



WALLIS LAKE

Estuary and Catchment Management Plan

SUMMARY DOCUMENT



Great Lakes
COUNCIL

This review of the Wallis Lake Estuary Plan (2005) and Wallis Lake Catchment Plan (2003) was produced with financial assistance from the NSW Government through the Office of Environment and Heritage and Great Lakes Council's Environmental Special Rate. This document does not necessarily represent the opinions of the NSW Government or the Office of Environment and Heritage.

Great Lakes Council 2014
Wallis Lake Estuary and Catchment Management Plan

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LIST OF ACRONYMS

AWTS	Aerated Wastewater Treatment System
E&CMP	Estuary and Catchment Management Plan
CAP	Catchment Action Plan
CMP	Catchment Management Plan 2003
CW	Community Wellbeing
DCP	Development Control Plan
DPI	NSW Department of Primary Industry
EH	Ecosystem Health
EMP	Estuary Management Plan 2005
ESR	Environmental Special Rate
GDE	Groundwater Dependent Ecosystem
GLC	Great Lakes Council
GLCG	Great Lakes Catchment Group
GLUG	Great Lakes Underwater Group
GSC	Gloucester Shire Council
GTCC	Greater Taree City Council
Hunter LLS	Hunter Local Land Services, formally Hunter-Central Rivers Catchment Management Authority (HCR CMA)
LEP	Local Environmental Plan
LGA	Local Government Area
MCW	MidCoast Water
NPWS	National Parks and Wildlife Service
NRM	Natural Resource Management
OEH	NSW Office of Environment and Heritage
OSMS	Onsite Sewage Management Strategy
SECEMS	Sediment Erosion Control Environmental Management System
SEPP	State Environmental Planning Policy
WQ	Water Quality
WQIP	Water Quality Improvement Plan
WSLCEC	Wallis and Smith Lakes Coast and Estuary Committee
WSUD	Water Sensitive Urban Design

EXECUTIVE SUMMARY

Wallis Lake and Catchment

Wallis Lake, on NSW's mid-north coast is unique in terms of the varied ecosystems represented in both its waterways and Catchment, as well as being the basis of a state-significant fishing, aquaculture and tourism industry.

Plan Review and Development

This Estuary and Catchment Management Plan (E&CMP) for Wallis Lake has been developed through an extensive review of the existing Wallis Lake Estuary Management Plan (EMP) (2005) and Wallis Lake Catchment Management Plan (CMP) (2003) as well as lengthy internal and external stakeholder engagement. The Great Lakes Water Quality Improvement Plan: Wallis, Smith and Myall Lakes (WQIP) developed in 2009 and subsequent research and management projects have provided the scientific information that underpins this new Management Plan.

A Vision of

Community, business and government working together for a healthy, productive and naturally beautiful Wallis Lake and Catchment now and into the future

as well as supporting Values and Principles have been developed through consultation with key stakeholders.

Community and Stakeholder Consultation

The development and implementation of the Wallis Lake E&CMP has a large number of both direct and indirect stakeholders; from those agencies and industry bodies with direct actions to implement under the plan, to the wider community who rely on the services the Lake and Catchment provides.

A key focus of stakeholder consultation was through engagement of the Wallis and Smiths Lake Coast and Estuary Committee (WSLCEC) and the Great Lakes Catchment Management Group (GLCMG). These two groups oversee and provide stakeholder input and advice to agencies on issues of management in their respective areas. Membership of these two groups is drawn from representatives from industry groups, state agencies, local government, community groups and community members within the committee's area of jurisdiction.

Providing input on the implementation of this plan is within both Committee and Groups' scope and as key agency and industry stakeholders are represented on one or both of these, they represent an important



vehicle for effective and efficient agency, industry and community engagement. Given this is a review of two existing plans, community engagement focused on working intensively with these committees. This involved:

- Facilitated workshops with the WSLCEC and GLCMG throughout 2012 and 2013 to develop the shared Vision and Values and review the threats to the catchment and estuary
- Review and update actions from existing Management Plans
- Identify new actions to address emerging threats
- Review of principles in the Plan
- Review of dredging strategy
- Face to face meetings with stakeholders involved in delivering actions to assess progress and identify new ideas that will address emerging threats

The wider general community has also been consulted through:

- Online survey hosted on Great Lakes Council's website
- Face-to-face engagement of community members through public stalls at community events and markets
- Media releases and radio interviews
- Survey of landholders in the sustainable farming program to determine emerging issues
- Independent review of the sustainable farming program to assess effectiveness of the program and determine a way forward for engagement
- Public exhibition of draft Plan

Review of Previous Plans and Lessons Learnt

The implementation of both the Wallis Lake's CMP and EMP has been responsible for delivering significant project outcomes within their target areas.

The Wallis Lake CMP (2003) provided a vision for the future of this significant and sensitive Catchment. The Catchment Plan was a direct response to the 1997 oyster Hepatitis A event that so clearly showcased the social and economic consequences of ecological impairment.

The delivery of actions in the Plan has had a direct positive influence on the health of Wallis Lake and

its Catchment. It has delivered significant long term environmental benefits and enhanced community understanding of environmental risks and threats including their management and remediation. The CMP has delivered rural Natural Resource Management (NRM) projects that have permanently conserved important native vegetation through private conservation instruments; protected riparian zones from stock through exclusion fencing and off-stream watering; stabilised actively-eroding areas; revegetated cleared landscapes; and facilitated weed control activities.

Implementation of the CMP has assisted in building the capacity of rural landholders in the Catchment to undertake NRM projects, sustainable land management and best management practices. Further, priority wetlands in the Wallis Lake Catchment have been secured in public conservation ownership and management, allowing the ecosystem services functions of such landscapes to be secured. The project achievements have been delivered in partnership with key associates, including the Hunter-Central Rivers Catchment Management Authority, local government and the rural Catchment community, as well as the support of external funding providers.

