

# Appendix A: Management Response Evaluation

Management Response		Feasibility			Viability						Weighted Score	Rank	Priority
		A. Values Importance Score	B. Threat Risk Level Addressed	C. Risk Reduction Effectiveness	D. Funding Difficulty	E. Duration of Works	F. Engagement Level Required	G. Investigations/ Approvals Required	H. Implementation Difficulty	I. Cost Category			
		1.56	1.88	2.03	0.94	0.00	0.16	1.09	0.63	1.72			
R1.1	Investigation of entrance opening trigger level sustainability	4	5	1	3	4	4	5	5	3	34.8	20	Low
R1.2	Incorporate review of causeway road level into future upgrade planning	4	3	2	5	4	3	5	4	5	37.7	10	High
R1.3	Update excavator access track for entrance opening	3	4	5	5	5	3	4	4	5	43.0	2	Very High
R1.4	Monitor and mitigate the impact of lake openings on beach-nesting birds	3	3	2	5	1	5	5	4	5	36.4	15	Medium
R2.1	Estuary health data collection program	5	3	4	4	1	5	5	5	2	38.1	9	High
R2.2	Updated bathymetric survey	5	3	1	3	5	5	5	5	3	32.8	25	Low
R3.1	Weed control program	5	4	4	4	1	4	5	4	3	40.9	7	High
R3.2a	Revegetation and signage program to rehabilitate view clearing areas	5	5	3	4	3	3	5	3	4	41.7	5	Very High
R3.2b	Improvement to foreshore areas of holiday parks	5	5	3	3	4	4	5	4	4	41.6	6	High
R3.2c	Vehicle and boat access to Meads Bay, Fairhaven	5	5	2	5	4	4	4	4	5	42.0	4	Very High
R4.1	Remove cattle grazing of priority wetlands	5	5	5	4	3	2	5	3	3	43.9	1	Very High
R5.1	Review, remove and rehabilitate unsealed roads and revegetate erodible areas	5	4	2	4	3	2	4	4	3	35.5	17	Low
R5.2	Improvements to requirements, monitoring and compliance of sediment controls for property developments	5	3	1	4	1	2	3	4	2	28.8	26	Low
R6.1	Bank stabilisation, implementation of grazing exclusion zone and riparian zone restoration	5	4	4	4	2	2	3	4	2	36.7	13	Medium
R7.1	Adaptation planning for low-lying assets	5	4	3	3	4	3	5	3	3	37.2	11	Medium
R7.2	Undertake coastal hazard risk planning for holiday/caravan parks	2	4	2	4	4	2	4	4	5	34.2	21	Low
R7.3	Develop a CVA and update relevant planning documents	3	4	2	5	4	2	5	3	4	35.5	17	Low
R7.4	Review CEA, CUA and CWLRA and adjust mapping (if required)	5	4	2	4	4	2	3	3	4	35.5	17	Low
R7.5	Dune rehabilitation program	5	3	3	4	1	5	5	4	3	37.2	11	Medium
R7.6	Analysis and mapping of entrance stability and migration	3	3	2	4	4	5	5	4	4	33.8	23	Low
R8.1	Incorporate assessment of impacts and cost/benefit of causeway into future upgrade planning	5	5	2	3	4	2	3	3	2	33.0	24	Low
R8.2	Investigation to quantify changes to Narira Creek delta and impacts on estuary	5	4	3	3	4	4	5	4	4	39.7	8	High
R9.1	Ensure "Threatened Shorebirds in Bega Valley Shire: Action Plan" is Implemented	4	5	2	5	1	4	5	5	5	42.2	3	Very High
R10.1	Continue supporting existing environmental community interest groups	5	2	2	4	1	3	5	4	5	36.4	15	Medium
R10.2	Community engagement and information sessions and activities	5	4	2	4	1	2	5	4	3	36.6	14	Medium
R10.3	Review and update interpretive signage as needed during CMP implementation period	4	2	2	4	5	5	5	5	4	34.1	22	Low

# Appendix B: Management Action Profiles

**Management Action Title:** Investigation of Entrance Opening  
Trigger Level Sustainability

**Management Action ID:** R1.1

**Date:** June 2024

## Description of Management Action

### Background

To achieve reasonable scour of an ICOLL entrance channel during artificial entrance opening, it is desirable to open the lake with as much water volume in the lake as possible, and with as much hydraulic head between the lake and sea level as possible. It has anecdotally been observed that when lake entrances are opened at low lake levels, the entrance rapidly shoals and closes again. With increasing sea levels, the long-term sustainability and effectiveness of artificial entrance management at the current opening trigger level is unknown.

As sea levels continue to rise, the head difference between the lake when it reaches the opening trigger level and the ocean surface, is steadily decreasing. Through time, artificial opening of the lake entrance will conceptually become less effective due to higher sea levels, and the trigger level will eventually have to be increased. As an example, with a 30 cm increase in sea levels, opening the lake at the current trigger level of 1.25 m AHD would be equivalent to opening the lake at 0.95 m AHD today. Experience has shown that openings at such a low lake water level are typically ineffective.

This issue is identified in the Entrance Management Policy, which includes a goal to raise low-lying assets in the future. However, at Wallaga Lake there is limited opportunity for this to occur without significant investment in adaptation of infrastructure such as the road causeway and bridge, and there is also little information available on the timeframes for this to occur. This issue is relevant to many ICOLLs with artificially managed entrances within BVSC.



**Figure 1: Artificial Opening of Wallaga Lake, 2017**



## Investigation of Entrance Opening Trigger Level Sustainability

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### Overview

An investigation of the long-term sustainability of the lake opening trigger level is required, to better understand the effectiveness of the current management strategy into the future. The intention is that the results of the study will inform timeframes for both raising the trigger level and for adaptation of low-lying assets. The analysis should combine calibrated hydrodynamic modelling of the entrance bar and breakout processes, hydrological data for catchment inflows, and the best available scientific projections of sea level rise and morphological changes at estuary entrances, to better understand the implications on artificial entrance opening effectiveness, entrance opening/closing regime etc.

This information could be undertaken for Wallaga Lake specifically, or could be combined with parallel investigations at other ICOLLS in the Shire to be undertaken as a single study.

### Timeframe and Responsible Organisations

This project would be coordinated by BVSC and will take approximately 6 months to complete (potentially longer if undertaken in parallel with other estuaries). The technical assessment would be undertaken by a procured consultant.

### Cost and Achievability Rating

Project management and procurement – Approximately 20 person days of Council staff time (over a period of 6 months);

Technical assessment \$100,000 - \$150,000;

### Priority Rating

This management action has a *Low* priority rating, and can be implemented independently of other management actions (though will need to be completed prior to R6.1).

### Implementation Progress Measures

1. Procurement of consultant completed;
2. Assessment is complete, and Council will have a clear understanding of the viability of entrance opening trigger levels into the future.

### Estuary Threats/Opportunities Addressed

This is a cross-cutting management response that helps address "*Threat 1: Artificial entrance management*" and "*Threat 6: Coastal Hazards*" within the Wallaga Lake Coastal Management Program, and improves a number of values for the lake including

- Physical processes;
- Recreational amenity;
- Built assets;
- Ecosystems; and
- Community satisfaction

### Areas of Lake Addressed

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## Investigation of Entrance Opening Trigger Level Sustainability

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This work is focused on processes at entrance channel of the lake, but impacts values around the full area of the estuary.

**Management Action Title:** Estuary Health Data Collection Program

**Management Action ID:** R2.1

**Date:** June 2024

## Description of Management Action

### Background

Estuarine health is monitored in NSW with the state-wide MER program, which identifies a range of indicators and target values for monitoring overall estuarine health. The MER monitoring indicators are summarised in Table 1, along with the dates for which data is available for Wallaga Lake. Dates for other water quality data sets are also shown.

