga Inlet. The range of permissible activities in these zones is very similar to the Habitat Protection Zone, with the exceptions that hand haul prawn nets are not allowed, and bait collection is generally not allowed, excepting bait trapping. Collection for aquariums is not allowed in these special purpose zones and spearfishing is not allowed east of the Princes Highway Bridge.

F.15 Demographics, Seasonal Patterns and Population Growth

A summary of the local demographics is provided in Councils Community Strategic Plan (Eurobodalla Shire Council, 2017a). Further analysis is available from the on-line demographic web site "*.id the population experts*"[18], which provides comparisons between the 2011 and 2016 censuses.

Overall, the estimated population of the Eurobodalla Shire at the end of 2017 was around 38,000 people although, due to the presence of visitors the number of people present overnight during winter, based on 2016 census data is around 50,000. In comparison, during the summer tourism peak up to 120,000 individuals may be

[18] *.id the populations experts:* https://atlas.id.com.au/eurobodalla

present. Around 40% of property owners are not resident in the Eurobodalla and around 30% of dwellings are not permanently occupied.

5.1% of the local population identifies as being Aboriginal, consistent with regional areas in NSW (State average is 2.5%), and 80% of the population was born in Australia.

The median age in Eurobodalla is 50, which is high for both the local region and NSW. More than a quarter of residents are over 65 years in age and this proportion is expected to grow by around 34% by 2036. In other words, this age cohort is expected to grow at around twice the rate of the general population over the next 20 years. The current growth rate of the general population has been around 0.9% in recent years, although this is expected to fall because of the 2019/20 bushfires and the COVID19 Pandemic.

Unsurprisingly, the population is highly seasonal which introduces substantial challenges. For example, facilities need to be constructed to handle summer peak seasonal loads and capacities. Around 1.2 million individuals visit the area annually, and 96% of nights booked in accommodation are for people from Australia, which is relatively high both regionally and for NSW. Visitors are commonly from Canberra and the ACT, who treat the region as a main holiday destination and from Sydney, who are generally touring regionally.

More fine-grained analysis has been completed (as available on the .id web site) for the three main towns. The result is shown in Table F.3.

Table F.3 Demographics and Change

Locality	Population 2020 (via Forecast)	Population 2036 (forecast)	Change in Population	Median Age 2016	Median Age 2011
Urban Moruya / Moruya Heads	3687	4732	+28.32%	51	46
Dalmeny	2027	2197	+8.38%	59	53
Narooma/North Narooma	3586	4029	+12.33%	59	53

While Narooma and Moruya are the second and third largest centres in the Eurobodalla LGA, Narooma is more of a destination for retirees and tourists, whereas Moruya provides a function as a rural service town. Moruya Heads is a coastal residential area associated with Moruya that attracts families who work in Moruya.

Together, the three main settlements associated with the three estuaries comprise around a quarter of the Eurobodalla LGA's permanent population, estimated as 39,369 (2020) and projected to grow by over 15% to 45,515 in 2036. Around 15,000 residents are actively employed, with the largest industry being health care and social assistance.

As of 2020, some $200M of funds have been allocated to the construction of a new hospital near Moruya, the *"Eurobodalla Health Service"*. Combined with construction of the Moruya Bypass, these projects are initiatives that will result in the relatively high population growth rate in Moruya over the next 15 years. Preliminary sites being investigated for the Hospital are:

- near the upper reaches of Malabar Creek, north of the location where it passes below the Princes Highway.
- Near the Tafe Campus to the south and east of the main commercial area of Moruya. This area sits within feeder tributaries of Racecourse Creek.

Both sites have the potential to impact on coastal wetlands by affecting their hydrology.

F.16 Economic Context

A summary of the local economy is provided by Council's Community Strategic Plan (CSP) and companion document (Eurobodalla Shire Council, 2017b, 2017a). The CSP notes that the local industry was once based on dairying, forestry, and fishing. The local economy is now built around tourism, agriculture, aquaculture, retail property and health services. 42% of households earn less than $600 per week (consistent with other regional communities) and 83% of working residents are employed locally. The local economy is worth around $1.31 billion per year.

Tourism is valued at over $400 million per year. Some sense of the attraction to the area is provided in the Plan of management for Eurobodalla National Park (NSW National Parks and Wildlife Service, 2000), where it was noted that fishing, surfing and camping were popular activities and visitors appreciated the unspoiled nature and minimal development of the area. As the population grows, some of these values will be challenged in some areas.

Unemployment is around 7% and is relatively high for regional New South Wales. Around 50% of the businesses in the LGA are home based. Council is keen to diversify the local economy to limit the seasonal boom and bust associated with the heavy reliance on tourism.

There are issues associated with available revenue to manage natural resources. There are a variety of factors, including the small rates base and increasing competition for grant funding

F.17 Cultural Context

The value placed on the natural resources of the estuaries in the Eurobodalla Shire has been prominent for millennia. The south coast of New South Wales, stretching from south of Wollongong to south of Eden is Yuin Country. The entire coastal strip from Bundeena to the Victorian Border, and inland to the tablelands, is presently subject to a native title claim which was filed in late 2017. The location is shown in Figure F.2. Media reports[19] highlight that a key concern of the native title claim relates to cultural fishing rights.

If successful, the claim is likely to affect Aboriginal fishing rights and use of some land, particularly national parks, state forests and Crown land, including Crown reserves managed by Council.

[19] For example https://www.abc.net.au/radio/programs/am/yuin-community-fight-for-cultural-fishing-rights/12077520, sourced 19/10/2020.

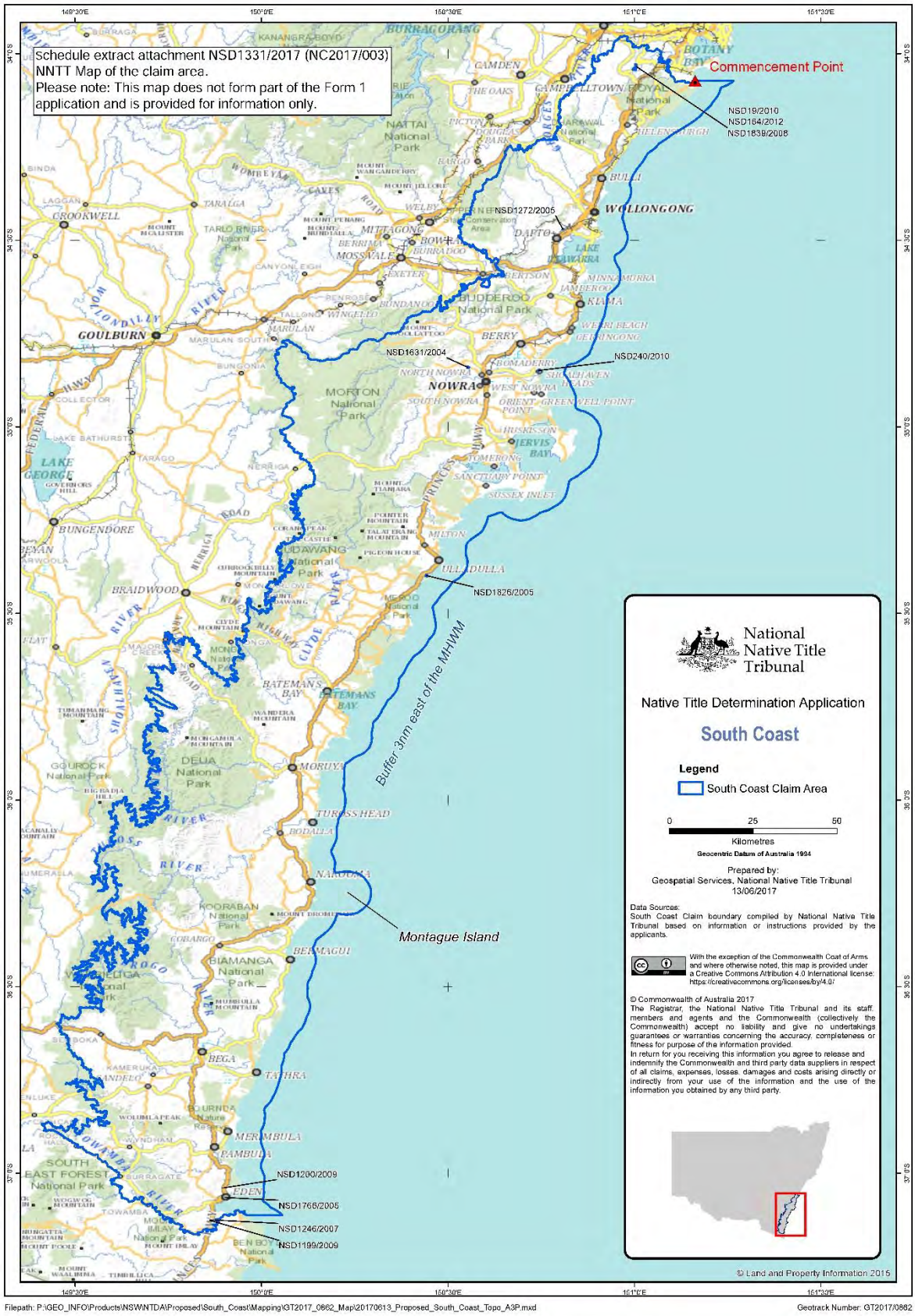

Figure F.2 Map of South Coast Native Title Application

Prior to the arrival of Europeans, the Yuin used fish, shellfish and sea mammals as food sources (NSW National Parks and Wildlife Service, 2000). Contact with Europeans began during the 1790's as a result of whaling. This was followed by foresters and the initial granting of land in the early 1800's. Many settlers had moved into Yuin Country by the 1820's and grazing activities began. Over time, as European settlement intensified, movement of the Yuin across their country was impeded and contact with Europeans caused a reduction in the Yuin population due to disease.

Large Aboriginal sites, including middens, campsites, and sites adjacent to waterways and estuaries are known to exist. Contemporary accounts from interviews with local Aboriginals highlight the continuing importance and use of the area by Yuin people (Dale Donaldson, 2006). There are numerous geographical sites of importance to the Yuin people in the region.

Threats to Aboriginal sites include uncontrolled public access, particularly to beaches, by vehicles and pedestrians given that numerous middens exist within the hind dunes (i.e. back barrier areas) which are often close to the entrances to estuaries. An example is the documented destruction of most middens that previously existed within areas of residential Narooma.

The most appealing features of the coastline to the Eurobodalla community are the beaches, parks, and historic sites. The coastline is seen as being unspoiled by development and the region is considered a family beach destination.

Following settlement of European pastoralists in the area, the Eurobodalla region was developed sporadically due to several gold rushes between the 1840's and 1900's. This growth was paralleled by the expansion of agricultural use and forestry.

Coltheart (1997) provides a description of development and training of the Moruya Estuary. The entrance to the Moruya River was first surveyed in 1874, and substantial dredging of the entrance began in 1883. However, problems remained, with the dredge superintendent reporting in 1888 that, where there had previously been deep water upstream to the township (presumably following a significant flood in 1847), there was:

> *"A continuation of sand banks …. The altered condition has been caused by the tearing up of the river bed and its banks by gold-diggers and sluicing parties seeking for gold from Araluen to Moruya, as well as the deposit of debris sent down from hydraulic sluicing"*

Work began on a fascine dyke, to help maintain a straight channel but this was breached in 1891 and works to maintain the channel faltered. Works continued in 1897 with dredged material being discharged behind a curved training wall. Additional work, including extension of the southern training wall in 1907 was reported as satisfactory until river scour caused the breakwater to subside in 1920. Work on a spur

wall began in 1925, the same year that another large flood flushed sand out of the lower River. Moruya became an important port, bringing in supplies as well as exporting products to Sydney. The entrance to the river received a significant amount of state government funding during the 1920s, during which time granite was being shipped from the quarry on the northern side of the river inside the entrance, to construct the pylons of the Sydney Harbour Bridge. Even after the contract for the Bridge was completed, rock from the Quarry was subsequently used to extend the southern training wall.

During the early 20th century development continued in the Eurobodalla Region, stifled periodically by World Wars I & II. In 1974, the Pilot Station at Moruya Heads ceased operation, although the buildings (pilot's cottage and several smaller buildings) remain as important sites of European heritage.

Timber getting and gold mining in and around Wagonga Inlet was occurring by the late 1800s. Dredging of the entrance around the turn of the century was ongoing, and internal training walls were constructed (completed in 1922) using rock quarried from hills to the north of the entrance. Even so, the entrance remained dangerous. Ultimately, breakwaters were not constructed at the ocean entrance until the 1970s, when the present-day entrance configuration was implemented.

APPENDIX B STAGE 2 STUDIES

REVIEW OF RISK BASED FRAMEWORK AND OTHER WATER QUALITY INFORMATION FOR MORUYA RIVER, MUMMUGA LAKE AND WAGONGA INLET

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Prepared For	EUROBODALLA SHIRE COUNCIL
Version	DRAFT
Date	04/12/2020

Document Control

Version	Date	CHECKED BY	ISSUED BY	Distribution[1]					
				EUROBODALLA SHIRE COUNCIL	OFFICE OF ENVIRONMENT AND				
DRAFT	04/12/2020	DJW	DJW	E	E				

[1] 'E' refers to electronic distribution; numerals refer to number of hard copies.

Contents

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1 Introduction

The *Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning Decisions* (Dela-Cruz et al., 2017) (the Framework) was developed by the NSW Office of Environmental and Heritage (now DPIE) and the NSW Environment Protection Authority. The Framework is underpinned by principles from the National Water Quality Management Strategy, and is intended for use by decision-making authorities in NSW such as councils and environmental regulators for the management of land-use activities in relation to the health of waterways.

The Framework describes a five-step process for the integrated management of urban development, waterway health and community expectations and values. The five steps are for implementation at the catchment or subcatchment scale and are defined as follows:

1 **Establish context:** identify land uses, waterway type, responses to previous land use activities, waterway objectives, and potential impacts of land use.

2 **Effects-based assessment:** quantify stressors from land use activities, the sensitivity of the waterway to stressors, and the extent of impact of the stressors. Identify the level of protection based on indication from stakeholders and the waterway objectives.

3 **Compare against waterway objectives (analysing risks of impact):** compare assessed indicators against the desirable range.

4 **Strategic impact assessment (evaluating risks based on feasibility):** evaluate the risks from land use activities based on the feasibility of achieving the intended outcomes of management responses. This step will inform which management responses are best suited to address the risks of each land use activity. Steps 2 to 4 are iterative to enable consideration of several management responses.

5 **Design and implementation.** Identify need for environmental offsets, set up a monitoring and review process.

2 NSW Estuary Health Risk Dataset

The former OEH produced the NSW Estuary Health Risk Dataset through application of Steps 1 and 2 of the Framework. The dataset identifies land use pressures and associated risk in relation to the ecological heath of estuaries. The dataset considers risks from nutrient and sediment runoff at the subcatchment scale. It does not, reportedly, consider other pressures such as acid sulfate soils, erosion, or contaminants.

"Risk scores", which aimed to represent the relative risk to estuary health for each subcatchment, were derived following a method that resembles the approach of ISO31000. The risk score for each subcatchments was the product of the likelihood and consequence scores assigned to a subcatchments. The likelihood score represents the chance that runoff from the subcatchment will impact the health of the estuary, and the consequence score represents the magnitude of impact on the health of the estuary.

Likelihood and consequence scores were determined from an "*effects-based assessment*" that consisted of coupled catchment runoff and estuary models.

Likelihood Scores

The likelihood scores in the dataset are based on expected catchment export loads. Local export coefficients (for total nitrogen, total phosphorous, and total suspended solids) were derived from modelled surface flows and measured export data for different land use activities from the literature. The export loads in the dataset are expressed as total export loads from each subcatchment (kg/year), as well as the average export load from one hectare per year (kg/ha/year). Both types of data were reportedly considered in determining likelihood scores.

The likelihood that subcatchment runoff will impact the health of the estuary is expressed as a relative score from 1 to 4, where a score of 4 indicates a high likelihood of impact. The likelihood scores in the dataset and their descriptors are presented in Table 1. In addition to the criteria in Table 1, Dela-Cruz et al. (2019), indicated that subcatchments which drain directly to an estuary were assigned a likelihood score of 4. However, based on our examination, this does not seem to be the case within the *Estuary Health Risk Dataset* for many of the fringing subcatchments for the estuaries being considered by this CMP.

Consequence Scores

Two types of models were used by Dela-Cruz et al. (2019), apparently depending on estuary type, for determining consequence scores. 1D box models were used for coastal lagoon/lake type estuaries such as Mummuga and Wagonga. The 1D box models only considered total nitrogen exports from the catchment, and outputs

comprised total nitrogen concentrations in the estuary and the related ecological responses represented by chlorophyll-a and water clarity (Secchi depth).

A 1D branched model was used for the Moruya River. Outputs seem to have been base exceedance (total nitrogen) and extent of impact (percentage of surface area). However, no results are present in the *Estuary Health Risk Dataset* for the Moruya River.

Table 1 Likelihood Score Definitions (Dela-Cruz et al., 2019)

Likelihood	Score	Description
High	4	The total and/or per hectare surface flows, TN, TP and TSS loads from the subcatchment are in the >75th percentile of modelled data.
Moderate	3	The total and/or per hectare surface flows, TN, TP and TSS loads from the subcatchment are in the >50th and ≤75th percentile of modelled data.
Low	2	The total and/or per hectare surface flows, TN, TP and TSS loads from the subcatchment are in the >25th and ≤50th percentile of modelled data.
Very Low	1	The total and/or per hectare surface flows, TN, TP and TSS loads from the subcatchment are in the ≤25th percentile of modelled data.

Table 2 Consequence Score Definitions (Dela-Cruz et al., 2019)

Consequence	Score	Description[2]
High	4	The chlorophyll-a and water clarity (1D box models) or base exceedance and/or extent of potential impact (1D branched models) metrics are in the >75th percentile.
Moderate	3	The chlorophyll-a and water clarity (1D box models) or base exceedance and/or extent of potential impact (1D branched models) metrics are in the >50th and ≤75th percentile.
Low	2	The chlorophyll-a and water clarity (1D box models) or base exceedance and/or extent of potential impact (1D branched models) metrics are in the >25th and ≤50th percentile.
Very Low	1	The chlorophyll-a and water clarity (1D box models) or base exceedance and/or extent of potential impact (1D branched models) metrics are in the ≤25th percentile.

Risk Scores

Risk scores are the product of the likelihood and consequence scores, and there are hence nine possible risk scores, ranging between 1-16 (lowest to highest). No risk scores for the Moruya River Estuary are included in the dataset.

2.1 Mummuga Lake

The risk scores for the Mummuga Lake catchment are shown in Figure 1. For simplicity, we have grouped the nine risk scores into three categories, with a score of

[2] We note that consequence scores are reported differently in other locations of the report. The definitions in this table are from Section 6.3. Alternative definitions are given in Section 2 and in Table 1b of the same report.

1-3 corresponding to a 'low' risk, a score of 4-8 corresponding to a 'moderate' risk, and a score of 9-16 corresponding to 'high' risk.

Considering Figure 1, it is surprising that:

- Most forested subcatchments are assigned the highest risk score.
- The urbanised catchments have moderate to low risk scores.
- Several subcatchments that fringe the estuary have low risk ratings.

We have examined the likelihood scores applied to fringing subcatchments and it is clear that these were not assigned a likelihood score of 4 as described in Dela-Cruz et al. (2019).

From inspection of the likelihood and consequence scores alongside the subcatchment areas, it can be noted that higher likelihood and consequence scores, and subsequently risk scores, were allocated to those with larger areas, indicating that the risk scores are largely influenced by the total export loads from a catchment. This is particularly evident when comparing subcatchment 53 in Figure 1 to its adjoining subcatchments, which are all assigned higher risk ratings, despite being all forested land.

To be useful for management a more nuanced approach is needed. The finding in the preceding paragraph indicates that the risk is highly correlated to subcatchments area, which is a somewhat arbitrary artefact of the way the analysis is completed.

2.2 Wagonga Inlet

The risk scores for the Wagonga catchment are shown in Figure 2. Again, we have grouped the nine risk scores into three categories. Considering Figure 2, we note that:

- The western area of the catchment consists of forested land. The majority of the subcatchments in this area are again assigned the highest risk scores, with the exception of the subcatchments which Billa Billa Creek passes through (e.g. subcatchments 8-12 and 14), which are mostly assigned low or moderate risk scores.
- Subcatchments in the mid to lower reaches of Punkally Creek (34 & 38) are assigned a low risk, whereas these are recognised as problematic considering ongoing erosion of the Banks of the creek, the land being cleared for grazing and sedimentation/faecal contamination affecting the oyster leases at the downstream end of the Creek.

The risk ranking for subcatchments around Wagonga Inlet do not match the experience of landowners, stakeholders, and the local council.

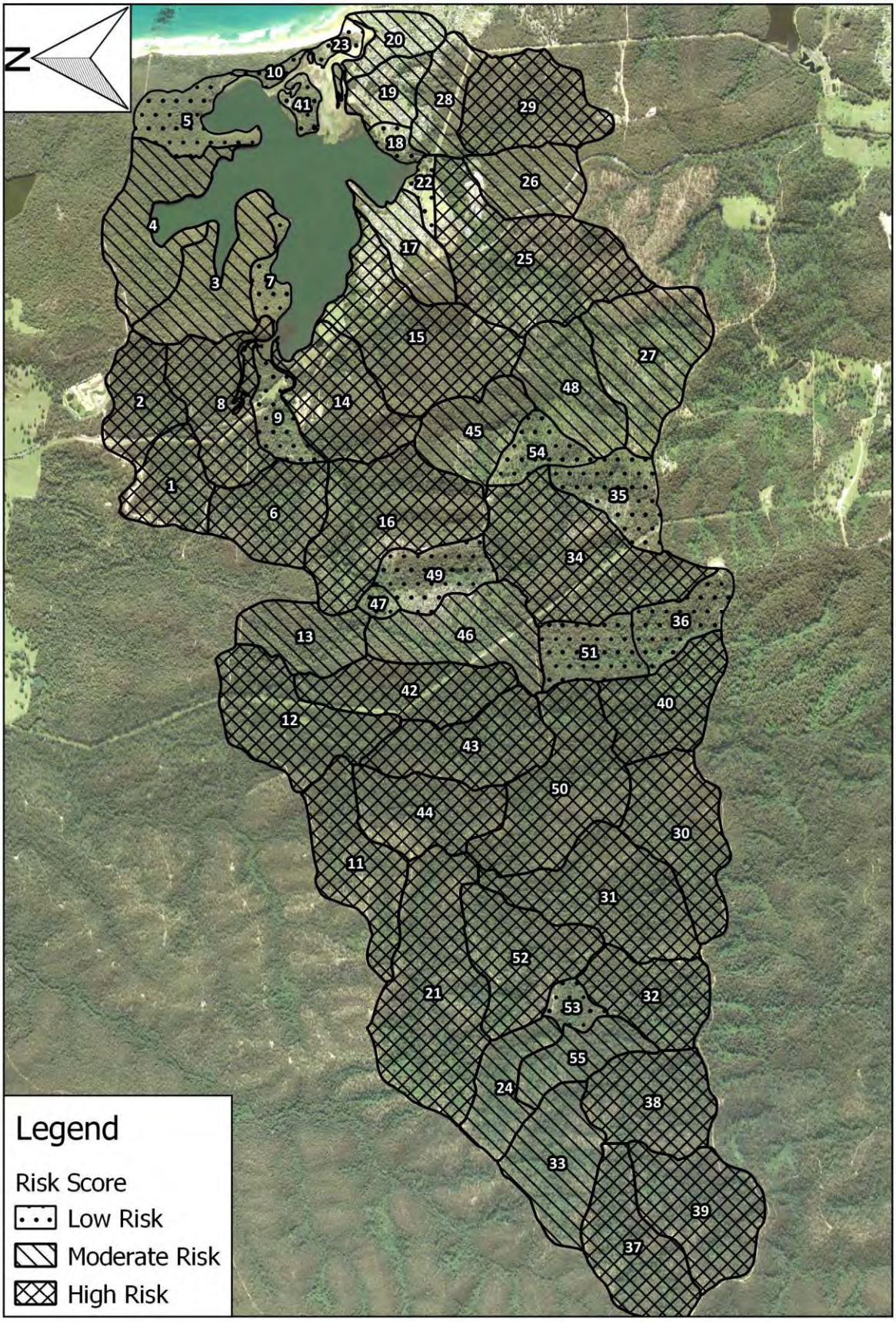

Figure 1: Mummuga Lake Estuary Risk Scores

0 0.5 1 1.5 km

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet

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Salients

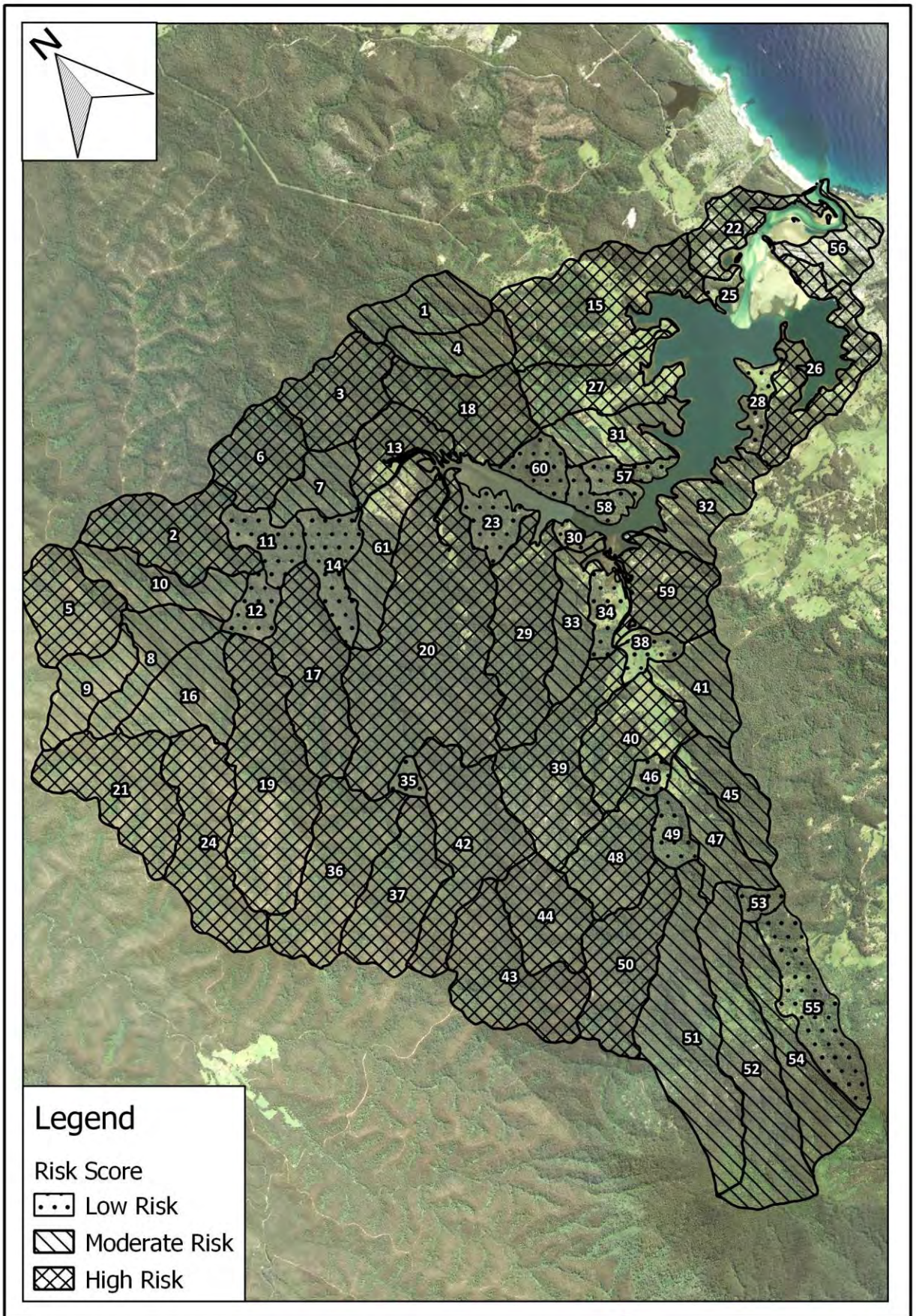

Figure 2: Wagonga Inlet Estuary Risk Scores

0 1 2 3 km

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet	REV A	DRAWN EN	CHECK DJW	Salients

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3 Conclusions

Considering our review of the estuarine health risk dataset, and the methodology reported in Dela-Cruz et al. (2019), we note that:

- The component input values (for 'likelihood' and 'consequence') seem to contradict some aspects of the description provided in relation to their derivation. It is possible that some subsequent steps have been involved in deriving the risk rankings, given that the Estuarine Health Risk data was released subsequently to Dela-Cruz et al. (2019). We know that application of the "Risk-Based Framework" is evolving as it is applied in NSW over time.
- The risk rankings in the Estuarine Risk dataset do not reflect the experience of landowners, stakeholders, and the local council in managing Wagonga Inlet or Mummuga Lake.
- The "Risk-Based Framework" provides a reasonable baseline for approaching the problem of catchment impacts on water quality in estuaries, but care is needed to ensure that the application is logical (i.e. comprises robust conformance with ISO31000) and that extra special care is taken in ensuring that terms like "risk", "consequence", "likelihood", "threat", "vulnerability" etc. are very clearly defined, preferably consistent with ISO31000 and those definitions consistently applied.
- Consideration of total export loads in determining likelihood and consequence scores seems to have resulted in a relationship between subcatchment size and risk, where higher risk scores are associated with larger subcatchments.