In 2005, the Wallis Lake EMP was adopted as the guiding document for the management of Wallis Lake. There has been considerable progress made towards implementing actions in the Plan, and these have delivered major improvements to the condition and quality of management of the Wallis Lake environment. To date, of the 143 listed actions within the Wallis Lake Estuary Management Plan, over 80% have been completed, commenced or are ongoing.

The diversity and breadth of works undertaken within the Wallis Lake Estuary and Catchment in response to these two previous Plans is extensive. Repairing roads, purchasing wetlands, urban retrofitting, land-use planning tools, and a wide-variety of community engagement programs all interact and contribute towards improving Water Quality, Ecosystem Health and Community Wellbeing within the Wallis Lake Estuary and Catchment. The development of this Wallis Lake Estuary and Catchment Management Plan (2014) has utilised the lessons learnt from these plans and supporting projects, to continue to deliver improvements to the condition and quality of management of the Wallis Lake environment.

Management Actions

The Wallis Lake Estuary and Catchment Management Plan has been developed to provide an integrated management strategy for both the estuary system and the broader land catchment area. From the earliest stages of the development of the Plan, it was recognised that these two sections of the Catchment could not be considered in isolation. The health of the Lake and Estuary is fundamentally linked to the health of the entire Catchment.

To achieve the vision of community, business and government working together for a healthy, productive and naturally beautiful Wallis Lake and Catchment, both now and into the future, a series of objectives (see below) has been developed. These objectives are underpinned by a detailed set of actions linked to stakeholder(s) responsible for their implementation. For ease of use, these objectives have been divided into themed management areas labelled: Water Quality, Ecosystem Health, and Community Wellbeing. Although treated separately in the Action Plans, it is acknowledged that these management areas exist in a complex system of humans interacting with nature where working towards one objective will have a multitude of outcomes.

Water Quality (WQ)

WQ1	Identify and reduce negative impacts on groundwater quality and quantity
WQ2	Reduce the impact of rural land use on water quality
WQ3	Reduce and repair foreshore erosion from water-based activities
WQ4	Reduce the rates of soil erosion and sedimentation from unsealed roads, road construction and maintenance, and construction sites
WQ5	Reduce sediment, acid sulfate soils, chemicals and nutrient loads to waterways from urban areas
WQ6	Reduce the risk of septic waste entering the Wallis Lake Estuary
WQ7	Reduce the impacts of gross pollutants entering waterways

Ecosystem Health (EH)

EH1	Protect and improve biodiversity, particularly threatened species, populations and ecological communities
EH2	Maintain and improve areas of locally significant native vegetation as well as linkages between key habitat nodes
EH3	Maintain environmental flows, and improve where necessary to reduce the impact of barriers to fish passage
EH4	Reduce the presence and impact of invasive species on terrestrial and aquatic environments
EH5	Maintain and improve riparian vegetation
EH6	Monitor and protect aquatic vegetation including seagrass and sponges
EH7	Maintain and improve wetlands in the Catchment
EH8	Address the threats to local ecosystems arising from climate change and associated sea level rise

Community Wellbeing (CW)

CW1	Manage recreational fishing, commercial fishing and oyster production for economic and ecological sustainability
CW2	Protect the aesthetic and cultural values of Wallis Lake and its Catchment
CW3	Facilitate safe and sustainable waterway usage of the Wallis Lake Estuary

Implementation

It is recognised that this Plan will be implemented in an environment dictated by potentially conflicting priorities of agencies and landholders within the Catchment. Successful implementation of these actions will be dependent upon a well-designed decision process aligning actions with stakeholder priorities along with available funding opportunities.

As the agency responsible for over 60% of the Wallis Lake Catchment, as well as having the bulk of its population and industry centred within this Catchment, Great Lakes Council has been the agency primarily responsible for developing this Plan. With this in mind, the Wallis Lake Estuary and Catchment Management Plan is guided by Great Lakes Council's Community Strategic Plan (GLC, 2012); in particular Key Direction 1: Embracing and Protecting our Natural Environment. This Strategic Plan, known as Great Lakes 2030, sets out the strategic direction of Great Lakes Council, and is based on the concerns and priorities of the local community.

The Wallis Lake Estuary and Catchment Management Plan will be used to inform Council's four-year Delivery Program and one-year Operational Plans with regard to management actions within the target area. These more specific plans detail how Council intends to deliver on the community's expectations.

It is worth noting that there is some overlap of the recommended management actions within a number of local NRM Plans, in particular the WQIP (2009), Wallis Lake Wetland Strategy (2010), the Tops to Lakes Initiative (2012) as well as a number of smaller-scale site specific documents such as local Rivercare Plans (GLC, 2003a).

Externally, the key document influencing the Wallis Lake E&CMP is the Catchment Action Plan (CAP) of the Hunter Local Land Services. The CAP is a broad-scale plan, intended to guide the management of the 36,500 km² of diverse landscapes within the Hunter area. The Action Plans developed to address the objectives identified in this Wallis Lake E&CMP are both influenced and supported by the Goals and Targets defined in the Hunter-Central Rivers Catchment Action Plan 2013-2023.

A summary of other stakeholder agency plans relevant to the implementation of this document is included as Appendix D.

Governance

The implementation of this Plan is a shared responsibility amongst stakeholders and relies on the participation and agreement of all levels of government and the community. The key agency stakeholders involved in this Plan's implementation include:

- Great Lakes and Greater Taree Councils
- Hunter Local Land Services
- Midcoast Water
- National Parks and Wildlife
- Forestry Corporation
- Department of Primary Industries (Agriculture and Fisheries)
- Roads and Maritime Services
- NSW Trade and Investment (Crown Lands)

All of these key agencies are represented on either the Wallis and Smith Lakes Coastal Estuary Committee or the Great Lakes Catchment Group. Rather than forming a specific committee to oversee the implementation of this Plan, these two committees will operate as the medium for overseeing their respective management areas in this Plan.

