

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NOTE: The Preliminary Risk Assessment Completed at Scoping Study Stage Has been subsumed and superseded by the Revised Risk Assessment completed during drafting of the Coastal Management Program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:	<i>Biodiversity Conservation Act 2016</i>
CM Act:	<i>Coastal Management Act 2016</i> , which commenced on 3 rd 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:	<i>State Environmental Planning Policy (Coastal Management) 2018</i> which commenced on 3 rd April, 2018
CL Act:	<i>Crown Lands Act 1989 (Now Repealed)</i>
CLM Act:	<i>Crown Lands Management Act, 2016</i>
CP Act:	<i>Coastal Protection Act 1979</i> which was repealed by the CM Act
EP&A Act:	<i>Environmental Planning and Assessment Act 1979</i>
FM Act	<i>Fisheries Management Act 1994</i>
LG Act:	<i>Local Government Act 1993</i>
MEM Act:	<i>Marine Estate Management Act 2014</i>
NPW Act	<i>National Parks and Wildlife Act 1974</i>

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 reasonably 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 reasonably 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.

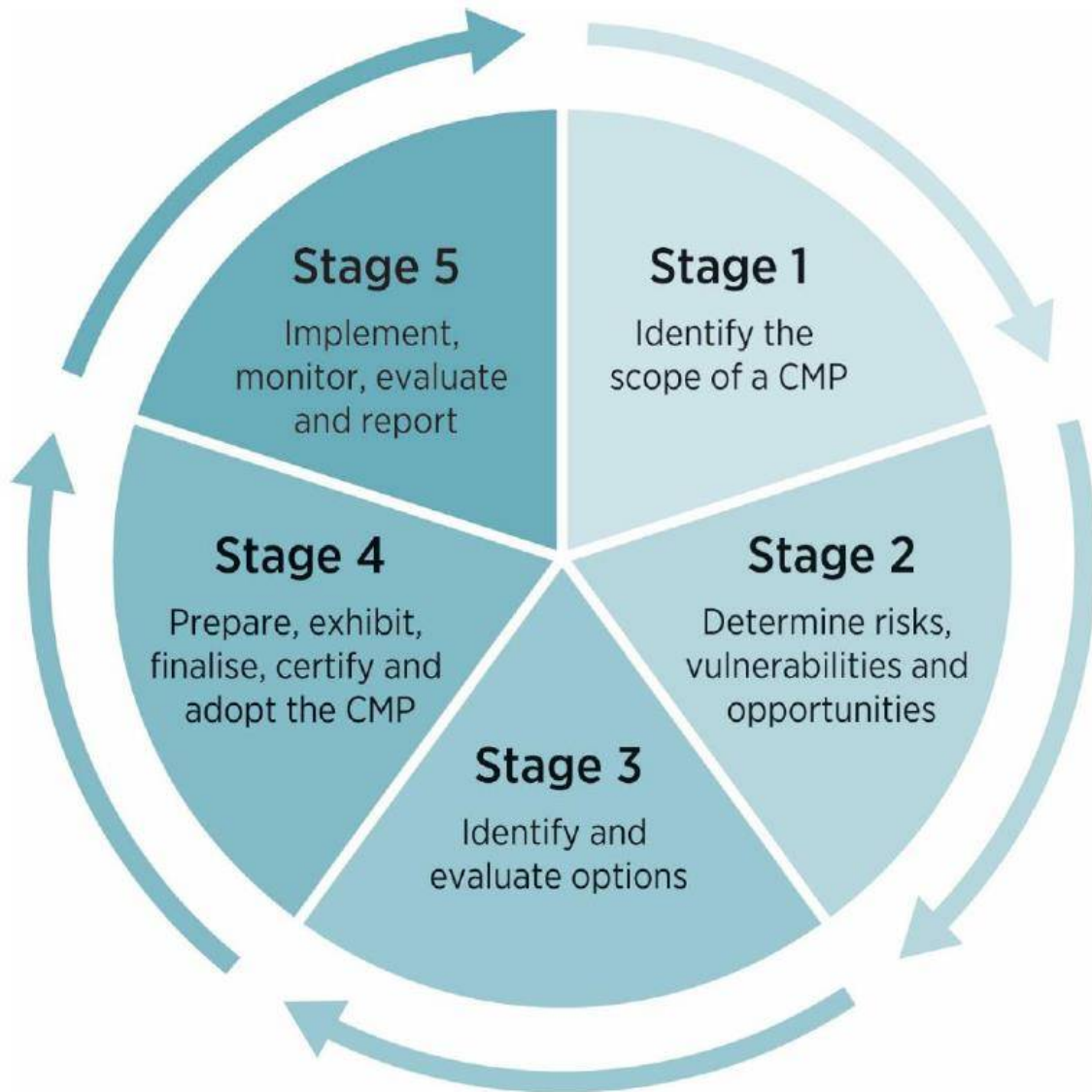


Figure F.1 Stages in Preparing and Implementing a CMP
(Source: NSW Government, 2018a)

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	Ongoing 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 site¹³ 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 flow¹⁵.

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 reports¹⁹ 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.

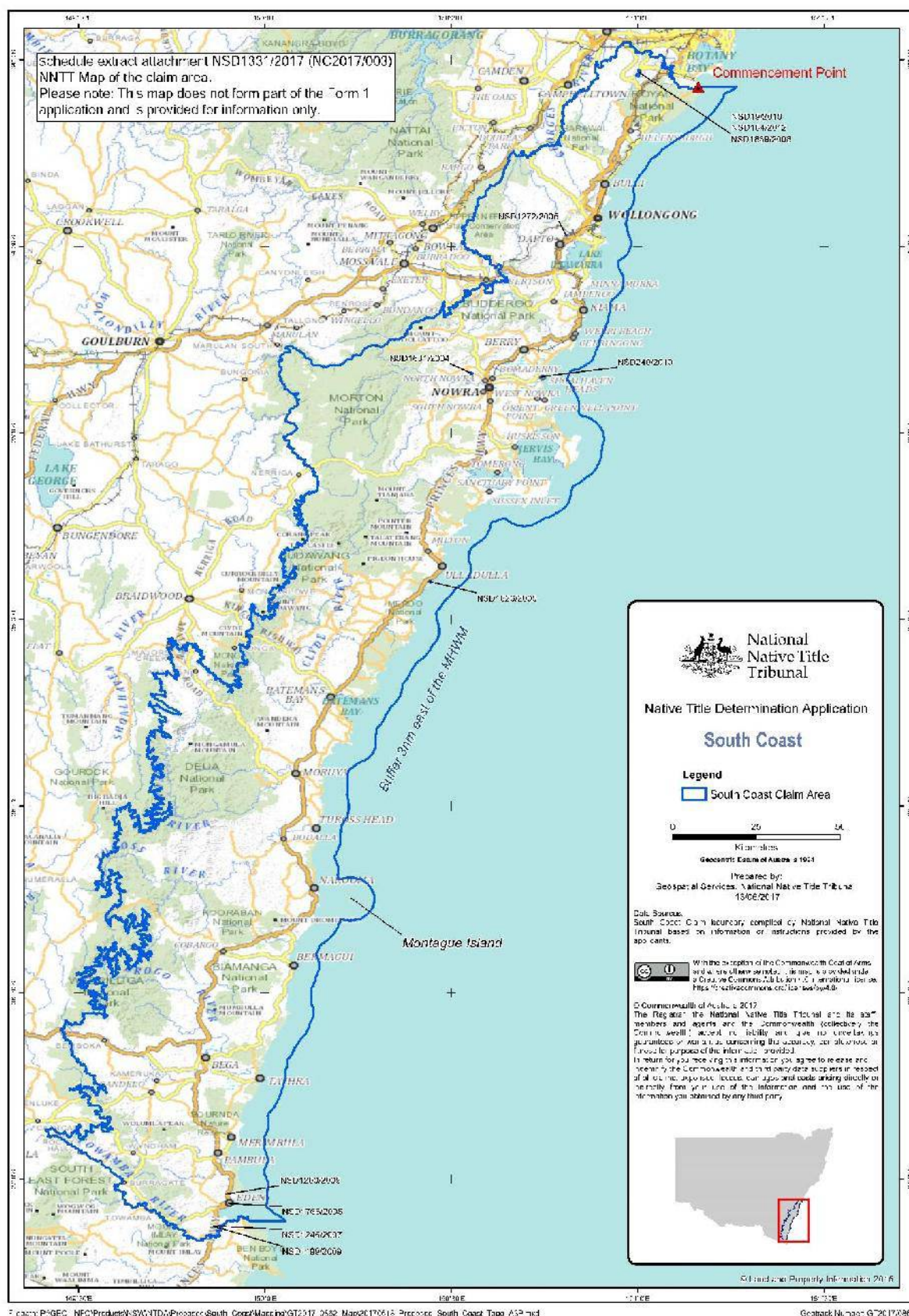


Figure F.2 Map of South Coast Native Title Application

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

Authors:	Elizabeth Nevell, David Wainwright
Prepared For	EUROBODALLA SHIRE COUNCIL
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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 DPE) 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 objectives, land uses, and potential impacts of land use. Establish context, identify objectives, land uses, 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 health 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.