ISO 31000 defines risk as the "effect of uncertainty on objectives". It will be necessary for future studies to consider more locally specific water quality objectives in order to refine the risk assessment presented in the dataset. The Water Quality Management Framework, described by the National Water Quality Management Strategy, provides guidelines for establishing locally specific water quality objectives to protect the community's current values and uses.

Establishing local values and water quality objectives through consultation with the community and stakeholders will enable a clear identification of risks based on the values within the waterbody which may be impacted, for example biodiversity, recreation, and aquaculture.

COASTAL WETLAND MIGRATION EXTENTS FOR MORUYA RIVER, MUMMUGA LAKE AND WAGONGA INLET

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Version	DRAFT
Date	04/12/2020

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Version	Date	CHECKED BY	ISSUED BY	Distribution[1]					
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DRAFT	04/12/2020	DJW	DJW	E	E				

[1] 'E' refers to electronic distribution; numerals refer to number of hard copies.

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1 Introduction

As part of the NSW Estuary Tidal Inundation Exposure Assessment (Office of Environment & Heritage, 2018) extents of inundation associated with projected sea level rise for estuaries along the entire NSW Coast were estimated. The estimation considered the transformation of tides along the length of each estuary and subsequent inundation of the adjacent floodplain and wetlands.

The NSW state government provided GIS layers of the approximate inundation extent that would occur around an estuary during a "King Tide" assuming several different amounts of sea level rise (0.0m, 0.5m, 1.0m and 1.5m). The Highest High Water during a Spring tide around the Solstices (HHWSS) was used as a proxy for the "King Tide".

Coastal wetlands in NSW are mapped by the State Environmental Planning Policy (Coastal Management) 2018 (CM SEPP). The wetlands were mapped based on floristic characteristics. In other words, the wetland extents in the CM SEPP are based on where important vegetation communities, such as saltmarsh or mangroves are known to occur (or to have occurred in the past). These extents may be based on aerial photographs of different ages, or field interpretation, depending on the best available information at the time the SEPP was mapped.

The vegetation communities that are classified as coastal wetlands depend on either permanent or periodic inundation to survive. As sea levels rise, tides will flood more of the landscape. There is potential for coastal wetlands to migrate landwards to ensure that they continue to inhabit the tidal range 'niche' where they thrive.

The tidal inundation dataset, provided as a single shapefile for each estuary for each amount of sea level rise, was used to estimate the potential expansion in tidally inundated area around the coastal wetlands within the Moruya River, Mummuga Lake and Wagonga Inlet estuaries.

In some locations, the extent where wetlands presently exist (as shown in the CM SEPP mapping) does not match the extent that king tides can presently inundate, as estimated by the "present day" modelled extent, using 0m of sea level rise. This is due to a variety of reasons, including potential blockage by structures such as levees or tide gates, or the use of areas of saltmarsh for grazing.

Accordingly, there exist a several areas where rehabilitation works can presently be undertaken to encourage an increase the extent of Coastal Wetlands (by fencing to exclude cattle, for example). These areas have been calculated for each key wetland complex around the three estuaries. Similarly, the change in area from present day HHWSS inundation extents to the extents represented by the three projected sea level rise scenarios presented has been calculated. The increase in inundation extents are presented on maps in the following sections.

2 Coastal Wetland Migration Capacity

Possible coastal wetland areas associated with the present HHWSS condition and three future sea level rise scenarios were determined by calculating the difference in area between the extent of inundation anticipated for each condition, excluding areas currently part of the water body, and the area of the CM SEPP mapped wetlands.

2.1 Moruya River

The coastal wetland areas for the Moruya River Estuary, as currently mapped by the CM SEPP, are shown in Figure 1. The existing wetland areas are as follows:

- A complex of wetlands totalling 94ha near Moruya Heads at the downstream end of the estuary.
- A 60ha area south of Moruya River, between Moruya and Moruya Heads.
- A complex of wetlands totalling 120ha bordering Malabar Creek and Lagoon.
- A 45ha area adjacent to Racehorse Creek.
- A smaller, 9ha area adjacent to Mogendoura Creek.

The additional areas (beyond the current coastal wetlands area) which these wetlands could occupy for sea level rise conditions of 0.0m, 0.5m, 1.0m, and 1.5m above current the HHWSS level are tabulated and presented in Figure 1. The additional area for the present (0.0m) condition represents the area which could currently, potentially, currently support coastal wetland area if rehabilitated.

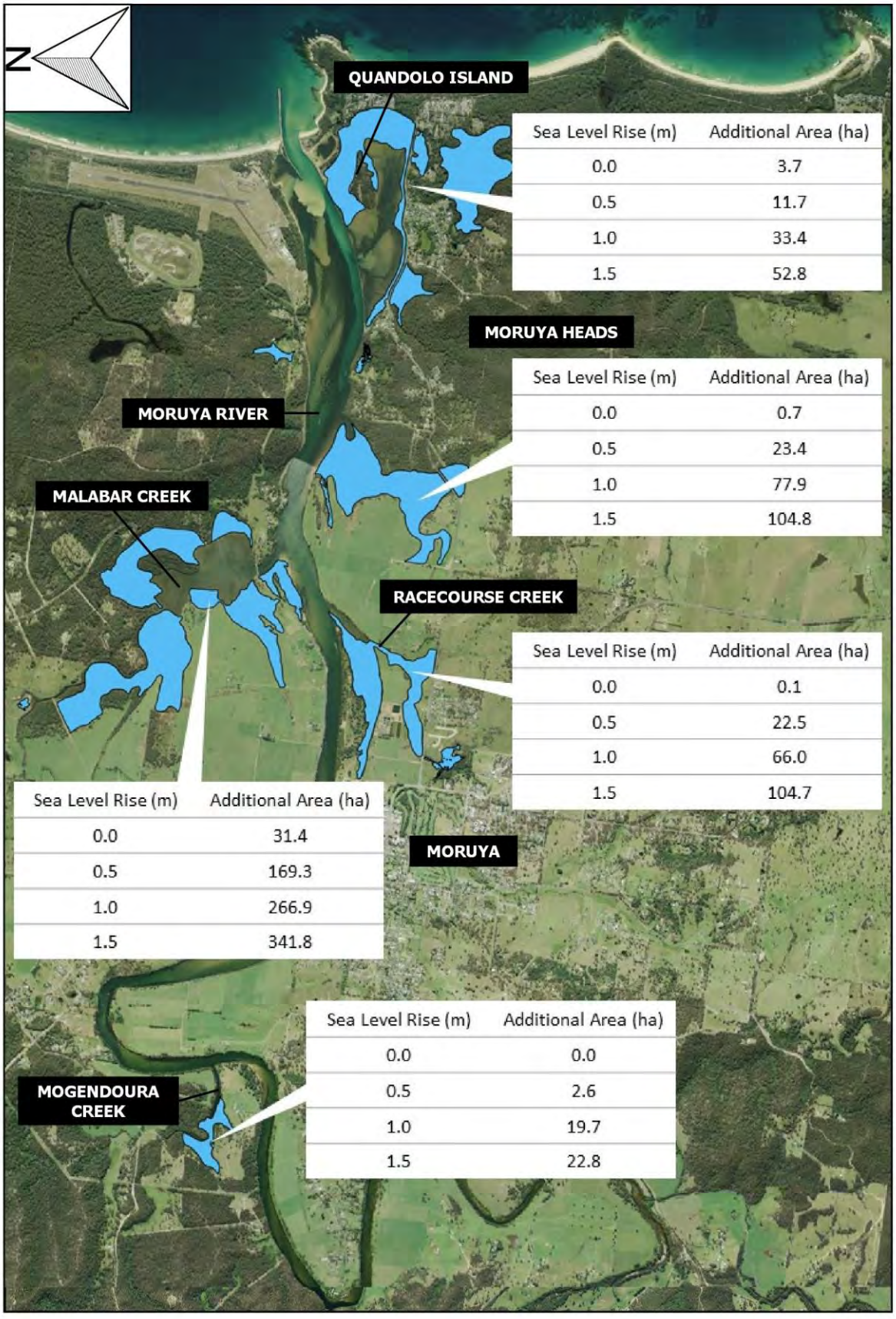
Note that in some areas, wetlands are bounded by urban areas and are not likely to adapt by moving further upslope in these areas. For example, the group of wetlands at the downstream end of the Moruya River, fringing South Head Road.

Figure 1 shows that the notable expansion is possible around the Malabar Lagoon wetland complex followed by wetlands downstream of Moruya, on the southern bank.

2.2 Mummuga Lake

The coastal wetland area for Mummuga Lake, as currently mapped by the CM SEPP, is shown in Figure 2. The existing wetland areas are as follows:

- A 7ha area at Amherst Island, at the downstream end of the estuary.
- A 16ha area on the western side of the Lake, where Lawlers Creek discharges into the Lake.



Sea Level Rise (m)	Additional Area (ha)
0.0	3.7
0.5	11.7
1.0	33.4
1.5	52.8

Sea Level Rise (m)	Additional Area (ha)
0.0	0.7
0.5	23.4
1.0	77.9
1.5	104.8

Sea Level Rise (m)	Additional Area (ha)
0.0	0.1
0.5	22.5
1.0	66.0
1.5	104.7

Sea Level Rise (m)	Additional Area (ha)
0.0	31.4
0.5	169.3
1.0	266.9
1.5	341.8

Sea Level Rise (m)	Additional Area (ha)
0.0	0.0
0.5	2.6
1.0	19.7
1.5	22.8

Figure 1: Coastal Wetlands Areas - Moruya River

0 0.5 1 1.5 2 km

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet

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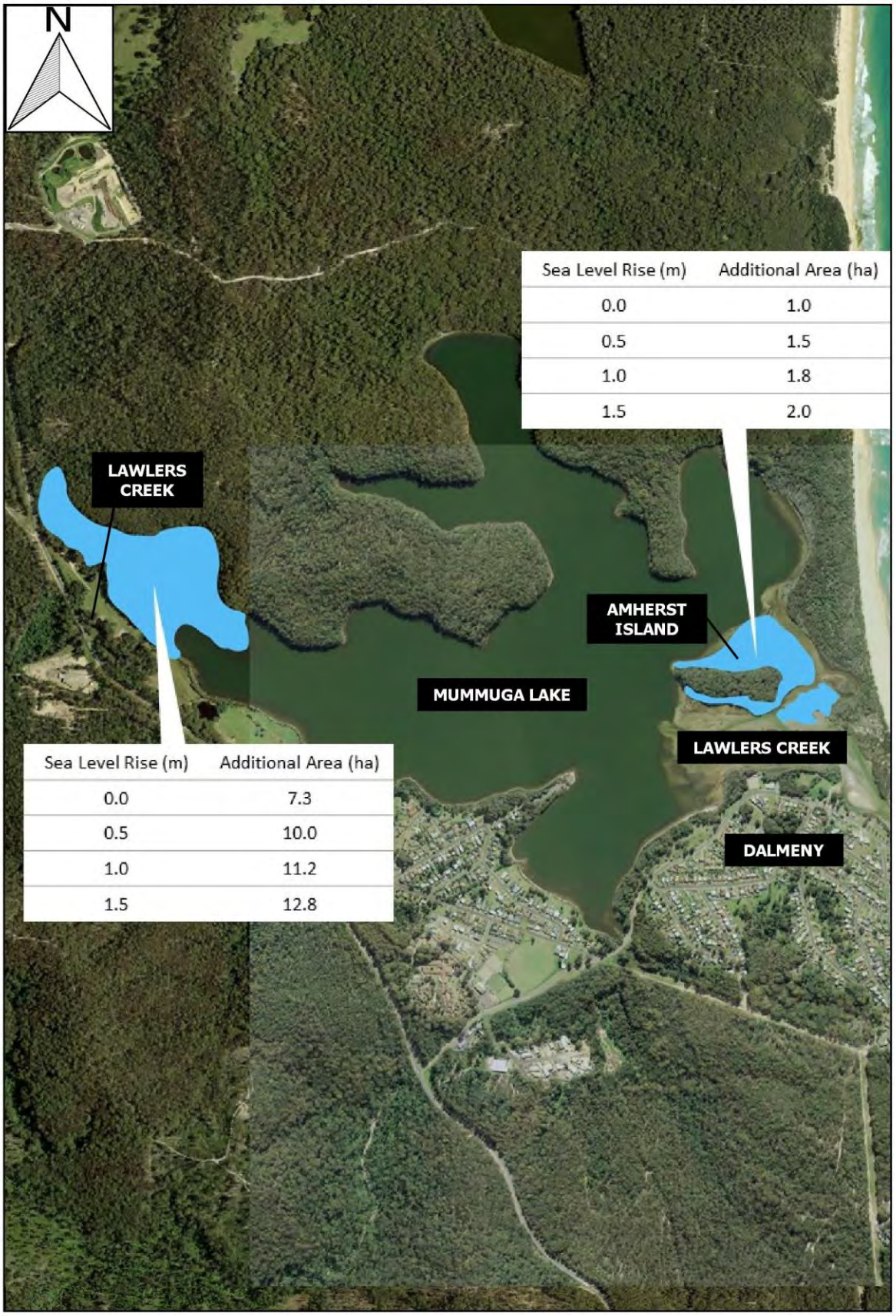

Sea Level Rise (m)	Additional Area (ha)
0.0	1.0
0.5	1.5
1.0	1.8
1.5	2.0

Sea Level Rise (m)	Additional Area (ha)
0.0	7.3
0.5	10.0
1.0	11.2
1.5	12.8

Figure 2: Coastal Wetlands Areas - Mummuga Lake

0 250 500 750 m

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet

REV	DRAWN	CHECK
A	EN	DJW

GIS File: Z:\BusinessShare\Them\Projects\P00053_CMPsforMoruya\GIS\SEPPWetlandsInundation\SEPPWetlandsMigration.qgz

Salients

The additional areas (beyond the current coastal wetlands area) which these wetlands could occupy for sea level rise conditions of 0.0m, 0.5m, 1.0m, and 1.5m above current the HHWSS level are tabulated and presented in Figure 2. The additional area for the present (0.0m SLR) condition represents the area which could currently, potentially, support coastal wetland area if rehabilitated.

Options for current and future rehabilitation are limited at Amherst Island, but that there is some scope for landward expansion around the Lawlers Creek fluvial delta.

2.3 Wagonga Inlet

The coastal wetland area for Wagonga Inlet, as currently mapped by the CM SEPP, is shown in Figure 3. The existing wetland areas are as follows:

- A narrow, 3ha area between the Pacific Highway Bridge and Quota Park.
- A 27-ha area at Hobbs Bay which extends along the downstream reaches of Punkally Creek.
- A 37ha area at the upstream end of Brices Bay.

The additional areas (beyond the current coastal wetlands area) which these wetlands could occupy for sea level rise conditions of 0.0m, 0.5m, 1.0m, and 1.5m above current the HHWSS level are tabulated and presented in Figure 3. The additional area for the present (0.0m SLR) condition represents the area which could currently, potentially, support coastal wetland area if rehabilitated.

Note that in some areas, wetlands are bounded by urban areas and are not likely to adapt by moving further upslope in these areas. For example, the group of wetlands between Quota Park and the Princes Highway Bridge, while analysis shows they could migrate further inland, this area within Narooma Flats presently contains urban development. Options for rehabilitation and expansion of existing wetlands would mostly be confined to the areas at the upstream (western) reaches of Wagonga Inlet.

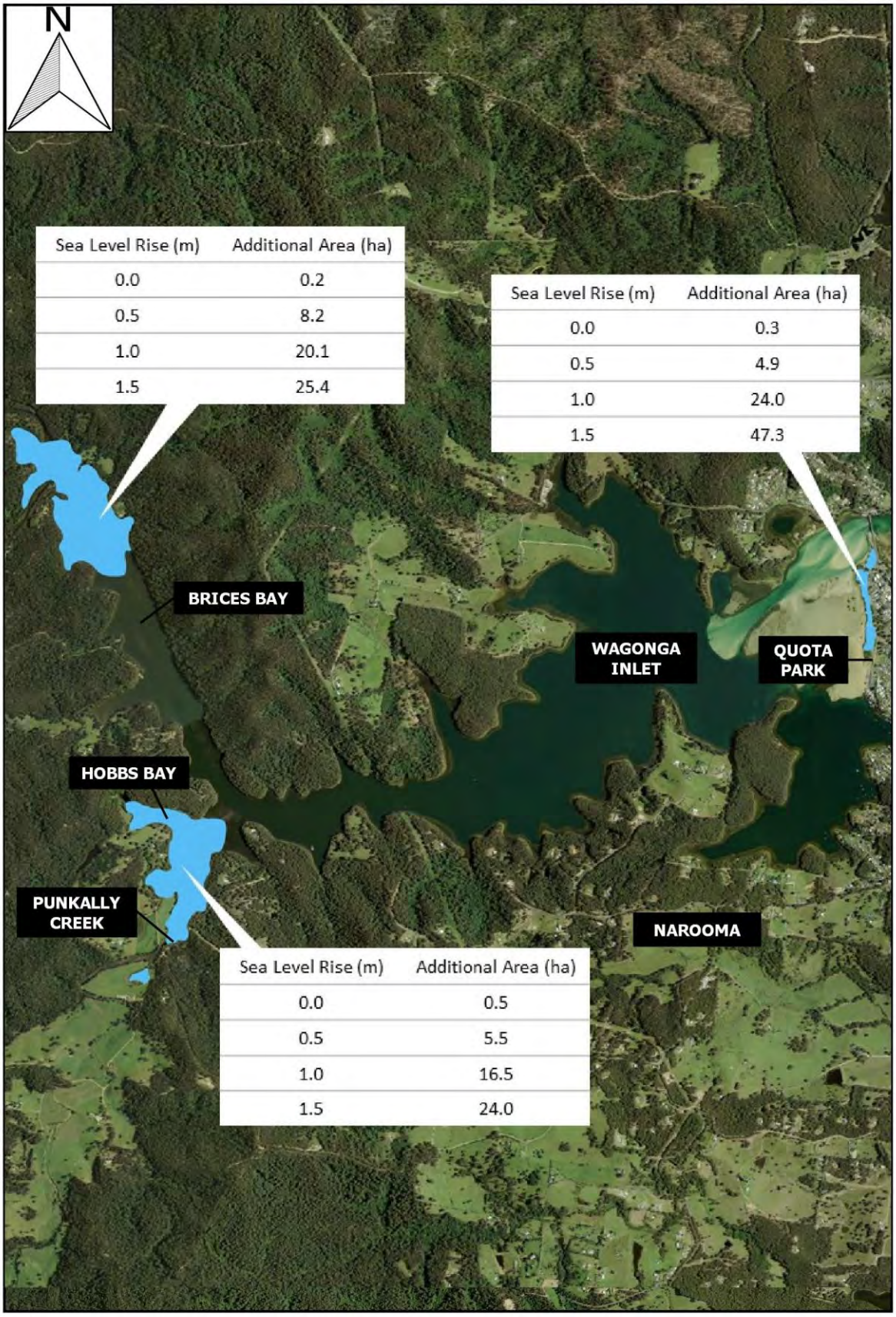

Figure 3: Coastal Wetlands Areas - Wagonga Inlet

0 500 1000 1500 m

APPROX SCALE

Coastal Management Program for Moruya River, Mummuga Lake and Wagonga Inlet

REV	DRAWN	CHECK
A	EN	DJW

GIS File: Z:\BusinessShare\Them\Projects\P00053_CMPsforMoruya\GIS\SEPPWetlandsInundation\SEPPWetlandsMigration.qgz

Salients

APPENDIX C ADDITIONAL CONSULTATION OUTCOMES

C.1 Introduction

Initial consultation activities are outlined in the scoping study which preceded the development of the CMP and is provided as a parallel Appendix.

Consistent with the recommendations of the guidance provided in the toolkit that accompanies the Coastal Management Manual (NSW Government, 2018b), the strategy adopted for public participation in development of the CMP has aligned with the "involve" level of the International Association for Public Participation (IAP2) spectrum. To this end, the community were engaged via drop-in sessions during the scoping study phase, and through direct face-to-face consultation and an online survey during preparation of the CMP. During 2020, some consultation activities have been constrained by the impact of the COVID-19 pandemic.

Following the scoping phase (Stage 1), additional consultation was completed to support Stages 2 and 3 of the CMP development process. The consultation completed needed to be modified from that originally intended due to restrictions around the COVID-19 pandemic and there were some delays. However, the activities ultimately undertaken at this stage were:

1. An online community survey was conducted between August and September of 2020. Questions related to values, issues, and access to the three estuaries.
2. Stakeholder consultation including:
    - COVID safe, on-site discussions with state government agency representatives in late August 2020; and
    - Ongoing email, telephone and online meetings with state government agency representatives and council staff during September - November 2020.

The outcomes of these consultation efforts have been summarised into the following two sections, expressing the outcomes in terms of issues for additional consideration in the revised risk assessment and potential management strategies to address risks.

C.2 Community Consultation

There were 117 responses to the online survey, including multiple choice questions alongside opportunities to submit written answers. Participants were asked to indicate which estuary they interact with the most, and the results corresponding to each estuary are summarised here.

C.2.1 Moruya River

67 (57%) survey participants reported that, of the three estuaries, they mostly interact with the Moruya River. The range of uses by these participants is presented in Figure C 1. Responses indicate that the Estuary is used for a range of activities, although recreational fishing was the least popular compared to other uses such as boating, walking, swimming, and bird watching.

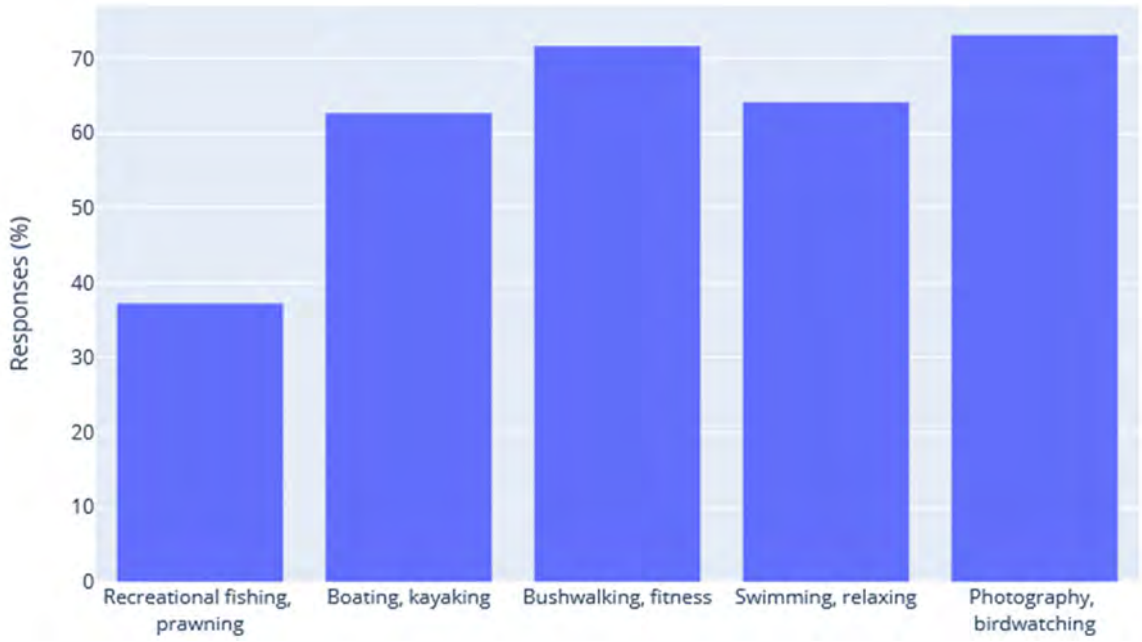

Figure C 1 Estuary Values - Moruya

Participants were asked to rank six management objectives in order of importance for the Moruya River. The management objectives were scored based on a weighted average of their ranking from 1st to 6th, and the results are presented in Figure C 2. "Improving protection of flora and fauna" followed by "Reducing erosion" were of highest priority. Similarly, when asked to nominate from a list of threats those they believed to be of most significance, the loss of marine habitat (e.g., seagrasses and mangroves) and invasive species were highlighted as the greatest threats. Many participants also submitted written responses to this question, from which commercial fishing, fish netting, and the use of jet skis were also nominated as threats to the estuary.