Monitoring

For the purposes of the Wallis Lake Estuary and Catchment, there are two levels at which the Wallis Lake E&CMP can and should be assessed; namely the achievement of management and ecological targets.

Measures for monitoring management targets are divided into Primary Performance Measures, Secondary Performance Measures and Secondary Performance Measures (Strategic Outputs). Achievement of these targets will primarily be reported on at the individual project level (eg. as part of project funding requirements), but may also be used as a surrogate where direct ecological targets are difficult to assess. Ecological targets, on the other hand, are a measure of the effectiveness of the completed actions; for instance Turbidity or

Chlorophyll A levels recorded in the Lake and Estuary as indicators of the success of management actions to improve water quality.

A Monitoring Plan has been developed to identify the data on ecological indicators that needs to be collected to evaluate the effectiveness of the Wallis Lake E&CMP (Appendix E). This Plan contains actions that have been identified in: existing Action Plans or which already occur; research projects previously undertaken (to provide baseline data on ecological indicators); as well as those actions that have been identified to address knowledge gaps on existing estuary and catchment processes. These monitoring actions which address specific knowledge gaps (and are not identified in the individual Action Plans in Section 3) are summarised in the Monitoring Action Plan (Section 4.3).

Reporting

Reporting is an essential part of the Wallis Lake E&CMP implementation process which adds accountability to ensure agreed actions are undertaken by the responsible agencies, and that these actions are achieving desired results.

Reporting for this project is based on the stakeholder engagement model used for developing it, and as such, reporting is undertaken at three levels:

- Reporting internally to GLC
- Reporting to key stakeholders through the WSLCEC and GLCG committees
- Reporting to the community of the Wallis Lake Estuary and Catchment

The annual Waterway and Catchment Report Card and 4-yearly State of the Environment Report (SoE) will be key cornerstones of this reporting process.

Plan Review

An 8-year full review is proposed for the Wallis Lake E&CMP. This 8-year full review cycle will be supported by a 4-year partial review of the Action and Monitoring Plans. The trigger for this review will be the legislative requirement for all NSW Councils to develop a detailed SoE every four years. The next detailed SoE Report for Great Lakes Council will be in 2016.

There is a large degree of uncertainty surrounding protection and management of the Wallis Lake Estuary and Catchment—a large social-ecological system, managed by multiple parties for multiple uses. There is also constant change in our knowledge about complex natural systems which themselves are dynamic, and this means that our management of the Estuary and Catchment needs to be flexible and able to evolve.

The intent of this plan is to manage uncertainty by utilising planned management actions (Chapter 3) and subsequent monitoring data (Chapter 4.3) to test hypotheses, build understanding of ecosystem dynamics and inform future management decisions. It is a structured cyclical process of learning from doing (Stankey and Allen, 2009), where learning is used to improve the next stage of management (Bormann et al, 1993).



VALUES

People in our community value Wallis Lake and its Catchment for many reasons, including the beauty of the area, the biodiversity, its productivity and economic values for local businesses, and the lifestyle that living here provides.

Threats

Following are the key issues threatening the attributes of Wallis Lake and its Catchment that the community most highly value. These threats primarily come about through the ways in which people historically, and continually, undertake various land uses and activities in the area.

- Elevated sediment and nutrient levels in waterways
- Other waterway pollutants (including litter, pathogens, chemical and oil spills and leachate)
- Loss of ecosystem function and associated services
- Detrimental soil and ground cover management
- Invasive species incursion into terrestrial and aquatic systems
- Climate change and associated sea-level rise
- Impacts of acid leachate from acid sulfate soils
- Increasing human population and development pressures
- Land and waterway use impacting on natural systems

The intent of this Plan is to assist all stakeholders in dealing with these issues and protecting—and restoring—what is valued.

Principles

The ecological health of Wallis Lake Estuary and its Catchment are to be maintained and improved in line with the following principles:

- The ecological needs of the Estuary and Catchment are to be met whilst balancing aesthetic, commercial, recreational and cultural uses
- Significant Aboriginal and European cultural heritage is to be protected
- People are to be informed and empowered to work together for a healthy Catchment and a strong, healthy community
- The management of the Estuary and Catchment is to be based on the precautionary principle, and aim to maintain and improve the resilience of natural systems
- The management of the Estuary and Catchment is to be best practice, adaptive and based on the best available scientific information
- Knowledge gaps are to be identified and addressed to continuously improve management of Wallis Lake and its Catchment

These Values, Threats, Principles and Vision were developed during 2012 and 2013 in consultation with the Wallis and Smiths Lake Coast and Estuary Committee (WSLCEC) and the Great Lakes Catchment Group (GLCG) to guide the review and subsequent development of this new Wallis Lake Estuary and Catchment Management Plan (E&CMP).

VISION

Community, business and government working together for a healthy, productive and naturally beautiful Wallis Lake and Catchment both now and into the future

ABOUT THE PLAN

This summary document provides an overview of the priority management and monitoring actions identified in the new Wallis Lake Estuary and Catchment Management Plan (E&CMP). A brief outline of the Wallis Lake E&CMP is provided below.

The E&CMP for Wallis Lake has been developed through an extensive review of the existing Wallis Lake Estuary Plan (2005) and Wallis Lake Catchment Plan (2003) as well as lengthy internal and external stakeholder engagement. At its heart, it provides recommended management actions to support the Vision developed for the Estuary and Catchment.

The plan has been developed for agency managers, to assist in the prioritisation, funding and implementation of key management actions for the benefit of Wallis Lake Estuary and Catchment, as well as to provide guidance and further information for stakeholders and affected community members on intended actions within the target area.