Table 1: MER Monitoring Program Indicators and Data Dates		
Issue	Indicator	Data Dates
Eutrophication	Microalgal Abundance (Chlorophyll –a)	2008, 2017, 2022
	Macroalgal Abundance	No Data
	Water Clarity (Turbidity)	2008, 2017, 2022
Habitat Availability	Extent of Seagrass	1994,1998/2002
	Extent of Mangroves	NA
	Extent of Saltmarsh	1994,1998/2002
Fish Assemblages	Species Diversity and Composition	1997-2000, 2018
	Species Abundance	1997-2000, 2018
	Nursery Function	No Data
	Trophic Integrity	No Data
Other Non-MER Water Quality Parameters	Nutrients	2017
	Salinity	2017
	DO	2017

Over the past three decades there has been a range of water quality data collected for Wallaga Lake, which can primarily be grouped into:

- General water quality data sets in the 1990s;
- Assessment of fish assemblages in 1997-2000;
- Macrophyte field validation in 2002 for aerial photos in 1998;
- MER data sets for microalgae and turbidity in 2008 and 2017;
- Assessment of fish assemblages in 2018;
- MER water quality data collected over the 2021–22 summer.

While data for water quality indicators is available at several points in time and provides somewhat of a snapshot of estuary water quality, it is generally inadequate to understand the impacts of seasonality and event-based processes (such as rainfall events, entrance state or

catchment bushfires). This makes it difficult to draw conclusions on long term changes in water quality or to attribute changes in water quality to specific events or management works (such as upgrades from onsite wastewater systems to pressure-sewer systems).

Data for aquatic habitat indicators is available from the analysis of Creese *et al.* (2009) and is based on aerial photographs from 1996 and 1998 and field validation in 2002. This data is now approximately 20 years old and is therefore possibly no longer a good representation of aquatic habitat health given the dynamic nature of sediment transport and entrance behavior of the estuary. The data also represents only a single snapshot in time, so provides little indication of trends in vegetation growth/die-back.

Data regarding fish assemblages was first collected in 1997-2000 and published in West and Jones (2001). This data was updated in 2018. In general the data provides a reasonable indicator of this component of present estuary health, and better data than what is available for most other estuaries in the region.

## Overview

On the basis of the available data sets, in the 2010 SOC assessment Wallaga Lake was rated as having an overall condition of Poor (D) in accordance with the MER grading process. This was largely the result of low scores for microalgae abundance (chlorophyll-a) and saltmarsh condition. The data measured in 2017 showed slight improvement in chlorophyll-a. Older data sets were reported in PBP(1996) as indicating very high nutrient levels in the lake, even when the entrance was open to the sea. The most recent sampling in Wallaga Lake was completed over the 2021–22 summer when 3 sites were sampled on a monthly basis. The report card from this analysis showed the condition of the estuary was *fair* (noting that this condition was primarily based on water quality indicators and not contemporary or up to date data for other health parameters) with:

- algae abundance graded poor (D)
- water clarity graded fair (C)
- overall estuary health graded fair (C)

Development of a targeted data collection program is required to inform an ongoing and contemporary understanding of estuary health. This issue relates to many estuaries within BVSC, and the program is best developed as a shire-wide activity in collaboration with the ongoing DCCEEW data collection program.

Prioritised activities for ongoing data collection at Wallaga Lake include:

- Targeted water quality monitoring (nutrients, chlorophyll –a, turbidity as a minimum, preferably also DO, salinity, FC and enterococci) that covers a period of both entrance open and closed conditions, and includes monitoring sites in the main tributaries feeding into the lake, the main lake basins and bays. This data collection should assist in identifying sources of nutrients entering the lake, and provide improved/contemporary understanding of event-based changes in water quality (management interventions, catchment changes, rainfall events, entrance opening events etc.).
- Developing an up-to-date understanding of aquatic habitat through revised mapping of seagrass and saltmarsh areas. This likely requires analysis of new aerial photographs in combination with field validation.

## Timeframe and Responsible Organisations

This management action will be led by BVSC but will involve contribution from and coordination with a range of other state agencies including DCCEEW and DPI Fisheries. Collection of water quality data across a ~2 year period would be advantageous for capturing a range of events, environmental conditions and entrance states. Updating aquatic habitat mapping could be undertaken within a 3 month window using a combination of UAV photography and field data.

All data collection could be undertaken by either Council staff (following upfront specialist equipment procurement) or by a consultant.

## Cost

Costs for collection of seasonal water quality data over a 1-2 year period will vary greatly with the sampling program and parameters measured, nevertheless is expected to be in the range of \$100,000-\$150,000 (for Wallaga Lake). Re-mapping and change analysis of aquatic and fringing vegetation communities is expected to cost \$40,000 - \$60,000.

## Priority Rating

Collection of water quality data and revised mapping of aquatic and fringing vegetation is of *high* priority.

## Implementation Progress Measures

1. Regularly updated water quality data sets will be available, including analysis of water quality within sub-catchment streams;
2. Updated mapping of aquatic and change analysis completed for fringing vegetation communities;
3. Understanding of estuary health rating updated and based on broad range of indicators;
4. Data to assess estuary health available at future intervals of no more than 10 years, and potentially as short as 3 years in response to specific environmental issues.

## Estuary Threats Addressed

This management response is targeted specifically at addressing "*Threat 2: Lack of Knowledge of Estuary Health and Condition*" and will also contribute to "*Threat 5: Catchment Runoff and Urban Pollutants*" in the Wallaga Lake Coastal Management Program:

## Areas of Lake Addressed

This work is relevant to the health of complete lake, but is focused on further understanding:

- The impacts of catchment inputs on lake health;
- The condition of aquatic habitat in the lake.

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<b>Management Action Title:</b>	Updated Hydrosurvey and Analysis
<b>Management Action ID:</b>	R2.2
<b>Date:</b>	May 2023

## Description of Management Action

### Background

There are a range of significant changes from the natural regime for the estuary, which have the potential to impact the sedimentation rates over the long-term. These changes include large areas of cleared and farmed agricultural land in the catchment, the road causeway that restricts the lower section of the estuary, and the artificial entrance management regime whereby the lake is opened at much lower water levels than would naturally occur. Measurement of the physical changes to the lake bed at different points in time enable an understanding of the areas where sedimentation is occurring, and the rates of infilling.

The last hydrosurvey of the lake was 1993 and is now 30 years old. An updated survey is required to provide a contemporary understanding of sedimentation hot-spots within the estuary, and to assist with understanding the long-term impacts of sediment loads from the catchment and within the entrance flood tide delta.

### Overview

An updated bathymetric survey is required for the full lake, with particular focus on:

- Area around the causeway and bridge, and between the bridge and the lake entrance;
- Narira and Dignams Creek tributaries up to the navigable limit and around the fluvial deltas where the tributaries join the lake.

The goals of the management response are to:

- Produce a contemporary geospatial model of the estuary;
- Understand the magnitude and location of changes in bathymetric form;
- Provide a measurable baseline for future sedimentation/change of the lake, and works to address these issues;
- Provide a quantitative data set that can be used in community engagement/education around sedimentation issues.

This management response will have three components:

1. Hydrosurvey of navigable areas of lake with boat;
2. RTK/GPS survey of targeted areas of lake unable to be captured in (1), such as fluvial and flood tide deltas, key foreshore zones;
3. GIS analysis and comparison of new survey data with previous survey from 1993.

### Timeframe and Responsible Organisations

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This management action will be led by BVSC and supported by DCCEEW as part of their ongoing program of marine surveys in NSW. The target is to complete the action within the short to mid-term.

### **Cost**

It is assumed that the bathy/topo survey would be completed on a commercial basis, with the cost likely to be in the range of \$50,000 - \$100,000. If the updated survey could be undertaken within DCCEEW's existing program, much of this cost could be avoided.

### **Priority Rating**

Undertaking the hydrosurvey and analysing the results has a *low* priority.

### **Performance Measures**

1. Updated hydrosurvey completed by 2024;
2. Updated understanding of lake bathymetric changes completed by 2025;

### **Estuary Threats Addressed**

This management response is targeted specifically at addressing "*Threat 2: Lack of Knowledge of Estuary Health and Condition*" and may also contribute to "*Threat 8: Structure and Function of Lake and Catchment*" in the Wallaga Lake Coastal Management Program.

### **Areas of Lake Addressed**

This work is relevant to the health of complete lake.