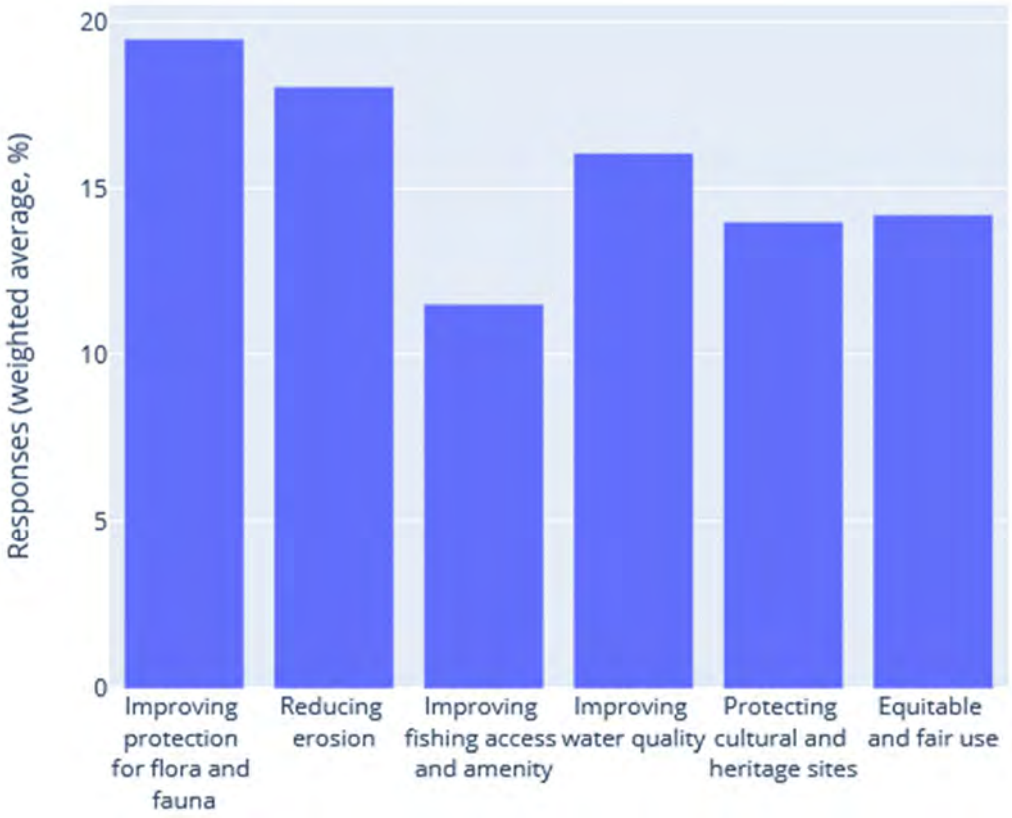

Figure C 2 Management Priorities – Moruya

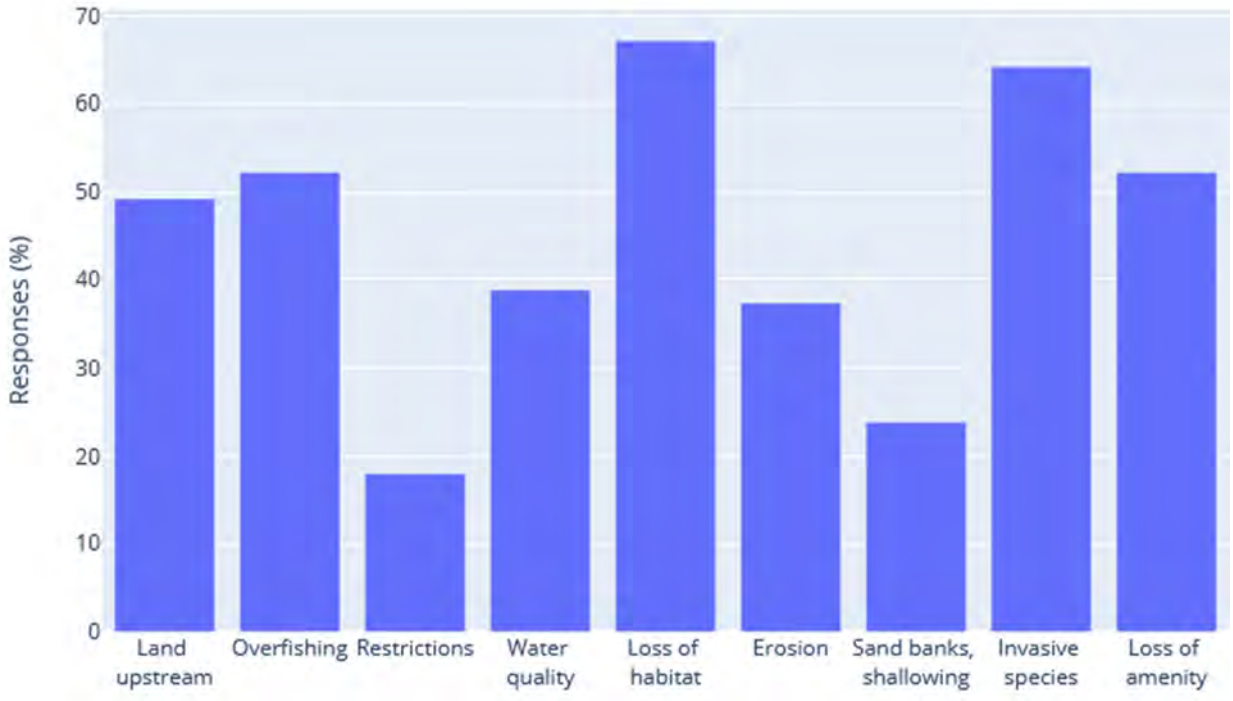

Figure C 3 Threats to estuaries - Moruya

Figure C 4 presents the spread of opinion regarding the level of access to the estuary, which received a mixed response. Over a third of responses (37%) indicated that they are satisfied with current access, and 30% indicated that access should be reduced to protect from degradation. A quarter of the responses requested improved access. Improved pedestrian access was a focus of the written responses, and where reduced access was suggested, comments were mostly about vehicle access.

The use of watercraft also received a mix of responses (Figure C 5), with several participants indicating that watercraft are 'definitely impacting' amenity of the estuary, and a similar number indicating that there is 'no issue' with watercraft use. Almost a third of responses acknowledged that the use of watercraft may be impacting amenity. Some written responses indicated that aversion to the use of jet skis is predominantly due to noise levels and their contribution to erosion, and many comments requested that the use of jet skis be prohibited or limited. It was also suggested that the speed limit should be lowered (a 4-knot limit was suggested) and/or better enforced.

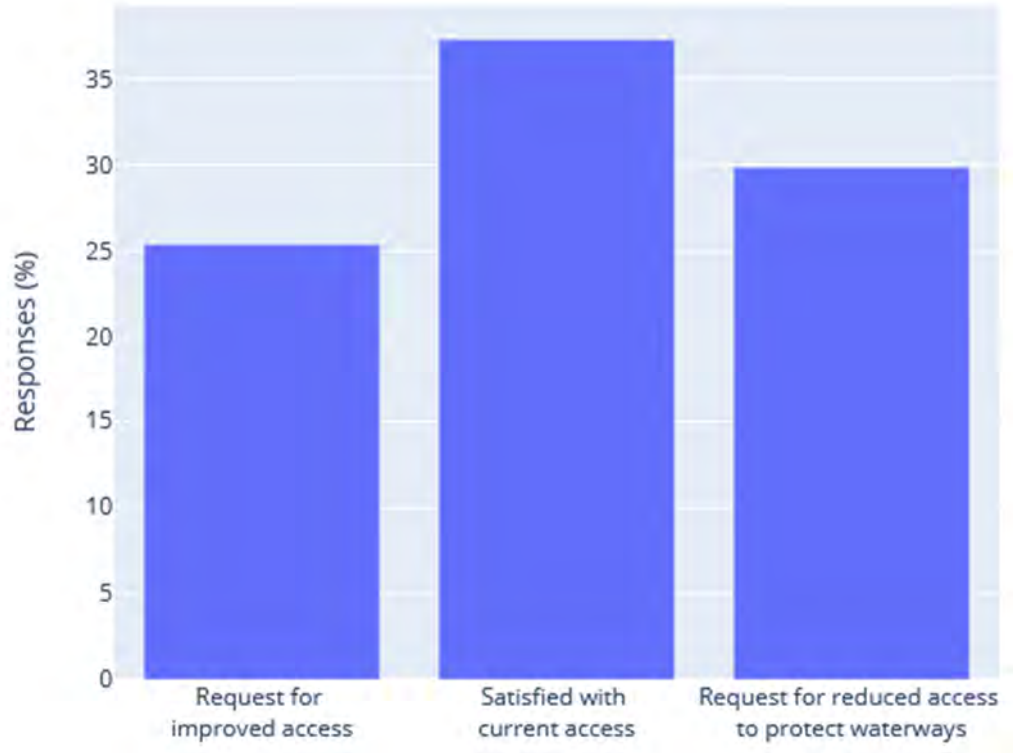

Figure C 4 Estuary Access - Moruya

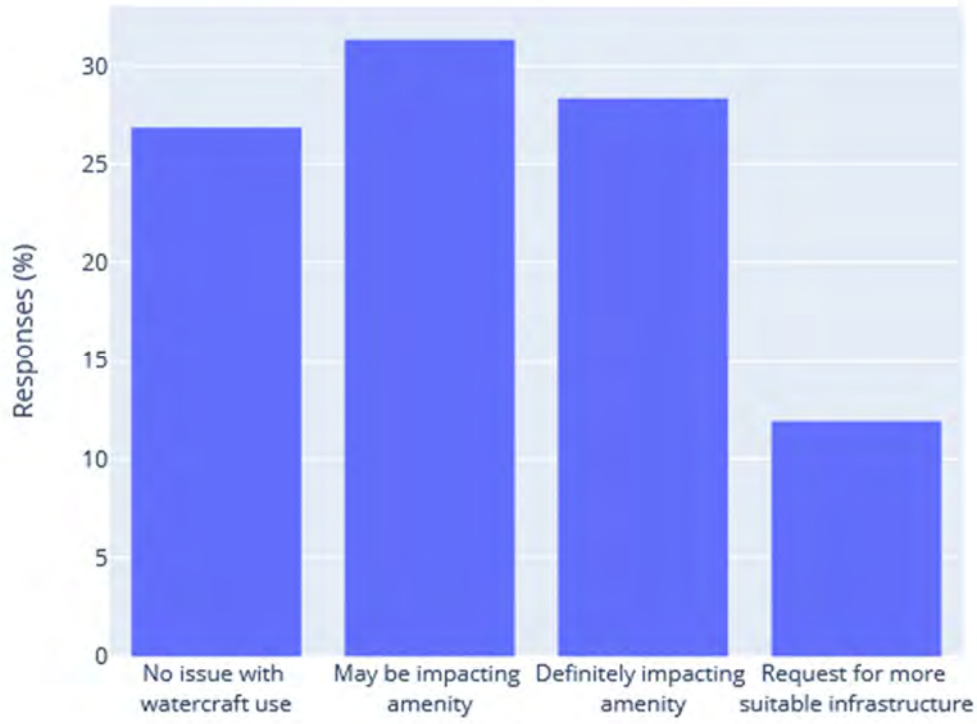

Figure C 5 Use of watercraft – Moruya

Future management

Participants were invited to provide written responses outlining the level of intervention required for access to the estuary, and what they would like to see implemented within the next five years.

The issues of most concern for the Moruya River were related to environmental management. The provision of additional bins to reduce litter was highly requested for frequently visited areas and for fishing tackle. Concerns relating to development and land clearing were also raised, as well as calls for the rehabilitation of disturbed natural areas and banks, greater protection for estuarine ecological communities, and improved water quality control measures. Installation of educational signage along walkways was suggested as a means of assisting with environmental conservation.

A marked number of written responses related to requests for improved pedestrian access and recreational amenity, for example, extended walking tracks, board walks, bike paths and racks, and improved access for swimming.

There were mixed responses relating to recreational fishing, where most comments called for more restrictions to be applied to recreational fishing, and some responses requested improved access for recreational fishing. There were multiple requests that commercial fishing be either limited or prohibited.

C.2.2 Mummuga Lake

Mummuga Lake received the lowest number of survey responses, with only 10 (9%) participants indicating that they mostly interact with Mummuga Lake. The nominated uses of the estuary shown in Figure C 6, which indicated that boating and/or kayaking is the most common use.

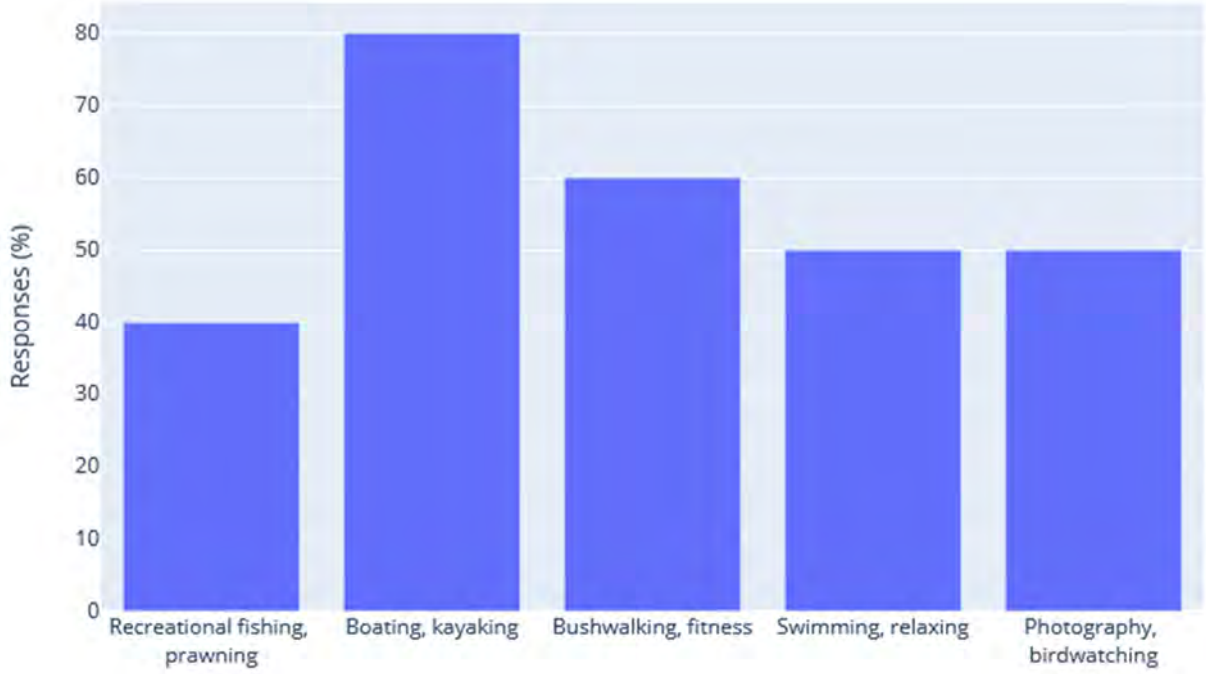

Figure C 6 Management priorities - Mummuga

Participants were asked to rank six management objectives in order of importance. The management objectives were scored based on a weighted average of their ranking from 1st to 6th, and the results are presented in Figure C 7. Water quality improvement and the protection of flora and fauna were identified as the highest priority for Mummuga Lake.

When asked to indicate from a list of threats which were of most significance to Mummuga Lake, most participants (80%) identified sand banks and associated shallowing as a threat. The second most common perceived threat was water quality (60%), and it was suggested by one written response that the frequency of opening the lake to the ocean be increased as a means of improving water quality. The perceived threats to Mummuga Lake are presented in Figure C 8.

The use of watercraft received divided responses, as shown in Figure C 9. 40% of responses reported no issue with watercraft use and 40% reported that it may be having an impact. There was one comment written in response to future management of the lake that requested a ban on the use of jet skis.

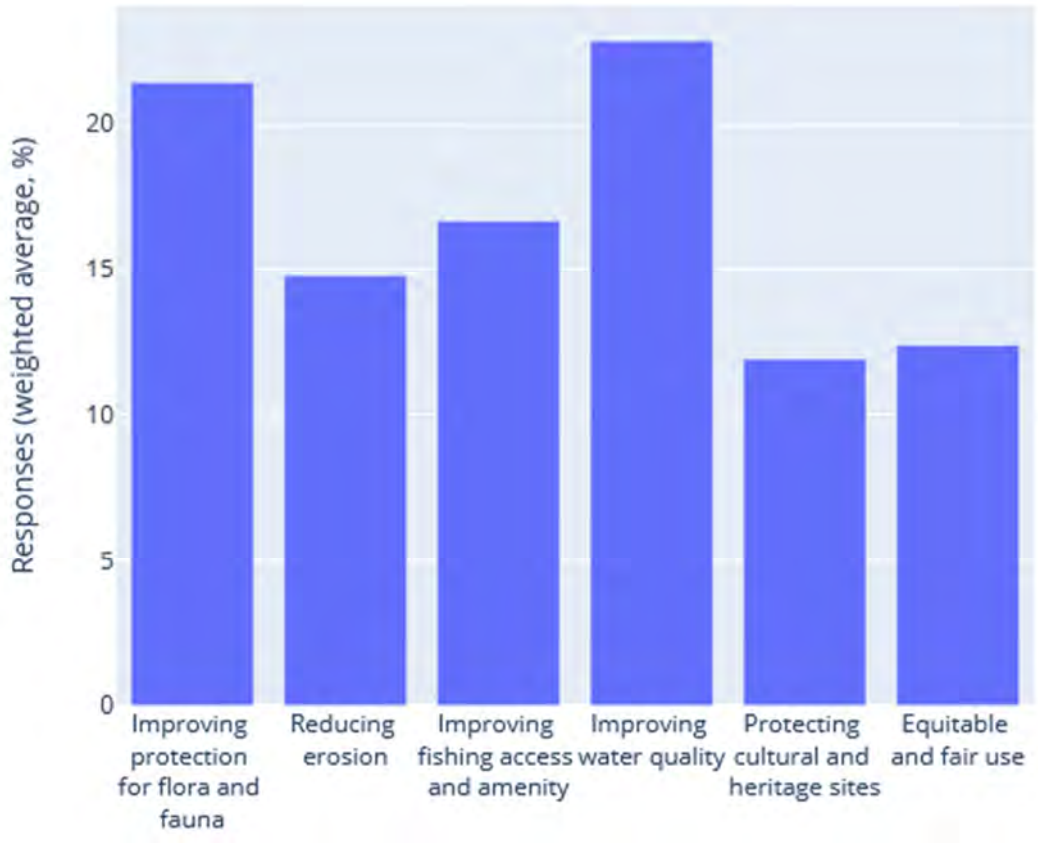

Figure C 7 Management priorities - Mummuga

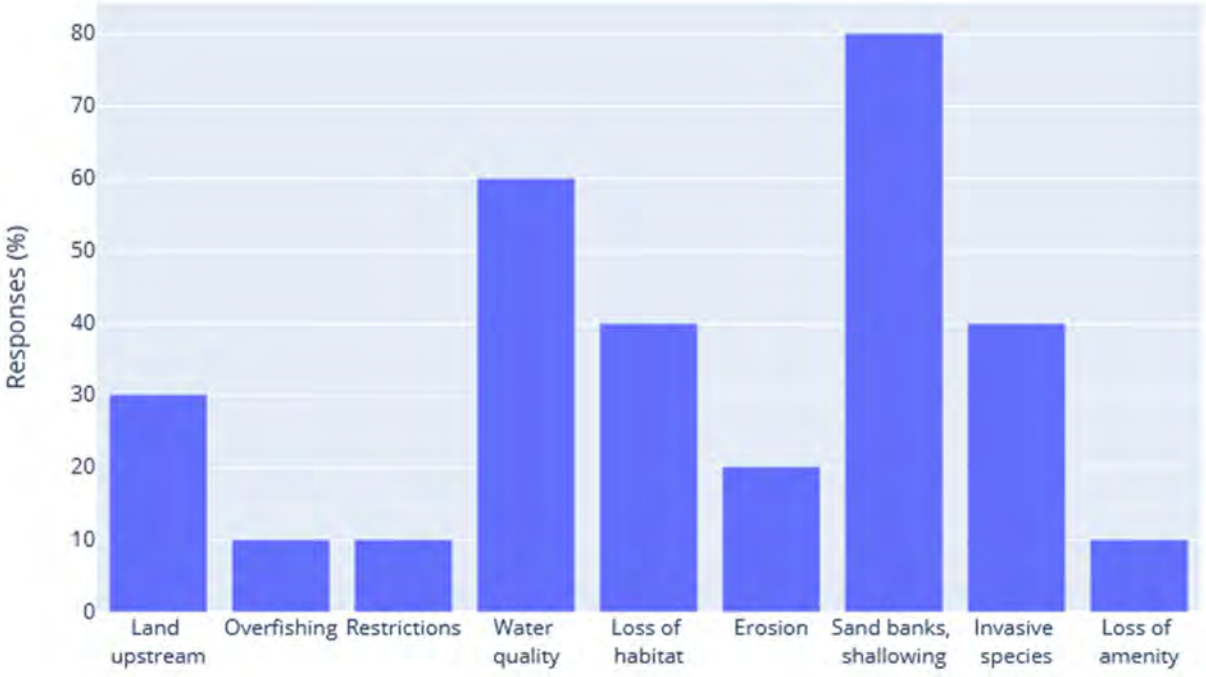

Figure C 8 Threats to estuaries - Mummuga

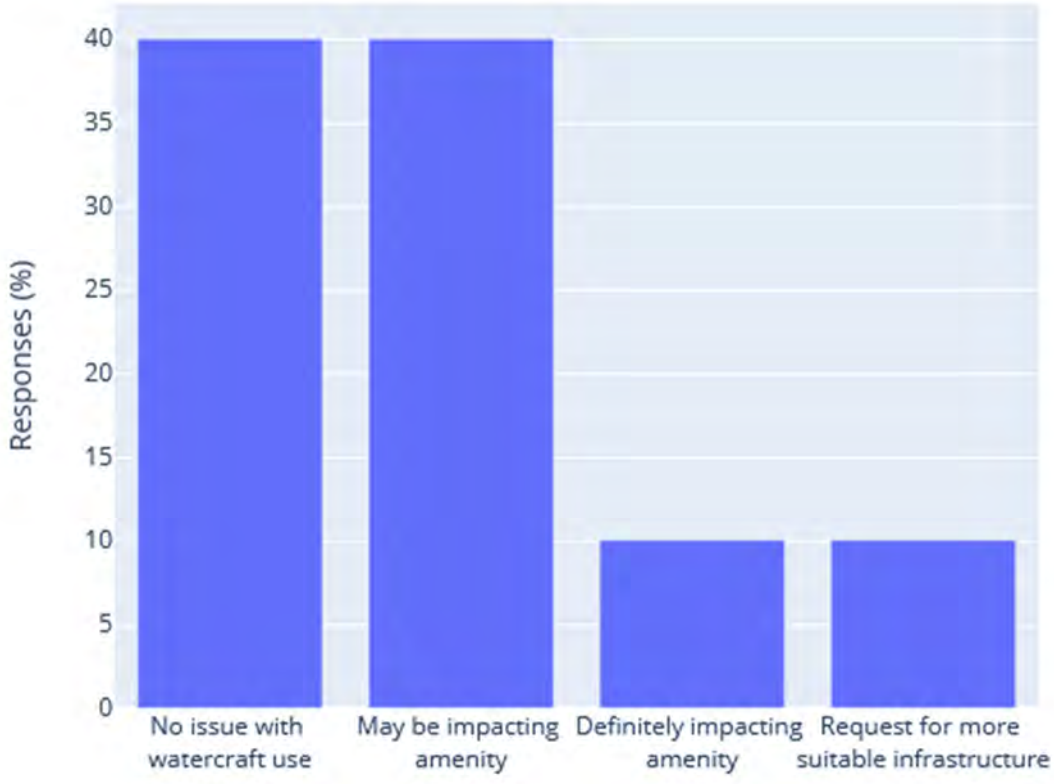

Figure C 9 Use of watercraft - Mummuga

Future management

Participants were invited to provide written responses outlining the level of intervention required for access to the estuary, and what they would like to see implemented within the next five years. Few responses were received for this question, with these mostly related to boating. Improvements to boating facilities were requested, as well as monitoring the depth of the channel for navigation. There were also suggestions to improve fish stocks, prohibit netting, and prohibit the use of jet skis.

C.2.3 Wagonga Inlet

40 (34%) survey participants nominated Wagonga Inlet as their most used estuary. The range of uses of the estuary by these participants is presented in Figure C 10. A variety of uses were reported, with the most popular activity being photography / birdwatching (70% of responses).

Participants were asked to rank management objectives for Wagonga Inlet in order of importance. The management objectives were scored based on a weighted average of their ranking from 1st to 6th and the results are presented in Figure C 11. The protection of flora and fauna was of greatest importance to participants. The remaining management objectives had similar levels of importance.