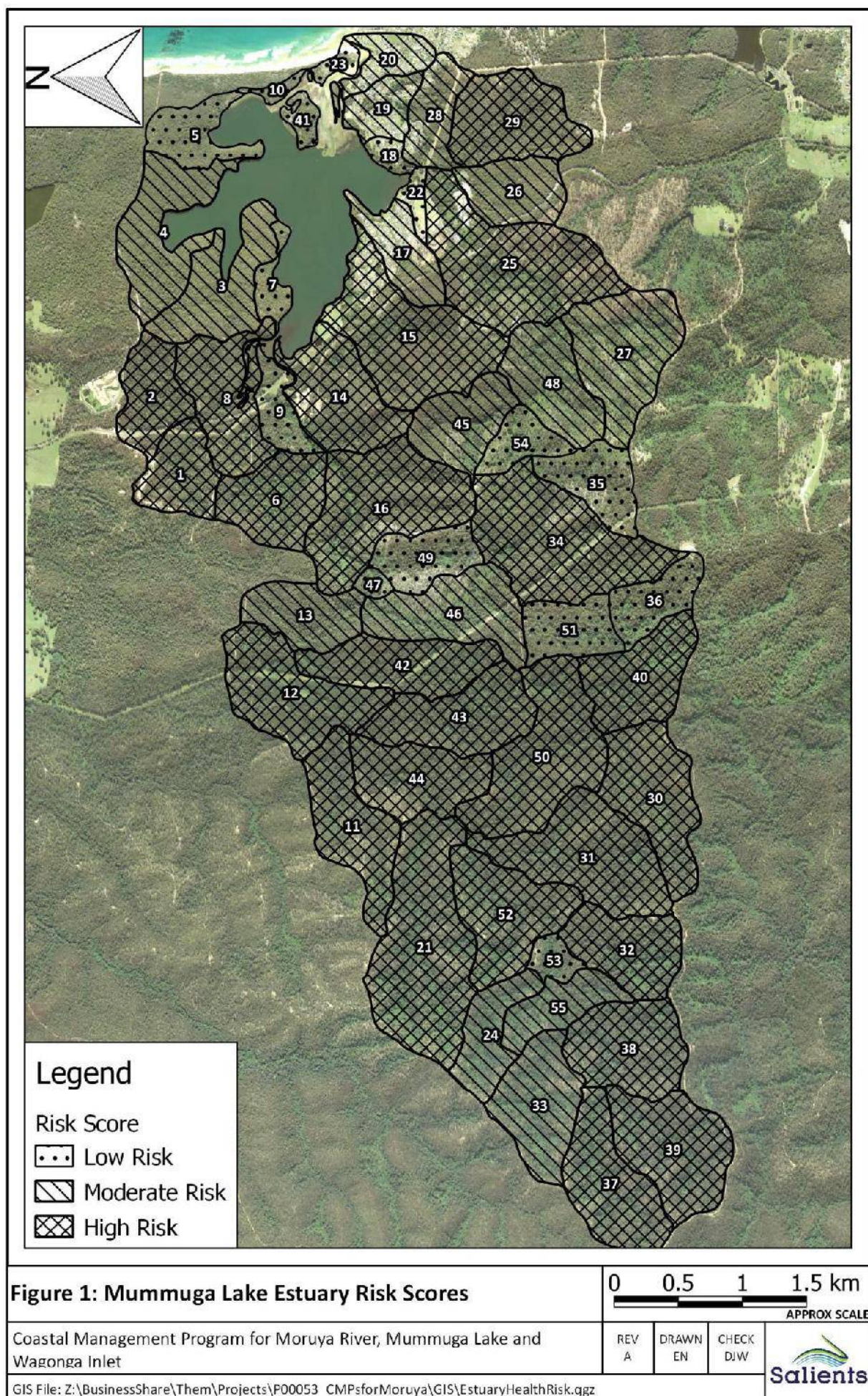
To be useful for management a more nuanced approach is needed. The finding in the preceding paragraph indicates that the risk is highly correlated to subcatchments area, which is a somewhat arbitrary artefact of the way the analysis is completed.

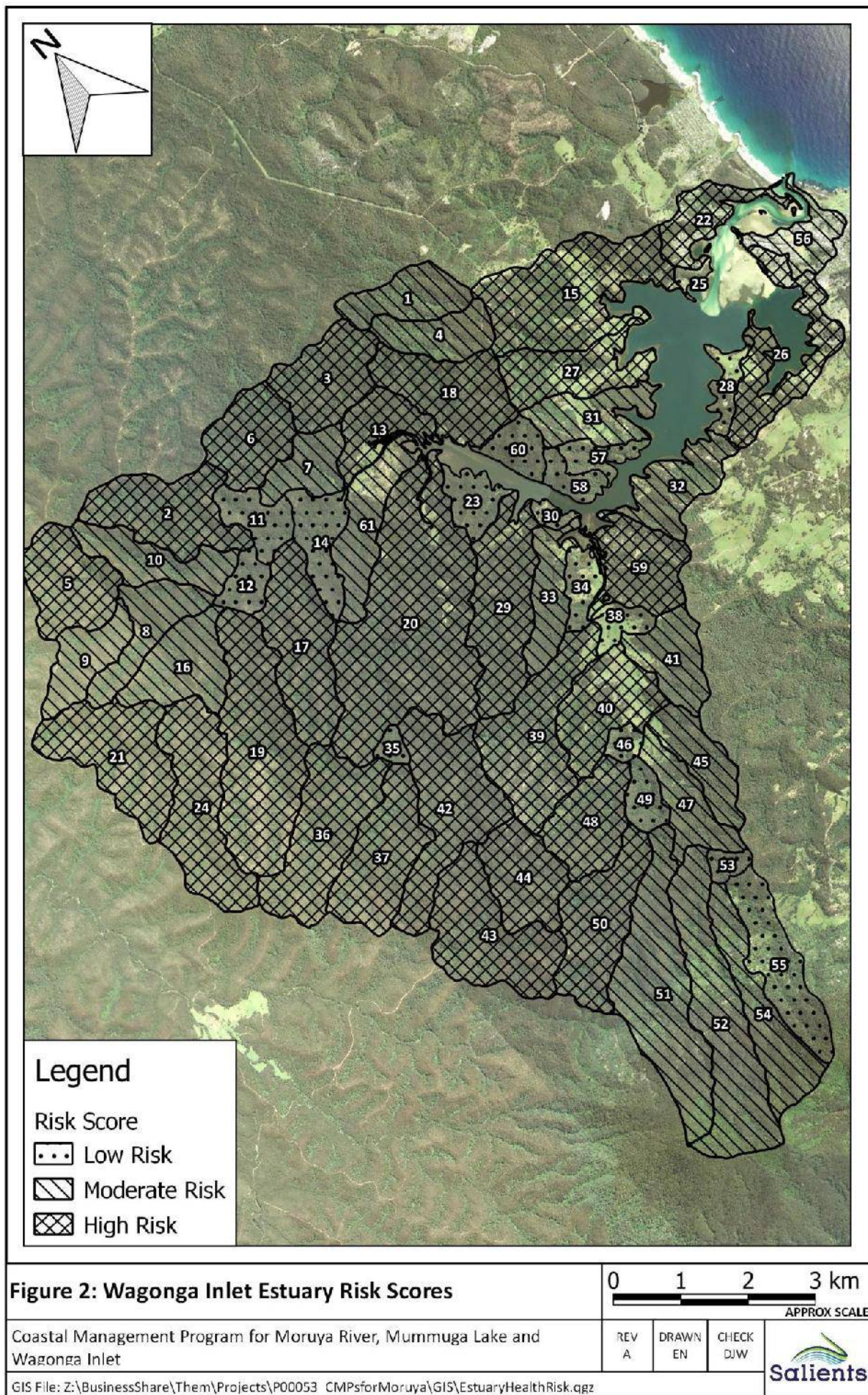
2.2 Wagonga Inlet

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.





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

Authors:	Elizabeth Nevell, David Wainwright
Prepared For	EUROBODALLA SHIRE COUNCIL
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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.

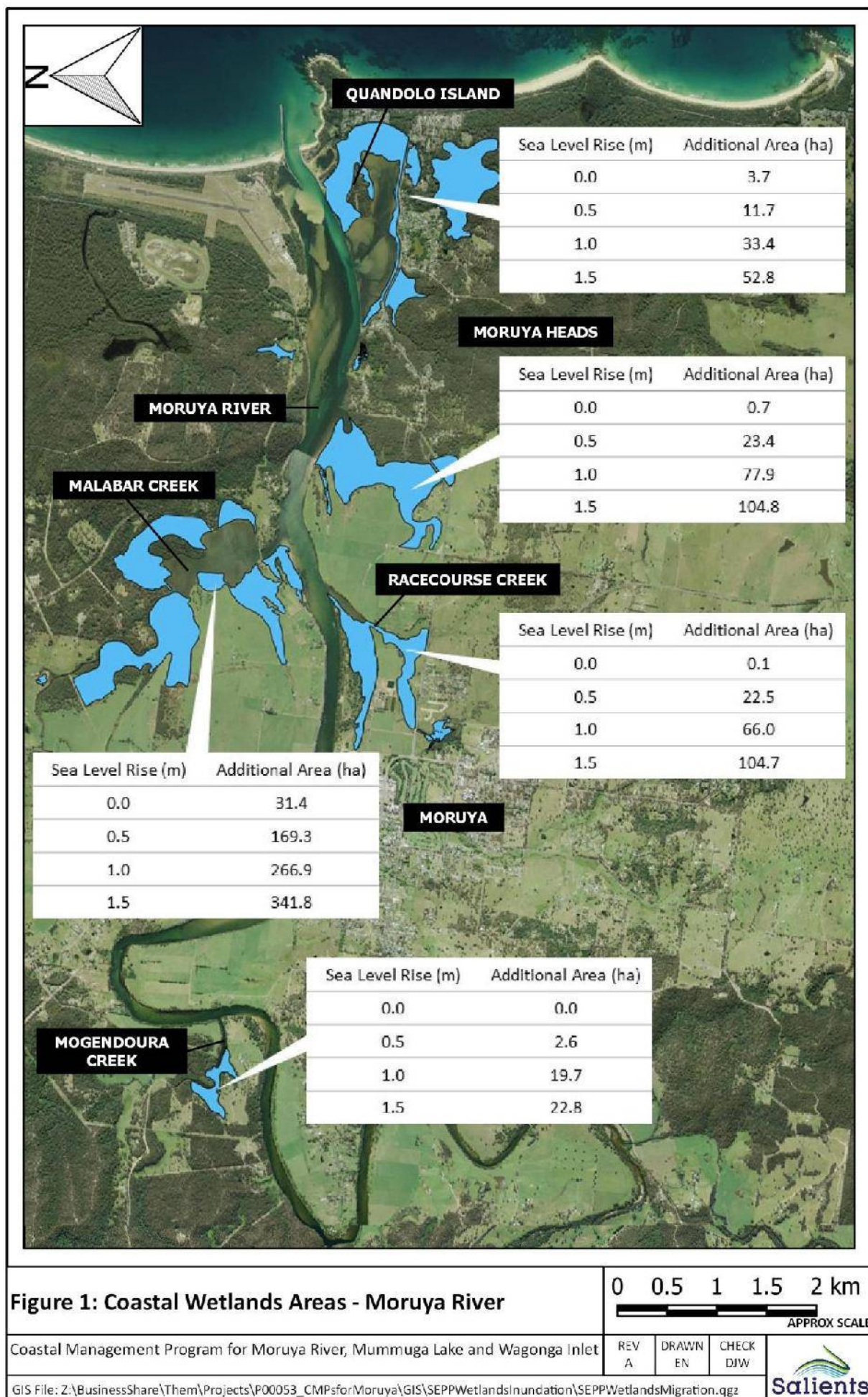
Note that in some areas, wetlands are bounded by urban areas and are not likely to adapt by moving further upslope in these areas. For example, the group of wetlands at the downstream end of the Moruya River, fringing South Head Road.