For ease of use, the complete Wallis Lake E&CMP is separated into 4 sections, and can be read as a cohesive document, or individual sections can be utilised by managers to support management decisions:

Table 1. Layout of Wallis Lake E&CMP

Section 1 provides background and context for this document, summarising the current state of the Estuary and Catchment.

Section 2 details the methodology undertaken for the review of the Wallis Lake Catchment Management Plan (GLC, 2003) and the Wallis Lake Estuary Management Plan (GLC, 2005) and the subsequent development of this current Plan, as well as investigating the lessons learnt during the ten-year period since the development of the initial Catchment Management Plan.

Section 3 details the management actions developed by those organisations responsible for managing the Estuary and Catchment to ensure that the Vision set for the Estuary and Catchment continues to be upheld.

Section 4 outlines how this plan will be implemented to ensure actions are undertaken and that the outcomes from these actions are monitored and will serve to inform subsequent review and adjustment of the Plan over time.



WATER QUALITY MANAGEMENT ACTIONS

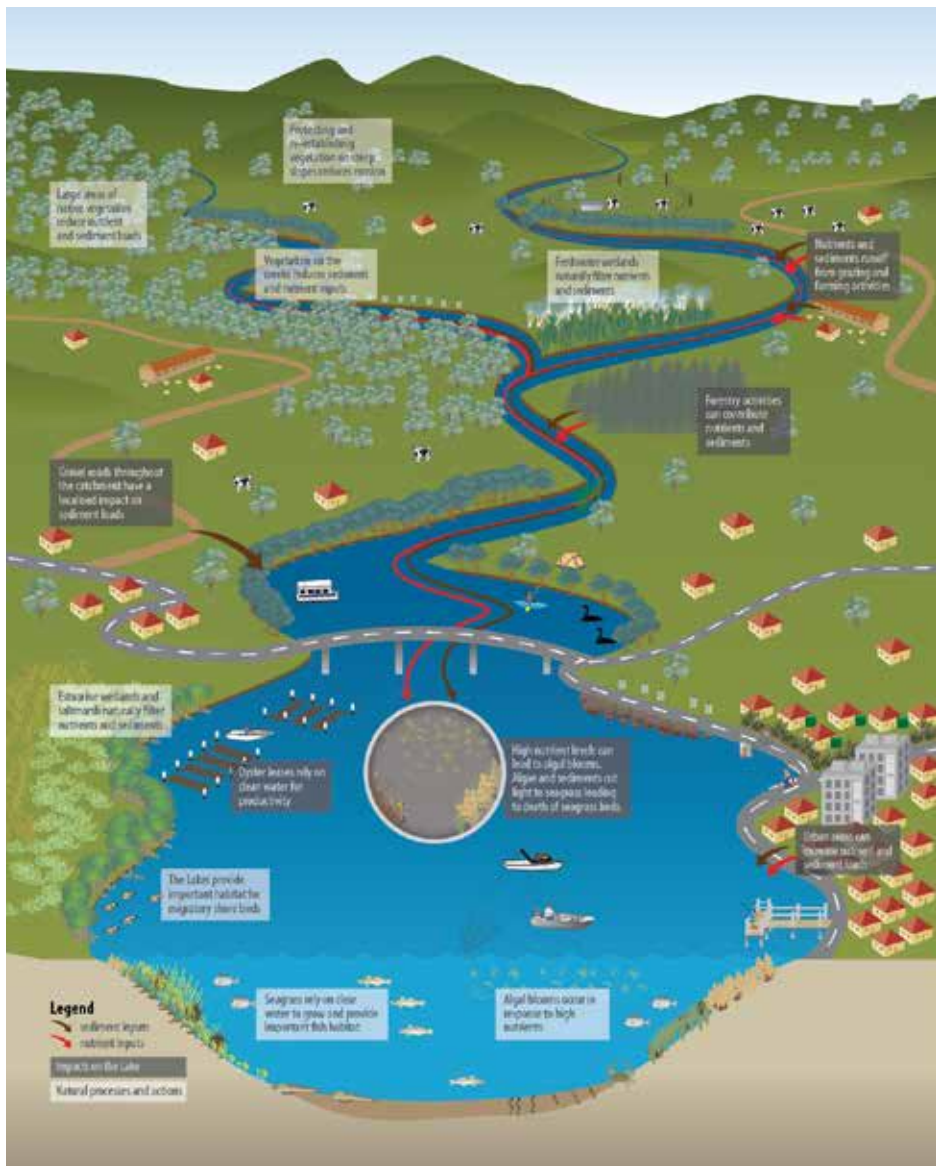
The suitability of water quality for desired uses has long been recognised as an important issue in Wallis Lake and its waterways. The hepatitis outbreak in 1997 and the toxic blue-green algal bloom in nearby Myall Lakes in 1999 brought the issue of water quality pollution into the public arena, specifically highlighting the impacts that sediments, nutrients and faecal coliforms can have on the suitability of lake waters (WQIP, 2009). Figure 7 below summarises many of the potential stressors on water quality experienced within the Wallis Lake Catchment.

In 2009 the Great Lakes Water Quality Improvement Plan (Wallis, Smith and Myall Lakes) was developed to identify ways to reduce the impacts of sediments, nutrients and faecal coliforms on the Estuary. The

primary sources of these pollutants are from varying broad scale human activities in catchments. That is, they are non-point source or diffuse pollutants.

With this in mind, the objectives and accompanying actions below address the varied impacts of human use on water quality from both land-based (catchment) and water-based activities. These objectives also clearly highlight the interconnectedness of catchment health, estuary health, and the wellbeing of the community: Healthy catchments lead to healthy waterways (Abal, Bunn & Dennison (2005).

Key indicators of water quality within the Estuary are algal growth, as measured by using chlorophyll A levels in the water, and sediment inputs by measuring turbidity (see sidebox).