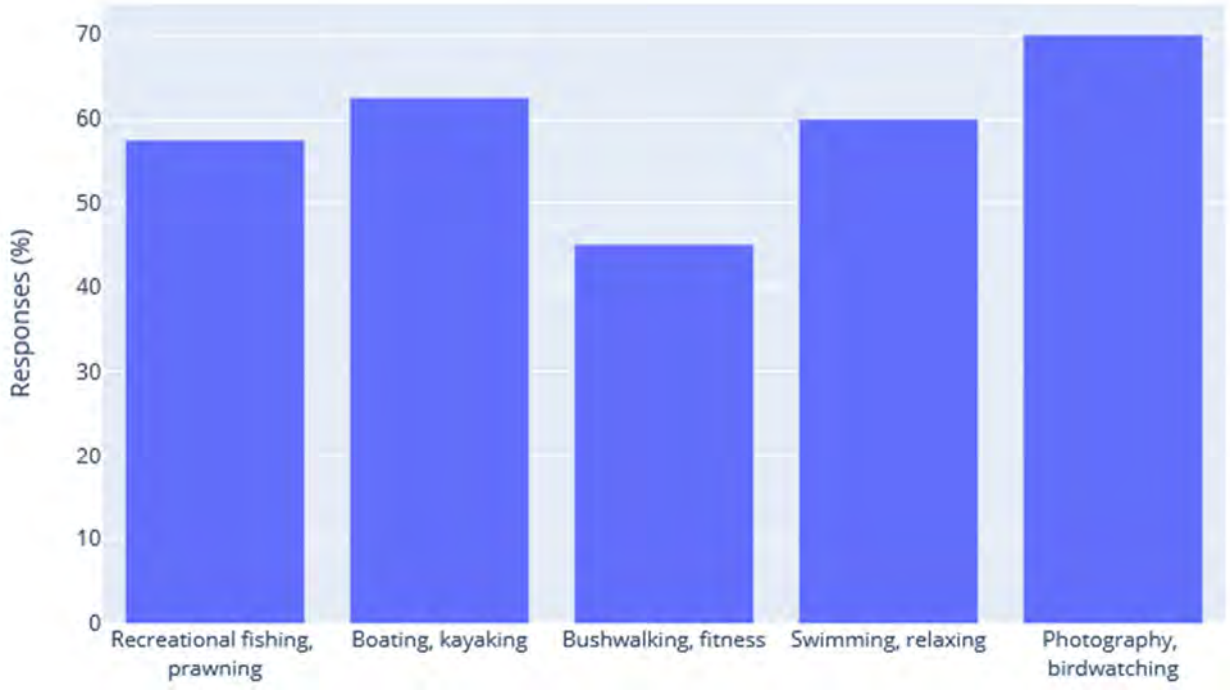

Figure C 10 Estuary values – Wagonga

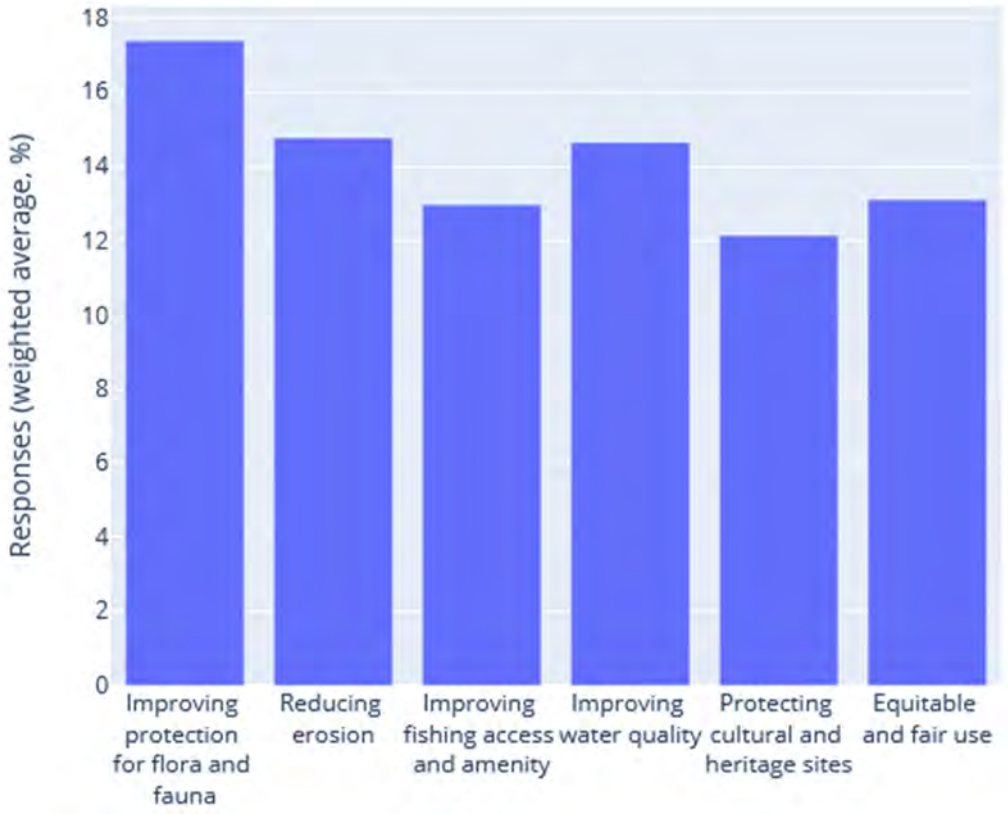

Figure C 11 Management priorities – Wagonga

When asked to indicate, from a list, those threats of most significance to Wagonga Inlet, 50% of respondents reported loss of habitat as a concern. This was closely followed by overfishing, erosion, invasive species, and the loss of amenity. The perceived threats to the estuary are presented in Figure C 12. Written responses to this question were also submitted, and fish netting and sewage discharge were cited as additional threats.

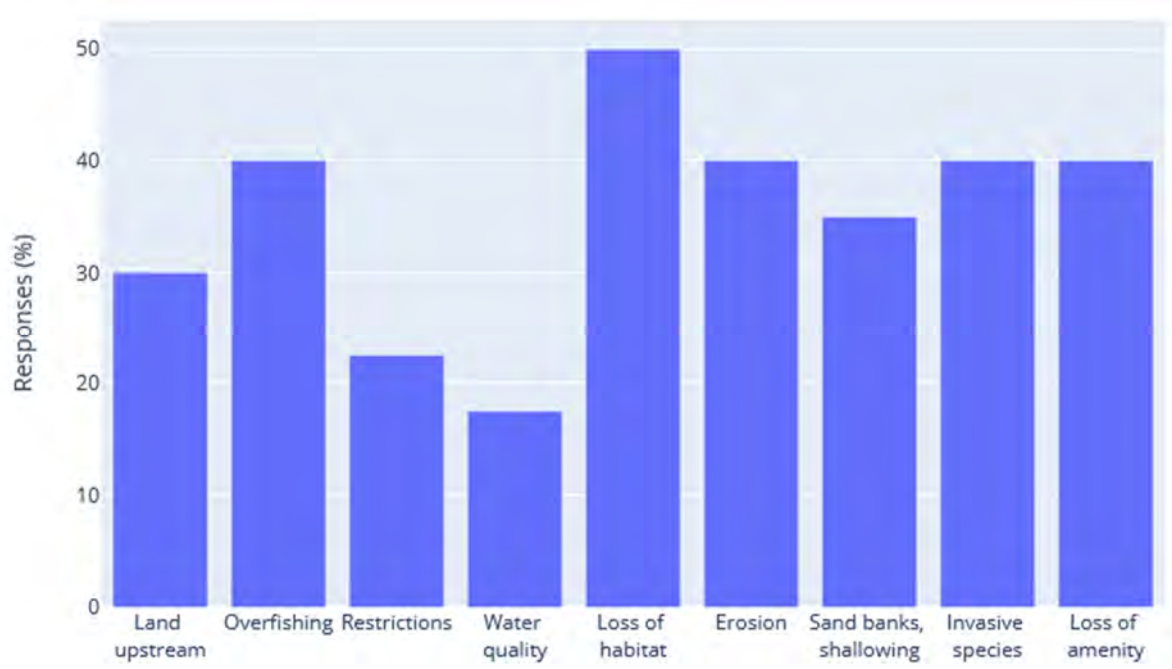

Figure C 12 Threats to estuaries – Wagonga

Figure C 13 presents the opinions regarding the level of access to the estuary. 40% of responses indicated that access should be improved, and 30% are satisfied with current access. Less than a quarter of responses wish to see reduced access. In the written responses, there were several requests for improved pedestrian access and facilities such as walking tracks, seating, toilets, cafes, and playgrounds.

The use of watercraft received divided responses, as shown in Figure C 14. Most responses indicated that the use of watercraft is impacting amenity, and in the written responses there were also suggestions to prohibit or restrict the use of jet skis and to lower the speed limit. A similar number of participants indicated that they have no issue with current watercraft use.

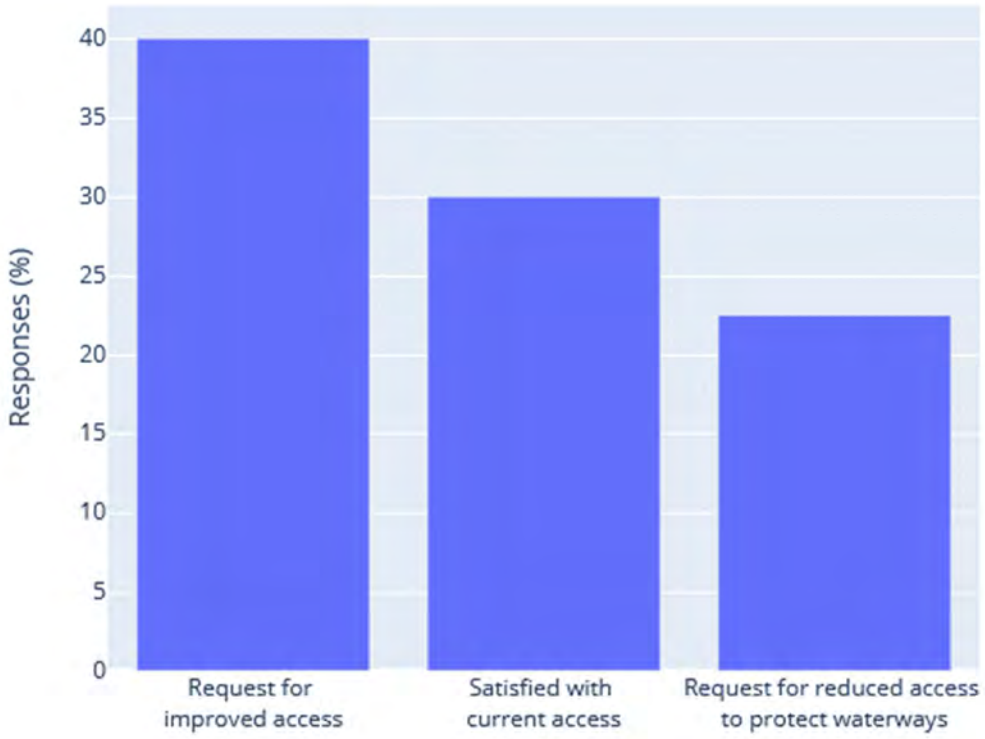

Figure C 13 Estuary Access - Wagonga

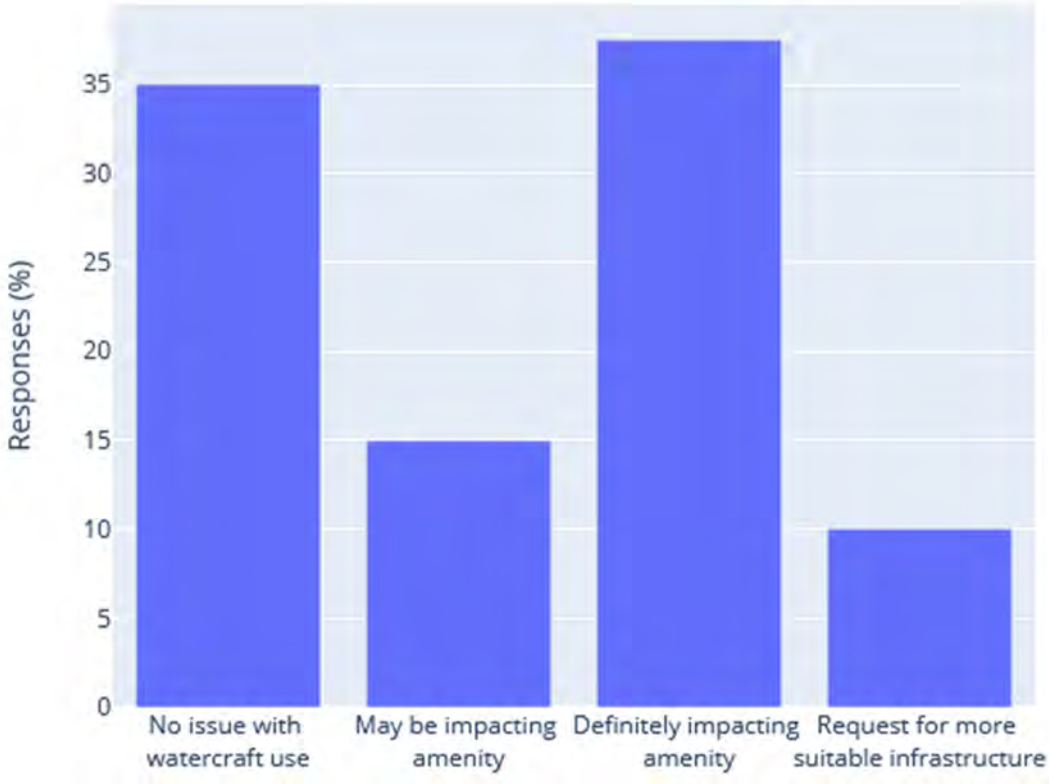

Figure C 14 Use of watercraft - Wagonga

Future management

Participants were invited to provide written responses outlining the level of intervention required for access to the estuary, and what they would like to see implemented within the next five years.

Almost half of the comments related to environmental issues, with multiple requests for increased ecological protection and reduced development and land clearing. Other suggestions for environmental management included restoration of marine sanctuary zones in Wagonga Inlet, increased planting of riparian vegetation, implementation of additional bins, measures to address erosion, and better sewage management. There were also suggestions for informative signage including indigenous history and culture.

Comments relating to boating were the second most common issues raised, with most comments relating to requests for improvement of boating facilities and measures to mitigate shallowing and associated navigational issues. Improved recreational fishing amenity was also suggested.

C.3 Stakeholder Consultation

Consultation, including on-site meetings and ongoing telephone, online meetings and email correspondence were completed with:

- Eurobodalla Shire Council.
- Local Aboriginal Land Councils.
- Department of Planning Environment (DPE): Environment, Energy and Science (EES).
- DPE (Planning).
- DPE – Crown Lands.
- Department of Primary Industries (DPI): Fisheries.
- Batemans Marine Park.
- DPI: NSW Food Authority.
- Transport for NSW (TfNSW): Maritime Infrastructure Delivery Office (MIDO).
- DPE: National Parks and Wildlife Service.
- South East Local Land Services (LLS).

The "issues" identified during additional stakeholder consultation are described herein. They have been divided into:

- Broad issues which cover all three estuaries, and potentially other estuaries managed by ESC.
- Site specific issues of concern to particular estuaries.

Where issues had already been identified during the Scoping Study, we have not included them here, unless significant new information which could affect our preliminary risk assessment was obtained.

A range of possible management actions were also gained from consultation. These were added to a long list of actions assessed in the parallel Appendix E to the CMP.

C.3.1 Common Issues and Broad Scale Potential Actions

Identified Issues, Threats & Values

Population Control: The issue of "overpopulation" and carrying capacity of a waterway and the infrastructure servicing the population has been raised. Realistically, a CMP has limited jurisdiction over policy relating to population growth, however strategies associated with new development or redevelopment need to account for impacts on the estuary.

The prime impacts of catchment development on waterways relate to catchment runoff, water quality processes and loss of estuarine and riparian vegetation. Actions which appropriately control impacts arising from these processes need to be set when development decisions are made. Even so, it is rare that development can have a positive or neutral impact when a previously undisturbed part of the catchment is developed, unless a system of offsets is somehow adopted.

Coordination of Actions: There are occasions where Council and the different agencies within state government are unaware of the activities being undertaken by other agencies. Some action to minimise this occurring would be useful.

Managing Litter: Overall, there has been an identified lack of signage in and around entrance points to the estuary. Control of litter and water quality more broadly is a key concern of the Marine Estate Management Strategy.

Aboriginal Heritage: There is a substantial concern that sea level rise could eventually result in the inundation and/or erosion of Aboriginal Heritage sites. Estuaries tend to contain a concentration of important heritage sites, and while there do not seem to be any major acute threats at the present time, it may be wise to prepare for this in advance.

Coastal Wetland Migration Pathways: There is an emerging awareness among government agencies and coastal managers in NSW that the CM SEPP does not yet include a robust mechanism to allow for the

migration of coastal wetlands as sea levels rise. The buffer providing for the *"Proximity Zone"* is uniformly applied in space and does not account for the topography which will govern the upslope migration of wetland vegetation to keep pace with sea level rise in the coming century. The threat is a future threat which will eventually require some planning to manage.

Bushfire Recovery Plan: At present, a bushfire recovery plan is being prepared for Shoalhaven, Eurobodalla, and Bega Valley Councils. There is potential for overlap and duplication between that plan and the CMP.

C.3.2 Moruya River

Identified Issues, Threats & Values

Commercial Fishing: the Moruya River Estuary is still "netted", and there are ongoing concerns about the continuation of commercial fishing. The process to eliminate commercial fishing from the estuary takes some time and is more appropriately managed by the DPI through other avenues than the Coastal Management Program.

Brierley's Boat Ramp: Brierley's Boat Ramp has received funding for an upgrade, including formalisation of the parking, installation of a gross pollutant trap and installation of a pontoon, toilet block and lighting. However, there are concerns from the Batemans Marine Park that the area is too shallow and that there is a significant risk of extensive seagrass beds being damaged by propellers. These issues will need to be resolved through the planning process and it is likely that the vessels which can realistically use the boat ramp will be limited in size.

Water Quality Concerns Racecourse Creek: There have been concerns relating to water quality in Racecourse Creek. This is something which needs to be investigated by Council.

Pied Oystercatchers: Pied oystercatchers, which are classified as endangered in NSW, and other waders are known to forage and nest around Quandolo Island and upon the breakwall, within the Eurobodalla National Park. A limited amount of signage may result in a lack of public awareness and hence threats to their safety.

Degradation of Mangrove Habitat at South Head: This issue was identified during consultation. However, data do not seem to support any widespread or significant degradation.

C.3.3 Mummuga Lake

Identified Issues, Threats & Values

Entrance Management: NPWS is responsible for opening the entrance, although Council equipment has been provided to complete the task in the past. The NPWS is presently revising its entrance management policy under a separate process, and we understand that the aim is to keep the entrance opening as natural as possible, but to prevent damage to low lying assets and property. The bridge across the entrance is being considered for replacement by NPWS, and it may be useful to allow for a higher capacity bridge that allows for small plant to cross here. These activities are largely the responsibility of NPWS. It is expected that the entrance management strategy will be completed during the 2020/21 financial year and is likely that a permanent water level recorder would form part of the strategy. Such a recorder would also provide useful information on the behaviour of this ICOLL, and it would be useful for one to be installed at Mummuga Lake.

Boat Ramp: Council is presently developing a Marine Infrastructure Asset Management Plan. We understand that the boat ramp at Mummuga Lake is considered a difficult site and unlikely to be a target for upgrade. However, there remain opportunities to improve/formalise car parking.

Water Skiing: Water Skiing has largely ceased on Mummuga Lake and the licenses permitting this have not been renewed.

Headland Access and Foreshore Usage Management: There are issues with uncontrolled access across Mummuga Headland and extending all the way around to the tennis court. This has issues relating to safety, erosion and first nations heritage.

C.3.4 Wagonga Inlet

Issues, Threats & Values

Land Clearing: Some of the concern around land clearing at Wagonga Inlet arises from a conflation of:

- The Rural Lands planning proposal which resulted in amendments to Council's LEP in October 2019. In fact, council has advised that increased development in rural areas is minor and kept clear from land adjacent to estuaries.
- A substantial increase in land clearing in fire affected areas following the 2019/2020 summer bushfire disaster.

As part of consultation, we heard one account of far more rapid runoff from the catchment and sudden impacts on salinity levels, attributed to increased land clearing following the 19/20 bushfires.

Overall, Council seems to have appropriate controls in place to manage clearing and there are penalties for illegal clearing. The issue is not one that will be addressed by the CMP.

Marine Park Sanctuary Zones: Concerns were raised that controls in marine sanctuary zones were overridden in December 2019. While this did occur, we note that any permanent removal of a sanctuary zone would need to be addressed under a separate regulatory process (amendment to the *Marine Park Regulation 1999,* requiring 60-day consultation).

On-site Sewage Management Systems: There seems to be ongoing concern relating to issues around on-site sewerage systems. However, we are not aware of any evidence to indicate that there is significant human faecal contamination in Wagonga Inlet. Some of the concerns we have heard repeated relate to Ringlands Estate and are concerns that were raised in prior Estuary Management Plans for Wagonga Inlet, but again, there is no clear evidence. At the time of writing, there is known faecal contamination of concern to oyster leases at the downstream end of Punkally Creek. This deserves some investigation. Overall, however, we note that Council's code of practice[6] refers to appropriate guidance including the Australian standard (AS1547) and other documents which specify a buffer distance of 100m to watercourses. Information provided to us demonstrates that Council applies a risk-based approach including scheduled inspection of on-site systems. It is beyond the scope of the CMP to propose modifications to the code of practice which appears to be in line with typical on-site management practice in NSW.

Management of Brice's Bay Historical Wharf: Recent works have been completed to repair the pontoon here and address some erosion issues. We also understand that toilet facilities have been removed. The lack of toilet facilities seems to be a problem with toilet waste being left behind. The area is culturally significant, and contamination of the waterway presents a risk to oyster leases.

Lewis Island Additional Issues: Erosion at Lewis Island was identified at Scoping Study stage. There are also ongoing issues with people illegally using Lewis Island, including camping and lighting fires. This has disturbed a breeding pair of Pied Oystercatchers. In addition, it is understood there is a midden on the island which is also being affected.

Coastal Squeeze of Mangroves: There is some concern expressed that Mangroves dieback is a significant issue within the Estuary. However, while dieback in some areas has been highlighted by recent research

[6] https://www.esc.nsw.gov.au/council-services/public-environmental-health/compliance-and-enforcement/septic-and-waste-water, accessed 24/11/2020

from the University of Canberra, the long term pattern is one of an increase in overall area of mangroves between 1957 and 2018 (Elgin Associates, 2018; Nielsen and Gordon, 2017). In fact, the endangered ecological community saltmarsh, which tends to exist in areas that Mangroves are encroaching upon, shows a more definite declining trend.

APPENDIX D REVISED RISK ASSESSMENT

REVISED RISK ASSESSMENT EUROBODALLA ESTUARINE COASTAL MANAGEMENT PROGRAM

Authors:	David Wainwright
Prepared For	EUROBODALLA SHIRE COUNCIL
Version	FINAL
Date	4/12/2020

Document Control

Version	**Date**	**CHECKED BY**	**ISSUED BY**	**Distribution[1]**					
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FINAL	4/12/2020	DJW	DJW	E	E				

[1] 'E' refers to electronic distribution; numerals refer to number of hard copies.

Contents

Figures

Tables

1 Introduction

1.1 Introduction

A preliminary risk assessment was completed as during the scoping study phase of CMP development. That preliminary risk assessment is now superseded by the present document.

The preliminary risk assessment was upgraded considering:

- Review comments on the draft scoping study, as provided by Eurobodalla Council and DPIE.
- The limited, additional study and analysis completed as part of the Scoping Study (presented in parallel Appendix B)
- Additional consultation activity completed as part of Stages 2 and 3 of the CMP process (presented in parallel Appendix C).

The limited additional "Stage 2" analysis completed means the outcome of the risk assessment for issues identified during the preliminary risk assessment have typically not changed, as some important data gaps have not yet been addressed.

1.2 Methodology

A risk assessment has been completed for the three estuaries in developing the Coastal Management Program. For each estuary, the scope of the risk assessment has been defined as follows:

- Geographically, the extent is defined by the coastal management areas associated with the estuary.
- The nature of the risks is limited to those which interact with the key objectives outlined for each of the four coastal management areas.

Risks have been identified by considering each of the key objectives in turn and recasting all the issues identified, via background data review and the examination of existing information, that could potentially threaten those objectives using a formal definition.

The formal definitions have used the “bow tie model” as represented by Figure 1.

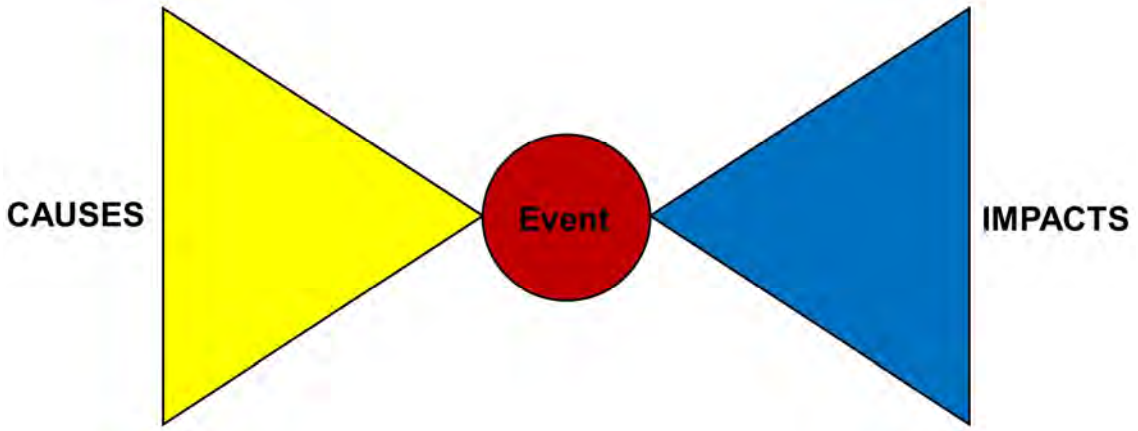

Figure 1 Bow Tie Model of Risk Formulation

With reference to Figure 1, a risk revolves around an event occurring. The event arises from a variety of causes, and occurrence of the event results in a range of impacts. Within the framework of the international standard for risk assessment, ISO 31000 (Standards Australia, 2009), the yellow side of the bow tie is most strongly associated with "likelihood" whereas the blue side is most strongly associated with "consequences".

In describing each risk, the following word formula has been used to populate the risk tables presented at the end of this appendix.