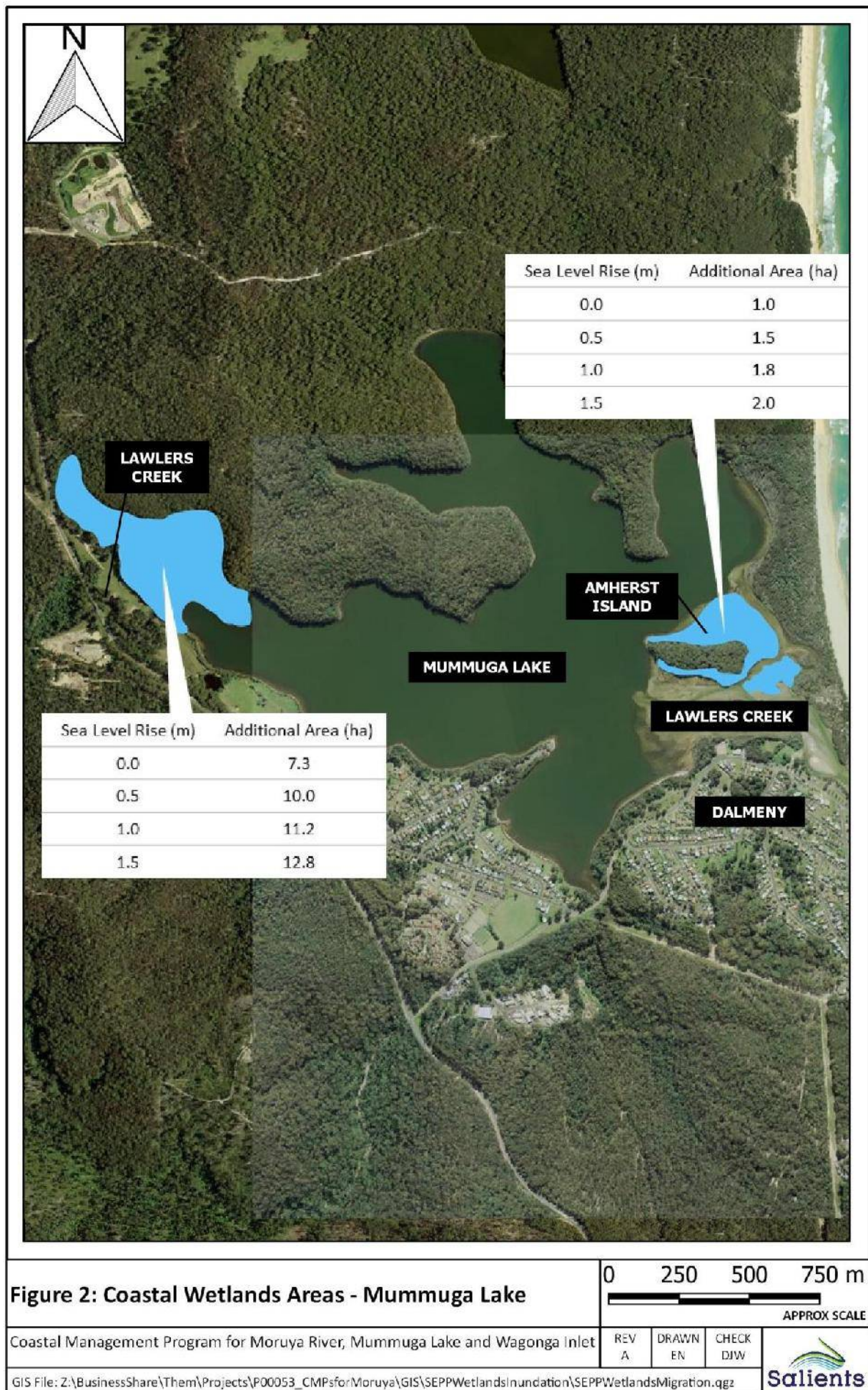
Figure 1 shows that the notable expansion is possible around the Malabar Lagoon wetland complex followed by wetlands downstream of Moruya, on the southern bank.

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.





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.

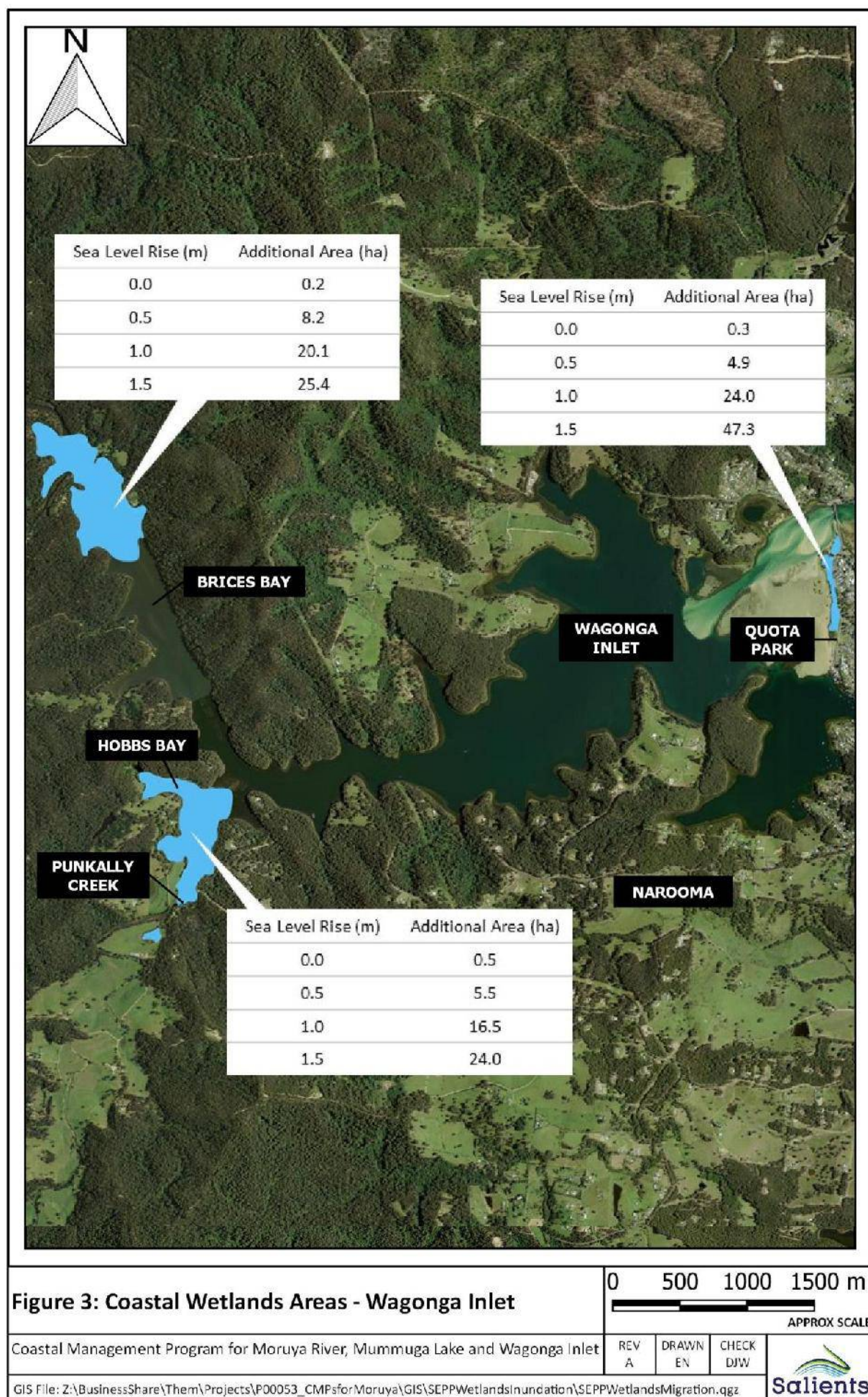
2.3 Wagonga Inlet

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.



APPENDIX C ADDITIONAL CONSULTATION OUTCOMES

C.1 Introduction

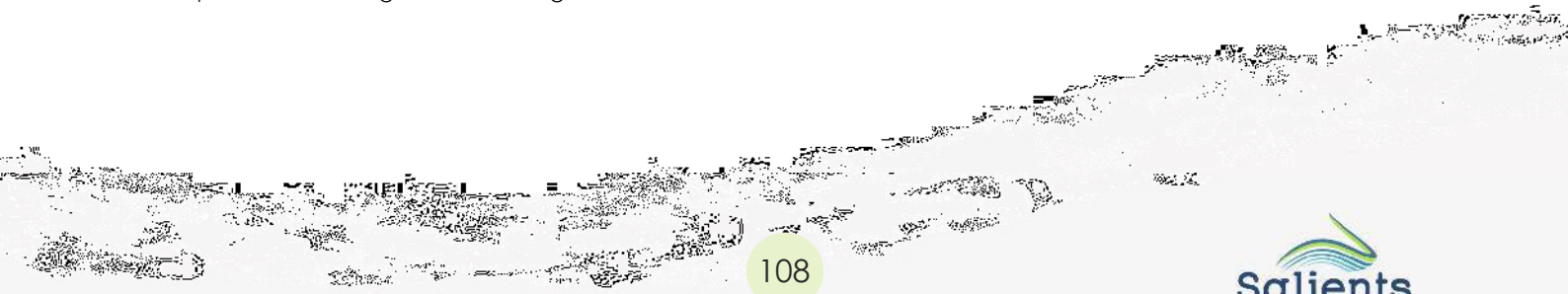
Initial consultation activities are outlined in the scoping study which preceded the development of the CMP and is provided as a parallel Appendix.

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:
 - o COVID safe, on-site discussions with state government agency representatives in late August 2020; and
 - o 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.

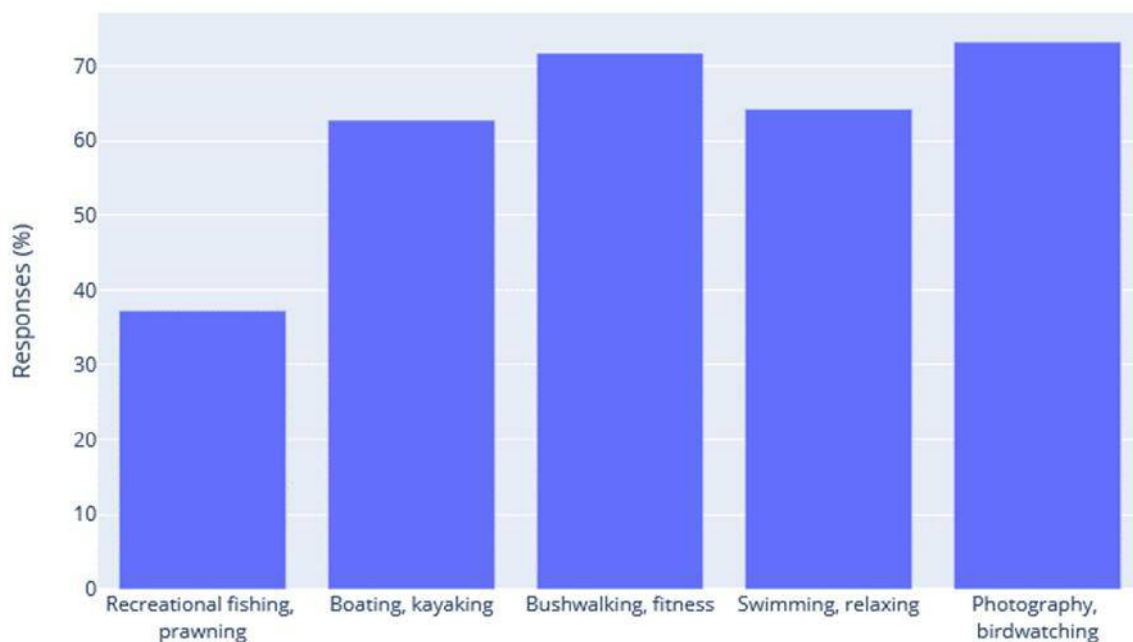


Figure C 1 Estuary Values - Moruya

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.