**Management Response Title:** Weed Control Program

**Management Response ID:** R3.1

**Date:** June 2024

## Description of Management Action

### Background

Inspections of the majority of the Wallaga Lake foreshore were undertaken as part of the development of the CMP, with identification and mapping of weeds where present. The primary focus of the field inspections was on species known to significantly degrade natural vegetation in this region, especially vines and shrubs, rather than the many minor weeds of disturbance such as *Cirsium vulgare* (spear thistle) and exotic grasses. A prioritisation process was used in identifying species requiring control, with several criteria used in determining which weed species and sites are highest priority for attention. Some species, of course, fit multiple criteria:

1. Species capable of wholly displacing native vegetation such as lantana (*\*Lantana camara*), bitou/boneseed (*\*Chrysanthemoides monilifera*), asparagus species (*\*Asparagus spp*). Sometimes termed 'transformer species', all are recognised as Weeds of National Significance.
2. Species that are very efficiently dispersed long distance to new sites across the landscape by such vectors as birds, wind, water eg lantana (*\*Lantana camara*), bitou/boneseed (*\*Chrysanthemoides monilifera*) asparagus species (*\*Asparagus spp*).
3. Species with great longevity in the seedbank such that control efforts need to be maintained through decades eg bitou/boneseed (*\*Chrysanthemoides monilifera*), gorse (*\*Ulex europaeus*).
4. Species which cause economic harm such as Crofton weed (*\*Ageratina adenophora*), which is highly toxic to horses.
5. Species which degrade Endangered Ecological Communities (EECs) eg sharp rush (*\*Juncus acutus*) in salt marsh and wetlands, Norfolk Island hibiscus (*\*Lagunaria pattersonia*) in Swamp Oak Floodplain Forest.
6. Species which promote bushfire, eg gorse (*\*Ulex europaeus*) and whiskey grass (*\*Andropogon virginicus*).
7. Species which substantially reduce amenity such as African boxthorn (*\*Lycium ferocissimum*), blackberry (*\*Rubus spp*) and sharp rush (*\*Juncus acutus*) which can produce impenetrable thickets along waterways or in sand dunes.
8. New weed incursions which can be very economically controlled in the early stage before they become fully established. New weed species are certain to continue to arrive in the region whether introduced by gardeners or by natural dispersal processes.



Mapping of priority weed species identified in the inspections are shown in Map 01a and Map 01b below. Foreshore areas from Wallaga Lake Koori Village and Akolele within ESC in the north, south to Fairhaven Point within BVSC, are becoming degraded, with a range of weed infestations that will require ongoing removal and maintenance. This includes species that have propagated organically and species that have spread from adjacent private garden areas.

However, this eastern shore is variable in its degree of weediness; there are stretches of shoreline with few or no invasive species, whereas in other sections, notably the south-facing shore at Beauty Point and the north-facing shore at Fairhaven, weeds have almost wholly displaced native species. The eastern shore of Wallaga Lake is infested with the greatest range of invasive species of any settled area along the Bega Valley Shire Coast and, without major on-going efforts at weed control and to modify residents' behaviour in plant selection and plant waste disposal, its native vegetation is likely to become even more massively and extensively degraded in future years.

The most significant weed species present in the catchment is lantana, with Wallaga lake currently the southernmost margin of the extensive infestation centred around Tilba. Lantana is scattered around the northern and eastern shores from Dignams Creek to Fairhaven, both deep within tracts of undisturbed native vegetation and in settled zones. Unless it is adequately controlled, lantana, which is readily dispersed, can be expected to continue spreading southwards. It is recommended that lantana control be accorded the highest priority since the spread of this weed threatens native vegetation along the entire Far South Coast.

There are large tracts of the TEC *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, along the shores of Wallaga lake. This community is threatened by invasive Norfolk Island hibiscus (*\*Lagunaria pattersonia*) and African boxthorn (*\*Lycium ferocissimum*), both well-established along the settled eastern shores of the lake and likely to spread further. Other shoreline weeds with the capacity to spread much further around the lake shores are African daisy (*\*Osteospermum ecklonis*) and *\*Asparagus* species. Also scattered along Wallaga shores is the listed Vulnerable species square raspwort (*Haloragis exalata* subsp. *exalata*) which could be at risk from the spread of shoreline weeds or even from poorly managed weed control works.

Streams flowing through farmed land frequently function as 'conveyor belts' carrying weed propagules downstream into estuaries, with significant potential for this process to occur at Wallaga Lake. Although African boxthorn (*\*Lycium ferocissimum*) is present along the lower banks of Narira creek and lantana (*\*Lantana camara*) on the banks of Dignams creek, both tributaries are currently in a largely weed-free state. The western shores of Wallaga lake within the Gulaga National Park are also largely weed-free.

## Overview

An intensive species-targeted weed control program will be required, likely over a number of years, followed by ~annual spot checks and follow-up eradication. It is recommended that lantana (*\*Lantana camara*) control be the highest priority for eradication since the spread of this weed threatens native vegetation along the entire Far South Coast. Control of lantana is also already underway with BVSC implementing targeted control measures in the area of Morunna Point. Other highly invasive species for prioritisation in a targeted eradication program for the catchment include Norfolk Island hibiscus (*\*Lagunaria pattersonia*), African boxthorn (*\*Lycium ferocissimum*), African daisy (*\*Osteospermum ecklonis*), and *\*Asparagus* species.

## Timeframe and Responsible Organisations

This management response will be coordinated by BVSC, likely with contractors to undertake the initial and more intensive control program. Subsequent annual checks may be undertaken by BVSC or contractors depending on available resourcing.

## Cost and Achievability Rating

It is estimated that within the first 3 years approximately \$20,000 - 30,000 per annum would be required for a BVSC staff member to coordinate and manage weed control and revegetation works (this would overlap with community liaison and engagement activities where relevant). In parallel with this, contractors to undertake the majority of weed control work and revegetation, would cost approximately \$20,000 - \$40,000 per annum.

Beyond an initial three-year period, if the initial intensive eradication works are successful, then ongoing weed maintenance would have significantly lower costs, expected to be approximately \$5,000 to \$10,000 per annum.

## Priority Rating

This management action has a *high* priority rating, and requires careful integration with other management responses, in particular the broader program of community engagement and awareness, as well as rehabilitation works for view clearing and bank stabilization.

## Implementation Progress Measures

- Major eradication and revegetation works completed:
  - 100% of lake foreshore reserve areas
  - 100% of Regatta Point areas
  - 100% of Beauty Point areas
  - 100% of Fairhaven Point areas
  - 100% of Coastal headland/dune areas
- Ongoing weed maintenance program active for all reserves around lake and tributaries, as well as Camel Rock beach dunes

## Estuary Threats/Opportunities Addressed

This management action is targeted specifically at addressing "*Threat 3: Degradation of Vegetation Communities*" within the Wallaga Lake Coastal Management Program. The works will improve a number of values for the lake and catchment including:

- Ecosystems;
- Visual amenity; and
- Community satisfaction;

## Areas of Lake Addressed

This work is relevant to the health of the lower lake catchment, tributaries and foreshore zone.





Wallaga Lake  
Coastal Management Program

Map Location: Southern Wallaga Lake	
Map Title: Invasive/Exotic Vegetation, Lower Catchment and Foreshore	
Map 01a	Date: 15/04/2019 Rev: 1







Wallaga Lake  
Coastal Management Program

Map Location: Northern Wallaga Lake	
Map Title: Invasive/Exotic Vegetation, Lower Catchment and Foreshore	
Map 01b	Date: 15/04/2019 Rev: 1





**Management Action Title:** Foreshore Vegetation Rehabilitation and Improvements

**Management Action ID:** R3.2

**Date:** June 2024

## Description of Management Action

### Background

Fringing and foreshore vegetation communities around the urbanised areas of the lake are being impacted by a number of processes. Clearing of foreshore vegetation for views and lake access including shrubs and trees, and mowing areas of saltmarsh as part of private property maintenance is prevalent along the foreshores of Akolele, Regatta Point, Beauty Point and Fairhaven (see Map 01), and occurs within the E2 zoned foreshore buffer area. This is undermining the effectiveness and intention of the buffer zone to provide the intended processes for the estuary.

The foreshore areas of the Big 4 and Ingenia holiday parks are heavily used for recreational purposes and lake access, with cleared vegetation completely maintained to the water's edge at both sites.

On the southern shoreline of Fairhaven Point there is an ad-hoc vehicle access extending from Fairhaven Point Way to the shoreline of Meads Bay (see Figures 1 and 2). The gravel access is cut through trees, shrubs and across intertidal/saltmarsh vegetation. With the larger informal boat launching area on the immediate northern side of Fairhaven Point, this ad-hoc access directly into Meads Bay is not required.