> There is a risk that a *cause* will lead to an *event (or chain of events)* resulting in an *outcome* with a *set of consequences/impacts.*

It is recognised that this is not the only way that risks can be described. For example, other schemas are applied in varying contexts as outlined in Table 1.

Table 1 Various Schema for Risk Identification

Adopted Schema	Cause	Event	Outcome	Impact/Consequences
Alternative A	Source	Path	Receptor	Consequences
Alternative B	Hazard	Exposure	Vulnerability	Impact

Following description of each risk, a qualitative assessment of the risk has been undertaken. The likelihoods of the identified risks have been assessed qualitatively using the descriptors provided in Table 2 (adapted from AS5334 (Australian Standards, 2013)).

Table 2 Likelihood Assessment Table

Likelihood Rating	Descriptor for Stationary Climate
Almost Certain	Could occur several times per year
Likely	May arise about once per year
Possible	Maybe a couple of times in a generation
Unlikely	Maybe once in a generation
Very Unlikely	Maybe once in a lifetime

The consequences of the identified risks have been assessed qualitatively using the descriptors provided in Table 3 and Table 4 (adapted from AS5334 (Australian Standards, 2013)).

Table 3 Consequences Assessment Table (Structures/Safety/Environmental)

Consequence Rating	Structural Factors	Safety/Health Factors	Environmental Factors
Insignificant	No damage	No adverse effects	No adverse effects on natural environment
Minor	No permanent damage, minor restoration required	Slight adverse human health effects	Minimal effects on the natural environment
Moderate	Limited damage, recoverable by maintenance and minor repair	Adverse human health impacts	Some damage to the environment including local ecosystems
Major	Extensive damage requiring major repair	Permanent physical injuries and fatalities to a single individual	Significant effect on the environment and local ecosystems. Remedial action required.
Catastrophic	Significant permanent damage or loss of structure	Injuries and/or fatalities involving multiple individuals	Very significant environmental loss with extensive remedial action required.

Table 4 Consequences Assessment Table (Adaptive Capacity/Cultural/Economy)

Consequence Rating	Adaptive Capacity	Social/cultural	Economical
Insignificant	No change	No effects	No effects on broader economy
Minor	Minor reduction, asset easily restored	Short term disruption	Minor effect on broader economy
Moderate	Some change in adaptive capacity, possible need for redesign	Frequent disruptions	High impact on local economy and some effect on broader economy
Major	Major change, redesign would be required	Severe disruptions	Serious effect on local economy, wider economy affected
Catastrophic	Asset destroyed or ineffective. Renewal and/or relocation required	Complete, chronic disruption and breakdown of cultural, social values	Major effect on local and regional economies

Using the likelihoods and consequences descriptors presented above, evaluation of the risks has been completed using Table 5 (also adapted from AS5334 (Australian Standards, 2013)).

Table 5 Risk Rating Matrix

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Low	Moderate	High	Extreme	Extreme
Likely	Low	Moderate	Moderate	High	Extreme
Possible	Low	Low	Moderate	High	Extreme
Unlikely	Low	Low	Moderate	Moderate	High
Very Unlikely	Low	Low	Low	Moderate	Moderate

AS5334 regards that the following treatments are applicable:

- *Low* risks would typically be addressed through routine maintenance and day to day operations.
- *Moderate* risks would require a change to the design or maintenance regime of assets.
- *High* risks require detailed research and appropriate planning (or design).
- *Extreme* risks would require immediate action to mitigate.

Once the risk rating has been determined for each risk, all moderate, high, and extreme risks have been considered further. Actions for addressing those risks have been considered in developing the CMP.

Whether the risks are being already addressed by working management actions was then considered. Furthermore, where there are gaps in understanding, the processes which drive those risks have been highlighted, and those gaps will need to be addressed through additional studies carried out as actions during implementation of the CMP, before suitable "on-ground" actions can be derived.

2 Risk Assessment Tables

Table 6 Overarching Risk Assessment

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome / Consequences/ Impact	Time Frame for Emergence (if required)	Indicative Year for Impact / Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study Comment	Finalised CMP Comment (where relevant)
E1	All	Environment	Objective EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity. Objective EB: to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change. Objective EC: to maintain and improve water quality and estuary health. Objective ED: to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons.	Population growth	Population growth exceeds capacity	Wide ranging negative impacts on the estuarine environment	Future	20 year	Possible	Major	High		The issue of "overpopulation" and carrying capacity of a waterway and the infrastructure servicing the population has been raised. Realistically, a CMP has limited jurisdiction over policy relating to population growth, however, strategies associated with new development or redevelopment need to account for impacts on the estuary. The prime impacts of catchment development on waterways relate to catchment runoff, water quality processes and loss of estuarine and riparian vegetation. Actions which appropriately control impacts arising from these processes need to be set when development decisions are made. Even so, it is rare that development can have a positive or neutral impact when a previously undisturbed part of the catchment is developed, unless a system of offsets is somehow adopted.
E2	All	All	All	Lack of cooperation between state government agencies	Disjointed management	Perverse and contradictory outcomes	Now / medium term / future	Mostly immediate, but impacts up to 100 years could result from poor coordination	Likely	Major (potentially)	High		There are occasions where Council and the different agencies within state government are unaware of the activities being undertaken by other agencies. An estuary steering committee should be formed with jurisdiction over all of the estuaries in the Eurobodalla LGA, chaired by Council and comprising membership of the key state government agencies.
E3	All	Environment	Objective EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity. Objective EC: to maintain and improve water quality and estuary health. Objective EF: to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.	Urban stormwater	Washes litter from catchment	Impacts on water quality and amenity	Now	Immediate	Likely	Major	High		Overall, there has been an identified lack of signage in and around entrance points to the estuary. Control of litter and water quality more broadly is a key concern of the Marine Estate Management Strategy (and hence given a 'major' consequences rating. Batemans Marine Park has identified willingness to help with funding end of pipe litter capture devices.
E4	All	Environment	Objective EB: to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change. Objective EF: to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.	Climate change	Sea level rise	Inundation/ destruction of cultural heritage sites.	Future	50 to 100 years is of most concern. Sea level rise is slow moving.	Almost certain	Major	Extreme		There is a substantial concern that sea level rise could eventually result in the inundation and/or erosion of Aboriginal Heritage sites. Estuaries tend to contain a concentration of important heritage sites, and while there do not seem to be any major acute threats at the present time, it may be wise to prepare for this in advance.
E5	All	Coastal wetlands	Objective WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity Objective WB: to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests. Objective WC: to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration. Objective WE: to promote the objectives of State policies and programs for wetlands or littoral rainforest management.	Climate change	Sea level rise and blockage of migration pathways	"Squeeze" of important coastal wetland ecosystems into increasingly diminishing area.	Future	50 to 100 years is of most concern. Sea Level rise is slow moving.	Almost certain	Major	Extreme		There is an emerging awareness among government agencies and coastal managers in NSW that the CM SEPP does not yet include a robust mechanism to allow for the migration of coastal wetlands as sea levels rise. The buffer providing for the "proximity zone" is uniformly applied in space and does not account for the topography which will govern the upslope migration of wetland vegetation to keep pace with sea level rise in the coming century. The threat is a future threat which will eventually require some planning to manage.
E6	All	All	All	Lack of integration of Bushfire Recovery Initiatives	Overlap of actions or poor coordination	Perverse outcomes or inefficient spending of scarce funds resulting in other opportunities being lost	Medium term	Immediate (next 1-2 years)	Possible	Major (potentially)	High		At present, a bushfire recovery plan is being prepared for Shoalhaven, Eurobodalla and Bega Valley Councils. There is potential for overlap and duplication between that plan and the CMP. A mini review of the CMP should be undertaken following completion of the Bushfire Recovery Plan to make sure consistency is maintained.

Table 7 Moruya Risk Assessment

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome/ Consequences/ Impact	Time Frame for Emergence (if required)	Indicative Year for Impact / Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study Comment	Finalised CMP Comment (where relevant)
M1	Moruya	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity. WC: to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.	Climate change	Sea level rise	Current location of coastal wetlands is no longer amenable. Vegetation to migrate upslope unless prevented by development, land use or physical barriers	Future	50 to 100 years is of most concern. Sea level rise is slow moving.	Almost Certain	Major	Extreme	The consequences will affect all areas of coastal wetland if not adequately planned for. Historical mapping shows that this is already occurring. A study to produce maps which highlight areas suitable for the migration and/or expansion of wetlands could be considered.	There is strong evidence that this should still be undertaken. It is similar to the issue associated with coastal vulnerability (M12) although, in this case, it is the viability of coastal wetlands that is threatened.
M2	Moruya	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity.	Inappropriate zoning	Incompatible land use or development allowed in coastal wetlands	Coastal wetlands damaged by development or land use (e.g. grazing)	Now	Immediate (1-2 years)	Unlikely	Moderate	Moderate	This is considered unlikely, as the provisions of the CM SEPP override those of the Eurobodalla LEP. Damages would be local and small scale.	The scoping study comment was somewhat misguided in that E2 zoning is based on land parcels, whereas the CM SEPP maps are based on floristic characteristics. The risk ratings are still relevant, and the issue is acknowledged as important across NSW with State Govt. However, estimation & planning methods to deal with this have not yet been settled upon.
M3	Moruya	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity.	Lack of compliance / inappropriate zoning	Grazing occurs in CM SEPP wetlands	Coastal wetlands damaged by grazing	Now	Immediate (1-2 years)	Possible	Moderate	Moderate	This seems to have arisen as part of a planning proposal put forward as part of the rural lands strategy. Again, however, the CM SEPP will override the Eurobodalla LEP.	Same as above. Efforts should focus on more rigorously mapping the CM SEPP coastal wetlands area.
M4	Moruya	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity.	Poor planning	Environmental protections are 'reduced'	Coastal wetlands suffer	Now	Immediate - 20 years	Very unlikely	Moderate	Low	The new CM Act and CM SEPP place high importance on coastal wetlands. A more significant threat would be non-compliance with the new framework.	No additional comment.
M5	Moruya	Wetlands	WB: to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests. WC: to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.	Climate change and unwillingness of property owners to fence CMSEPP areas	Grazing occurs in CM SEPP wetlands	Coastal wetlands damaged by grazing and cannot adapt to rising water levels	Now/ medium term	All Time frames to 100 years	Likely	Major	High	It is known that there are issues around areas such as Malabar Lagoon, and its status as a Sanctuary Zone makes the consequences major.	No additional comment. Specific actions recommended at Malabar Lagoon and ongoing foreshore treatment actions by Council and LLS should continue.
M6	Moruya	Wetlands	WD: to support the social and cultural values of coastal wetlands and littoral rainforests.	Lack of knowledge on midden locations around Malabar Lagoon	Damage to middens	Loss of cultural heritage	Now	Immediate - 20 years	Possible	Major	High	This risk is poorly understood at the present time due to a lack of information. Conservatively, consequences assigned a 'major' rating.	An overarching study of all aboriginal sites, considering the impact of Sea level rise should be carried out for all estuaries (see overarching actions section).
M7	Moruya	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity.	Informal stock crossing in upper reaches of Douga Creek	Cause erosion, introduce pollutants to this tributary of Malabar Lagoon	Pollutants and silt load increases to Malabar Lagoon.	Now	Immediate	Possible	Moderate	Moderate	This is only a possibility but requires investigation due to its potential to impact the Sanctuary Zone.	This should be addressed as part of an overarching study of Malabar Lagoon.
M8	Moruya	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity.	Some mangroves dying along South Head Road	Significant loss of vegetation	Affects the functioning of coastal wetlands.	Now	Immediate	Unlikely	Minor	Low	Evidence of this is limited and it does not seem it is widespread.	No additional comment.
M9	Moruya	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity. WB: to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests.	Acid sulfate soils to north of Moruya River	Acid drainage	Cause low pH and attendant problems in Malabar Lagoon.	Now	Immediate - 20 years	Possible	Moderate	Moderate	This risk is poorly understood at the present time. There is no indication of impacts on Malabar Lagoon to date, however this may need to be monitored.	This should be addressed as part of an overarching study of Malabar Lagoon.

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome/ Consequences/ Impact	Time Frame for Emergence (if required)	Indicative Year for Impact / Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study Comment	Finalised CMP Comment (where relevant)
M10	Moruya	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity. WB: to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests. WC: to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.	Current mapping of CMSEPP wetlands does not match that of vegetation on ground.	Incompatible land use or development allowed in areas that contain coastal wetland vegetation	Damage of saltmarsh in particular, mangroves and seagrasses	Now / medium term / future	Immediate (1-2 years)	Almost certain	Moderate	High	Note the coarse buffer applied to wetlands may also need to be revisited as migration of vegetation will largely be governed by topography.	This is still an issue and mapping of the wetlands for future migration pathways is an issue that should be revisited by actions.
M11	Moruya	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity. WB: to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests. WC: to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.	Malabar Lagoon presently not well understood	Ill-informed actions taken to manage this Sanctuary Zone	Ineffective or potentially perverse outcomes from management actions	Now/ medium term	Immediate - 20 years	Likely	Major	High	Due to uncertainty around this issue, consequences are set at Major. Understanding is poor, based on a lack of background information uncovered during this Scoping Study. This risk is associated with other risks around Malabar Lagoon. The relative importance of different habitats to functioning of this ecosystem and fisheries could be investigated.	This should be addressed as part of an overarching study of Malabar Lagoon.
M12	Moruya	Vulnerability	VB: to mitigate current and future risk from coastal hazards by taking into account the effects of coastal processes and climate change.	The absence of a mapped coastal vulnerability area	Inability to plan for enhanced tidal inundation and erosion hazards inside the estuary	Poor planning outcomes result in unnecessary exposure to future risks and potential maladaptation	Now / future	50 to 100 years is of most concern. Sea level rise is slow moving	Almost certain	Major	Extreme	The absence of a mapped CV area makes it difficult to appropriately address the objectives of the CM Act associated with coastal vulnerability and would represent a major failing against all of the objectives. A coastal vulnerability assessment including present day tidal inundation and projected future impacts should be undertaken.	Mapping needs to be progressed - based on discussions with DPIE/Council, this would be most conveniently addressed through the floodplain risk management process, using models developed therein.
M13	Moruya	Environment	ED: to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons.	Sand influx from the ocean and catchment	Estuary shallows	Navigation impaired	Medium term	20 years - 100 years	Likely	Moderate	Moderate	A study of bathymetric change may be warranted. Effects seem to be emerging more notably near the entrance, although there are reports of issues in the upper reaches of the estuary, possibly related to historic gold mining in the catchment.	Overall, issues at the entrance seem to be slowly emerging, and we note conflict between the use of Brierley's Boat Ramp and relatively shallow, seagrass covered shoals that need to be traversed to get to the deeper part of the river adjacent to the southern training wall. Improvement works are proposed for Brierley's Boat Ramp and seem set to go ahead. It seems that catchment inputs could be investigated in detail as part of the bushfire recovery plan, which needs to understand how the 2019/20 bushfires have impacted on sediment inflow to the Deua River, upstream of the estuary. Historical patterns relating to gold mining would also need to be elucidated by the study.
M14	Moruya	Environment	EC: to maintain and improve water quality and estuary health.	Activities in and around the estuary poorly controlled	Runoff / pollution inflow to estuary	Water quality and estuarine health suffer	Now	Immediate - 20 years	Possible	Moderate	Moderate	This risk is broad ranging, identified as a general concern by a member of the public. WQ in the estuary is typically reasonable and monitoring should continue.	WQ is generally reasonable. Batemans Marine Park have identified the possibility of contributing to the netting of a major stormwater outlet from the Moruya Urban Area.
M15	Moruya	Environment	EF: to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.	Lack of access points around estuary	Inability to access the estuary for recreational activities (e.g. fishing/ kayaking)	Underutilisation of the estuary as a community resource	Now	Immediate (1-2 years)	Unlikely	Minor	Low	The importance of this issue possibly needs to be better defined to determine whether management actions are required.	A much larger proportion of individuals replying to the community survey indicated that they were either satisfied or thought that there was too much access to the waterway (around 2/3 against 1/3 for adding access). While ongoing studies by TfNSW and Eurobodalla Shire Council may investigate this further, the present risk level for this study has been changed to low to reflect this finding.

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome/ Consequences/ Impact	Time Frame for Emergence (if required)	Indicative Year for Impact / Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study Comment	Finalised CMP Comment (where relevant)
M16	Moruya	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity. EE: to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place.	Poor quality or non-existent riparian veg	Floods, climate change and stock access affect riverbank stability and facilitate erosion	Sediment is delivered to the estuary, causing siltation, affecting the natural character of the estuary and the loss of land	Now	Immediate - 20 years	Almost Certain	Moderate	High	This issue has been one of major focus under the current plan, although works seem to have been opportunistic and coordination or a fixed plan is not in place. Furthermore, follow up maintenance is affected by a lack of funding and there is significant uncertainty regarding future funding, particularly for LLS, who are well placed to consult with local land holders to get this done. The impact on the estuary is also influenced by clearing in the non-estuarine reaches of the river, and adequate buffer widths (>10m) should be aimed for wherever possible. There is a parcel of riparian land in the upper estuary currently leased by Council. This should be allowed to lapse so that a riparian buffer can be established.	Agreed that this remains a high risk. However, the current practice needs to be modified to ensure that records are kept and ongoing progress, follow up is appropriately monitored.
M17	Moruya	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Poor planning	Environmental protections are 'reduced'	The coastal environment is adversely affected	Now	Immediate - 20 years	Unlikely	Moderate	Moderate	This risk has been suggested by a community member, possibly in response to concerns surrounding the rural lands policy of Council. The implications of the policy, which is subjugated by the CM SEPP provisions, may need to be examined for consistency in the coastal environment area.	Overall, the rural lands policy, which has now been passed into the LEP as part of a planning proposal, is based on land parcels, whereas the CM SEPP overrides and is based on vegetation communities. Better strategies for this risk involve better assessment of the extent of CM SEPP wetlands.
M18	Moruya	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Entrance modifications	High tides are getting higher	Knock on effects to infrastructure and fringing tidal environments	Now	20-50 years	Unlikely	Moderate	Moderate	It seems unlikely that this is an issue, however, it can be easily analysed by reviewing historical tidal records. The entrance has been trained for many decades and, while tidal range is known to grow in response to training in some estuarine lakes (e.g. Wagonga Inlet, Lake Illawarra), it is less pronounced in tidal rivers. Furthermore, sea level rise is also contributing to a rise in high tides within estuaries.	This is a relatively easy study, but the moderate nature of it and the benefit of having longer records to analyse promote delaying it for several years.
M19	Moruya	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Rock lining of foreshores in lower reaches	Reduction in the diversity of habitats available in the estuary.	Negative effect on ecological processes and biodiversity.	Now	Immediate	Likely	Moderate	Moderate	There is an opportunity here to improve on current practices. However, foreshore protection works constructed to also enhance biodiversity will result in some expense and require proper, considered design. Some experimentation with alternative methods has been trialled upstream of Moruya Bridge and these could potentially be examined in detail to assess efficacy. A clearer understanding of the ongoing maintenance requirements and responsibility for the training walls may need to be established. Furthermore, investigation of the values and importance of these training structures to ecosystem functioning could be undertaken.	There is emerging evidence that rock revetment training walls can actually provide value to ecosystems. DPI Fisheries is presently preparing guidance on the ecological value of these structures and ways in which it can be enhanced. Before any action is taken, ongoing research and guidance should be reviewed and assessed.
M20	Moruya	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity. EF: to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms.	Poor public access for recreational activities such as fishing	Improper and ad-hoc access across foreshores	Erosion and Loss of riparian vegetation	Now	Immediate	Likely	Minor	Moderate	It is known that there are issues at some locations, although these are relatively few. The CMP may pinpoint locations where access could be formalised to improve the situation.	Once TfNSW and Council have completed their studies into maritime facilities, a review of informal access points and whether these should be closed should be undertaken and actioned.

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome/ Consequences/ Impact	Time Frame for Emergence (if required)	Indicative Year for Impact / Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study Comment	Finalised CMP Comment (where relevant)
M21	Moruya	Environment	EC: to maintain and improve water quality and estuary health.	Poorly maintained On-site wastewater systems	Overflows and system failures discharge sewage to environment	Estuary is polluted, unsafe for swimming	Now	Immediate	Unlikely	Minor	Low	While on-site wastewater systems can cause issues with environmental pollution, this has not been raised as a major concern during our background review. The low density of development not connected to the town sewer means that this should be manageable through compliance checking already being carried out by Council.	Agreed. In addition, a brief (and incomplete) review of Council's policy for management indicates that this issue is appropriately managed at present.
M22	Moruya	Environment	EC: to maintain and improve water quality and estuary health. EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Sub-standard stormwater management	Lack of stormwater treatment results in pollutants being delivered to estuary	Estuary is polluted, unsightly and unhealthy	Now	Immediate	Likely	Minor	Moderate	There are probably some examples of stormwater management which could be improved. These have not been audited as part of the Scoping Study. However, formal stormwater drainage is limited in extent, with most of the system located around the Moruya Township and smaller areas likely associated with Moruya Heads and Moruya North. If localised issues with stormwater pollution arise, a study to identify the cause/source of the pollution could be considered.	Water quality in the estuary is generally good. As noted for M14, Batemans Marine Park have identified the possibility of contributing to the netting of a major stormwater outlet from the Moruya Urban Area.
M23	Moruya	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Lack of protection for migratory wader habitat	Key habitat for migratory waders is lost	Reduction in population of important migratory waders	Now	Immediate	Possible	Major	High	Migratory waders, such as the Eastern Curlew and Bar-Tailed Godwit are commonly spotted in Moruya Heads, based on data provided by Birdlife Australia.	In addition, NPWS have indicated that Pied Oystercatchers, which are classified as endangered in NSW, are known to forage and nest around Quandolo Island and on the breakwall. Signage may help with public awareness to provide protection.
M24	Moruya	Use	UA: to protect and enhance the scenic, social and cultural values of the coast by ensuring that: (ii) adverse impacts of development on cultural and built environment heritage are avoided or mitigated.	Lack of care for Pilot Station at entrance to Moruya River	Facility falls into disrepair	Loss of European cultural heritage	Now	Immediate - 20 years	Unlikely	Minor	Low	While recognising the importance of the site for European Heritage, it is noted that the site is currently leased by the National Parks and Wildlife Service and falls within the boundaries of Eurobodalla National Park. Accordingly, management of the site is best kept within the national parks PoM.	No further comment.
New Issues at CMP Development Stage													
M25	Moruya	Environment	Objective EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity. Objective ED: to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons.	Commercial fishing	Overfishing	Loss of fish stocks	Future	20-50 years	Likely	Minor	Moderate		The Moruya River Estuary is still "netted" and there are ongoing concerns about the continuation of commercial fishing. The process to eliminate commercial fishing from the estuary takes some time and is more appropriately managed by the DPI through other avenues than the CMP.
M26	Moruya	Environment	Objective EC: to maintain and improve water quality and estuary health.	Urban development in Racecourse Ck catchment	Runoff / pollution inflow to estuary.	Decline in water quality	Now	Immediate	Possible	Moderate	Moderate		There have been concerns relating to water quality in Racecourse Creek. This is something which should be investigated by Council.

Table 8 Mummuga Risk Assessment

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome / Consequences / Impact	Time Frame for Emergence (if required)	Indicative Year for Impact/Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study	Finalised CMP Comment (where relevant)
Mu1	Mummuga	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity. WB: to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests. WC: to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.	Current mapping of CM SEPP wetlands does not match that of vegetation on ground	Incompatible land use or development allowed in areas that contain coastal wetland vegetation	Damage of saltmarsh in particular, mangroves and seagrasses	Now/ medium term/ future	Immediate - 100 years	Almost certain	Insignificant	Moderate	It is noted that there are differences in the CM SEPP mapping and the most recently mapped date of estuarine macrophytes. The estuarine macrophytes have not been recently mapped, and this should be completed with appropriate modifications to the CM SEPP wetlands extents submitted as part of a planning proposal.	It is possible that the CM SEPP mapping, which may be based on a particular date of aerial photo mapping, may not represent the full extent and natural range of coastal wetland within this ICOLL. The extent may vary naturally as the ICOLL opens and closes. A more detailed study at a future time may be required. Notably, however, natural water level variation in Mummuga Lake is not yet understood. Aerial photograph interpretation may assist, but an understanding of water levels is probably needed (i.e. installation of water level recorder and capture of several years of record) before an informed assessment could be made. Some revised mapping could be considered for Mummuga.
Mu2	Mummuga	Vulnerability	VA: to ensure public safety and prevent risks to human life. VB: to mitigate current and future risk from coastal hazards by taking into account the effects of coastal processes and climate change. VE: to encourage land use that reduces exposure to risks from coastal hazards, including through siting, design, construction and operational decisions.	The absence of a mapped coastal vulnerability area	Inability to plan for enhanced tidal inundation and erosion hazards inside the estuary	Poor planning outcomes result in unnecessary exposure to future risks and potential maladaptation	Now/ future	Immediate - 100 years	Almost certain	Major	Extreme	The absence of a mapped CV area makes it difficult to appropriately address the objectives of the CM Act associated with coastal vulnerability and would represent a major failing against all of the objectives. A coastal vulnerability assessment including present day tidal inundation and projected future impacts should be undertaken. Risks associated with coastal vulnerability areas, such as impacts on property values, changes to entrance management strategies etc., are difficult to assess without this area being mapped. To better inform the mapping of coastal vulnerability, a permanent water level recorder, installed for several years to cover periods of the Lake being open or closed would be very useful.	Mapping needs to be progressed - based on discussions with DPIE/Council, this would be most conveniently addressed through the floodplain risk management process, using models developed therein.
Mu3	Mummuga	Vulnerability	VA: to ensure public safety and prevent risks to human life.	Lack of foreshore protection to address erosion in the entrance channel	Foreshore erodes and collapses	Potential injury	Now	Immediate (1-2 years)	Almost certain	Moderate	High	There are a number of areas on the southern side of the entrance channel that are currently eroding. This area is also used by members of the public. A detailed study of eroding areas and recommendation / development of conceptual options to address the issue is warranted given the potential safety implications for the public	This is still an issue; however, we note that recent closure of the ICOLL would have changed the usability of the area used by the public. Ongoing, informal access down this slope is a concern for aboriginal heritage issues now, and a foreshore management plan should be prepared, possibly as part of a Crown Reserve management plan.
Mu4	Mummuga	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Lack of maintenance work associated with saltmarsh regeneration projects	Area invaded by weeds, overgrown with grass	Scrappy vegetation results in Lack of perceived values to community, who resume mowing of the saltmarsh area	Now	Immediate	Almost certain	Moderate	High	The rear of Myuna and Attunga Streets has been subject to regeneration efforts, and requires maintenance to keep it in good condition and to retain the support of the community.	No further comment. Maintenance should be occurring.