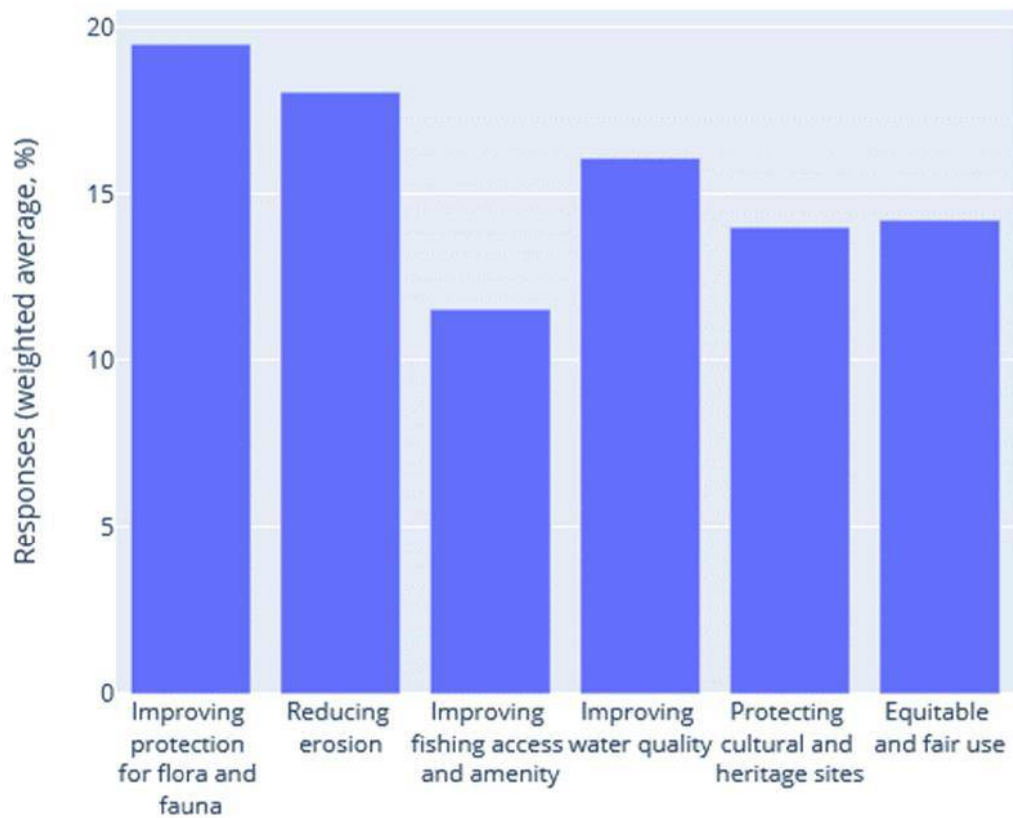


Figure C 2 Management Priorities – Moruya

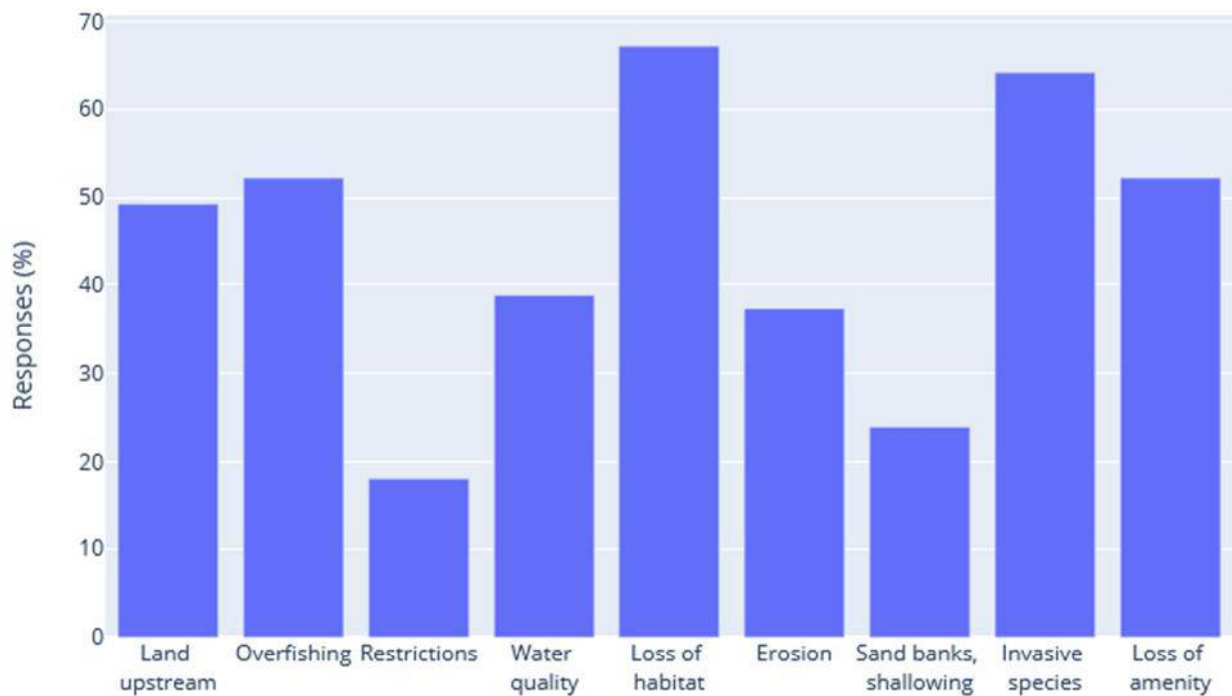


Figure C 3 Threats to estuaries - Moruya

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.

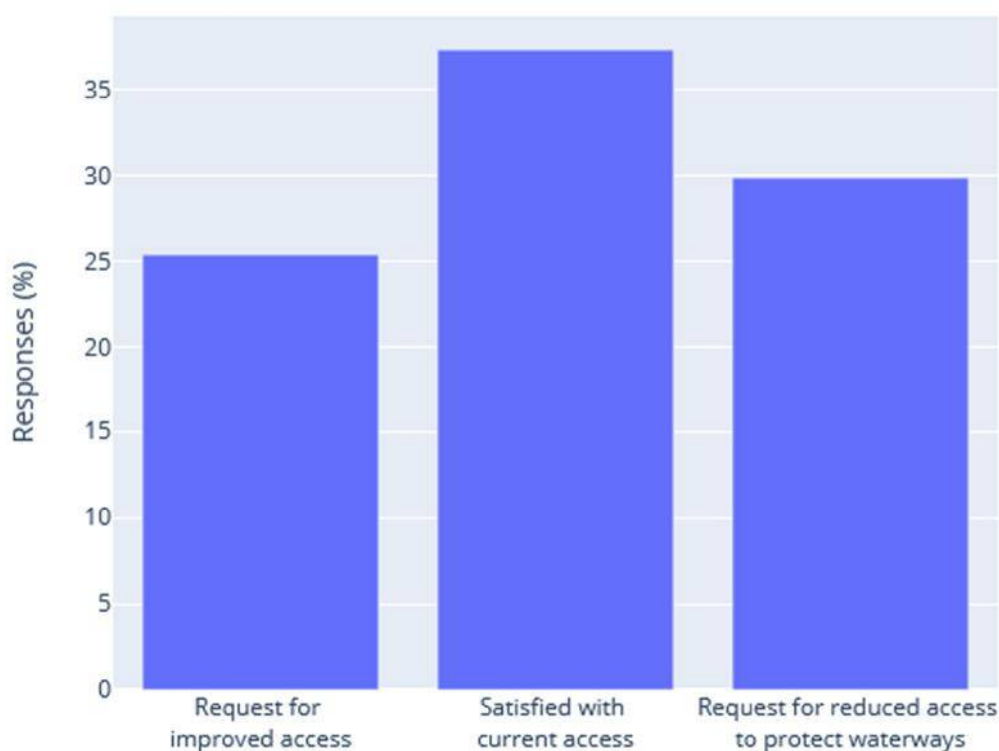


Figure C 4 Estuary Access - Moruya

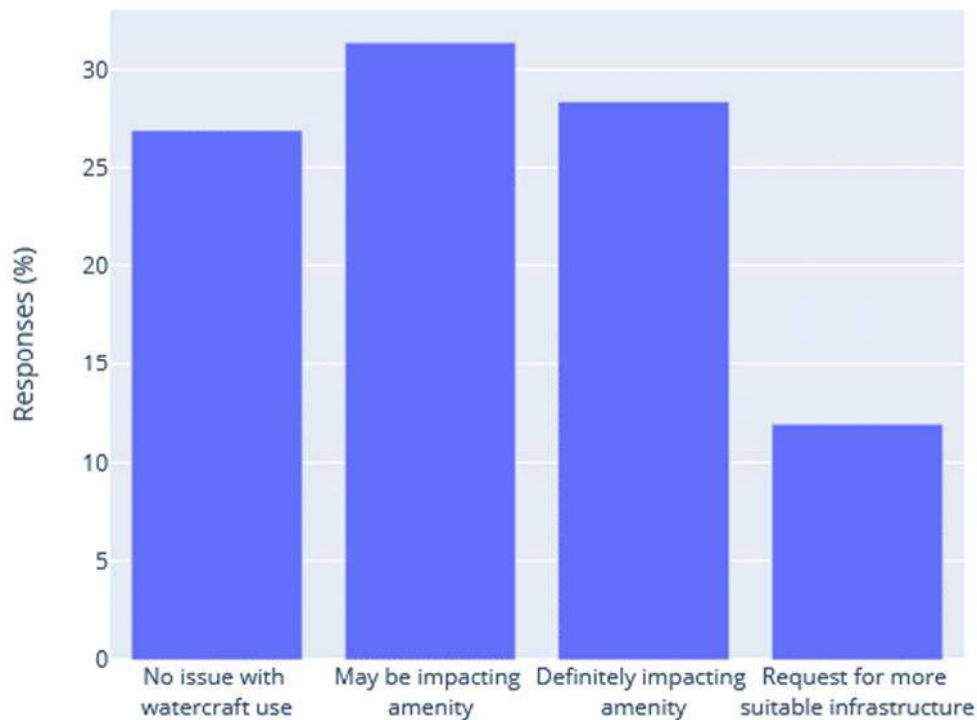


Figure C 5 Use of watercraft – Moruya

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.