Collectively, and when combined with the informal vehicle access roads around the foreshore at Akolele and Beauty Point (discussed in R5.1), these issues are degrading the quality of the natural foreshore vegetation buffer around the developed section of the lake where it is most required.

### Overview

Council's existing program of rehabilitating and revegetating foreshore areas that have been impacted by view clearing and inappropriate mowing will be focused on the identified and mapped sites around the lake. This will be supported by targeted engagement and education within R10.2 with specific private property owners, and if required, enforcement of compliance by Council and DPI Fisheries as required. Compliance monitoring in the longer term will also be required.

Engagement with the site managers of the Ingenia and Big 4 holiday parks will be undertaken to establish improved management of foreshore areas of the parks (in particular the Big 4 park where the foreshore strip is a Crown Land reserve). The objective will be to maintain the recreational needs and functions of these areas to support their tourism activities and water access, while rehabilitating sections of vegetation through landscaping, maintenance and improved stormwater management.

The ad-hoc vehicle access to Meads Bay will be removed through exclusion of vehicles and installation of signage, with the site to be revegetated and rehabilitated.

### **Timeframe and Responsible Organisations**

This management action will be coordinated by BVSC, with support from DPI Fisheries and Crown Lands. Rehabilitation of foreshore vegetation in front of private properties will be undertaken in parallel with engagement actions in R10.2 and will be completed within the short term. Engagement with managers at Ingenia and Big 4 holiday parks to improve their foreshore areas will be undertaken within the short to medium term, along with closure and rehabilitation of the ad-hoc vehicle access through the vegetation on the Meads Bay foreshore.

### **Cost**

Engagement with private property owners and rehabilitation of foreshore vegetation from view clearing an inappropriate maintenance is part of an existing Council program so will have no additional cost (Beyond Council staff time) over the longer term. In the short to medium term it is expected that \$25,000 - \$35,000 will be required for vegetation rehabilitation in foreshore reserves fronting private property, and a further \$25,000 for vegetation rehabilitation and \$15,000 for stormwater improvements in reserves used as part of holiday parks.

Exclusion of vehicles, signage and rehabilitation of the ad-hoc boat launching area into Meads Bay can be undertaken by Council staff, with a materials cost of less than \$5,000.

### **Priority Rating**

This management action has a very *high* priority rating.

### **Implementation Progress Measures**

1. Engagement with targeted private land owners and holiday park managers completed.
2. Measurable rehabilitation and reduction of previously cleared sites.
3. Exclusion of vehicles and rehabilitation of ad-hoc vehicle access into Meads Bay completed.

### **Estuary Threats Addressed**

This management response is targeted specifically at addressing “*Threat 3: Degradation of Vegetation Communities*” in the Wallaga Lake Coastal Management Program.

### **Areas of Lake Addressed**

This work is relevant to the immediate foreshore areas within the developed areas of Akolele, Regatta Point, Beauty Point and Fairhaven.



Figure 1: Location of cleared ad-hoc vehicle access to Meads Bay off Fairhaven Point Way





**Figure 2: Cleared ad-hoc vehicle access to Meads Bay**





Wallaga Lake  
Coastal Management Program

Map Location: Regatta Point, Beauty Point and Fairhaven  
 Map Title: Zones of Damage to Foreshore Vegetation from Clearing  
 Map 01  
 Date: 15/04/2019  
 Rev: 1





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<b>Management Action Title:</b>	Remove Cattle Grazing from Priority Wetland Areas
<b>Management Action ID:</b>	R4.1
<b>Date:</b>	June 2024

## Description of Management Action

### Background

Extensive areas of high value wetland mapped within the Resilience and Hazards SEPP are accessible and grazed by cattle. This is a significant issue around the areas where the Narira and Dignams creeks enter Wallaga Lake, and moving further upstream along the rivers. This issue has been identified on Crown Land, Crown Land under grazing leases, National Park land and private land (see maps 01, 02 and 03 for locations). This issue has been ongoing for many decades and was a priority issue within the previous Estuary Management Plan.

Cattle grazing on these areas results in degradation of wetland vegetation communities and promotes erosion of estuary banks, with associated follow on impacts to areas of ecological significance including Meads Bay and Dignams Creek Sanctuary Zones of the Batemans Marine Park.



**Figure 1: Example of stock accessing wetland areas of Narira Creek**

Wallaga Lake Coastal Management Action Profile  
**Remove Cattle Grazing from Priority Wetland Areas**

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Figure 2: Example of cattle tracks in saltmarsh areas on Crown Land adjacent Meads Bay



Figure 3: Example of cattle tracks around wetland areas on National Park land at Narira Creek





Figure 4: Example of cattle tracks around wetland areas on Private Property, Dignams Creek

## Overview

Consultation will be completed with private landholders along both Narira and Dignams Creek identifying those supportive of improving wetland conditions on and adjacent to their property. A strategy will be implemented to offer a mix of incentives and information of legislative requirements to ensure compliance with the relevant legislation and regulations that prohibit cattle from harming wetland vegetation, polluting waterways and entering the adjoining marine park. This will be assisted by an educational campaign on the impacts of grazing on priority wetlands and broader estuary health.

For private properties identified via initial consultation, surveys will be completed to confirm land tenure and boundaries to open up funding sources. Crown Lands will also review grazing lease areas that overlap gazetted CWLR areas and/or Proximity Areas, to establish a timeframe to terminate the leases or enforce lease requirements consistent with the sensitivity of the land.

Work will be completed with private landholders and government agencies to suitably exclude cattle from wetland areas. This program may require trialing of modern/innovative fencing techniques to accommodate flood flows and other previous challenges to fencing.

Monitoring will be completed and evidence gathered for cattle grazing impacts on wetlands across all sites within Wallaga Lake to better establish the scale and location of the issue and undertake compliance investigations where relevant.

## Timeframe and Responsible Organisations

This management action will largely be driven by BVSC, with the support of LLS, DPI Fisheries, and Crown Lands. Initial consultation activities will be completed in the short term, with works to exclude cattle installed on identified properties within the medium term. Compliance

monitoring will be ongoing to assist land-owners in identifying problem locations where fencing is ineffective.

### **Cost**

Council staff time will be required to drive this activity, supported by staff time from state agencies. Physical works will primarily include contractor costs for fencing cattle out of priority wetland areas will be approximately \$50,000 - \$100,000. The costs will vary significantly depending on the extent of private land-owner support that is achieved. Where possible funding will be sourced from grant funding to support these activities.

### **Priority Rating**

This management action has a *very high* priority rating.

### **Implementation Progress Measures**

1. Initial review and recommendations for crown grazing leases in foreshore and wetland areas of Narira and Dignams Creek completed;
2. Initial engagement and planning with priority land-owners completed;
3. Exclusion of cattle from priority sites (R&H SEPP wetlands, National Parks and BMP Sanctuary Zones) achieved;
4. Exclusion of cattle from all wetland and immediate foreshore areas.