Further information on water pollution and estuary and catchment processes can be found in the WQIP (GLC, 2009) and the annual Waterway and Catchment Report Card for Wallis, Smiths and Myall Lakes (GLC, 2013).

Algae

Algae or microscopic plants are always present in waterways but if conditions change and are suited to algal growth, blooms can occur. Blooms may occur if there are a lot of nutrients in the water which can come from urban stormwater, fertiliser runoff from farms and gardens and seepage from septic tanks. Algal blooms can reduce the amount of light reaching seagrass beds limiting their growth. When blooms of algae die and start to decay, the resulting bacterial activity can reduce oxygen concentrations in the water column, possibly leading to fish kills. Chlorophyll is a good measure of the amount of algae in the water as all algae have chlorophyll in their cells giving them their green colour.

Chlorophyll A

Chlorophyll A is a pigment found in plants and is an essential molecule for the process of photosynthesis (the conversion of light energy to chemical energy resulting in the consumption of carbon dioxide and the production of oxygen and sugars). In estuarine and marine waterways, chlorophyll A is present in phytoplankton such as cyanobacteria, diatoms and dinoflagellates. Because chlorophyll A occurs in all phytoplankton it is commonly used as a measure of phytoplankton biomass.



Sediment

Sediment from the land can be washed into waterways when it rains. If land is not properly managed with trees and groundcover, large amounts of sediment can wash into our waterways. Sediment also comes from roads and pathways washing directly into the stormwater and then the estuaries.

Too much sediment in the water reduces the amount of light reaching the bottom and is detrimental to seagrass which require light for growth. Seagrass is critical for the health of estuaries as it provides essential habitat for fish and invertebrates which support bird life and subsequently influence the local tourism and aquaculture industries. Excess amounts of suspended particles can also smother benthic organisms like sponges and seagrass, irritate the gills of fish and transport contaminants. Turbidity provides a measure of sediment in the water.

Turbidity

Turbidity is the measure of light scattering by suspended particles in the water column, providing an indication of water clarity.



WQ1

Identify and reduce negative impacts on groundwater quality and quantity

Original objective/s	State-wide target/s addressed	HCR CAP Goals addressed
EMP: W CMP: G	6	Goal 5, Target 4.

Proposed actions		Responsibility
WQ1.1	Develop and enact Minimbah Aquifer Management Plan	MCW GLC NoW
WQ1.2	Implement the new Drinking Water Catchment Clause in the Great Lakes Standard Local Environmental Plan (LEP) as it pertains to groundwater	GLC
WQ1.3	Identify and map groundwater dependant ecosystems and potential impacts due to groundwater extraction, exfiltration and/or pollution	NoW GLC MCW
WQ1.4	Investigate the need for a Tuncurry Aquifer Management Plan, particularly in relation to groundwater quality impacting Duck Swamp and the Estuary as well as potential draw down impacting groundwater dependent ecosystems	GLC NoW
WQ1.5	Ensure any future or current developments comply with WQIP and do not adversely impact ground water resources and ground water dependent ecosystems through development assessment	GLC GTCC
WQ1.6	Continue to monitor landfill impacts (Tuncurry and Minimbah) on groundwater as per licence conditions and ensure management of landfill adopts best practice through an EMS	GLC

Objective notes

- NSW Office of Water (NoW) is the licensing and regulatory body for groundwater extraction and recharge
- Treated effluent from Hallidays Point sewage treatment plant is reused on North Tuncurry playing fields, golf course and cemetery, and exfiltrated into the dunal environment near the sewage treatment plant
- Seawater intrusion risk was assessed as part of the Review of Environmental Factors (REF) process for the Minimbah Aquifer. Salinity will be tested as part of ongoing water quality monitoring program. Sea level rise not considered a significant threat with regards to intrusion to the aquifer, as groundwater levels are currently several metres above sea level

Rain infiltrating surface soil may be drawn up by plants. Otherwise it continues to filter through the soil, topping up aquifers (underground supplies). Within the Wallis Lake Catchment people draw on this water for agricultural and domestic (rural and urban) use.

When this groundwater is depleted, either because too much is drawn off or because compacted impervious surfaces prevent water from penetrating, there are consequences for aquatic ecosystems (Turner et al, 2004). There is also the potential for activities near aquifers to contaminate or pollute this water (eg. run-off from landfills).

Anticipated outcomes

Minimbah aquifer managed for environmentally sustainable outcomes, and extraction and infiltration activities demonstrate best-practice management.

New developments will not cause any adverse impacts on drinking water quality and flows with specific regard to interception or lowering of the watertable, or any change in groundwater flow direction (Clause 7.2 (3)).

Groundwater dependent ecosystems mapped and assessed for risk.

Tuncurry aquifer managed for environmentally sustainable outcomes, and extraction activities demonstrate best-practice management. Improved groundwater quality.

Future and current developments do not adversely impact ground water resources.

Monitoring is regularly undertaken to ensure leachate from landfill is not entering adjacent aquifer.

Action notes

Completion of The Minimbah Aquifer Management Plan anticipated to be in 2014.

Ongoing regular monitoring of the aquifer occurs at: Minimbah aquifer, Tuncurry aquifer, Hallidays Point sewerage treatment plant.

Identification and protection of groundwater dependent ecosystems (GDEs) (through, for instance, establishing buffer zones around well recognised GDEs) is incorporated into NoW's Regional Groundwater Plans (currently under review).

Historic spear-point access to Tuncurry aquifer exists on properties within the Tuncurry area. Potential impact of extraction activities to be investigated, particularly during periods of drought and subsequent water restrictions.

"Aquifer interference activities" include landfills (past/present), mining, urban development and extraction industries such as coal seam gas.

NSW Office of Water (NoW) has developed Risk Assessment Guidelines for Groundwater Dependent Ecosystems.