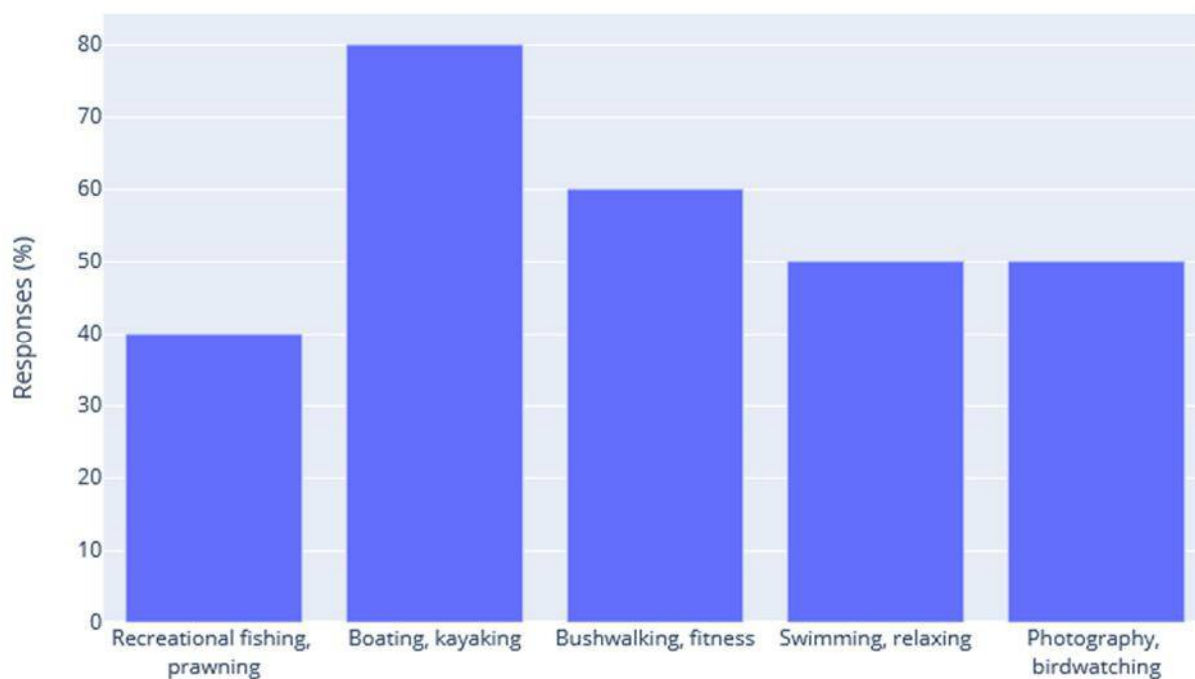


Figure C 6 Management priorities - Mummuga

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.

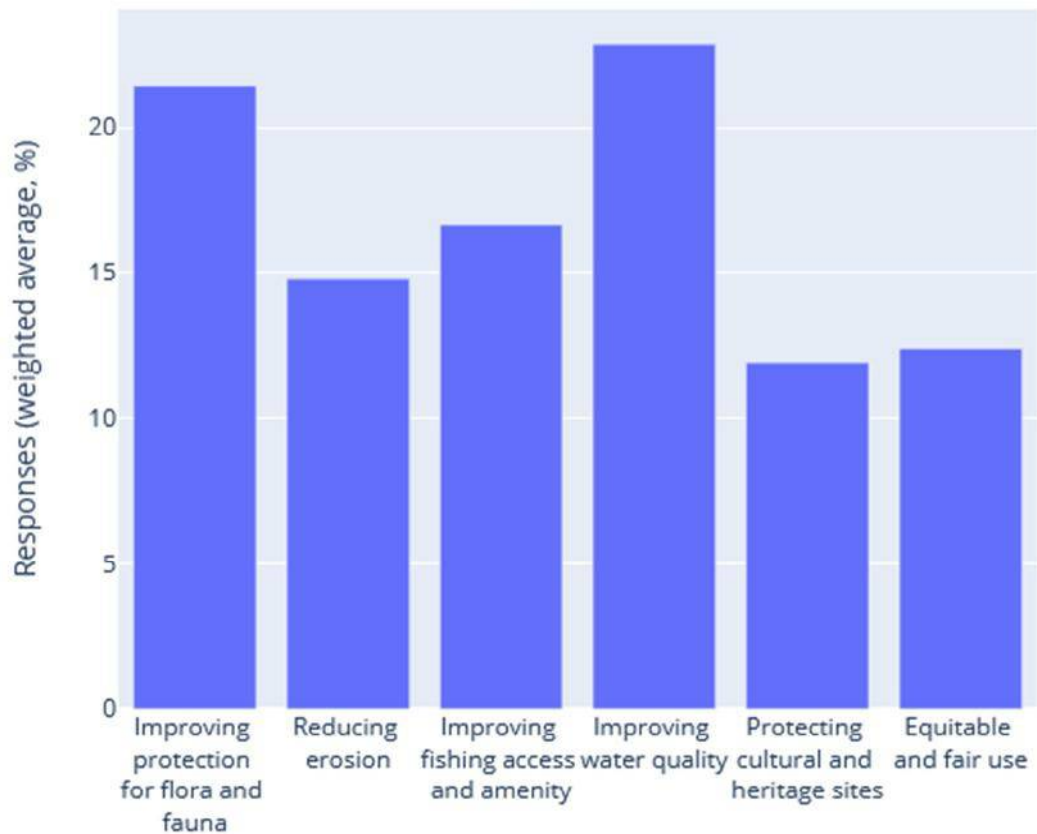


Figure C 7 Management priorities - Mummuga

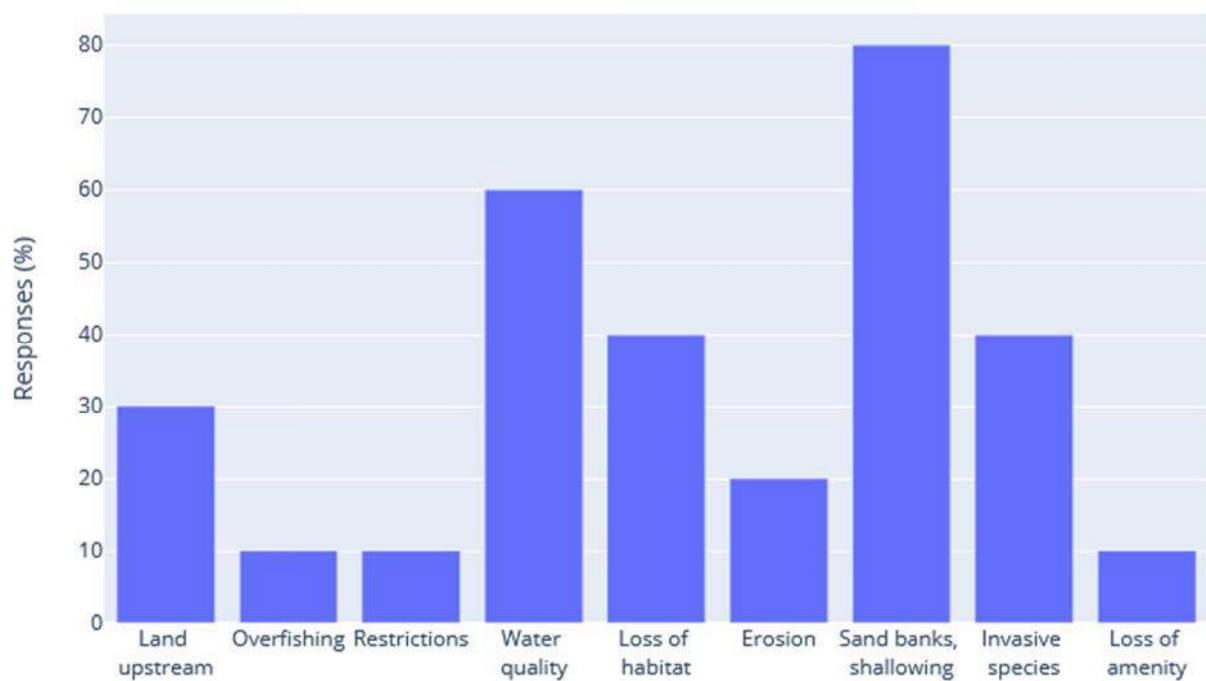


Figure C 8 Threats to estuaries - Mummuga

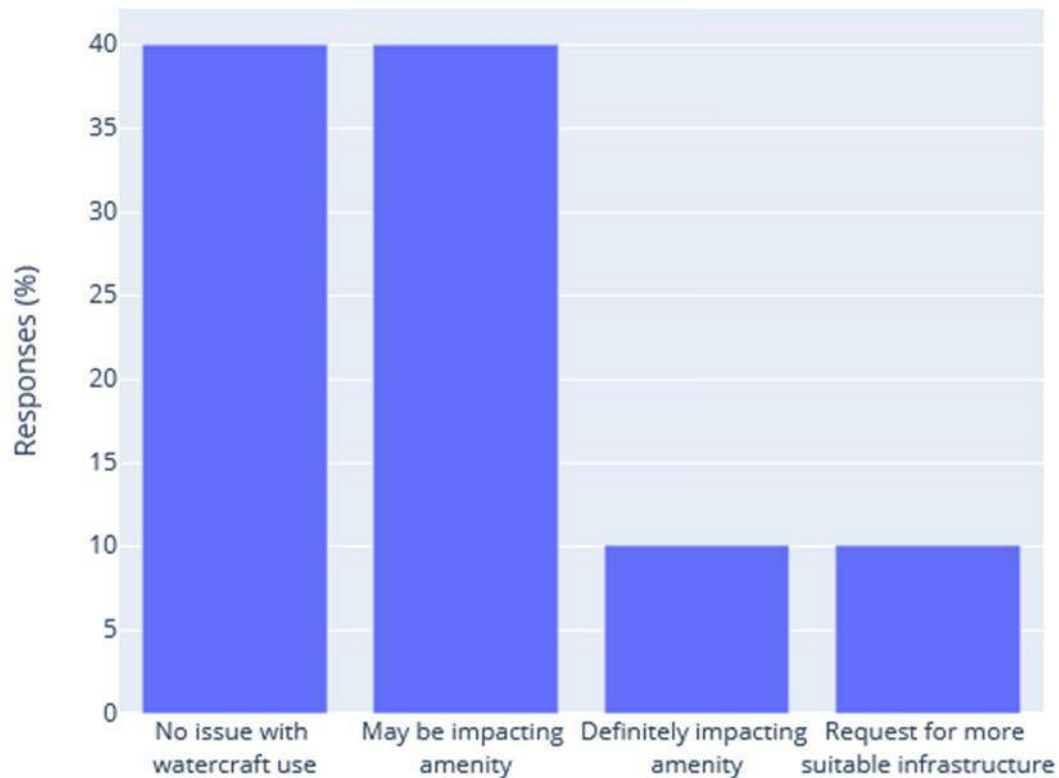


Figure C 9 Use of watercraft - Mummuga

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.