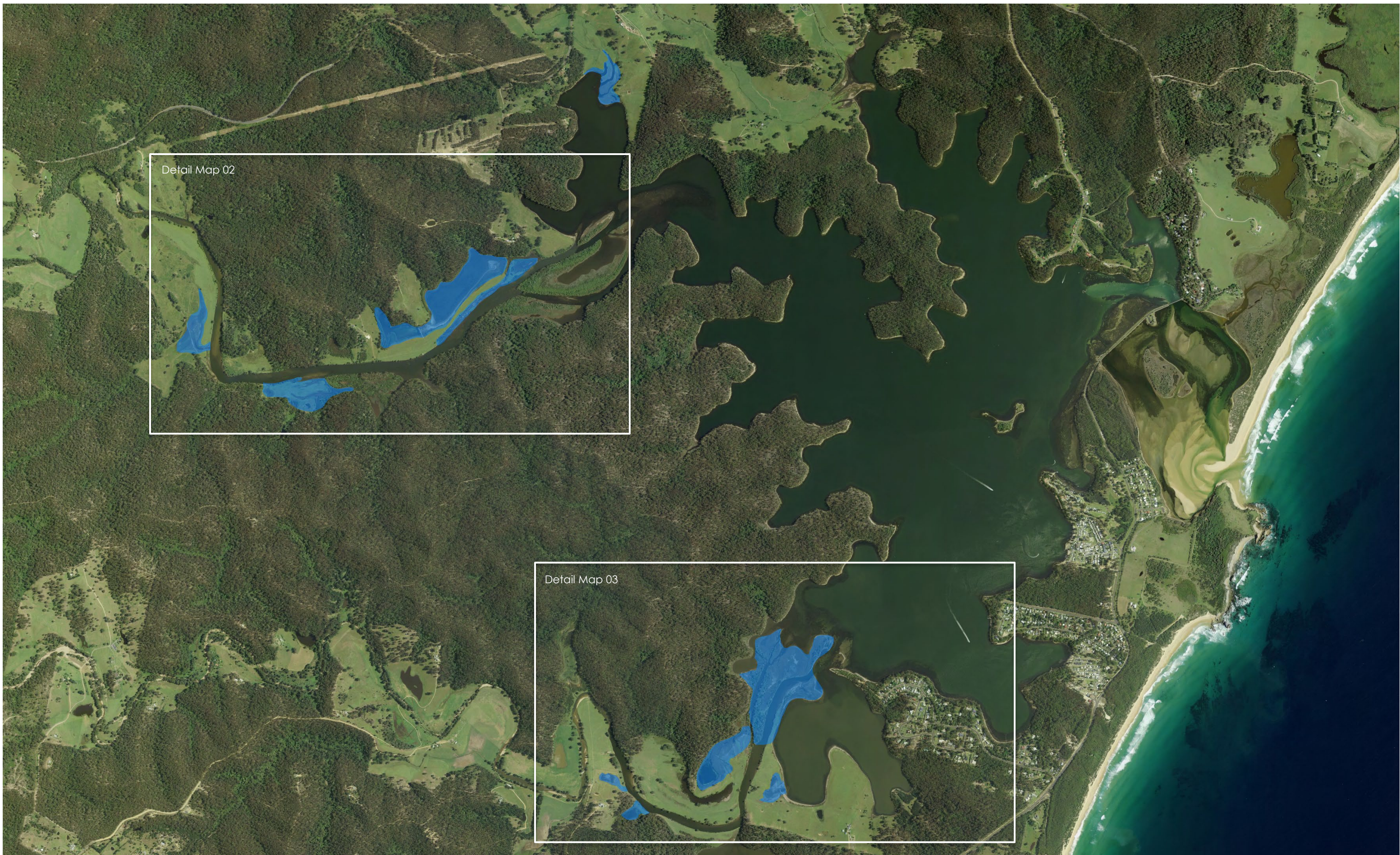
### **Estuary Threats Addressed**

This management response is targeted specifically at addressing "*Threat 4: Degradation of Wetlands*" in the Wallaga Lake Coastal Management Program.

### **Areas of Lake Addressed**

This work is relevant to wetlands located around the Dignams and Narira Creek areas, and includes Crown Land, National Park and private property.





Wallaga Lake  
Coastal Management Program

Map Location: Wallaga Lake

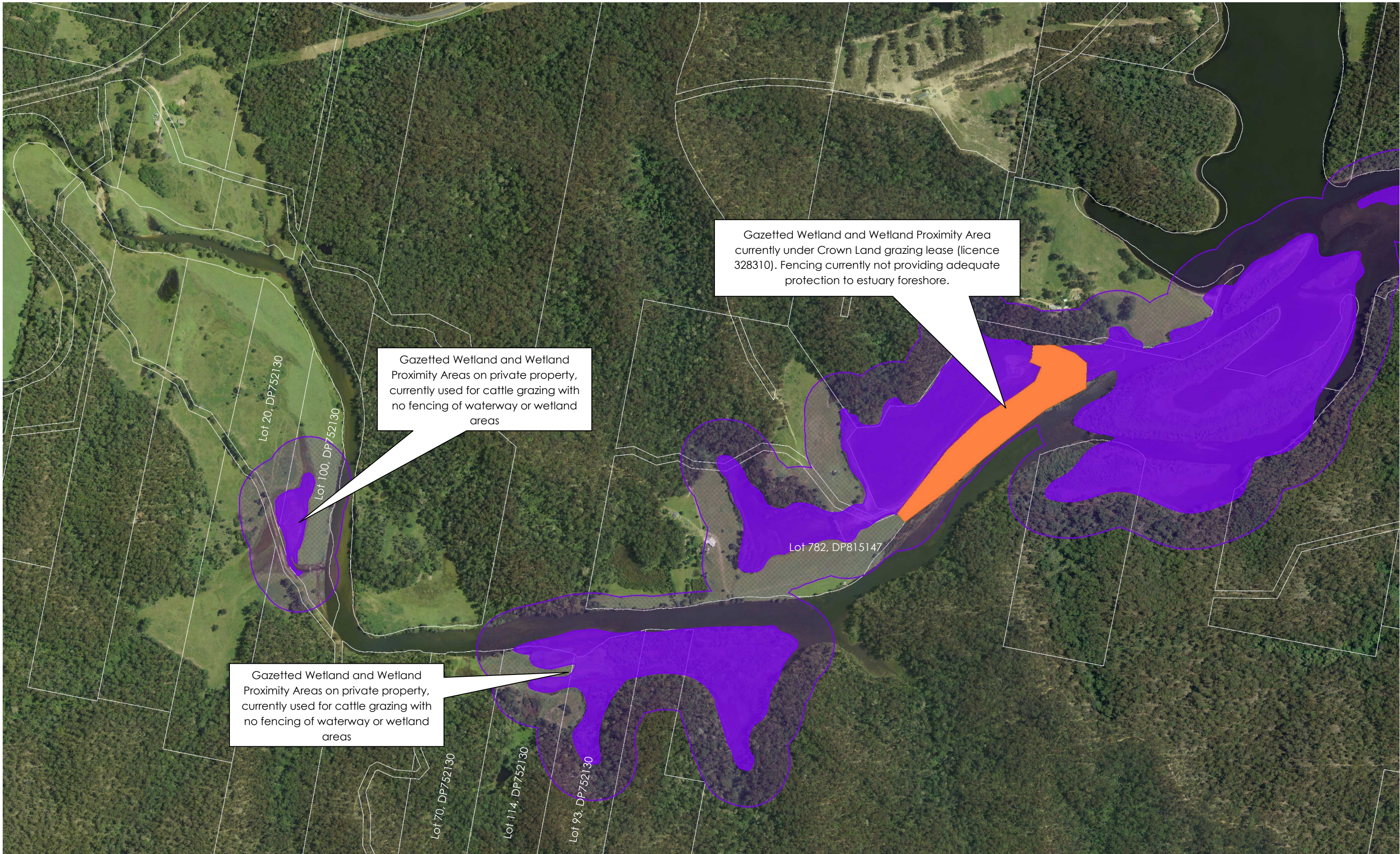
Map Title: Wetland Zones Impacted by Cattle Grazing