Site testing currently undertaken at Tuncurry (and Minimbah when it becomes operational) landfill as per licence conditions. EMS development also for Transfer Stations.

WQ 2 Reduce the impact of rural land use on water quality

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: W, M, C	5, 9, 19, 11, 12	Goal 4, Targets 1, 2, 3
CMP: 4, 7, 8		Goal 5, Target 4, 5 Goal 8, 12, 15

Proposed actions		Responsibility
WQ2.1	<p>Work with landholders to build their capacity to undertake sustainable farming activities that improve groundcover and reduce direct cattle impacts on waterways including:</p> <ul style="list-style-type: none"> Establish stock exclusion riparian fencing, as well as off-stream watering and shade Identify and remediate priority soil erosion sites Undertake optimal soil nutrient management Improve infiltration rates and soil health through promoting beneficial pasture, soil and slope management 	GLC LLS GTCC
WQ2.2	<p>Review and update existing rural conservation and development strategies (including Great Lakes Rural Living Strategy, 2009a) to:</p> <ul style="list-style-type: none"> Set a conservation framework and guide development for future areas of growth, including identification and management of potential future intensification of rural land use Explore mechanisms for protecting and rehabilitating steep lands including, but not limited to, options for land use change Incorporate provisions from Mid North Coast Regional Strategy (DoP, 2009) 	GLC GTCC MCW LLS
WQ2.3	<p>Investigate methods to minimise fragmentation and increased land disturbance from rural subdivisions (eg. reduction in minimum lot size, requirement to fence off a stream if subdividing)</p>	GLC

Rural activities have the potential to generate excess amounts of nutrients and sediments. Some rural activities can expose soil to erosion, resulting in large amounts of sediment and attached nutrients that can be transported into waterways. Other activities (eg. Intensive farming, cattle access to streams, inappropriate fertiliser use), if

inappropriately managed, have the potential to generate an increased source of pollutants that can be washed off into drains, creeks and rivers. Sediments can also be eroded from stream banks and delivered to coastal lakes during runoff events (GLC, 2009).

Anticipated outcomes

Rural landholders in the Wallis Lake Catchment implement a 'whole of farm approach' to managing the impacts of their property on Catchment and Estuary water quality.

Impacts of intensification of rural land use on Catchment water quality such as intensive cattle and poultry farming, and extractive activities are proactively managed.

Steep lands within the Catchment are managed appropriately, and where possible remediated and protected into perpetuity.

Rural land is managed through the land use planning and assessment system to reduce disturbance and the impacts this has on water quality.

Rural land is managed through the land use planning and assessment system to reduce fragmentation and increased land disturbance and the impacts this has on water quality.

Action notes

Limiting cattle access to waterways improves riparian habitats' capacity to filter nutrients, sediments and the direct impacts of cattle pugging and defecating, thereby improving Catchment water quality.

GLC in cooperation with other agencies utilise Participant Action Learning principles to assist landholders in building the capacity to undertake such activities, particularly through the Sustainable Farming Program (WQIP, 2009).

Potential land uses include intensive cattle and poultry farming as well as mineral, petroleum or other extractive industries. Great Lakes Council, MidCoast Water and Greater Taree City Council have adopted a common position statement on coal seam gas and extractive industries.

Steep lands are particularly susceptible to erosion, especially when over grazed or cleared as identified in WQIP (2009) implementation framework: Catchment management in rural areas. Limited LiDAR mapping has been undertaken of high-risk areas.

Rural growth areas identified by the Mid North Coast Regional Strategy (DoP, 2009) within the Wallis Lake Catchment include Nabiac, Wootton, Bunyah, Coomba Park, and Coolongolook.

Guidelines will provide guidance on measures to manage potential water quality issues, such as stipulating a requirement for no change or an improvement in water quality, or the need to fence off a stream when subdividing.

WQ 2 Reduce the impact of rural land use on water quality

Proposed actions		Responsibility
WQ2.4	Enforce provisions in the Great Lakes Standard Local Environment Plan as they pertain to rural land use	GLC
WQ2.5	Implement Wallis Lake Wetland Strategy (2010), monitor and report on the implementation of this strategy as it pertains to water quality and review and update as necessary	GLC
WQ2.6	Develop an efficient and effective system for the capture and sharing of new land management practices	GLC LLS GTCC

Objective notes

- Prioritisation, timing and location of works undertaken or funded are dependent on many factors, including interest of landholders and the focus of external funding
- One-to-one advice offered to landholders is generally the most effective land management change tool, but this is highly budget and resource dependent
- Best Practice Farms and Farm Trials have proven a generally successful method of supporting improvement works, as well as educating the wider farming community
- Subcatchment approaches may be required to balance sustainable farm production and ecological restoration corridors, rather than attempting to manage the entire Catchment simultaneously. Contributions of pollutant from specific subcatchments in the Wallis Lake Catchment are discussed in detail in the WQIP (Appendix 6, 2009)

Anticipated outcomes

Rural land is managed through the land use planning and assessment system to reduce fragmentation and increased land disturbance, and the impacts this has on water quality.

Development within the rural Catchment maintains or improves water quality.

There is a demonstrated achievement with regard to the stated vision, guiding principles and actions of the Wallis Lake Wetland Strategy, such that there is net improvement in wetland condition, conservation status and management over time.

New land management practices can be easily recorded, mapped, and subsequently accessed. Such a system will allow quantification of program outputs, analysis of the effectiveness of programs, and identification of areas where future land use management programs may need to be targeted.