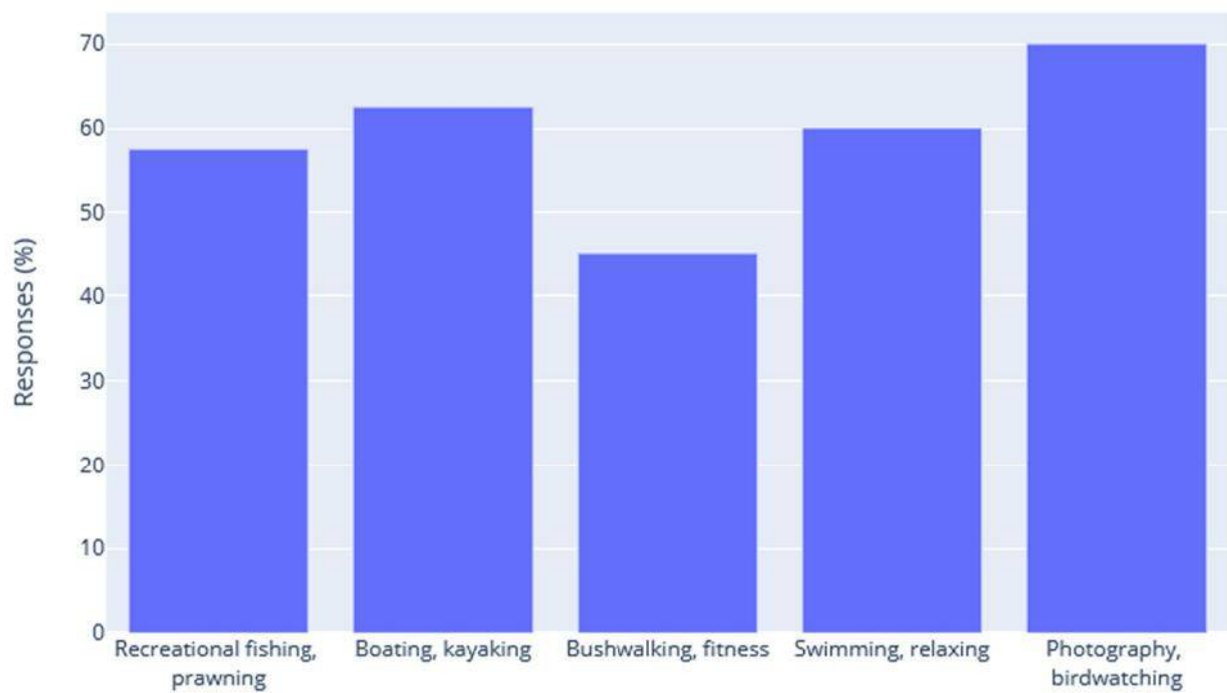


Figure C 10 Estuary values – Wagonga

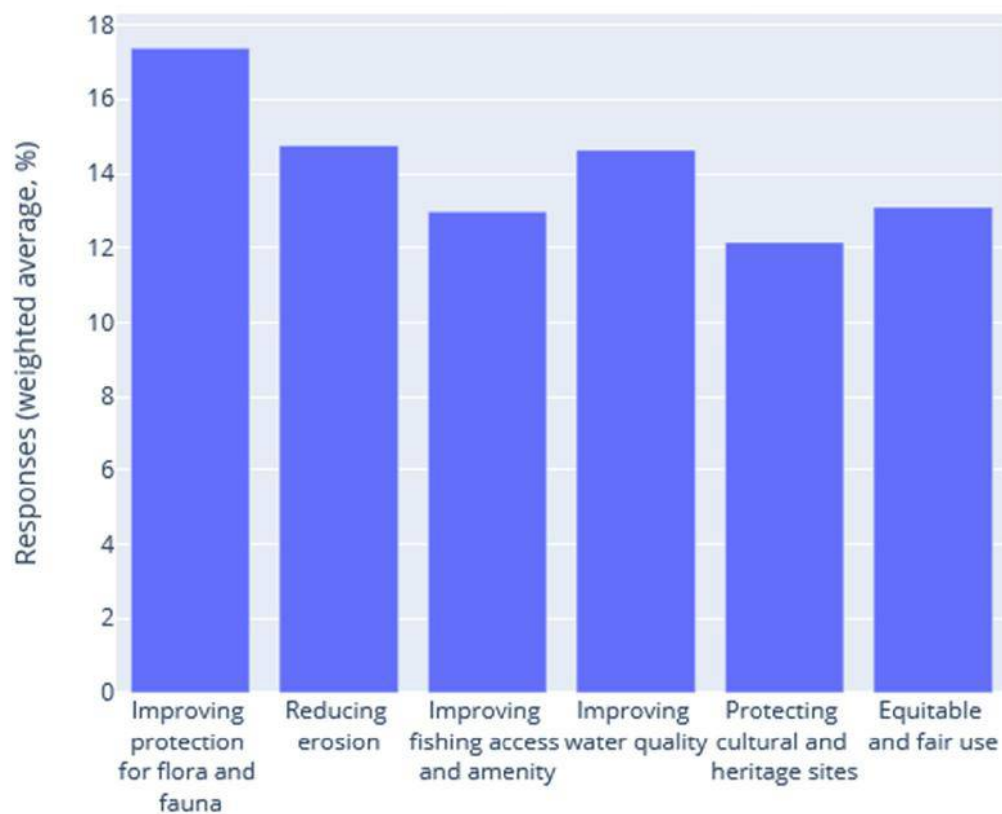


Figure C 11 Management priorities – Wagonga

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.

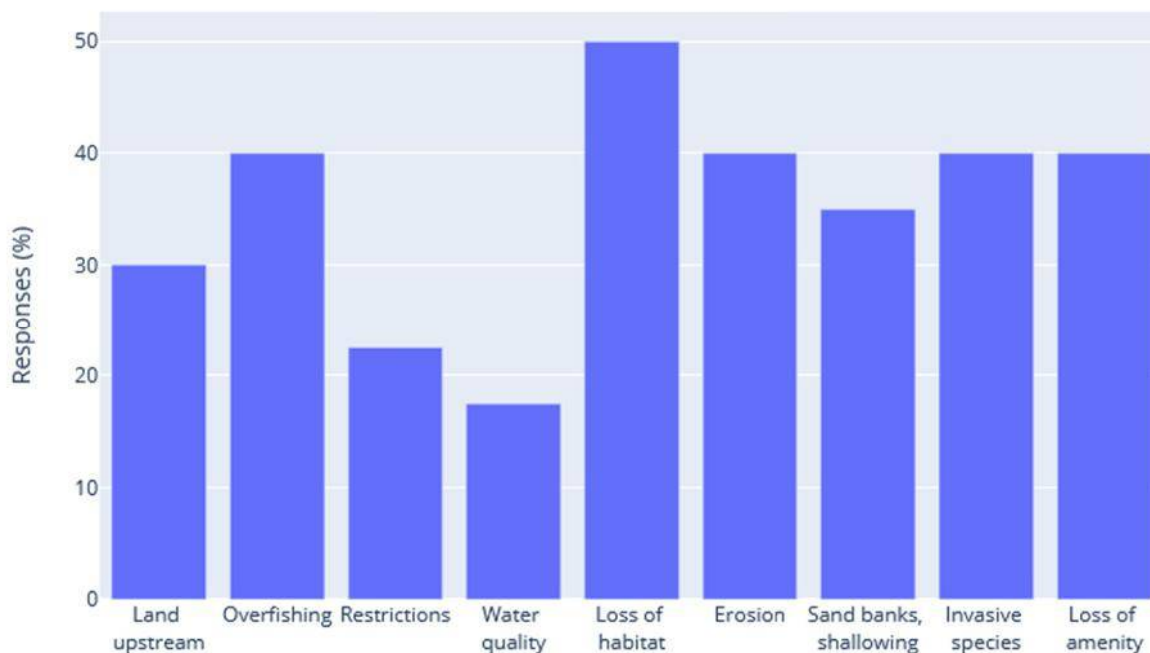


Figure C 12 Threats to estuaries – Wagonga

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.