Map 01

Date: 18/11/2019  
Rev: 1







Wallaga Lake  
Coastal Management Program

Map Location: Dignams Creek, Wallaga Lake

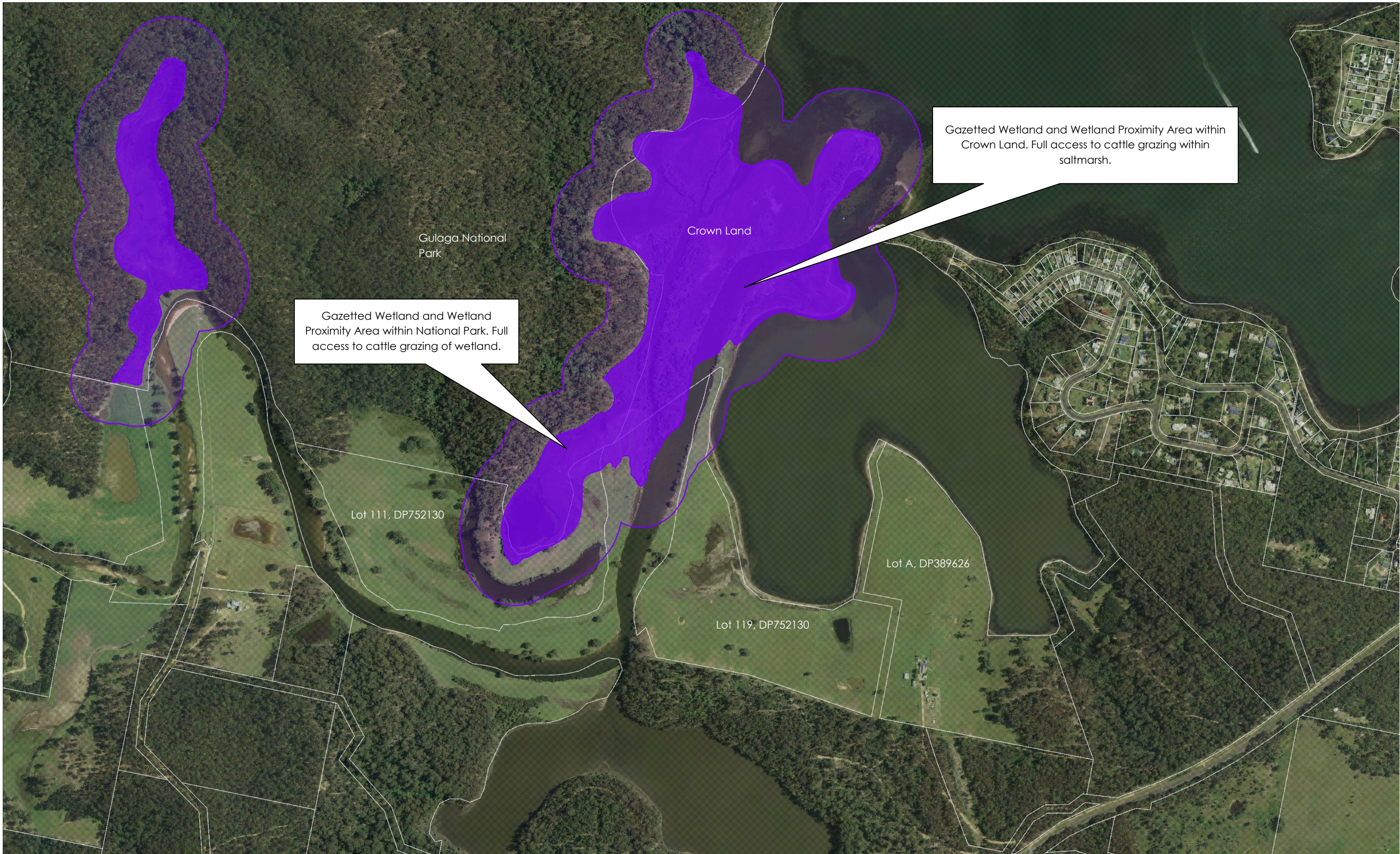
Map Title: Wetland Zones Impacted by Cattle Grazing

Map 02

Date: 18/11/2019  
Rev: 1







Wallaga Lake  
Coastal Management Program

Map Location: Narira Creek, Wallaga Lake	
Map Title: Wetland Zones Impacted by Cattle Grazing	
Map 03	Date: 18/11/2019 Rev: 1





**Management Response Title:** Review, remove and rehabilitate unsealed roads and revegetate eroding areas

**Management Response ID:** R5.1

**Date:** June 2024

## Description of Management Action

### Background

There are numerous unsealed roads and foreshore access tracks that are immediately adjacent the lake edge and through the lower lake catchment including locations at Akolele, Beauty Point, Fairhaven Point and Black Lagoon (see specific locations and examples in Figures 1 to 7). There is a log and roadbase bridge constructed across tributary creek of Black Lagoon, and de-vegetated powerline easements at Akolele. These areas all provide a source of increased sediment load to the lake, contributing to catchment derived impacts on the estuary's water quality, ecology and overall health.



**Figure 1: Unsealed foreshore road and eroded powerline easement track at Akolele**



## Review, Remove, and Rehabilitate Unsealed Roads and Revegetate Eroding Areas



Figure 2: Unsealed roads and tracks in Beauty Point and Fairhaven



## Review, Remove, and Rehabilitate Unsealed Roads and Revegetate Eroding Areas



Figure 3: Unsealed roads and tracks in Beauty Point and Fairhaven





Figure 4: Eroding surface of former vehicle turning area, Fairhaven Point Way



Figure 5: Eroding surface of former vehicle turning area, Fairhaven Point Way





Figure 6: Eroding surface of former vehicle track



Figure 7: Poor condition unsealed track





Figure 8: Log bridge on Scenic Forest Way, across Black Lagoon

## Overview

Within this management action there are works required at several sites around the lake to reduce sediment load from currently eroding surfaces. Sub-actions for this process could include a selection of the following items and sets (subject to further prioritization/consideration by land/asset managers):

- An initial review and rationalisation of the need and function of Wallaga Lake (foreshore) Road between Turner Drive and the northern abutment of Wallaga Lake Bridge (Figure 1) and the foreshore track between Beauty Point boat ramp and O'connells Point Road (Figure 2). Consideration should be given to converting these vehicle tracks to walking tracks only, while maintaining vehicle access to the waterway only at each end of the road (or not at all).
- The powerline easement access track at Akolele (Figure 1) is in an eroding condition and requires surface maintenance and installation of appropriate sediment controls.
- Surface maintenance and installation of appropriate sediment controls and drainage is required on the dirt road that runs beside Montreal Goldfields office to the lake edge. There is also a disused vehicle track adjacent the lake edge that is badly eroding and requires revegetation (Figures 2, 6 and 7).
- While Scenic Forest Way is a long stretch of unsealed road that eventually drains to Black Lagoon, sealing of the road is likely inconsistent with the character and unnecessary while ever the road surface is maintained in good condition and with appropriate sediment controls. However, there is one log bridge over a gully of the lagoon where road base and sediment are readily contributed to the lagoon (Figures 3 and 7). Consideration should be given to replacing the bridge with box culverts and sealing of this low-lying section of the road.
- The former vehicle turning circle at the end of Fairhaven Point Way (now excluded from vehicles) has an eroding surface with sediment washing directly into the lake (Figure 4). This area should be revegetated. Likewise the as-hoc boat launching ramp at the same location is a source of direct sediment wash-off to the lake (Figure 5). Consideration should be given to a strategy to minimise the impacts of this area.

## Timeframe and Responsible Organisations

This management response will be coordinated by BVSC. Some areas of land are also under the management of ESC, Merrimans LALC and Forestry Corporation of NSW. Treatment of higher priority areas will take place over the medium term, with straight-forward sites to be prioritised in the short term.

## Cost and Achievability Rating

Costs to rehabilitate eroding sites that are not active vehicle tracks are estimated at between \$10,000 and \$20,000. Subject to decisions regarding future function and usage of foreshore roads (such as Aqua Marine Circuit at Beauty Point), management costs could be as little as nothing (if the decision is to maintain status quo) or as much as \$50,000 to convert the tracks to high-value walking trails and revegetate/rehabilitate the areas.

### Priority Rating

This management action has a *Low* priority rating.

### Implementation Progress Measures

1. Sites prioritised, plans developed and community consultation completed;
2. High priority sites closed and rehabilitated or improved;
3. All remaining identified tracks/roads rehabilitated or improved.

### Estuary Threats/Opportunities Addressed

This management action is targeted specifically at addressing "*Threat 5: Catchment Runoff and Urban Pollutants*" within the Wallaga Lake Coastal Management Program. The works will improve a number of values for the lake and catchment including water quality and ecosystems.

### Areas of Lake Addressed

This management action is relevant to the foreshore and lower catchment areas within the developed northern and eastern foreshore areas.



**Management Action Title:** Bank stabilisation, implementation of grazing exclusion zone and riparian zone restoration

**Management Action ID:** R6.1

**Date:** June 2024

## Description of Management Action

### Background

Extensive areas of riparian foreshore are (or have previously been) grazed to the water's edge by cattle, resulting in degraded banks and increased sediment loads to rivers/lake at some locations, while at other sites it has simply prevented the establishment of native fringing vegetation communities (including both terrestrial and intertidal/high stand wetland species). This has been recorded during site inspections along banks of Meads Bay, Narira and Dignams Creeks, and the areas where these creeks join the main body of the lake.