Action notes

Environmental provisions in the GLC LEP (2014):

- Acid Sulfate Soils (Clause 7.1)
- Earthworks (Clause 7.2)
- Stormwater Management (Clause 7.5)
- Drinking Water Catchments (Clause 7.6)
- Riparian Land and Watercourses (Clause 7.7)
- Wetlands (Clause 7.8)
- Limited Development on Foreshore Area (Clause 7.10)
- Significant Extractive Resources (7.14)

The key elements of the Wallis Lake Wetland Strategy that are relevant to this Plan include:

Private land conservation of wetlands

Strategic and prioritised acquisition and public reservation. Key sites include West Swamp, Minimbah Creek and Wallingat River

Investigate Ramsar listing of Wallis Lake

Monitor wetland health and function

Hunter LLS currently map management practices from projects where LLS is a key partner.

GLC's Management Practices GIS is a register of management practice changes across the Great Lakes LGA, undertaken or supported by GLC.

WQ3

Reduce and repair foreshore erosion from water-based activities

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: M, U, W	5, 7, 9	Goal 4, Target 1
CMP: 3, 4, 8, 10		Goal 5, Target 5

Proposed actions		Responsibility
WQ3.1	Identify and prioritise foreshore areas in need of protection from erosion	GLC RMS
WQ3.2	Develop and implement Best Management Practice for riparian stabilisation in high-wash areas according to priority and opportunity	GLC RMS
WQ3.3	Continue to implement and periodically review the Wallamba River memorandum of understanding (MoU) regarding the management of powerboat recreational activities	GLC RMS
WQ3.4	Monitor and assess the impacts and appropriateness of wakeboarding, water-skiing and other powerboat recreational activities in the Wallingat River upstream of the broadwater and the Coolongolook River	GLC RMS

Objective notes

- Objective EH.5 *Maintain and improve riparian vegetation* is also an important aspect of achieving this objective

While many of the impacts on water quality come from land-based activities, human use of the Lake and waterways can also affect water quality. In this context, actions targeting waterway use (such as powerboat-

based recreational activities) are identified, as well as those protecting and managing areas that are particularly susceptible to these impacts (such as erodible foreshores).

Anticipated outcomes

Foreshore areas at most threat from erosion are identified, prioritised and managed appropriately.

The impacts of waterway use on the foreshores of Wallis Lake and its Estuaries are mitigated, and degraded sites are protected and reinstated.

Government agencies and private users of the waterways continue to work together to ensure that erosion of the foreshore and riparian zone is minimised.

Current and future sites identified for intensive recreational use of waterways are managed appropriately.

Action notes

Benchmarks for Wallamba River erosion were set during monitoring leading up to the development of the Wallamba River MoU.

Primary method currently used is the establishment of bank protection structures in the form of rock fillets and the encouragement of mangrove establishment.

Revegetation of riparian zone and other activities discussed in WQ2.1 also support this outcome.

Latest version adopted in 2011. The MoU is applicable for 20 years, and can be reviewed every 5 years.

WQ4

Reduce the rates of soil erosion and sedimentation from unsealed roads, road construction and maintenance, and construction sites

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: W, S, M, C CMP: 4, 7, 8	6	Goal 5, Target 4.

Proposed actions		Responsibility
WQ4.1	Identify and prioritise areas of erosion and sediment input to Wallis Lake from unsealed roads and creek crossings and undertake mitigation activities according to priority	GLC GTCC, NPWS
WQ4.2	Revise GLC's Erosion and Sediment Control Policy to align with state government standards	GLC GTCC
WQ4.3	Engage internal staff to reduce sedimentation and erosion from GLC projects through the continued implementation of GLC's Sediment and Erosion Control Environmental Management System (SECEMS)	GLC GTCC
WQ4.4	Expand SECEMS to address management of SEC on unsealed roads	GLC GTCC
WQ4.5	Develop a best practice Building & Construction Education and Capacity Building program that develops the knowledge of the responsibilities architects, designers and builders have in relation to relevant legislation, and also builds capacity to improve practices	GLC GTCC
WQ4.6	Include driveway specifications for SEC and sealing in high-risk locations in the requirements for Development Applications in rural and rural-residential areas	GLC

Unsealed roads (predominantly in rural areas) can be a large source of localised sediment and nutrient loads which are flushed into the Estuary during rain events. As more sediments are washed into the Lake, the water becomes more murky (turbid) and transmits less light.

Plants such as seagrasses which depend on light for photosynthesis can be particularly impacted by turbid water. Similarly, if seagrasses are physically covered by sediments washed into the water as a result of eroded soils, they are smothered and die (GLC, 2009).

Anticipated outcomes

Rates of erosion and sedimentation from unsealed roads and creek crossings is reduced, leading to decreased rates of sedimentation in Wallis Lake and waterways.

GLC's SEC policy reflects current best-practice management.

Great Lakes Council and Greater Taree City Council staff set a consistently high standard with regard to management of SEC during road construction and maintenance activities.

Great Lakes Council and Greater Taree City Council staff set a consistently high standard with regard to management of SEC during unsealed road maintenance activities.

Private builders and construction workers within the Catchment proactively implement best management practice SEC.

High-risk areas requiring SEC or sealing of driveways are identified.

Landowners become aware of the SEC impacts of unsealed driveways, and these impacts can be subsequently reduced, leading to reduced rates of sedimentation in Wallis Lake and waterways.

Action notes

Actions include sealing of roads, stabilisation and repair (or closure) of unsealed roads, as well as sealing creek crossings and/or approaches to creek crossings.

Great Lakes Council's SEC policy needs to be updated to reflect recent planning changes and staff training.

NSW standards are included in the Managing Urban Stormwater: Soils and Construction Volume 1 ('The Blue Book') (Landcom, 2004) and Volume 2 (Dept of Environment and Climate Change, 2004).

In 2011 Great Lakes Council and Greater Taree City Council developed and implemented an environmental management system to support internal staff to execute best-practice SEC during road construction and maintenance.

The EMS is based on a system of continuous improvement, where the ongoing implementation, review and adaptation of this system will ensure council maintains a best-practice approach to sediment and erosion control.