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome / Consequences / Impact	Time Frame for Emergence (if required)	Indicative Year for Impact/Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study	Finalised CMP Comment (where relevant)
Mu5	Mummuga	Environment	EC: to maintain and improve water quality and estuary health.	Poor stormwater controls	Pollutants, sediment and rubbish enters the lake - or stormwater system causes lake to freshen rapidly	Water quality within the Lake suffers, potential mortality of lake fauna.	Now	Immediate - 20 years	Almost certain	Moderate	High	Water quality conditions within the lake are not well understood at present, as limited baseline data have been collected. While we can be certain that there are some water quality impacts which arise from runoff, there is no way of assessing how severe the impacts might be. Accordingly, a moderate rating is assumed, giving this item a high risk rating. To address this issue, an estuary-specific monitoring program could be developed and implemented to increase the understanding of ecological function.	We have obtained several records from Mummuga Lake from DPIE EES, although these all seem to be at least 5 years old. Furthermore, consideration of the Estuarine Health Risk Dataset indicates that more effort is required to understand relative risks related to water pollution from various catchments. Over the past couple of years, several projects have been completed looking at practical application of the Risk Based Framework and this should be investigated further. Batemans Marine Park has expressed an interest in assisting with the funding of nets at the end of major stormwater outlets to reduce litter & gross pollutants flowing to the estuary. This could be an action which follows better understanding of the risks from urban stormwater.
Mu6	Mummuga	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Weak compliance with illegal fishing activity or poor controls	Overfishing & harvesting occurs within lake	Ecological integrity threatened	Now	Immediate	Likely	Moderate	Moderate	This issue was raised by a couple of individuals consulted during the Scoping Study. The easy way to improve this situation is to strengthen compliance (signage / controls), and this is best managed by NSW DPI as part of their normal processes. Commercial fishing is not allowed in Mummuga Lake.	Nothing Further - Ongoing Compliance.
Mu7	Mummuga	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Artificial opening at a level which is too low	Weak outflow means limited scour of entrance	Sand washes into entrance following opening, meaning that sand is gradually accumulating in the entrance channel	Now	Immediate	Likely	Moderate	Moderate	This expressed concern may arise when community members note that the entrance channel shallow in a particular location. This occurrence may actually be localised and not representative of the whole channel. While there is an REF for the opening of the lake (DEC, 2007), no formal policy has been uncovered during the Scoping Study. It is likely that this needs to be updated, but management of the entrance is the responsibility of the National Parks and Wildlife Service. That update should consider the issue of sediment washing into the entrance and also the opinion expressed by some in the community that the entrance used to open in a more northerly location (which would be atypical for an entrance in a location similar to Mummuga's).	As of 2020, the Entrance Opening Policy is being updated by NPWS.
Mu8	Mummuga	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Artificial opening has altered natural tidal conditions in the lake	Lake becomes less amenable to supporting prawns	Prawning in the lake is "ruined"	Now	Immediate	Possible	Moderate	Moderate	This may be feasible but would require additional data to research properly. By their nature, ICOLLs are highly variable environments and it is expected that there would have naturally been periods when prawning was good and periods when prawning was bad. Whether or not entrance management would significantly affect the number of prawns in the lake (compared to a more 'natural' situation where no artificial opening occurs) could be a subject for the update of the management plan for entrance management (by NPWS). NSW Fisheries may also be able to provide information/ funding for the necessary studies which could investigate the productivity of prawn populations and the habitats upon which they depend to inform on ground actions, such as protection of the most important habitats.	As of 2020, the Entrance Opening Policy is being updated by NPWS (expected completion in 2021). At present, NPWS is aiming to follow NSW state policy which allows for as natural an opening as possible, but realises that there are low-lying assets which need to be protected from unnecessary inundation. No action other than support of the NPWS process is required of Council. A permanent water level recorder would likely form part of the strategy for entrance management and it is possible that DPIE can facilitate this as it will also provide useful information relating to tidal exchange and opening/closing of the lake.

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome / Consequences / Impact	Time Frame for Emergence (if required)	Indicative Year for Impact/Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study	Finalised CMP Comment (where relevant)
Mu9	Mummuga	Environment	ED: to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons.	Lack of access points for boats	Informal access causes erosion	Degradation of lake foreshores	Now	Immediate (1-2 years)	Possible	Moderate	Moderate	It is certainly true that there are limited formal locations for boats to access the waterway. This could be managed by formalising/ providing improved facilities at the main access points and to exclude access from other locations. However, our site inspections uncovered limited evidence of this issue. The boat ramp at Evans Point can definitely be improved.	It is true that there are issues which would ideally be addressed at the Evans Point Boat Ramp. However, discussions with both Eurobodalla Shire Council and TfNSW have indicated that, due to funding constraints, this boat ramp is unlikely to attract funding and attention is more likely to be given to other sites such as Wagonga Inlet. For this reason, further actions need not be considered.
Mu10	Mummuga	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Uncontrolled vehicular access to foreshore through saltmarsh areas	Destruction of salt marsh vegetation by vehicle tracks and pedestrian traffic	Inability of salt marsh to rehabilitate / thrive / migrate	Now	Immediate	Almost certain	Moderate	High	This risk relates specifically to a large patch of potential saltmarsh though which vehicular access is provided to the foreshore of the lake - off Mort Avenue. The issue can be easily addressed by providing a barrier to vehicles. While saltmarsh tends to rejuvenate naturally, some work may be needed to loosen ground hardened through compaction of the tyre tracks and, possibly, planting of appropriate species. This patch of saltmarsh is probably more important than the efforts that have been spent on rehabilitation of areas adjacent to Myuna and Attunga Streets. A raised boardwalk or dedicated pedestrian access may also be worthwhile, although more study on the history of this patch of land and water levels would be advised before extensive expenditure is made. More broadly, the identification of areas that are suitable for the expansion and migration of saltmarsh resulting from sea-level rise could be undertaken.	Inspection of the site in 2020 indicated that the saltmarsh area was less extensive than seen in 2018. However, a simple fix here would be to install bollards to prevent vehicular access.
Mu11	Mummuga	Environment	EC: to maintain and improve water quality and estuary health.	Low level of commitment to estuary management	System gradually degraded	Unhealthy system, unpleasant for the local community and visitors, poor environmental outcomes	Now	Immediate - 20 years	Very unlikely	Moderate	Low	This is given a very unlikely ranking as the current coastal management framework prioritises environmental outcomes. For this risk to arise, the management process which is required by law to be followed would need to be abandoned.	No further comment.
Mu12	Mummuga	Use	UA: to protect and enhance the scenic, social and cultural values of the coast by ensuring that: (iii) urban design, including water sensitive urban design, is supported and incorporated into development activities.	Poorly understood impacts on water quality	Existing development generates pollution	Water quality of the lake is poor, resulting in a poor feature for ongoing recreation	Now	Immediate - 20 years	Very likely	Moderate	High	It is clear that the water quality dynamics of the catchment runoff and its interaction with water quality in the lake are poorly understood. Stormwater warrants some study, with particular issues associated with stormwater discharging directly to the entrance channel and the possibility that the Industrial Area south of the Dalmeny residential area is increasing the volume of runoff and silt load. Hot spots for pollution would be identified to inform on ground management actions.	Our examination of water quality data provided to us by DPIE provides no indication that water quality is degraded. There is a possibility that water quality dynamics and the natural variability of water quality in an ICOLL is poorly understood by the community. This is not uncommon. Water quality variation between when the entrance is open and when the entrance is closed can be very different. Ongoing monitoring by DPIE through their MER process, combined with updated examination using the Risk-based Framework may assist.
Mu13	Mummuga	Use	UA: to protect and enhance the scenic, social and cultural values of the coast	Use of Lake for high powered vessels and Jet Skis	Generation of noise, conflict with other lake uses	Character of the adjacent environment and use of waterway for recreation is diminished	Now	Immediate	Almost certain	Moderate	High	This issue was raised by both National Parks and community stakeholders. The issue could be managed by banning jet skis and water skiing from the lake, possibly while enhancing facilities at nearby Corunna Lake. Furthermore, a speed limit could also be set in the lake.	As of 2020, water skiing has been largely eliminated from the park. The boating ramp at Evans Point is noted as being unformed and suitable as a small craft access point only. Given the unlikely upgrading of this ramp, it seems unlikely that use will intensify. TfNSW and Council should consider the matters raised here, and the overall suitability as part of the South Coast Boating Network Plan and Maritime Infrastructure Asset Management Plan, respectively.

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome / Consequences / Impact	Time Frame for Emergence (if required)	Indicative Year for Impact/Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study	Finalised CMP Comment (where relevant)
Mu14	Mummuga	Use	UA: to protect and enhance the scenic, social and cultural values of the coast by ensuring that: (ii) adverse impacts of development on cultural and built environment heritage are avoided or mitigated, and (iv) adequate public open space is provided, including for recreational activities and associated infrastructure.	Access to lakes edge is uncontrolled	Ad hoc, informal access to foreshores	Erosion, damage to middens, potential safety risks	Now	Immediate	Almost certain	Major	Extreme	There is a good argument for a cohesive plan to assist with access to the foreshore within Dalmeny. Key areas of concern are: (i) Adjacent to the entrance channel where informal tracks down the slope are a safety issue and a potential risk to Aboriginal heritage. (ii) Ensuring signage is provided to inform the public that dogs are not allowed in the National Park (i.e. the lake). (iii) Potentially providing more formalised access to the foreshore near Mummuga Drive, as access in this part of Dalmeny is quite limited. (iv) Development of a scheme to remove illegal structures, such as those behind Myuna St.	Following discussions with the local representatives of first nations people during development of the CMP, the impact was changed to Major. Not only along the southern foreshore of the entrance channel, but across Mummuga Headland, there is a very strong argument for a cohesive access and foreshore management strategy to be implemented in this area. Aboriginal Heritage values are being affected and ongoing loss / damage is irreversible. A cohesive, safe, recreationally friendly and culturally sensitive plan is required.
Mu15	Mummuga	Use	UA: to protect and enhance the scenic, social and cultural values of the coast.	Tree and undergrowth clearing on reserves occurs selectively behind some blocks	Loss of foreshore vegetation, discontinuous character of littoral lake fringe	Sense of inequity between landowners viz. perceived bushfire risk and/or presence of water views	Now	Immediate	Almost Certain	Minor	Moderate	This issue was raised regarding three properties on Attunga Street that were, reportedly, previously provided with permission by Council to clear the reserve between their property and the water. This issue is of importance but can be managed by Council having a clear policy on land clearing. The areas cleared could be rehabilitated if considered necessary and practical.	While of some importance, rehabilitation of other areas around Mummuga Lake is likely to take precedence considering the limited funding generally available.
Issues discussed at CMP development stage resulted in additional insights to already identified risks													

Table 9 Wagonga Risk Assessment

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome / Consequences / Impact	Time Frame for Emergence (if required)	Indicative Year for Impact / Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study Comment	Finalised CMP Comment (where relevant)
W1	Wagonga	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity. WB: to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests. WC: to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.	Current mapping of CMSEPP wetlands does not match that of vegetation on ground	Incompatible land use or development allowed in areas that contain coastal wetland vegetation	Damage of saltmarsh in particular, mangroves and seagrasses	Now / medium term / future	Immediate - 50 years	Almost certain	Major	Extreme	The issue of saltmarsh loss is particularly of concern in Wagonga Inlet, where there is ongoing colonisation of saltmarsh beds by mangroves and a lack of space for migration due to the steep topography. Both the CM Maps and extents of E2 zoning should be adjusted.	The scoping study comment was somewhat misguided in that E2 zoning is based on land parcels, whereas the CM SEPP maps are based on floristic characteristics. The risk ratings are still relevant, and the issue is acknowledged as important across NSW within State Govt. However, estimation and planning methods to deal with this have not yet been settled upon.
W2	Wagonga	Wetlands	WB: to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests. WC: to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration.	Sea level rise / response of entrance channel to training	High tides rise	Saltmarsh areas are drowned out with major loss from the system.	Now / medium term / future	Immediate - 20 years	Almost certain	Catastrophic	Extreme	There seem to be limited options to address this issue, apart from the rehabilitation / enhancement of areas where saltmarsh is generating around the fringes of the entrance compartment areas protected by training walls downstream of bridge. This could be integrated with more formalised and controlled access, for example, in front of the caravan park to the east of the bridge. If such options are to be considered, it may be worthwhile to assess the productivity of the fishery to justify and/or guide such on-ground actions.	This issue remains. Aside from the area fronting the caravan park, which is also covered in the "Narooma Sport and Leisure Precinct Plan of Management" (currently under development), there are also opportunities to work with large, existing saltmarsh areas at the most upstream extents of the estuary, to try and encourage landward growth of saltmarsh areas.
W3	Wagonga	Wetlands	WA: to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity.	Conflicting classification of coastal wetlands under different instruments	Inconsistencies in approach by different agencies	Uncertain outcomes	Now	Immediate	Almost certain	Moderate	High	An area containing mangrove stands and saltmarsh to the west of the highway bridge, in Narooma Flats, is classified as coastal wetland under the CM SEPP. Under the Batemans Marine Park, this is classified as a "Special Purpose", and classified as "Recreational Waterway" under the Eurobodalla LEP. It is suggested that this situation should be made more consistent. At the moment, saltmarsh vegetation landward of the fringing mangrove stand is being mown by Council, and this needs to be discouraged.	Situation remains. BMP can be approached to change the area to a Habitat Protection Zone. The saltmarsh areas being mown should be marked out and mowing avoided/managed.
W4	Wagonga	Vulnerability	VC: to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place.	Ongoing instability of the entrance channel	Channel migration and wind waves eroding southern foreshore of Lewis Island	Recession of foreshore and loss of Lewis Island	Now	Immediate - 20 years	Almost certain	Moderate	High	The foreshore is clearly eroding, and this seems to be related to both the morphodynamics of the channel and wind waves from the south. A study to examine these processes, including updating the bathymetric survey of the channel, is warranted. While temporary protection works appear to be holding the foreshore in place for the time being, this cannot be relied on as a permanent fix.	As of 2020, temporary works have mainly failed and erosion is continuing. Broader understanding of entrance dynamics is required before this issue can be addressed, if necessary. Aboriginal Heritage and shorebird nesting site issues are known to be present on the island and access to the island is becoming problematic.
W5	Wagonga	Vulnerability	VB: to mitigate current and future risk from coastal hazards by taking into account the effects of coastal processes and climate change.	The absence of a mapped coastal vulnerability area	Inability to plan for enhanced tidal inundation and erosion hazards inside the estuary	Poor planning outcomes result in unnecessary exposure to future risks and potential maladaptation	Now / future	Immediate - 100 years	Almost certain	Major	Extreme	The absence of a mapped CV area makes it difficult to appropriately address the objectives of the CM Act associated with coastal vulnerability and would represent a major failing against all of the objectives. A coastal vulnerability assessment including present day tidal inundation and projected future impacts should be undertaken. To assist with future monitoring, it is recommended that a permanent water level recorder be re-established inside the main waterbody of Wagonga Inlet, potentially within Forsters Bay.	Mapping needs to be progressed - based on discussions with DPIE/Council, this would be most conveniently addressed through the floodplain risk management process, using models developed therein.

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome / Consequences / Impact	Time Frame for Emergence (if required)	Indicative Year for Impact / Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study Comment	Finalised CMP Comment (where relevant)
W6	Wagonga	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Use of drag nets for prawning	Damage to foreshore environments and seagrass / bycatch poorly managed and resulting overfishing	Flow on impacts to fisheries and stocks.	Now	Immediate - 20 years	Unlikely	Minor	Low	Drag netting is banned in Wagonga Inlet. Therefore, their extensive use is unlikely and, due to this expected low intensity illegal activity, the impact is expected to be minor. The issue can be dealt with using existing compliance arrangements.	Nothing Further.
W7	Wagonga	Environment	ED: to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons.	Training of the entrance	Entrance instability (variable depths and shifting shoals)	Impaired navigation	Now	Immediate - 20 years	Almost Certain	Moderate	High	This is known to be occurring, and shallow areas upstream of the Princes Highway Bridge have been an issue for more than a decade. This has flow on effects to the local economy (tourism, accessibility of the main basin of the Inlet, potential expansion of the Marina in Forsters Bay) and previous attempts at resolving the issue around 10 years ago (if they were carried through) were unsuccessful. To address this issue properly, however, would come at substantial cost and a detailed study would need to be undertaken to justify grant funding. Installing a water level recorder and resurveying the entrance channel would comprise important base information to inform such a study. On a related matter, navigation markers are presently in a poor location in some areas because of the shifting sand in the entrance channel. The maintenance of these markers is the responsibility of RMS.	It appears that dredging was completed around 2006 but was short lived. Dredging needs to be thought about carefully as, once it is undertaken, a perception that it will be done continuously emerges. A study which leads to understanding of the dynamics of the entrance and expected future evolution is required. The issue of navigation markers has been discussed with Transport for NSW and we are satisfied that these are being actively managed / considered with inputs from the local boating safety officer.
W8	Wagonga	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	An increase in seal population in the region	Seals use the inlet more frequently	Potential impacts on fish stocks and potential for boat collisions and interactions of aggressive seals with humans	Now	Immediate - 20 years	Possible	Minor	Low	Seals are known to be more frequently visiting and using Wagonga Inlet. This corresponds, reportedly, to a change in the population of seals on nearby Montague Island. However, the consequences rating has been listed as minor as while there may be some impact on fish stocks, which may impact recreational fishing, the seals may also be seen as a positive feature of the inlet. Seals are protected under law, and it is difficult to envisage any management action aimed at culling or somehow excluding seals from using the inlet.	Likelihood of an impact was changed from Almost Certain to Possible. The reason being that this may only be something which occurs from time to time and recent increases may be temporary. Furthermore, there are benefits from seals as a tourist attraction too and potentially having a beneficial impact on the ecosystem, including fish stocks. See: https://www.naroomanewsonline.com.au/story/4153962/seals-in-narooma-inlet-problem-or-not/
W9	Wagonga	Environment	EC: to maintain and improve water quality and estuary health.	Catchment and waterfront land use in Forsters Bay	Increased loads of pollutants, sediment delivered to the bay, which is relatively poorly flushed	Decline in water quality	Now	Immediate	Likely	Moderate	Moderate	While we do not have access to the raw data, a number of figures seem to indicate that sediment and water quality in Forsters Bay can be relatively poor compared to the rest of the inlet. A catchment modelling study and strategy for improving this situation could be considered further. The operation and maintenance of tidal flap gates within Narooma Flats should form part of this study.	Further investigation of this issue is probably justified. However, the Estuary Health Risk Dataset around Wagonga, examined as part of the Stage 2 study, does not seem reliable, and a more rigorous application of the Risk Based Framework is justified for Forsters Bay.
W10	Wagonga	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Unsealed roads	Sediment runoff	Sediment deposits in estuary, cause of siltation	Now	Immediate	Possible	Moderate	Moderate	There are a number of locations where unsealed roads in the catchment are considered to be an issue for causing sedimentation in Wagonga Inlet. Examples include Clarke's Bay and the Historic Wharf within Brice's Bay. Small, site specific studies and ameliorative actions might be considered.	We note that recent funding through MEMA and LLS has been applied to this issue. While warranted, works are only likely to have a localised impact considering the scale of the estuary in relation to the contributing tributaries. The work should continue as funding becomes available.

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W11	Wagonga	Environment	EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity.	Livestock use of Punkally Creek	Transport and deposition of sediment and pollutants in and around alluvial deltas	Interference with navigation and oyster farming, loss of foreshore habitat and grazing of mangrove seedlings	Now	Immediate	Almost certain	Moderate	High	Punkally Creek is a site of particular concern as there are known issues with water quality and sedimentation at its downstream end. A targeted investigation to determine the cause/source of the problems and potential solutions is warranted.	Agreed. Alongside potential livestock use, the location is sensitive with saltmarsh and oysters. Bacteriological contamination is a particular issue for the oyster industry.
W12	Wagonga	Use	Objective UA: to protect and enhance the scenic, social and cultural values of the coast by ensuring that: (i) the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast.	Sea plane using Forsters Bay	Collision with other users of bay	Injury and / or death	Now	Immediate	Unlikely	Catastrophic	High	An understanding of the way in which this activity has been approved to ascertain whether a proper risk assessment was completed, and whether appropriateness in terms of estuary management was considered, may be warranted. Any required action is unlikely to form part of the CMP.	While this may be an issue, it is not going to be addressed by the CMP. It is an issue for the federal Civil Aviation Safety Authority.
W13	Wagonga	Use	Objective UA: to protect and enhance the scenic, social and cultural values of the coast by ensuring that: (i) the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast.	Waterside facilities are of poor quality or limited in distribution and functionality	Capacity for tourism and use of the natural resource by locals in the general area is diminished	Cost of missed opportunities	Now	Immediate (1-2 years)	Likely	Moderate	Moderate	There were a couple of responses which were highly critical of the lack and quality of facilities (boat ramps, wharfs, jetties, public moorings, and fuel facilities). While there are arguments to, for example, upgrade some facilities where it can be easily achieved or completely remove dilapidated facilities (Jetty at Ringland's Point), intensification of boat use within the estuary is a broader issue that needs to be considered alongside navigability of the entrance. A survey and boating needs study could be completed, but there would need to be appetite for such an expansion from several agencies - including the Marine Park, Council, NSW Waterways and NSW Fisheries.	While this may be a moderate risk, discussions with TfNSW indicate that they are preparing an overarching South Coast Boating Network Plan which, combined with Council's Maritime Infrastructure Asset Management Plan (also under development), will help to address this issue. No actions are to be proposed in the CMP given that it is being managed through a separate process.
W14	Wagonga	Use	Objective UA: to protect and enhance the scenic, social and cultural values of the coast by ensuring that adverse impacts of development on cultural and built environment heritage are avoided or mitigated	Historic Wharf at Brice's Bay falls into disrepair	Wharf underutilised, potential failure	Potential safety issue and loss of heritage value.	Now	Immediate	Likely	Moderate	Moderate	While not an overly critical issue, the pontoon seems to be bottoming out at low tide and is warped. This may be partly caused by runoff of sediment from the adjacent road, and repairs of the pontoon could occur at the same time as efforts to reduce this runoff.	Brice's Bay wharf has been repaired since the Scoping Study was completed. No action recommended. However, new issues at this site have emerged as discussed below.
New issues at CMP development stage													
W15	Wagonga	Environment	Objective EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity. Objective EB: to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change. Objective EC: to maintain and improve water quality and estuary health.	Land clearing	Erosion and export of sediment from catchment	Sedimentation	Now / medium term	Immediate - 20 years	Possible	Minor	Low		There are specific locations where sedimentation may be seen as a problem, most notably in the upstream reaches where sedimentation affects oyster leases. The specific situation at Punkally Creek deserves special attention. Otherwise, the expected negative impacts are minor and may even be beneficial in terms of promoting the potential for future saltmarsh habitat. Furthermore, results of the Bushfire Recovery Plan should be examined (when ready) to see if enhanced sedimentation after the bushfires is of particular concern. Council seems to have appropriate controls in place to manage clearing.

Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome / Consequences / Impact	Time Frame for Emergence (if required)	Indicative Year for Impact / Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study Comment	Finalised CMP Comment (where relevant)
W16	Wagonga	Environment	Objective EC: to maintain and improve water quality and estuary health.	On-site sewerage systems	Poor management and / or maintenance	Water pollution	Now	Immediate – 20 years	Unlikely	Moderate	Moderate		We are not aware of any evidence to indicate that there is significant human faecal contamination in Wagonga Inlet. At the time of writing, there is known faecal contamination of concern to oyster leases at the downstream end of Punkally Creek. This deserves some investigation. Information provided to us demonstrates that Council applies a risk-based approach including scheduled inspection of on-site systems. Any ongoing issues should continue to be managed in accordance with established protocols
W17	Wagonga	Environment	Objective EA: to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character, scenic value, biological diversity and ecosystem integrity. Objective EB: to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change. Objective EC: to maintain and improve water quality and estuary health. Objective ED: to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons.	Lack of toilet facilities at Brice's Bay Historic Wharf	Use of facility by public with informal toileting practices	Environmental pollution	Now	Immediate	Almost certain	Moderate	High		This situation needs to be addressed. It may be that a sealed pumpout system needs to be installed, or an alternative (composting toilet or other low maintenance option) provided a suitable distance from the foreshore. Education of locals and business owners of the limited toilet facilities needs to be undertaken in the short term.

APPENDIX E MANAGEMENT OPTIONS ASSESSMENT

ASSESSMENT OF MANAGEMENT OPTIONS EUROBODALLA ESTUARINE COASTAL MANAGEMENT PROGRAM

Authors:	David Wainwright, Elizabeth Nevell
Prepared For	EUROBODALLA SHIRE COUNCIL
Version	FINAL
Date	4/12/2020

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[1] 'E' refers to electronic distribution; numerals refer to number of hard copies.

Contents

Tables

1 Introduction

This appendix to the Eurobodalla Estuarine Coastal Management Program (CMP) outlines the identification, filtering, and assessment of potential management actions for the Moruya River, Mummuga Lake and Wagonga Inlet estuaries. It is structured as follows:

- Section 2 provides a listing of potential management options. Options were identified throughout the CMP development process, including the background review, consultation and risk assessment phases of the Scoping Study (parallel Appendix A), additional consultation undertaken as part of CMP development (parallel Appendix C), and the revised risk assessment (parallel Appendix D).
- While many options were filtered out during earlier stages of the process, a final filtering step has been carried out, as presented in Section 2. In this process, we have aimed to eliminate actions which are clearly being handled by a separate process, those which are beyond the jurisdiction of a CMP and/or those which are simply not feasible or will not work.
- Section 3 presents a more robust assessment of options. While there are several "high" and "extreme" risks for each estuary, the decision making around them is seen to be relatively simple and, in most cases, a relatively clear pathway forward has been identified during the risk assessment process. Management options have been assessed qualitatively against the objectives of the *Coastal Management Act 2016* and an indicative cost estimate is provided based on recent experience at other sites or standard published rates.

This appendix should be read in conjunction with the revised risk assessment (parallel Appendix D).

2 Long Listing of Options and Filtering

2.1 Overall Actions

Listing and filtering of actions that relate to all estuaries in Eurobodalla are presented in Table 1.