### Overview

While there are substantial stretches of tributary/estuary bank that are impacted by cattle grazing to the water's edge and are suffering from undercutting, slumping and erosion, as most of these areas are on private land, extensive foreshore rehabilitation in the short term is likely over-ambitious. Instead, a more achievable initial management action will include both design and implementation of a pilot project with at least one landowner on each of the Narira and Dignams creek tributaries.

The project would include elements of cattle exclusion, riparian revegetation and bank stabilisation works. The focus will be on identifying and demonstrating an approach that is suitable to the local conditions, scalable to larger areas and achieves successful outcomes with regards to both landowner and estuarine health objectives.

In the longer term the learnings from the pilot would inform and underpin larger scale riparian rehabilitation works for the estuary, and the success of the pilot would also be used to gain momentum with other landowners which is currently lacking. The learnings and support of the pilot project will be leveraged to identify additional sites and funding opportunities for expansion of the work within the longer term implementation of the CMP.

### Timeframe and Responsible Organisations

This management action will largely be led by BVSC and LLS and would be supported by Crown Lands and DPI Fisheries. Education and engagement initiatives with land owners will also take place within R10.2. The aim will be to complete a pilot project on both tributaries within short to medium term, subject to identification of suitable sites and securing of funding.

## Bank stabilisation, grazing exclusion and riparian restoration

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### Cost

Costs for pilot projects will largely depend on the specific sites selected and the individual requirements, nevertheless it is expected that between \$10,000 and \$20,000 in materials should be spent on each site to demonstrate positive improvements. Implementation will also require investment of BVSC and LLS staff time, as well as land-owner time in addition to this.

Over the longer term a further \$300,000 - \$350,000 would be required for rehabilitation of mapped stretches of estuary foreshore with bank erosion issues (assuming a target rehabilitation of 50% of mapped areas (approximately 10 km of eroded bank was mapped in total) within the longer term 10 year implementation period of the CMP.

### Priority Rating

This management action has a *medium* priority rating.

### Implementation Progress Measures

1. Site/s for pilot program identified, and landowner support confirmed;
2. Pilot project operational.
3. Ongoing riparian restoration works active

### Estuary Threats Addressed

This management response is targeted specifically at addressing "*Threat 6: Degradation of Foreshore Areas and Tributary Banks*" in the Wallaga Lake Coastal Management Program.

### Areas of Lake Addressed

This work is relevant to the immediate foreshore/riparian areas on the Dignams and Narira Creeks.



## Bank stabilisation, grazing exclusion and riparian restoration



Figure 1: Zones of Bank Erosion/Slumping, Dignams Creek Estuary Branch



## Bank stabilisation, grazing exclusion and riparian restoration



Figure 2: Zones of Bank Erosion/Slumping, Narira Creek Estuary Branch



## Bank stabilisation, grazing exclusion and riparian restoration



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<b>Management Action Title:</b>	Adaptation Planning for Low-Lying Assets
<b>Management Action ID:</b>	R7.1
<b>Date:</b>	June 2024

## Description of Management Action

### Background

Tidal inundation will progressively become an issue that impacts TECs and built assets around the foreshore of the lake and coastal inundation will impact low-lying built assets on the eastern foreshore of the lake. Furthermore, the current trigger level for artificially opening the entrance of the lake is at 1.25 m AHD, and the Wallaga Lake Entrance Management Policy identifies a goal to increase this level commensurate with sea level rise. In time various foreshore areas and assets will require managed adaptation from coastal hazards to ensure ongoing functionality.

If not well planned, tidal inundation and inundation from high lake water levels when the entrance is closed, could result in squeeze on land areas available for natural buffers and ecosystem services, and also further impact recreational infrastructure and other built assets. There could also be missed opportunities to ensure that environmental conservation is prioritised as part of an integrated adaptation plan for this area.

Appendix A contains the surveyed levels of many assets around the lake, illustrated relative to the current trigger level of 1.25 m AHD. This identifies that there are a number of assets that are impacted by inundation even at the current entrance opening trigger level.

### Overview

Based on the survey work undertaken during the development of the Entrance Management Policy (Appendix A), prioritisation is required for low-lying assets that need to be adapted to higher lake water levels. Information obtained from R1.1 (investigation of trigger level sustainability) can subsequently be used to inform the timing within a plan/strategy to adapt the assets. This strategy is expected to include items such as:

- modifications to existing asset management plans (for assets such as boat ramps)
- new actions for a future update of the CMP
- modifications and new Plans of Management for private and public areas/infrastructure (such as holiday parks).

Future adaptation actions should identify and include opportunities for foreshore land to be taken up as fringing habitat zones wherever possible. This is particularly relevant for foreshore roads, reserves and holiday parks.

### Timeframe and Responsible Organisations

This management action will largely be undertaken by BVSC. The evaluation and adaptation planning is expected to be completed within the short term timeframe.

## Cost

Costs to undertake an initial prioritisation of assets is very low (existing Council officer time). Developing an adaptation plan for relevant assets will depend on the specific assets and the extent of specialist advice and community engagement required. Nevertheless, is expected to be within the range of \$50,000 to \$100,000 (assuming a blend of recreational assets such as boat ramps, transport assets such as foreshore roads and the MR272 causeway, and holiday park assets).

## Priority Rating

This management action has a *medium* priority rating.

## Implementation Progress Measures

1. Prioritisation of assets completed;
2. Adaptation planning for BVSC managed assets completed.

## Estuary Threats Addressed

This management response is targeted specifically at addressing "*Threat 7: Coastal Hazards*" in the Wallaga Lake Coastal Management Program.