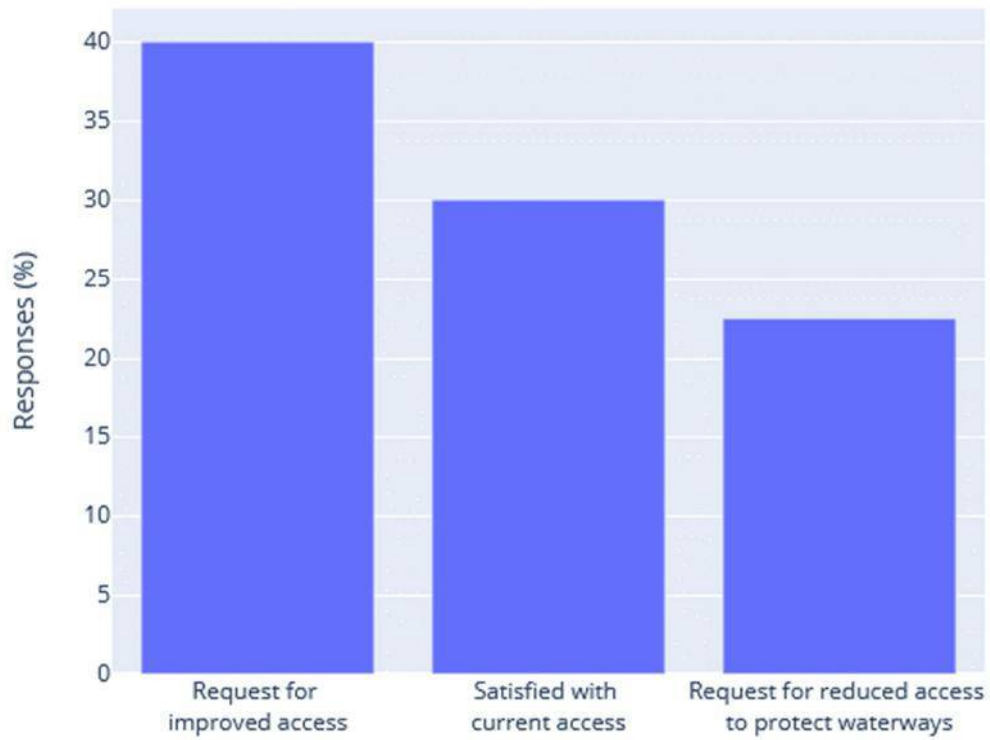


Figure C 13 Estuary Access - Wagonga

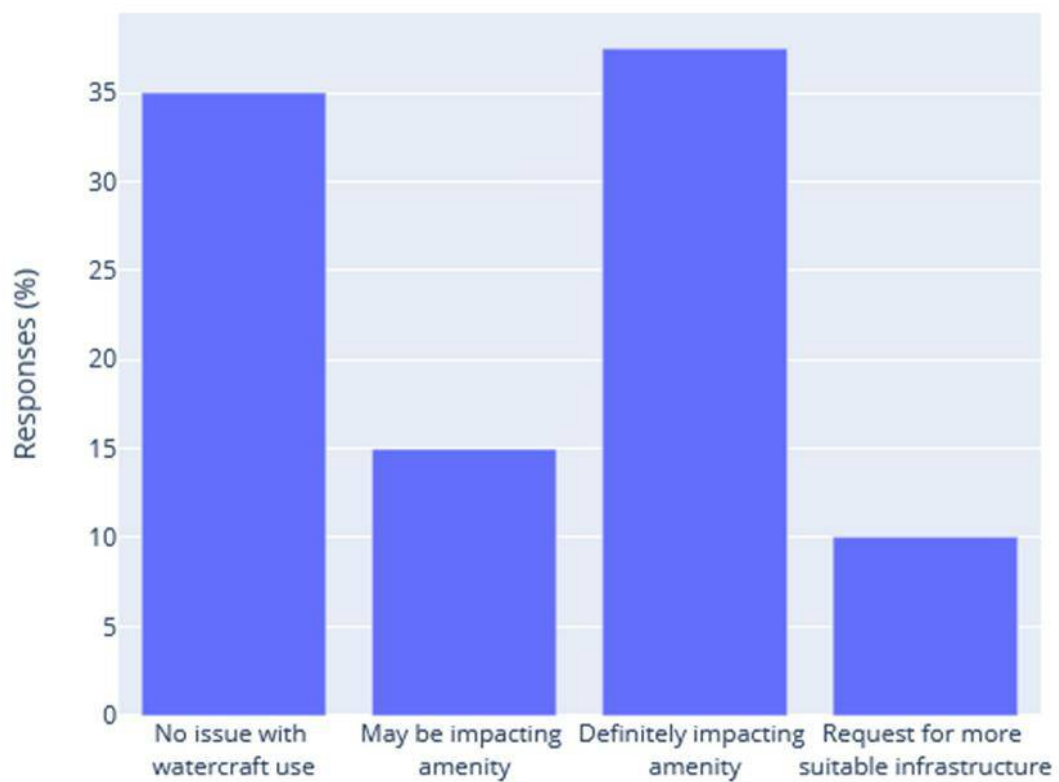


Figure C 14 Use of watercraft - Wagonga

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 and heritage Group (EHG).
- 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 Quandlo 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 practice⁶ 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.

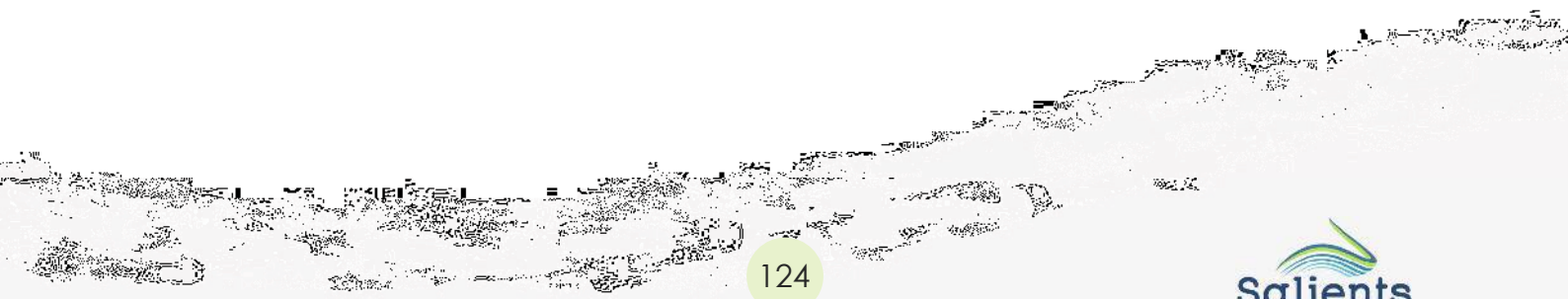
Management of Brice's Bay Historical Wharf: Recent works have been completed to repair the pontoon here and address some erosion issues. We also understand that toilet facilities have been removed. The lack of toilet facilities seems to be a problem with toilet waste being left behind. The area is culturally 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.

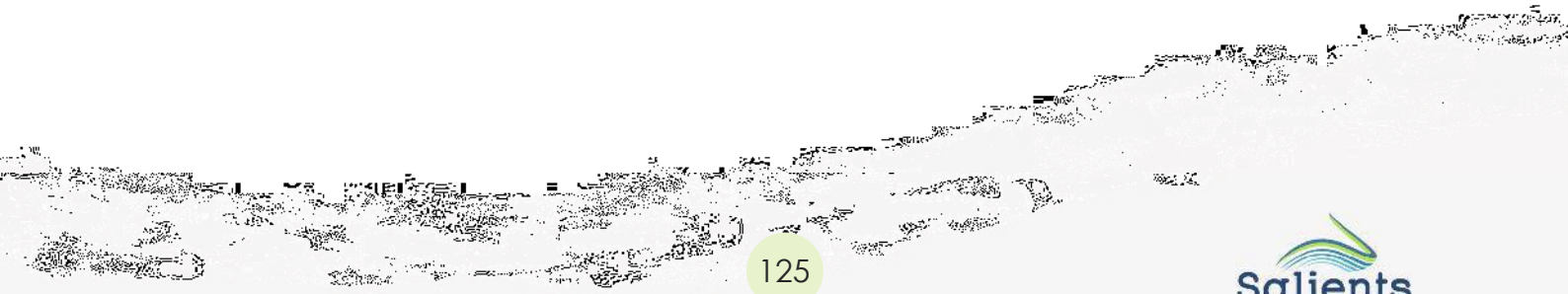
Coastal Squeeze of Mangroves: There is some concern expressed that Mangroves dieback is a significant issue within the Estuary. However, while dieback in some areas has been highlighted by recent research

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

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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 DPE.
- 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.

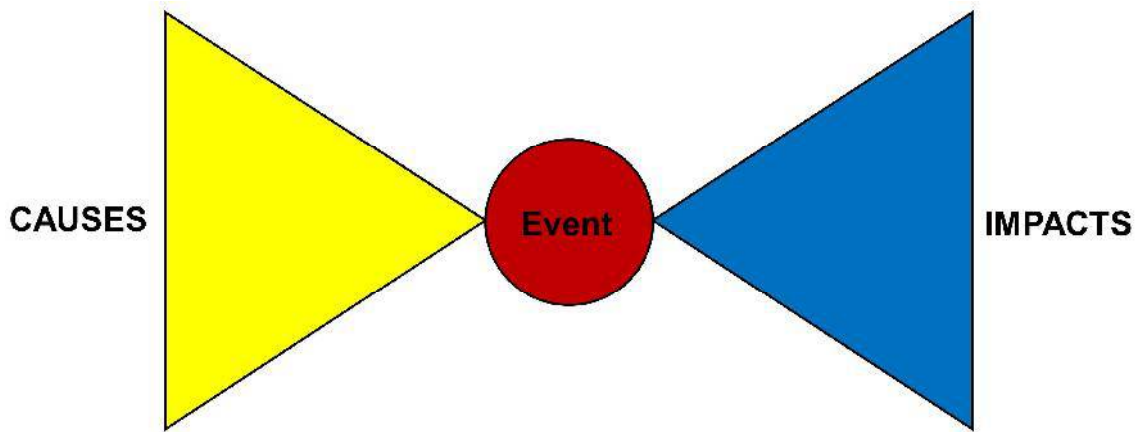


Figure 1 Bow Tie Model of Risk Formulation

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 DPE/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 DPE/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 DPE EHG, 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 DPE 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 DPE 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 DPE 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

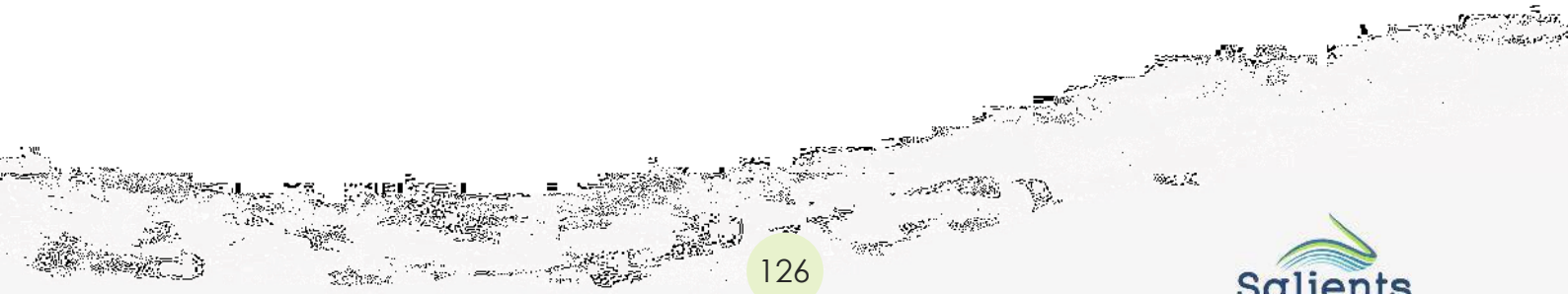
Risk	Estuary	Coastal Management Area	Management Objective(s) Affected	Cause	Event	Outcome / Consequences / Impact	Time Frame for Emergence (if required)	Indicative Year for Impact / Action	Likelihood Ranking	Consequences Ranking	Risk Rating	Scoping Study Comment	Finalised CMP Comment (where relevant)
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 DPE/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.

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)
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
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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 & DPE
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 DPE.
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. DPE 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 <i>Narooma Precinct Plan</i>	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 <i>Risk Based Framework</i> 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

Management Option	Risks Addressed	Criteria (Objects/Objectives from CM Act and MEM Act)																																	Impact Scale Scaled Impact Score Capital Cost Annual Cost																	
		CM Act Objects											MEM Act Objects					Wetlands		Environment			Use				Vulnerability																									
		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		
Appropriately planning for Population Growth & Identifying Offsets	E1, M17	2	2	1	2	2	1	0	2	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	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	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	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	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	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	3	87	\$	12,000.00	\$	-	

Table 6 Detailed Assessment of Management Options – Moruya River

Management Option		Risks Addressed		Criteria (Objects/Objectives from CM Act and MEM Act)																																				Impact Scale				Scaled Impact Score				Capital Cost				Annual Cost							
				CM Act Objects										MEM Act Objects						Wetlands				Environment				Use				Vulnerability																											
				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/P 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
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	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	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	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	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	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	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	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	0	1	0	2	0	0	0	1	0	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	0	1	0	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	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	0	3	93	\$	-	\$	-						

Table 7 Detailed Assessment of Management Options – Mummuga Lake

Management Option		Risks Addressed		Criteria (Objects/Objectives from CM Act and MEM Act)																																				Impact Scale		Scaled Impact Score		Capital Cost		Annual Cost								
				CM Act Objects										MEM Act Objects						Wetlands			Environment			Use			Vulnerability																									
				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
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	2	2	2	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	75	\$	20,000.00	\$	-	
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	87	\$	10,000.00	\$	-
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	0	0	0	2	1	0	0	0	0	2	2	2	2	2	2	1	2	0	0	0	0	0	0	0	0	0	0	0	2	78	\$	50,000.00	\$	-
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	1	2	2	1	0	1	2	2	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	28	\$	20,000.00		
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	1	1	0	1	0	2	2	2	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	104	\$	50,000.00			
Entrance Management Policy	Mu7, Mu8	0	0	0	0	2	1	0	1	1	1	2	0	1	0	0	1	1	1	0	1	1	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	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	Mu9, Mu12	1	0	0	0	2	0	0	0	0	1	1	2	2	0	1	2	0	0	0	2	2	2	0	0	2	2	2	0	2	2	2	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	1	32	\$	10,000.00			