Table 1 Listing and Filtering of Management Options – Overall

Management Option	Risk Addressed	Road Blocks							Comment
		Illegal	Irrelevant	Wont Work	Out of Scope of CMP	Duplicates Existing Process	Too Expensive to be Considered	Not Eligible for Funding	
Appropriately Planning for Population Growth & Identifying Offsets	E1, M17	N	N	N	N	N	N	N	No Regrets Option
Establish Estuarine Management Steering Committee and Meet Regularly	E2	N	N	N	N	N	N	N	No Regrets Option
Trial Installation of End of Pipe Net at Key Urban Stormwater Outlets	E3	N	N	N	N	N	N	N	Batemans Marine Park has indicated will fund - First Trial at Riverside Park.
Identify Aboriginal Heritage Sites Potentially Affected by Sea Level Rise	E4	N	N	N	N	N	N	N	Minor internal GIS analysis, followed up by liaison with Aboriginal Consultative Committee & DPIE
Map Coastal Migration Pathways	E5, M1	N	N	N	N	N	N	N	Should follow Mapping of vulnerability areas through FRM Process for each estuary, discuss with DPIE.
Mini Update of CMP in Response to Bushfire Recovery Plan	E6	N	N	N	N	N	N	N	To ensure consistency/no overlap + access any funding opportunities. Council staff to stay aware.
Revisit/Localised Application of Risk-Based Framework	-	N	N	N	N	Y	N	N	Individual actions to be defined for particular estuaries
Audit Formal Entrance Points to Estuaries and Provide Waste Receptacles incl. Tackle Bins	E3	N	N	N	N	N	N	N	Funding may be available from DPI Grants
Mapping of CVA for Tidal Inundation	-	N	N	N	N	Y	N	N	Individual actions to be defined for particular estuaries. Leverage use of models from FRMP process.
Riparian Rehabilitation Plans	-	N	N	N	N	Y	N	N	Individual actions to be defined for Wagonga and Moruya.

2.2 Moruya River

Listing and filtering of actions that relate to the Moruya River Estuary are presented in Table 2.

Table 2 Listing and Filtering of Management Options – Moruya River

Management Option	Risk Addressed	Road Blocks							Comment
		Illegal	Irrelevant	Wont Work	Out of Scope of CMP	Duplicate Process	Too Expensive to be Considered	Not Eligible for Funding	
Adjust E2 Zoning to better match CM SEPP Wetlands	M2	N	Y	Y	N	N	N	N	Not needed, plus the two types of mapping are fundamentally different.
Foreshores and Wetland Restoration Plan - Moruya	M3,M5, M16	N	N	N	N	N	N	N	Formalisation of ongoing work being completed by LLS and Council with support of DPI & Marine Park.
Overarching Study of Scientific, Feasibility and Heritage Study of Malabar Wetland	M6, M7, M9, M11	N	N	N	N	N	N	N	Include migration pathways, weir, stock crossings, fencing aboriginal heritage - DPI flagship funding?
Update SEPP Mapping of Coastal Wetlands	M10	N	N	N	N	Y	N	N	Existing mapping by Elgin doesn't match SEPP. However, likely that migration pathways mapping will supersede.
Map Coastal Vulnerability Area for Moruya	M12	N	N	N	N	N	N	N	As part of Moruya River Flood Study which is expected soon, once model from Moruya Bypass is ready.
Study Bathymetric Change at Entrance	M13	N	Y	N	N	N	N	N	Overall, this particular location is not a big issue at present. May be considered at a future date.
Study influx of Sediment into Upper Reaches of Estuary	M13	N	N	N	N	N	N	N	Aim to have this investigated as part of the Bushfire Recovery Project.
Improve Water Quality	M14, M23	N	N	N	N	Y	N	N	Ongoing monitoring and installation of litter capturing nets as proposed in overarching actions is reasonable.
Study to Assess Changes to Tides	M18	N	N	N	N	N	N	N	This is a fairly simple study to fill an existing data gap, (around $5,000)
Investigate changing Rock Lined foreshores.	M19	N	Y	Y	N	Y	N	N	There may be limited ecological benefit based on more recent research, forthcoming DPI guidelines.
Study into Poor Public Access	M20	N	N	N	N	Y	N	N	Existing TfNSW and Council studies into Boat access, maritime facilities should be allowed to complete first.
Provide additional signage at Quandolo Island and around Eurobodalla NP viz shorebirds	M23	N	N	N	N	N	N	N	Likely relatively cheap and falls within the jurisdiction of NPWS.
Ban Commercial Fishing from Estuary	M25	N	N	N	Y	Y	N	N	Would be an overreach for the CMP. Is the responsibility of DPI and changes are slow.
Water Quality Monitoring of Racecourse Creek	M26	N	N	N	N	N	N	N	Could be completed by Council as part of ongoing monitoring to determine if there is an issue.
Return of Riparian Parcels, Northern Foreshore Moruya, to Public Care and Control	M16	N	N	N	N	N	N	N	Follow this up by rehabilitation as part of Foreshores Restoration Plan. Crown Lands needs to commit.
Assess Impacts of Major Projects (Bypass, Hospital) on Wetland Migration Pathways	M4, M17	N	N	N	N	N	N	N	Requires commitment from TfNSW and possibly DPIE-Planning

2.3 Mummuga Lake

Listing and filtering of actions that relate to Mummuga Lake are presented in Table 3.

Table 3 Listing and Filtering of Management Options – Mummuga Lake

Management Option	Risk Addressed	Road Blocks							Comment
		Illegal	Irrelevant	Wont Work	Out of Scope of CMP	Duplicate Process	Too Expensive to be Considered	Not Eligible for Funding	
Revised Coastal Wetland Mapping for Mummuga Lake	Mu1	N	N	N	N	N	N	N	Should follow a few years of water level record in Mummuga Lake + analysis of aerial photographs
Map Coastal Vulnerability Area for Moruya	Mu2	N	N	N	N	N	N	N	Can be undertaken as an adjunct to Mummuga Lake Floodplain Risk Mgmt. Process (currently underway)
Foreshore and Headland Access Management Plan	Mu3, Mu14	N	N	N	N	N	N	N	Foreshore access & erosion problems affecting cultural heritage, safety & coastal processes.
Saltmarsh Management, Attunga and Myuna	Mu4	N	N	N	N	N	N	N	Initiate dialog with community to establish protocol for mowing, in conjunction with DPI to acquire permits etc.
Water Quality Management Mummuga Lake	Mu5	N	N	N	N	N	N	N	Need to start with community concerns (consultation) plus analysis and development of plan for management.
Entrance Management Policy	Mu7, Mu8	N	N	N	N	N	N	N	Underway, by NPWS, Council to support.
Install Bollards to Prevent Vehicular Access to Saltmarsh, West of Tennis Courts	Mu9, Mu12	N	N	N	N	N	N	N	Small expenditure with big impact. Bollards to be installed on Council land.
Remove High Powered Vessels, Jet Skis from Mummuga Lake	Mu13	N	N	N	Y	Y	N	N	This largely sits out of scope and is being covered by TfNSW and Council studies
Install On-line Water Level Recorder	Mu1, Mu7, Mu8, Mu5	N	N	N	N	N	N	N	Has multifaceted benefits and interactions with other management options. DPIE to action.

2.4 Wagonga Inlet

Listing and filtering of actions that relate to Wagonga Inlet are presented in Table 4.

Table 4 Listing and Filtering of Management Options – Wagonga Inlet

Management Option	Risk Addressed	Road Blocks							Comment
		Illegal	Irrelevant	Wont Work	Out of Scope of CMP	Duplicate Process	Too Expensive to be Considered	Not Eligible for Funding	
Update SEPP Mapping of Coastal Wetlands	W1	N	N	N	N	Y	N	N	Existing mapping by Elgin doesn't match SEPP. However, likely that migration pathways mapping will supersede.
Incorporate Saltmarsh Friendly Foreshore Treatment in *Narooma Precinct Plan*	W2	N	N	N	N	N	N	N	Can also incorporate interpretive signage, and integrate oyster reef plans by DPI.
Fencing to Exclude Stock from Saltmarsh in Upper Reaches of Inlet	W2	N	N	N	N	N	N	N	Needs to be preceded by liaison and potentially community consultation by LLS.
Change Marine Park Zoning of Mangroves between Bridge and Narooma Flats	W3	N	N	N	N	N	N	N	Batemans Marine Park to integrate into their review / planning process - General Purpose to Habitat Protection
Council to Install Markers to Prevent Mowing of Saltmarsh, Narooma Flats.	W3	N	N	N	N	N	N	N	Quite simple solution, but need to integrate with landscaping.
Dynamics Study of Wagonga Inlet Entrance to Inform Coastal Vulnerability Mapping.	W4, W7	N	N	N	N	N	N	N	Will also inform dynamics surrounding navigation, erosion of Lewis Island, ongoing adaptation of Inlet
Map Coastal Vulnerability Area for Moruya	W5	N	N	N	N	N	N	N	As an adjunct to Wagonga Inlet Floodplain Risk Mgmt. Process (currently underway). Dynamics study required
Water Quality Management Forsters Bay	W9	N	N	N	N	N	N	N	Relatively poorly flushed section of estuary. Application of *Risk Based Framework* would help here.
Seal Roads in Catchment	W10	N	N	N	N	Y	N	N	Continue supporting, but this is a process which is already being managed via LLS/MEMA.
Punkally Creek Attribution and Monitoring Study	W11	N	N	N	N	N	N	N	Very important study, investigate attribution of sedimentation, faecal contamination + impact of works.
Improve Waterside Infrastructure	W13	N	N	N	N	Y	N	N	Processes being completed by Council/TfNSW are presently examining this.
Install Environmentally sensitive toilet facilities at Brice's Bay	W15, W17	N	N	N	N	N	N	N	Will require ongoing maintenance, but current situation is untenable.
Manage Access to Lewis Island	W4	N	N	N	N	N	N	N	First stage is to undertake consultation with community to determine a way forward. Co-design may work.
Demolish Ringlands Jetty	-	N	N	N	N	N	N	N	Small, No Regrets Action to remove derelict structure owned by Council.
Foreshores and Wetland Restoration Plan - Wagonga Inlet	W10, W11	N	N	N	N	N	N	N	Overarching plan developed in consultation with LLS & Council.

3 Detailed Assessment Tables

An assessment of the management options with respect to the objects of the *Coastal Management Act 2016* and the *Marine Estate Management Act 2014* and objectives of the coastal management areas from the Coastal Management SEPP has been completed.

The outcomes for Overarching Management Actions are presented in Table 5.

The outcomes for the Moruya River, Mummuga Lake and Wagonga Inlet Estuaries are presented in Table 6, Table 7, and Table 8, respectively. Each of the objectives/objects against which the options have been assessed has been identified with a short name. These are presented, alongside an interpretation of the qualitatively performance scores (between -2 and +2) and impact scores (1 through 4) in Table 9.

Table 5 Detailed Assessment of Management Options – Overarching Actions

		Criteria (Objects/Objectives from CM Act and MEM Act)																																																
		CM Act Objects												MEM Act Objects							Wetlands					Environment						Use						Vulnerability												
Management Option	Risks Addressed	Coastal Processes/Values	Social and Cultural Values	Aboriginal Values/Uses	Coastal Economies	Ecologically Sustainable Development	Coastal Hazards / Climate Change	Ambulatory Recognition	Integrated Planning/Management	Resilience of Coastal Assets	Co-ordinated Management Activities	Public Participation/Understanding	Identify Land for Protection	Biologically diverse and healthy	Economic Opportunities	Cultural, Social, Recreational	Ecosystem Integrity	Scientific Research and Education	Promote Coordination	Management of Marine Parks	Natural Biodiversity/Integrity	Rehabilitation/Restoration	Resilience/Migration	Social/Cultural Values	Promote State Policies/Programs	Environmental Values/Processes	Resilience of Coastal Waters	Water Quality	Social/Cultural Values	Beaches / Dunes / Natural Features	Public Access/Amenity	Natural Scenic Quality	Cultural / Built Environment Heritage	Urban Design	Public Open Space	Use of Surf Zone	Urbanised and Natural Coastline	Public Safety	Mitigate Coastal Hazards	Maintain Beaches	Public Amenity	Sensible Land Use	Reduce Hazard Exposure	Do no harm	Essential Infrastructure	Resilient Development	Impact Scale	Scaled Impact Score	Capital Cost	Annual Cost
Appropriately planning for Population Growth & Identifying Offsets	E1, M17	2	2	1	2	2	1	0	2	0	2	2	2	2	2	2	2	0	2	2	2	2	2	2	2	2	2	2	2	0	1	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	4	216	$ -	$ -
Establish Estuarine Management Steering Committee and Meet Regularly	E2	2	2	2	0	2	1	0	2	0	2	2	2	2	2	2	2	1	2	1	1	2	2	2	0	2	2	2	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4	184	$ -	$ 10,800.00
Trial Installation of End of Pipe Net at Key Urban Stormwater Outlets	E3	1	1	0	1	1	0	0	0	0	0	1	0	1	1	1	1	0	0	0	1	0	0	1	0	2	2	2	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	60	$ 10,000.00	$ 3,000.00
Identify Aboriginal Heritage Sites Potentially Affected by Sea Level Rise	E4	0	2	2	0	0	1	0	1	1	0	1	0	0	0	2	0	1	0	0	0	0	0	2	1	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	4	72	$ 1,500.00	$ -
Map Coastal Migration Pathways	E5,M1	2	0	0	0	2	1	0	1	0	0	0	2	1	0	0	2	2	0	1	2	2	2	0	1	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	108	$ -	$ -
Mini Update of CMP in Response to Bushfire Recovery Plan	E6	0	0	0	1	2	0	0	2	0	2	1	0	0	1	2	1	0	2	0	0	0	0	0	1	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	63	$ 1,500.00	$ -
Audit Formal Entrance Points to Estuaries and install Waste Receptacles incl. Tackle Bins	E3	1	1	0	1	1	0	0	1	0	0	1	0	1	1	1	1	0	0	0	1	0	0	1	1	2	2	2	1	1	2	2	1	1	2	0	0	0	0	0	0	0	0	0	0	0	3	87	$ 12,000.00	$ -

Table 6 Detailed Assessment of Management Options – Moruya River

		Criteria (Objects/Objectives from CM Act and MEM Act)																																																
		CM Act Objects												MEM Act Objects							Wetlands					Environment						Use						Vulnerability												
Management Option	Risks Addressed	Coastal Processes/Values	Social and Cultural Values	Aboriginal Values/Uses	Coastal Economies	Ecologically Sustainable Development	Coastal Hazards / Climate Change	Ambulatory Recognition	Integrated Planning/Management	Resilience of Coastal Assets	Co-ordinated Management Activities	Public Participation/Understanding	Identify Land for Protection	Biologically diverse and healthy	Economic Opportunities	Cultural, Social, Recreational	Ecosystem Integrity	Scientific Research and Education	Promote Coordination	Management of Marine Parks	Natural Biodiversity/Integrity	Rehabilitation/Restoration	Resilience/Migration	Social/Cultural Values	Promote State Policies/Programs	Environmental Values/Processes	Resilience of Coastal Waters	Water Quality	Social/Cultural Values	Beaches / Dunes / Natural Features	Public Access/Amenity	Natural Scenic Quality	Cultural / Built Environment Heritage	Urban Design	Public Open Space	Use of Surf Zone	Urbanised and Natural Coastline	Public Safety	Mitigate Coastal Hazards	Maintain Beaches	Public Amenity	Sensible Land Use	Reduce Hazard Exposure	Do no harm	Essential Infrastructure	Resilient Development	Impact Scale	Scaled Impact Score	Capital Cost	Annual Cost
Foreshores and Wetland Restoration Plan - Moruya	M3,M5,M16	2	0	1	2	2	0	0	0	0	1	0	1	2	1	1	2	0	1	0	2	2	2	0	0	2	2	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	120	$ 400,000.00	
Overarching Study of Scientific, Feasibility and Heritage Study of Malabar Wetland	M6, M7, M9, M11	2	1	2	1	2	0	0	1	0	2	0	2	2	1	1	2	2	2	2	2	2	2	1	0	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	78	$ 250,000.00	$ -
Map Coastal Vulnerability Area for Moruya	M12	0	0	0	1	2	2	0	2	2	1	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	2	2	2	2	2	2	2	2	2	66	$ 10,000.00	$ -
Study Influx of Sediment into Upper Reaches of Estuary	M13	1	0	1	0	1	0	0	0	0	1	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	22	$ -	$ -
Study to Assess Changes to Tides	M18	2	0	0	0	1	2	0	1	1	1	0	1	1	0	0	1	1	1	0	2	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2	2	2	2	2	2	2	2	2	4	144	$ 5,000.00	$ -
Provide Additional Signage at Quandolo Island and around Eurobodalla NP viz shorebirds	M23	1	1	0	1	2	0	0	0	0	0	2	2	2	0	1	2	1	0	0	2	1	0	1	0	0	0	0	1	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	23	$ 10,000.00	$ -
Water Quality Monitoring of Racecourse Creek	M26	1	1	0	0	2	0	0	0	0	0	0	0	2	1	1	2	0	0	0	1	1	0	1	0	2	2	2	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	42		$ 12,000.00
Return of Riparian Parcels, Northern Foreshore Moruya, to Public Care and Control	M16	2	0	0	0	1	0	0	1	0	1	0	2	2	0	1	2	0	0	0	0	0	0	0	1	2	2	2	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	44	$ -	$ -
Assess Impacts of Major Projects (Bypass, Hospital) on Wetland Migration Pathways	M4, M17	1	1	0	1	2	1	0	2	1	2	1	1	1	2	0	1	0	1	0	1	1	1	1	2	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3	93	$ -	$ -

Table 7 Detailed Assessment of Management Options – Mummuga Lake

Criteria (Objects/Objectives from CM Act and MEM Act)

Management Option	Risks Addressed	CM Act Objects: Coastal Processes/Values	Social and Cultural Values	Aboriginal Values/Uses	Coastal Economies	Ecologically Sustainable Development	Coastal Hazards / Climate Change	Ambulatory Recognition	Integrated Planning/Management	Resilience of Coastal Assets	Co-ordinated Management Activities	Public Participation/Understanding	Identify Land for Protection	MEM Act Objects: Biologically diverse and healthy	Economic Opportunities	Cultural, Social, Recreational	Ecosystem Integrity	Scientific Research and Education	Promote Coordination	Management of Marine Parks
Revised Coastal Wetland Mapping for Mummuga Lake	Mu1	1	0	0	0	2	1	0	1	0	0	0	2	2	0	0	2	1	0	1
Map Coastal Vulnerability Area for Mummuga	Mu2	0	0	0	1	2	2	0	2	2	0	0	2	0	0	0	0	0	0	0
Foreshore and Headland Access Management Plan	Mu3, Mu14	1	2	2	1	1	0	0	2	1	1	2	2	1	1	2	1	2	1	0
Saltmarsh Management, Attunga and Myuna	Mu4	1	1	0	0	1	0	0	0	0	0	2	2	2	0	0	2	2	0	0
Water Quality Management Mummuga Lake	Mu5	2	1	0	1	1	0	0	0	0	0	2	0	2	1	1	1	2	0	0
Entrance Management Policy	Mu7, Mu8	0	0	0	0	2	1	0	1	1	1	2	0	1	0	0	1	1	1	0
Install Bollards to prevent vehicular Access to Saltmarsh, west of Tennis Courts	Mu9, Mu12	1	0	0	0	2	0	0	0	0	1	1	2	2	0	1	2	0	0	0

Management Option	Wetlands: Natural Biodiversity/Integrity	Rehabilitation/Restoration	Resilience/Migration	Social/Cultural Values	Promote State Policies/Programs	Environment: Environmental Values/Processes	Resilience of Coastal Waters	Water Quality	Social/Cultural Values	Beaches / Dunes / Natural Features	Public Access/Amenity	Use: Natural Scenic Quality	Cultural / Built Environment Heritage	Urban Design	Public Open Space	Use of Surf Zone	Urbanised and Natural Coastline
Revised Coastal Wetland Mapping for Mummuga Lake	2	2	2	0	0	2	2	2	0	0	0	0	0	0	0	0	0
Map Coastal Vulnerability Area for Mummuga	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Foreshore and Headland Access Management Plan	0	0	0	2	1	0	0	0	2	2	2	2	2	1	2	0	0
Saltmarsh Management, Attunga and Myuna	1	2	2	1	0	1	1	1	1	1	2	2	0	0	0	0	0
Water Quality Management Mummuga Lake	1	1	0	1	0	2	2	2	1	0	0	0	0	2	0	0	0
Entrance Management Policy	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0
Install Bollards to prevent vehicular Access to Saltmarsh, west of Tennis Courts	2	2	2	0	0	2	2	2	0	2	2	2	0	0	2	0	0

Management Option	Vulnerability: Public Safety	Mitigate Coastal Hazards	Maintain Beaches	Public Amenity	Sensible Land Use	Reduce Hazard Exposure	Do no harm	Essential Infrastructure	Resilient Development	Impact Scale	Scaled Impact Score	Capital Cost	Annual Cost
Revised Coastal Wetland Mapping for Mummuga Lake	0	0	0	0	0	0	0	0	0	3	75	$ 20,000.00	$ -
Map Coastal Vulnerability Area for Mummuga	2	2	2	2	2	2	2	2	2	3	87	$ 10,000.00	$ -
Foreshore and Headland Access Management Plan	0	0	0	0	0	0	0	0	0	2	78	$ 50,000.00	$ -
Saltmarsh Management, Attunga and Myuna	0	0	0	0	0	0	0	0	0	1	28	$ 20,000.00	
Water Quality Management Mummuga Lake	0	0	0	0	0	0	0	0	0	4	104	$ 50,000.00	
Entrance Management Policy	0	0	0	0	0	0	0	0	0	4	76	$ -	$ 1,000.00
Install Bollards to prevent vehicular Access to Saltmarsh, west of Tennis Courts	0	0	0	0	0	0	0	0	0	1	32	$ 10,000.00	

Table 8 Detailed Assessment of Management Options – Wagonga Inlet

Criteria (Objects/Objectives from CM Act and MEM Act)

		CM Act Objects											
Management Option	Risks Addressed	Coastal Processes/Values	Social and Cultural Values	Aboriginal Values/Uses	Coastal Economies	Ecologically Sustainable Development	Coastal Hazards / Climate Change	Ambulatory Recognition	Integrated Planning/Management	Resilience of Coastal Assets	Co-ordinated Management Activities	Public Participation/Understanding	Identify Land for Protection
Incorporate Saltmarsh Friendly Foreshore Treatment in Narooma Precinct Plan	W2	1	1	0	2	2	1	0	2	1	2	2	2
Fencing to Exclude Stock from Saltmarsh in Upper Reaches of Inlet	W2	2	0	0	1	2	0	0	0	0	1	1	2
Change Marine Park Zoning of Mangroves between Bridge and Narooma Flats	W3	1	0	0	0	2	0	0	1	0	1	1	2
Council to Install Markers to Prevent Mowing of Saltmarsh, Narooma Flats.	W3	1	0	0	0	2	0	0	1	0	1	1	2
Dynamics Study of Wagonga Inlet Entrance to Inform Coastal Vulnerability Mapping.	W4, W7	1	0	0	1	2	2	0	1	1	1	0	1
Map Coastal Vulnerability Area for Wagonga	W5	0	1	0	1	2	2	0	2	2	1	0	2
Water Quality Management Forsters Bay	W9	1	1	0	1	1	0	0	0	0	0	0	0
Punkally Creek Attribution and Monitoring Study	W11	2	0	0	1	2	0	0	0	0	1	0	0
Install Environmentally Sensitive Toilet Facilities at Brice's Bay	W15, W17	1	2	2	1	2	0	0	0	0	1	1	0
Manage Access to Lewis Island	W4	1	1	1	0	2	1	0	1	0	1	1	1
Demolish Ringlands Jetty	-	0	0	0	0	0	0	0	0	2	0	0	0
Foreshores and Wetland Restoration Plan - Wagonga Inlet	W10, W11	2	0	0	0	2	0	0	1	0	1	0	2

	MEM Act Objects							Wetlands				
Management Option	Biologically diverse and healthy	Economic Opportunities	Cultural, Social, Recreational	Ecosystem Integrity	Scientific Research and Education	Promote Coordination	Management of Marine Parks	Natural Biodiversity/Integrity	Rehabilitation/Restoration	Resilience/Migration	Social/Cultural Values	Promote State Policies/Programs
Incorporate Saltmarsh Friendly Foreshore Treatment in Narooma Precinct Plan	2	2	2	2	2	2	0	2	2	2	1	0
Fencing to Exclude Stock from Saltmarsh in Upper Reaches of Inlet	2	1	0	2	1	1	0	2	2	2	0	0
Change Marine Park Zoning of Mangroves between Bridge and Narooma Flats	2	0	0	2	1	1	2	2	2	2	0	1
Council to Install Markers to Prevent Mowing of Saltmarsh, Narooma Flats.	2	0	0	2	1	1	2	2	2	2	0	1
Dynamics Study of Wagonga Inlet Entrance to Inform Coastal Vulnerability Mapping.	1	1	0	1	1	1	0	1	0	0	0	0
Map Coastal Vulnerability Area for Wagonga	0	1	0	0	0	1	0	0	0	0	1	0
Water Quality Management Forsters Bay	2	1	0	1	0	0	0	1	1	0	1	0
Punkally Creek Attribution and Monitoring Study	2	0	0	1	2	1	0	2	2	0	0	0
Install Environmentally Sensitive Toilet Facilities at Brice's Bay	2	2	2	1	0	1	0	2	2	0	2	2
Manage Access to Lewis Island	1	0	2	1	0	1	0	0	0	0	1	0
Demolish Ringlands Jetty	0	0	1	0	0	0	0	0	0	0	0	0
Foreshores and Wetland Restoration Plan - Wagonga Inlet	2	0	1	2	0	1	0	2	2	1	0	0