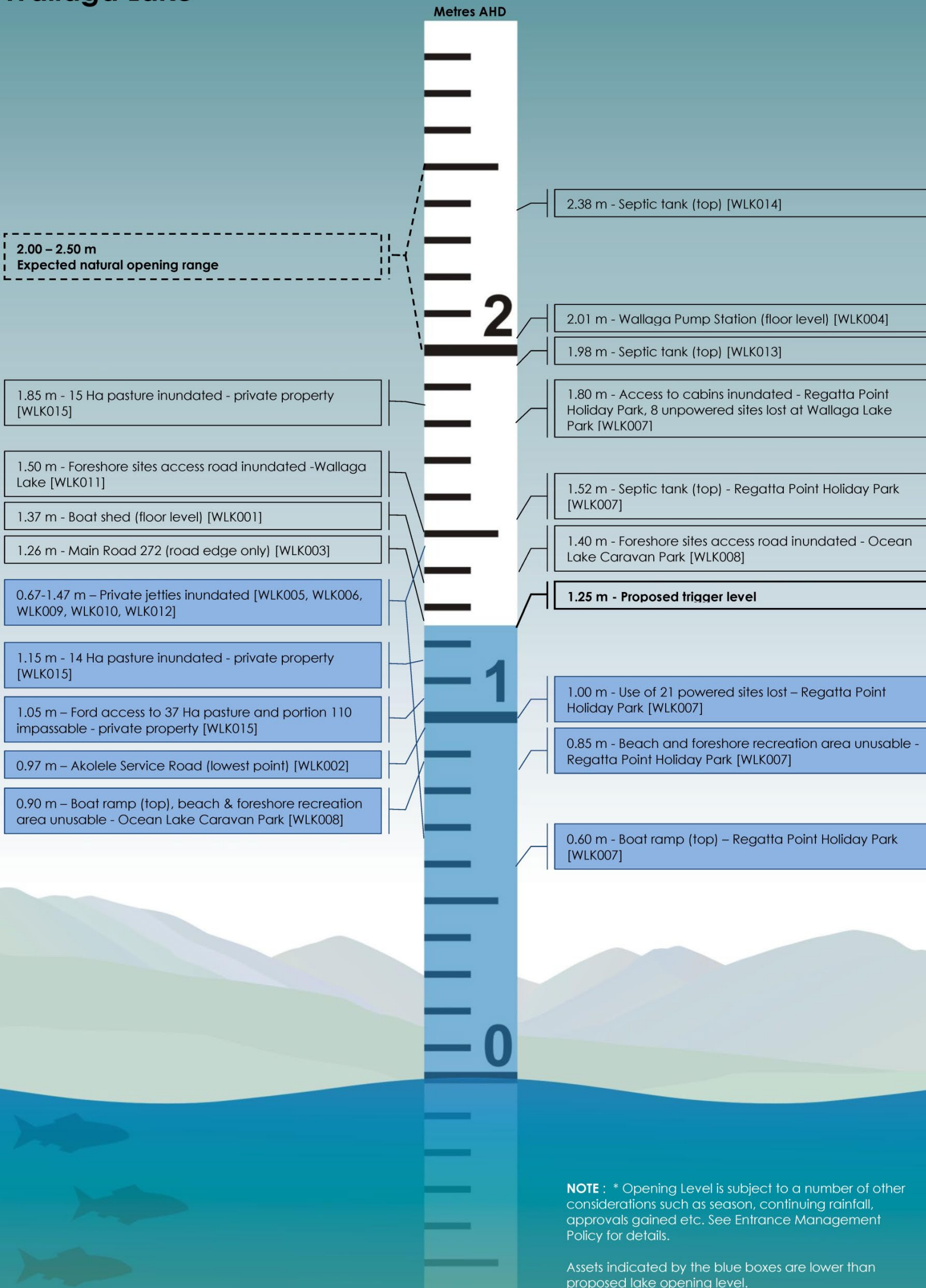
## Areas of Lake Addressed

This work is relevant to low-lying foreshore areas around the fringes of the complete lake.

## **Appendix A: Elevations of Assets in Lake Foreshore Areas**



# Wallaga Lake



Metres AHD

2.00 – 2.50 m  
Expected natural opening range

2.38 m - Septic tank (top) [WLK014]

2.01 m - Wallaga Pump Station (floor level) [WLK004]

1.98 m - Septic tank (top) [WLK013]

1.85 m - 15 Ha pasture inundated - private property [WLK015]

1.80 m - Access to cabins inundated - Regatta Point Holiday Park, 8 unpowered sites lost at Wallaga Lake Park [WLK007]

1.50 m - Foreshore sites access road inundated - Wallaga Lake [WLK011]

1.52 m - Septic tank (top) - Regatta Point Holiday Park [WLK007]

1.37 m - Boat shed (floor level) [WLK001]

1.40 m - Foreshore sites access road inundated - Ocean Lake Caravan Park [WLK008]

1.26 m - Main Road 272 (road edge only) [WLK003]

1.25 m - Proposed trigger level

0.67-1.47 m - Private jetties inundated [WLK005, WLK006, WLK009, WLK010, WLK012]

1.15 m - 14 Ha pasture inundated - private property [WLK015]

1.00 m - Use of 21 powered sites lost - Regatta Point Holiday Park [WLK007]

1.05 m - Ford access to 37 Ha pasture and portion 110 impassable - private property [WLK015]

0.85 m - Beach and foreshore recreation area unusable - Regatta Point Holiday Park [WLK007]

0.97 m - Akolele Service Road (lowest point) [WLK002]

0.90 m - Boat ramp (top), beach & foreshore recreation area unusable - Ocean Lake Caravan Park [WLK008]

0.60 m - Boat ramp (top) - Regatta Point Holiday Park [WLK007]

**NOTE :** \* Opening Level is subject to a number of other considerations such as season, continuing rainfall, approvals gained etc. See Entrance Management Policy for details.

Assets indicated by the blue boxes are lower than proposed lake opening level.

**Management Action Title:** Investigation to quantify changes to Narira Creek delta and impacts on estuary

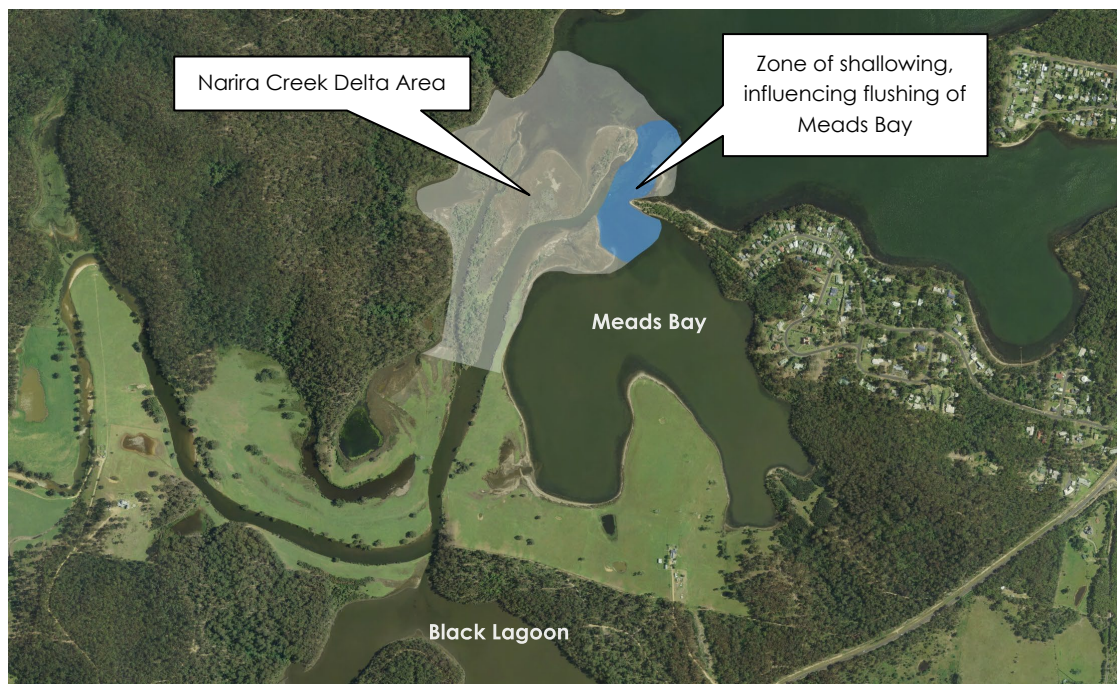
**Management Action ID:** R8.2

**Date:** June 2024

## Description of Management Action

### Background

The Narira Creek fluvial delta at the entrance to Mead's Bay has anecdotally been accreting at an accelerated rate. This zone of the lake is a depositional point for catchment derived sediment that moves down the catchment during floods. Due to the layout of the lake, the growth of this fluvial delta both in planform area and localized shallowing of the lake depth has the potential to significantly alter the hydraulic function and hydrodynamics of both Meads Bay and Black Lagoon. This issue was previously identified in the Wallaga Lake Estuary Management Plan (2000), and remains a relevant concern, as raised by stakeholders during the preparation of this CMP.



**Figure 1: Location of Narira Creek delta, Meads Bay and Black Lagoon**

### Overview

An investigation is required to document the current condition/state of the delta area for quantitative comparison with both previous and future states. The investigation would principally comprise:

- collection of new bathymetry data (potentially also collected as part of R2.2);
- collection of new topography data;
- collection of high-resolution aerial photography;
- digitisation of features from historical aerial imagery;
- analysis of changes in plan form morphology, topography and bathymetry where possible.

Subject to the findings of the investigation, ongoing work could investigate impacts of changes on flushing and water quality of Meads Bay and Black Lagoon.

The outcomes from the investigation would provide quantitative information to enable understanding of the impacts of sedimentation of the delta, and whether any active intervention is required in order to maintain the hydrodynamic processes for Meads Bay in particular.

### **Timeframe and Responsible Organisations**

This management action will be coordinated by BVSC and will require a consultant to undertake the data collection and analysis. The assessment will take approximately 6 months to complete and will be undertaken within the short term implementation period.

### **Cost**

Costs for a consultant to undertake the field data collection and provide analysis of the results will be \$30,000 - \$50,000. Detailed numerical modelling of the impacts of delta growth on hydrodynamics of Meads Bay would require additional funding, and may or may not be required subject to the findings of the initial analysis.

### **Priority Rating**

This action has a *high* priority.

### **Implementation Progress Measures**

1. Funding and consultant procured to complete assessment;
2. Analysis of bathymetric changes completed.

### **Estuary Threats Addressed**

This management response is targeted specifically at addressing "*Threat 8: Structure and Function of Lake and Catchment*" in the Wallaga Lake Coastal Management Program.

### **Areas of Lake Addressed**

This action is relevant to Meads Bay, with a focus on the mouth of the bay at the Narira Creek Delta.