Table 8 Detailed Assessment of Management Options – Wagonga Inlet

Management OptionRisks Addressed		Criteria (Objects/Objectives from CM Act and MEM Act)																																Impact ScaleScaled Impact ScoreCapital CostAnnual Cost																		
		CM Act Objects										MEM Act Objects						Wetlands			Environment			Use			Vulnerability																									
		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		
Incorporate Saltmarsh Friendly Foreshore Treatment in Narooma Precinct Plan	W2	1	1	0	2	2	1	0	2	1	2	2	2	2	2	2	2	2	0	2	2	2	1	0	2	2	2	1	2	2	2	2	2	2	0	0	0	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	W2	2	0	0	1	2	0	0	0	0	1	1	2	2	1	0	2	1	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	0	0	2	60	\$5,000.00	
Change Marine Park Zoning of Mangroves between Bridge and Narooma Flats	W3	1	0	0	0	2	0	0	1	0	1	1	2	2	0	0	2	1	1	2	2	2	2	0	1	2	1	2	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	31	\$-	\$-
Council to Install Markers to Prevent Mowing of Saltmarsh, Narooma Flats.	W3	1	0	0	0	2	0	0	1	0	1	1	2	2	0	0	2	1	1	2	2	2	2	0	1	2	1	2	0	0	0	1	0	0	2	0	0	0	0	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.	W4, W7	1	0	0	1	2	2	0	1	1	1	0	1	1	1	0	1	1	1	0	1	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	4	160	\$40,000.00	\$-
Map Coastal Vulnerability Area for Wagonga	W5	0	1	0	1	2	2	0	2	2	1	0	2	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	3	105	\$20,000.00	\$-
Water Quality Management Forsters Bay	W9	1	1	0	1	1	0	0	0	0	0	0	0	2	1	0	1	0	0	0	1	1	0	1	0	2	2	2	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	40	\$30,000.00		
Punkally Creek Attribution and Monitoring Study	W11	2	0	0	1	2	0	0	0	0	1	0	0	2	0	0	1	2	1	0	2	2	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	66	\$-	\$-	
Install Environmentally Sensitive Toilet Facilities at Brice's Bay	W15, W17	1	2	2	1	2	0	0	0	0	1	1	0	2	2	2	1	0	1	0	2	2	0	2	2	2	2	2	2	0	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	39	\$40,000.00	\$6,000.00		
Manage Access to Lewis Island	W4	1	1	1	0	2	1	0	1	0	1	1	1	1	0	2	1	0	1	0	0	0	1	0	0	0	0	0	1	1	2	0	1	1	0	0	0	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	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	11	\$10,000.00			
Foreshores and Wetland Restoration Plan - Wagonga Inlet	W10, W11	2	0	0	0	2	0	0	1	0	1	0	2	2	0	1	2	0	1	0	2	2	1	0	0	2	2	2	0	0	0	2	0	0	0	0	0	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


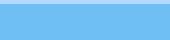


Coastal Vulnerability Objectives	Short Name	Description from Act
1	Public Safety	to ensure public safety and prevent risks to human life
2	Mitigate Coastal Hazards	to mitigate current and future risk from coastal hazards by taking into account the effects of coastal processes and climate change
3	Maintain 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.

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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 DPE: 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 & Heritage (EHG) group of the Department of Planning 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 EHG:

- 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 grants² 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 2021².

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 DPE 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

DPE 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 looking 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 2019-2024³ 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 Strategy⁴ 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

⁴https://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).
- DPE: EHG (See Section 3).
- DPE 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), DPE Water, DPE Crown Land and local councils.

The MEMS Implementation Plan⁵ 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

Our ref: LBN22/1425

Attn: Mr Cameron Whiting

Coastal and Flood Management Planner

Eurobodalla Shire Council

18 January 2023

Subject: Moruya River, Mummuga Lake and Wagonga Inlet Estuarine Coastal Management Program, Final for Certification

Dear Mr Whiting

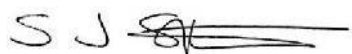
Thank you for your email dated 13 December 2022, concerning the Moruya River, Mummuga Lake and Wagonga Inlet Estuarine Coastal Management Program (herein referred to as the CMP). As is required under section 15(4)(b) of the *Coastal Management Act 2016* (CM Act), agreement is being sought from the Department of Planning and Environment - Crown Lands (Department), to the actions in the CMP that would be carried out by the Department or that relate to land or assets owned and/or managed by the Department.

The Department has reviewed the actions in the CMP that are relevant to the management and administration of Crown land, and that have nominated the Department as a 'supporting' agency. The Department provides formal agreement to the CMP under section 15(4)(b) of the CM Act. This agreement does not exclude or replace the need for authorities to undertake the various planning, regulatory and approval processes that may be required under the *Crown Land Management Act 2016* as part of implementing the CMP.

The CMP is the result of a comprehensive planning process and I congratulate Eurobodalla Shire Council on finalising this important strategic document for the management of the Moruya River, Mummuga Lake and Wagonga Inlet estuaries. The Department looks forward to working with Council during the implementation phase of the CMP.

If you have any questions, please do not hesitate to contact Malcolm Robertson on (02) 6659 8212 or at malcolm.robertson@crownland.nsw.gov.au.

Yours sincerely,

A handwritten signature in black ink, appearing to read "S J Southgate".

Steve Southgate
Director Asset Strategy, Programs and Compliance
Crown Lands

Our ref: DOC22/1037597

Mr Cameron Whiting
Coastal and Flood Management Planner
Eurobodalla Shire Council
PO Box 99
MORUYA NSW 2537

By email: cameron.whiting@esc.nsw.gov.au

Dear Mr Whiting

I refer to Council's request of the Department of Planning and Environment - Environment and Heritage Group (EHG) for a letter of support for the Moruya River, Mummuga Lake and Wagonga Inlet Coastal Management Program (CMP).

We would firstly like to commend Council on preparing the CMP which provides the long-term direction for the management of some of the Eurobodalla estuaries. We are pleased to have contributed to its preparation via technical and financial assistance. The CMP will facilitate the collaborative management of priority threats and risks to the environmental, social, cultural and economic values of Moruya River, Mummuga Lake and Wagonga Inlet.

As requested, I can confirm that EHG supports the strategic intent of the CMP and specific management actions where EHG is listed as a supporting partner. EHG's commitment to the implementation of these actions is of course dependent on the availability of staff and financial resources. In the case of any EHG financial contribution, as you are aware, the Coastal and Estuary Grants Program is a contestable grant program dependent on availability of Government funding, consistency with grant funding guidelines and other statewide priorities which can all change with time.

I would like to take this opportunity to acknowledge the continued commitment and leadership of Council in sustainably managing Eurobodalla's coastal zone and look forward to our continued partnership.

If you have any further questions about this matter, please contact Mr John Bucinskas Senior Team Leader Water, Floodplains and Coast, South East on 4224 4153 or at john.bucinskas@environment.nsw.gov.au.

Yours sincerely



MICHAEL SAXON
Director South East, Biodiversity and Conservation
Environment and Heritage Group

23 January 2023

Enclosure

cc: council@esc.nsw.gov.au

Department of Primary Industries
Department of Regional NSW



OUT22/22356

General Manager
Eurobodalla Shire Council
PO Box 99
MORUYA NSW 2537

Email: Council@esc.nsw.gov.au

DPI Fisheries agency support for the Moruya Mummaga Wagonga Coastal Management Program

The General Manager,

I write to provide DPI Fisheries support for the *Moruya Mummaga Wagonga Coastal Management Program (CMP)*.

The Department notes the significant efforts of Eurobodalla Shire Council in developing and finalising this CMP, in collaboration with other agencies and key stakeholders. I am informed that DPI Fisheries staff have had an active supporting role in all stages of preparing the CMP and they have reviewed previous drafts of the plan. I note that the CMP aligns with several initiatives of the NSW Government's Marine Estate Management Strategy (2018-2028), developed under the *Marine Estate Management Act 2014*.

DPI Fisheries supports the inclusion of all relevant actions within this CMP where the department is listed as a supporting organisation. I also note that DPI Fisheries does not have a primary responsibility for any actions within the CMP.

Primary DPI Fisheries contacts for the implementation of the supporting actions in the plan are as follows:

- Shamaram Eichmann, A/Marine Park Manager, Marine Operations (sham.eichmann@dpi.nsw.gov.au, 4476 0804)
- Carla Ganassin, Senior Fisheries Manager, Coastal Systems (carla.ganassin@dpi.nsw.gov.au, 4222 8342)

DPI Fisheries look forward to working with Eurobodalla Shire Council to achieve the objectives of this CMP.

Yours sincerely



Sarah Fairfull
Director, Aboriginal Fishing and Marine and Coastal Environments
DPI Fisheries

21 December 2022

References:	Division/Branch:	Approving officer:
OUT22/22356	DPI Fisheries/ACFME	Marcus Riches, 6626 1370

24/01/2023

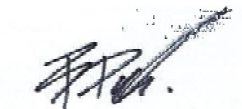
Re: Endorsement Final Moruya River, Mummaga Lake and Wagonga Inlet Coastal Management Program

Dear Eurobodalla Shire Council,

South East Local Land Services agree to the actions in the final Coastal management Program for Moruya River, Mummaga Lake and Wagonga Inlet CMP. The actions in the plan are consistent with South East Local Strategic Plan and the Final South East NRM Plan June 2021-2026.

The funding and support we are able to provide towards those actions is subject to funding availability each financial year and the criteria for spending these funds.

Sincerely,

A handwritten signature in black ink, appearing to read "Byron Dale".

Byron Dale

Local Land Services Officer



General Manager
Eurobodalla Shire Council
PO Box 99

MORUYA NSW 2537

By email: council@esc.nsw.gov.au

Thank you for Council's request of the Department of Planning and Environment (DPE), National Parks and Wildlife Service (NPWS), Eurobodalla Area, letter of support for the Estuaries Coastal Management Plan (CMP)

I write to provide National Park and Wildlife Service (NPWS) Eurobodalla Area support for the Moruya, Mummuga and Wagonga Coastal Management Plan (CMP).

NPWS notes the significant efforts of the Eurobodalla Shire Council in development and finalising the CMP, in collaboration with other agencies and key stakeholders.

NPWS supports the inclusion of the relevant actions within this CMP where the department is listed as an organisation with responsibilities for delivery or supporting delivery of actions. NPWS commitment to the implementation of these actions is depending on the continued availability of staff and financial resources.

The key agency contact is Daniel Bridle, Ranger for Eurobodalla National Park
npws.eurobodalla@environment.nsw.gov.au

NPWS looks forward to working with Eurobodalla Shire Council to achieve the objects of the CMP.

Yours sincerely

A handwritten signature in black ink, appearing to read "Joanne".

Joanne Issaverdis
**Area Manager, Eurobodalla
National Park and Wildlife Service**

16 January 2023