	Environment						Use					
Management Option	Environmental Values/Processes	Resilience of Coastal Waters	Water Quality	Social/Cultural Values	Beaches / Dunes / Natural Features	Public Access/Amenity	Natural Scenic Quality	Cultural / Built Environment Heritage	Urban Design	Public Open Space	Use of Surf Zone	Urbanised and Natural Coastline
Incorporate Saltmarsh Friendly Foreshore Treatment in Narooma Precinct Plan	2	2	2	1	2	2	2	2	2	2	0	0
Fencing to Exclude Stock from Saltmarsh in Upper Reaches of Inlet	2	2	2	0	0	0	2	0	0	0	0	0
Change Marine Park Zoning of Mangroves between Bridge and Narooma Flats	2	1	2	0	0	0	1	0	0	2	0	0
Council to Install Markers to Prevent Mowing of Saltmarsh, Narooma Flats.	2	1	2	0	0	0	1	0	0	2	0	0
Dynamics Study of Wagonga Inlet Entrance to Inform Coastal Vulnerability Mapping.	2	2	2	0	0	0	0	0	0	0	0	0
Map Coastal Vulnerability Area for Wagonga	0	0	0	1	0	0	0	0	0	0	0	0
Water Quality Management Forsters Bay	2	2	2	1	0	0	0	0	2	0	0	0
Punkally Creek Attribution and Monitoring Study	2	2	2	0	0	0	0	0	0	0	0	0
Install Environmentally Sensitive Toilet Facilities at Brice's Bay	2	2	2	2	0	2	1	2	0	0	0	0
Manage Access to Lewis Island	0	0	0	1	1	2	0	1	1	0	0	0
Demolish Ringlands Jetty	1	1	1	0	0	0	2	2	1	0	0	0
Foreshores and Wetland Restoration Plan - Wagonga Inlet	2	2	2	0	0	0	2	0	0	0	0	0

	Vulnerability												
Management Option	Public Safety	Mitigate Coastal Hazards	Maintain Beaches	Public Amenity	Sensible Land Use	Reduce Hazard Exposure	Do no harm	Essential Infrastructure	Resilient Development	Impact Scale	Scaled Impact Score	Capital Cost	Annual Cost
Incorporate Saltmarsh Friendly Foreshore Treatment in Narooma Precinct Plan	0	0	0	0	0	0	0	0	0	2	108	$1,000,000.00	$ 3,500.00
Fencing to Exclude Stock from Saltmarsh in Upper Reaches of Inlet	0	0	0	0	0	0	0	0	0	2	60	$ 5,000.00	
Change Marine Park Zoning of Mangroves between Bridge and Narooma Flats	0	0	0	0	0	0	0	0	0	1	31	$ -	$ -
Council to Install Markers to Prevent Mowing of Saltmarsh, Narooma Flats.	0	0	0	0	0	0	0	0	0	1	31	$ 1,000.00	$ 1,000.00
Dynamics Study of Wagonga Inlet Entrance to Inform Coastal Vulnerability Mapping.	2	2	2	2	2	2	2	2	2	4	160	$ 40,000.00	$ -
Map Coastal Vulnerability Area for Wagonga	2	2	2	2	2	2	2	2	2	3	105	$ 20,000.00	$ -
Water Quality Management Forsters Bay	0	0	0	0	0	0	0	0	0	2	40	$ 30,000.00	
Punkally Creek Attribution and Monitoring Study	0	0	0	0	0	0	0	0	0	3	66	$ -	$ -
Install Environmentally Sensitive Toilet Facilities at Brice's Bay	0	0	0	0	0	0	0	0	0	1	39	$ 40,000.00	$ 6,000.00
Manage Access to Lewis Island	0	0	0	0	0	0	0	0	0	1	22	$ 30,000.00	
Demolish Ringlands Jetty	0	0	0	0	0	0	0	0	0	1	11	$ 10,000.00	
Foreshores and Wetland Restoration Plan - Wagonga Inlet	0	0	0	0	0	0	0	0	0	4	108	$ 100,000.00	$ -

Table 9 Interpretation of Management Option Scoring

CM Objects		Short Name	Description from Act
	1	Coastal Processes/Values	to protect and enhance natural coastal processes and coastal environmental values including natural character, scenic value, biological diversity and ecosystem integrity and resilience
	2	Social and Cultural Values	to support the social and cultural values of the coastal zone and maintain public access, amenity, use and safety
	3	Aboriginal Values/Uses	to acknowledge Aboriginal peoples' spiritual, social, customary and economic use of the coastal zone
	4	Coastal Economies	to recognise the coastal zone as a vital economic zone and to support sustainable coastal economies
	5	Ecologically Sustainable Development	to facilitate ecologically sustainable development in the coastal zone and promote sustainable land use planning decision-making
	6	Coastal Hazards / Climate Change	to mitigate current and future risks from coastal hazards, taking into account the effects of climate change
	7	Ambulatory Recognition	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
	8	Integrated Planning/Management	to promote integrated and co-ordinated coastal planning, management and reporting
	9	Resilience of Coastal Assets	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
	10	Co-ordinated Management Activities	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
	11	Public Participation/Understanding	to support public participation in coastal management and planning and greater public awareness, education and understanding of coastal processes and management actions
	12	Identify Land for Protection	to facilitate the identification of land in the coastal zone for acquisition by public or local authorities in order <<for the environment>>

Coastal Wetland Objectives		Short Name	Description from Act
	1	Natural Biodiversity/Integrity	to protect coastal wetlands and littoral rainforests in their natural state, including their biological diversity and ecosystem integrity
	2	Rehabilitation/Restoration	to promote the rehabilitation and restoration of degraded coastal wetlands and littoral rainforests
	3	Resilience/Migration	to improve the resilience of coastal wetlands and littoral rainforests to the impacts of climate change, including opportunities for migration
	4	Social/Cultural Values	to support the social and cultural values of coastal wetlands and littoral rainforests
	5	Promote State Policies/Programs	to promote the objectives of State policies and programs for wetlands or littoral rainforest management

Coastal Environment Objectives		Short Name	Description from Act
	1	Environmental Values/Processes	to protect and enhance the coastal environmental values and natural processes of coastal waters, estuaries, coastal lakes and coastal lagoons, and enhance natural character
	2	Resilience of Coastal Waters	to reduce threats to and improve the resilience of coastal waters, estuaries, coastal lakes and coastal lagoons, including in response to climate change
	3	Water Quality	to maintain and improve water quality and estuary health
	4	Social/Cultural Values	to support the social and cultural values of coastal waters, estuaries, coastal lakes and coastal lagoons
	5	Beaches / Dunes / Natural Features	to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place
	6	Public Access/Amenity	to maintain and, where practicable, improve public access, amenity and use of beaches, foreshores, headlands and rock platforms

Coastal Use Objectives		Short Name	Description from Act
	1	Natural Scenic Quality	the type, bulk, scale and size of development is appropriate for the location and natural scenic quality of the coast
	2	Cultural / Built Environment Heritage	adverse impacts of development on cultural and built environment heritage are avoided or mitigated
	3	Urban Design	urban design, including water sensitive urban design, is supported and incorporated into development activities
	4	Public Open Space	adequate public open space is provided, including for recreational activities and associated infrastructure
	5	Use of Surf Zone	the use of the surf zone is considered
	6	Urbanised and Natural Coastline	to accommodate both urbanised and natural stretches of coastline

Coastal Vulnerability Objectives	Short Name	Description from Act
1	Public Safety	to ensure public safety and prevent risks to human life
2	Mitigate Coastal Hazards	to mitigate current and future risk from coastal hazards by taking into account the effects of coastal processes and climate change
3	Maintain Beaches	to maintain the presence of beaches, dunes and the natural features of foreshores, taking into account the beach system operating at the relevant place
4	Public Amenity	to maintain public access, amenity and use of beaches and foreshores
5	Sensible Land Use	to encourage land use that reduces exposure to risks from coastal hazards, including through siting, design, construction and operational decisions
6	Reduce Hazard Exposure	to adopt coastal management strategies that reduce exposure to coastal hazards
7	Do no harm	if taking that other action to reduce exposure to coastal hazards <<avoid degradation and allow for restoration>>
8	Essential Infrastructure	if taking that other action to reduce exposure to coastal hazards
9	Resilient Development	to improve the resilience of coastal development and communities by improving adaptive capacity and reducing reliance on emergency responses.

MEMA Objects	Short Name	Description from Act
1	Biologically diverse and healthy	promotes a biologically diverse, healthy and productive marine estate
2	Economic Opportunities	economic opportunities for the people of New South Wales, including opportunities for regional communities
3	Cultural, Social, Recreational	the cultural, social and recreational use of the marine estate
4	Ecosystem Integrity	the maintenance of ecosystem integrity
5	Scientific Research and Education	the use of the marine estate for scientific research and education
6	Promote Coordination	to promote the co-ordination of the exercise, by public authorities, of functions in relation to the marine estate
7	Management of Marine Parks	to provide for the declaration and management of a comprehensive system of marine parks and aquatic reserves

Object / Objective Scoring Scale

-2	Very Detrimental
-1	Has Negative Impact
0	Not Relevant/Minimal Impact
1	Has Positive Impact
2	Performs Excellently

Impact Scale

1	Limited Localised Impact
2	River Reach / Embayment Impact
3	Estuarine Zone
4	Estuary Wide Impact

APPENDIX F REVIEW OF FUNDING OPTIONS AND STATUTORY RESPONSIBILITIES

REVIEW OF FUNDING OPTIONS AND STATUTORY RESPONSIBILITIES EUROBODALLA ESTUARINE COASTAL MANAGEMENT PROGRAM

Authors:	David Wainwright
Prepared For	EUROBODALLA SHIRE COUNCIL
Version	FINAL
Date	4/12/2020

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[1] 'E' refers to electronic distribution; numerals refer to number of hard copies.

Contents

1 Introduction

There are several agencies responsible for coastal management in New South Wales and a range of different streams for grant funding. These are described in the following sections, with each section dealing with a specific agency, their key responsibilities, and the funding opportunities they provide.

Historically, the situation surrounding responsibilities and funding opportunities have been extremely fluid. Accordingly, the summary provided herein should be considered as a snapshot, current during November 2020, and subject to ongoing change.

The agencies with responsibility for the Coast and having some funding mechanism are dealt with in separate sections, as follows:

- Eurobodalla Shire Council.
- Department of Planning, Industry and Environment (Environment, Energy and Science).
- Department of Primary Industries (Fisheries and Batemans Marine Park).
- Maritime Infrastructure Delivery Office (within Transport for NSW).
- Marine Estate Management Authority.
- Other Sources.

2 Eurobodalla Shire Council

Direct funding of estuarine projects from within Eurobodalla Council is heavily constrained. Appendix F of the Scoping Study included a review of Council's budget breakdown and where different funds could be expected to be derived and used for coastal and estuary management. This reviewed the 2017-18 budget.

Subsequent discussions with staff have indicated that Council funds are stretched thinly, particularly following the bushfire disaster of Summer 2019/2020.

Funding that is used in implementing actions relating to estuarine and coastal management (and associated studies to support actions) are divided across numerous sections within Council. This makes it very difficult to identify exactly how much money can be set aside, per annum, to fund a Coastal Management Program (CMP) for the three estuaries.

Based on discussions with Council staff, we estimate that Council could set aside $40,000 per annum for targeted management actions within the CMP for the three estuaries of Moruya, Mummuga and Wagonga.

3 Department of Planning, Industry and Environment

3.1 DPIE: Environment, Energy and Science

Several sections of state government traditionally focussed on coastal management were moved from the Office of Environment and Heritage into the Environment Energy and Science (EES) group of the Department of Planning, Industry and Environment. The functions of relevance to the Eurobodalla Estuarine CMP are presently contained as listed below:

1. **Within the Biodiversity, Conservation and Science Secretariat:**

- Water, Wetlands and Coasts Science Directorate: Includes scientists which undertake targeted research and monitoring relating to estuaries and may provide an avenue for completion of some additional studies needed to better inform management.
- South East Directorate: Containing regional staff, largely located in Wollongong, with a detailed focus on coasts and estuaries along the NSW coast south of the Sydney Metropolitan Area.
- Marine, Coastal, Estuaries and Floods Directorate: Including specialists in coastal and estuarine policy and management who have an overarching role in the delivery of coastal and estuary focused programs and policy, including the delivery of high-level guidance such as the development of the Coastal Management Manual and supporting documentation.

2. **Within the Executive Directorate, Office of the Coordinator General of EES:**

- The Grants Directorate: which manages the Coast and Estuary Management, Floodplain Management and NSW Environmental Trust contestable grants programs.

Staff within all these directorates contribute to the provision of both technical and financial assistance to local councils in managing the coast.

3.2 Coast and Estuary Grant Funding Streams

The coast and estuary grants[2] cover several streams, of which the "Implementation" stream is the main one of interest to progress concrete actions of a CMP. For some actions within a CMP, which relate to 'planning' studies, grant applications can be made under the planning funding stream.

[2] https://www.environment.nsw.gov.au/topics/water/coasts/coastal-and-estuary-grants/current-grants, accessed 18 November 2020

3.2.1 Coast and Estuary Planning Stream

These grants effectively cover the actions which lead to the implementation 'on-the-ground' works that would be funded under the various implementation funding streams discussed in Section 3.2.2.

These include the preparation of CMPs and studies that are needed to develop a CMP. Investigations and designs for works recommended in a CMP are also covered, along with cost benefit / distributional analyses to support such works.

A strict read of the most recent guidelines for grants indicates that the planning stream is only valid for activities which are needed to develop a CMP, transition from a CZMP to a CMP, or to undertake investigations, designs and cost-benefit analyses for infrastructure works recommended in a certified CMP. In other words, general planning and investigation required for mapping, additional processes investigation or other supporting studies to fill data gaps or help formulate actions do not seem to be covered by either the Planning Stream nor the Implementation Stream (see next section).

Applications for funding under the Planning Stream are to remain open until 30 June 2021[2].

3.2.2 Implementation Streams

For the *coastal vulnerability area*, activities that can be demonstrated to reduce the threat from coastal hazards can be funded. These include beach nourishment, dune restoration works and seawalls.

For the *coastal wetlands and littoral rainforests area*, actions indicated as being suitable for funding include the management of weeds and invasive animals, trails and accessways, works to reduce exposure to coastal erosion, replanting and stabilising vegetation and habitat restoration/conservation.

For the *coastal environment area,* actions indicated as being suitable for funding include community education, access management, environmentally beneficial dredging, monitoring (linked with actions to improve ecosystem health), the protection of Aboriginal heritage, management of stormwater quality (where demonstrated to be beneficial to the receiving environment), revegetation and weed management, sediment and erosion control actions. Activities in the upper catchment, where beneficial to estuarine health may also be funded.

For the *coastal use area,* actions indicated as being suitable for funding include community education, the management of public access, actions to protect Aboriginal heritage, stormwater management, revegetation and weed management and monitoring.

Overall, funding for works that are entirely or significantly for amenity purposes are unlikely to be funded. There are other constraints on grants, most importantly:

- Administrative costs will not be funded.
- Projects that could be reasonably expected to undertake using the finances otherwise available to the applicant.
- Maintenance activities, including maintenance of existing infrastructure.

For the most part, funding for activities identified in a certified CMP will be provided at a 2:1 ratio (state:local government contribution). For projects costing over $1M, this ratio will only apply to that component which is determined to be of public benefit. That component assessed as benefiting private interests will not be funded. For projects valued over $500,000, investigation and design must be completed before application.

In recent years, it has been common for DPIE to accept grant applications for implementation of coastal management actions during a limited time window each year. For example, the most recent funding round opened on 11 August 2020 and closed on 29 September for the implementation streams.

3.3 Floodplain Management Grants

DPIE runs a parallel grants program relating to floodplain risk management in NSW. There are opportunities to pursue grants under this program to address the hazards associated with tidal inundation (and its interaction with catchment flooding).

Grants are usually provided within strands representing different stages of the floodplain risk management process in NSW (NSW Government, 2005):

1. Flood study.
2. Floodplain risk-management study.
3. Feasibility study.
4. Implementation.

Funding has historically been at a level of 2:1, although higher funding ratios have also been awarded for implementation of works, particularly in rural areas. Applications for these grants are generally accepted during a limited window annually, with the most recent window between late February and the end of April.

3.4 Environmental Trust

The NSW Environment Trust provides opportunities for the funding of community and government organisations to conserve, protect and rehabilitate the NSW

environment, or to promote environmental education and sustainability. The program promotes several programs of funding. The different streams open and close at varied times, and grants are available, for example, to support:

- Environmental Education (most recent round closed 16 November 2020), with a pool of $1M available and up to $250,000 per project being funded.
- Environmental Research (open to collaborations and research institutions), with a pool of $1M most recently available and up to $200,000 per project being funded.
- Restoration and Rehabilitation (open to state and local government and community groups), with a total of $4M in funding provided and up to $170,000 per project being available, although the amounts available are dependent upon experience.

For the Restoration and Rehabilitation program, for which the current round of funding closes on 14 December, funding for supporting threatened species and addressing climate change (including adaptation) are immediate funding priorities. It appears that actions to promote the adaptation of saltmarsh, for example, to sea level rise should be viewed favourably.

4 Department of Primary Industries

4.1 DPI Fisheries - Responsibilities

DPI Fisheries is responsible for the management of recreational and commercial fishing, marine protected areas (including the Batemans Marine Park), aquaculture industries and the management of threatened aquatic species.

DPI Fisheries is responsible for administration of the *Fisheries Management Act 1994,* including the conservation of estuarine vegetation such as seagrasses, mangroves and saltmarsh.

4.2 DPI Fisheries - Funding

4.2.1 Habitat Action Grants

Habitat Action Grants are funded by NSW recreational fishing fees and are available to local councils and organisations looing to rehabilitate fish habitats throughout NSW. Grants are classified as small (up to $2,000) and large (up to $40,000).

Typical projects include:

- Removal or modification of barriers to fish passage.
- Rehabilitation of riparian land (including fencing to exclude stock).
- Waterway re-snagging.
- Weeding and replacement with native species.
- Bank stabilisation.

Typically, 25-30 individual projects have been funded each year over the past decade, with a total of around $550,000 to $750,000 funding provided per year.

Funds provided through the program must be at least matched by in-kind contributions, such as voluntary labour and/or the supply of materials.

Applications for the most recent round of funding closed at the end of September 2020.

4.2.2 Flagship Fish Habitat Rehabilitation Grants

The Flagship Grants are available for projects that significantly enhance fish habitat, water quality and fish passage within coastal catchments of NSW. The intention of this pool of grant funding is to tackle much larger scale projects. The grants support a range of actions including on-ground works, of a similar nature but larger scale than those of the Habitat Action Grants, and hydrological and environmental investigations, community consultation and economic assessments.

A maximum project funding of $360,000 is set, with $360,000 available across the program each year.

4.3 Batemans Marine Park

The Batemans Marine Park is in the process of upgrading their existing management plan. Sitting as a responsibility of DPI, the Management Actions within the marine park are one way in which the Marine Estate Management Strategy (See Section 6) will be implemented.

5 Maritime Infrastructure Delivery Office (within Transport for NSW)

5.1 Role

Transport for NSW (TfNSW) is responsible for maritime policy, including safety, access and infrastructure. Their role includes on-water compliance activities.

5.2 MIDO

The Maritime Infrastructure Delivery Office (MIDO) combines the previous maritime division of TfNSW and the maritime related functions that were previously contained within Crown Lands. MIDO was recently formed and aims to streamline the delivery of maritime infrastructure and dredging.

Delivery of the NSW Maritime Infrastructure Plan for 2019-2024[3] is largely the responsibility of MIDO, and several programs support delivery of that plan which focusses on assets and facilities including:

- Entrance breakwaters.
- Harbours.
- Dredged navigation channels.
- Boat ramps, wharves and jetties.
- Boat maintenance and repair facilities.
- Moorings.
- Fuel and sewage pumpout.
- Navigation aids and lighthouses.

5.2.1 Boating Now Program

The Maritime Infrastructure Plan notes that support will be provided to development of council owned infrastructure under the Boating Now Program. The Program is funded from boating license, registration, and other fees, and has delivered some 200 boating projects across the state since 2014. The most recent round of funding, (Round 3) announced in October 2019, included a $28M investment for the period from July 2020 to June 2022 and 69 projects were funded. We have been advised that funding has been announced for a subsequent Round 4 of funding, which will open next year.

[3] https://maritimemanagement.transport.nsw.gov.au/documents/Maritime_Infrastructure_Plan.pdf, accessed 22/11/2020

While none of the estuaries subject to the CMP are identified as "*key investment locations*" within the Maritime Infrastructure Plan, that plan does indicate that funding support would be available to councils to develop strategic plans for other locations. Those plans should identify the priority and longer-term infrastructure needs of local waterways to encourage a better planning and management approach to local boating facilities. Such a strategy could potentially have an area added to the list of key investment locations or make a location more attractive for funding.

Staff from TfNSW have advised that studies are more likely to be funded if they have a clear aim of improving local boat access and navigation. In other words, studies which aim to address multiple objectives, including environmental outcomes, may be judged as having less merit under this funding stream, when compared to those purely associated with environmental outcomes. Success would depend largely on whether a round of grants funding is oversubscribed or not.

It seems that projects which are not on the list of *key investment locations* would require a greater funding contribution from local councils.

However, according to guidelines for the most recent Round 3 grant guidelines, recipients of the grants may be eligible for up to 100% of the cost for repair or replacement costs of existing, publicly owned facilities (up to a total of $500,000 per asset).

In the past, the imminent upgrade of Brierley's Boat Ramp Facility (100% funded) at Moruya and the Apex Part Boat Ramp (~50% funded) were implemented under this program.

5.2.2 Rescuing our Waterways

The *Rescuing our Waterways* Program is part of the state government's *Coastal Dredging Strategy* and aims to deliver enhanced access for recreational and commercial waterway users, particularly the access to public waterway infrastructure and beneficial reuse of dredged material. Up to $1.5M was made available in 2019/2020. Projects included actual dredging and pre-dredging activities, and supporting studies relating to sedimentation and hydrodynamics.

The overall Coastal Dredging Strategy[4] aims to support local government and build their capacity to undertake dredging, and to help Councils prioritise and establish long term dredging delivery plans to identify the best funding opportunities. The Strategy notes that dredging is not a legislative responsibility, but that the Government is committed to improving and sustaining coastal access to key locations. However, it does not commit to dredging "local waterways" where the purpose is not to provide

[4] https://www.industry.nsw.gov.au/__data/assets/pdf_file/0004/142744/NSW-coastal-dredging-strategy.pdf, accessed 22/11/2020

access to state owned maritime infrastructure. Grant funding can be applied for under the *Rescuing our Waterways* Program with local councils expected to finance up to 50% of a project's costs, and to take responsibility for developing and managing their projects.

Under the Coastal Dredging Strategy, the "Narooma River" (i.e. Wagonga inlet) upstream of the Town commercial wharf and the entrance to the Moruya River are identified as "Priority Regional Locations" for dredging, indicating that these locations are eligible for 100% funding by the State Government.

MIDO has received additional funding under the recently delivered (November 2020) NSW Budget. Discussions with MIDO and TfNSW staff have indicated that the model for funding dredging works is currently being reviewed.

5.2.3 Coastal Infrastructure Program

The NSW Maritime Infrastructure Plan indicated that, between 2011 and 2019, some $95M was invested to maintain maritime infrastructure on Crown Land, including 26 regional boat harbours and 21 trained entrances along the NSW coast. This program appears to focus primarily on management, repair and maintenance of state government owned maritime infrastructure.

6 Marine Estate Management Authority

The Marine Estate Management Authority (MEMA) is responsible for development and delivery of the Marine Estate Management Strategy (MEMS), which was developed under the *Marine Estate Management Act 2014*. Membership of MEMA includes the four main agencies managing the marine estate from within the NSW Government:

- DPI: Including Fisheries and the Batemans Marine Park (See Section 4).
- DPIE: EES (See Section 3).
- DPIE Planning and Assessment, which is responsible for the state's land use planning system, state significant developments and infrastructure.
- Transport for NSW (See Section 5).

Other agencies with interests include, for example, Local Land Services (LLS), DPIE Water, DPIE Crown Land and local councils.

The MEMS Implementation Plan[5] tends to include specific councils as "partners" in the delivery of management actions.

LLS was a lead agency on the riparian vegetation improvements in particular catchments, including the Moruya River. Furthermore, bank protection works and the improvement of roads and tracks for Wagonga Inlet were also identified.

At the time of writing, the NSW Budget had just been handed down, and we were unable to clearly determine the status of ongoing funding. While funding was made available for 2018 – 2020 to cover the first stage of implementing the Marine Estate Management Strategy, it appears at this initial stage that funding will only be provided to continue with those actions which carry over from the first stage.

[5] https://www.marine.nsw.gov.au/__data/assets/pdf_file/0020/1139042/Marine-Estate-Management-Strategy-Implementation-Plan.PDF, accessed 22/11/2020

7 Other

7.1 South East Local Land Services

Under Goal 3 of the South East Strategic Plan (*"Healthy, diverse, and connected natural environments"*), LLS identifies priorities including maintenance of riparian vegetation, estuaries, coasts, and marine areas.

Perusal of the current LLS South East Web Page indicates that there are, apparently, limited opportunities for funding of projects through this stream, although in kind contributions are made by LLS in providing project management and the delivery of grants awarded to LLS by other state government agencies or via other sources.

LLS has recently been receiving funding to assist with implementation of the Marine Estate Management Strategy as follows:

- To improve the quality of drainage from roads and tracks. This funding is commonly provided to councils to undertake maintenance work.
- To undertake riparian works including fencing, weeding, planting and maintenance. Funds are often provided to private landholders to purchase fencing materials, with contractors managed by LLS taking care of vegetation.
- To undertake erosion remediation works, where LLS will engage and manage contractors to complete the work.

Funding which comes through MEMA is not constrained in terms of usage on private and public land. In other words, MEMA funding via LLS can be used to undertake repair/rehabilitation works on riparian reserves that are under the care and control of Council.

7.2 Federal Funding Sources

Eurobodalla Council staff have reported that current programs for federal funding sources tend to vary from year to year and cannot be relied upon for programming actions. These may present possibilities for opportunistic funding and should be kept in mind.

7.3 Non-Government Funding Sources

There are a range of other options for non-government and private funding of projects. One current example is the *Reef Builder* partnership between the Australian Government and the Nature Conservancy, a global non-profit NGO, working at conserving land and water. The partnership will develop a $20 million investment to rebuild shellfish reefs around the Australian coastline, with the Sapphire Coast of NSW identified as one of 13 potential sites (with at least 11 sites to be used). NSW DPI

is presently involved in identifying potential sites. Shellfish reefs, which have been decimated in Australia since 1788, provide multiple benefits including filtering and cleansing sea water and providing habitat.

Similarly to federal funding sources, the opportunities for funding through these sources may be variable over time.

APPENDIX G AGENCY CORRESPONDENCE IN SUPPORT OF CMP ACTIONS