Ongoing engagement of a variety of stakeholders is important to ensure that businesses, residents, builders, councils, developers and real estate agents can assist with implementing the WQIP (2009) and know what they can do to help protect and improve water quality within the Catchment.

Unsealed driveways can be a significant source of sedimentation. Sealing or maintaining driveways to a desired standard can reduce these impacts.

WQ 5

Reduce sediment, acid sulfate soils, chemicals and nutrient loads to waterways from urban areas

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: W, S, C, F	5, 7, 9	Goal 5, Target 5
CMP: 4, 5, 7, 8, 10		Goal 8, Target 12,

Proposed actions		Responsibility
WQ5.1	Implement the WQIP (2009) as it relates to urban areas including: <ul style="list-style-type: none"> Continue to implement, review and update the Water Sensitive Design section of the Great Lakes DCP for greenfield sites and redevelopment Retrofitting of existing areas to improve WQ in line with WQIP and Stormwater Strategy Incorporate WSD into urban road design and infrastructure development Implement effective maintenance schedule for Council's WSD facilities and incorporate into asset database Engage developers to proactively investigate WSD facilities and incorporate maintenance of these facilities during the planning stage Integrate WSD policy with existing road design guidelines 	GLC GTCC
WQ5.2	Develop a WSD education and capacity building program for key urban stakeholders within the community including: developers; building designers and architects; real estate agents; businesses; and residents. <ul style="list-style-type: none"> Engage private builders and construction workers to raises awareness of the importance of WSD practices and how to construct and maintain devices 	GLC
WQ5.3	Adopt and implement the Wallis Lake Stormwater Management Plan (Forster-Tuncurry), to improve water quality and overall ecological condition of Wallis Lake	GLC
WQ5.4	Develop a Stormwater Management Plan for Coomba Park	GLC
WQ5.5	Assess the impacts of excessive sediment build-up at stormwater drains, and remediate if required (for instance Pipers Creek & Bay)	GLC

Urban areas have a small land use footprint, but high sediment loading rates (Abal, Bunn & Dennison (2005) due to high flow rates. The rainfall that once infiltrated into the ground through native vegetation now meets impervious surfaces such as roofs, roads and footpaths and runs directly into stormwater drains and the Estuary. This stormwater runoff carries with it pollutants such as sediments and nutrients from houses, roads, lawns and pets (GLC, 2012b).

In Wallis Lake, areas such as Pipers Creek and Pipers Bay receive the majority of stormwater runoff from the Forster urban area, and as such have previously experienced large algal blooms and shown signs of poor ecological health.

Anticipated outcomes

Council practices ensure a consistent application of WSD principles across the organisation to maximise opportunities and benefits to waterways by integrating the management of water quality with water quantity.

Wallis Lake maintains or improves its current water quality standards. The ecological health of Pipers Creek which receives significant run-off from the urban Catchment in particular, remains within acceptable levels of chlorophyll and turbidity.

The wider community becomes aware of the impact their choices have on water quality, and over time adapt their choices and behaviour to proactively manage or avoid these impacts, as well as accept and support the installation and maintenance of WSD solutions to water quality.

Developers, builders and construction workers are aware of their responsibilities pertaining to WSD and proactively incorporate it into their planning process.

Key sites within the urban Catchment are managed to improve stormwater quality, and reduce stormwater quantity.

All council policies and plans relating to water management in the Wallis Lake urban and peri-urban Catchments are aligned.

Impacts on water quality from Coomba Park and surrounds are identified and prioritised for action.

Stormwater drains efficiently transport water from urban areas to Wallis Lake without unnecessarily increasing sediment loads.

Action notes

Adapt the Water Sensitive Design section of the Great Lakes DCP as required to make it more effective and accessible for the community. Supporting information could include fact sheets, standards, training, etc.

Pollutants include organic contaminants (incl faecal coliforms), suspended solids, sediment, nitrogen, phosphorous, pathogens, heavy metals, pesticides, herbicides and gross pollutants.

Further detail and recommendations for this action are available in the WQIP (2009).

Sustainable gardening groups have recently been trialled within Forster. Utilising a Participatory Action Learning model to engage with the community about their own impacts on water quality and how they can mitigate these impacts, this program has been very successful and will inform future engagement activities within the urban community.

The Wallis Lake Stormwater Management Plan breaks the Forster/Tuncurry stormwater catchment into subcatchments and identifies specific actions to manage stormwater impacts in each of these subcatchments.

Historic loads of sediment accrue in stormwater drains over time. This sediment may slowly be pushed from stormwater drains into the Lake during rain events. If it is assessed (for instance, through video monitoring) that this is occurring and presents significant WQ impacts to Wallis Lake, these sediment loads (where feasible) may need to be removed.

WQ5

Reduce sediment, acid sulfate soils, chemicals and nutrient loads to waterways from urban areas

Proposed actions		Responsibility
WQ5.6	Utilise opportunities in development assessment and land use planning (for instance, rezoning) for the protection of existing drainage lines and stormwater channels to improve the quality of water entering Wallis Lake	GLC
WQ5.7	Protect identified wetlands, foreshore vegetation and remnant long-lived, deep-rooted vegetation in urban areas to maintain water quality	GLC
WQ5.8	Implement rainwater tank retrofitting program in urban areas	MCW GLC
WQ5.9	Ensure appropriate development and enforce new provisions in the Great Lakes Standard Local Environment Plan (LEP) 2014 as they pertain to urban land use and foreshore development	GLC

Anticipated outcomes**Action notes**

Existing drainage lines are remediated or revegetated where possible to improve stormwater quality and reduce stormwater quantity.

These vegetated areas are protected (and revegetated where required) into perpetuity to improve the quality and reduce the quantity of stormwater flows into Wallis Lake.

Increase in community awareness of the benefits of watertanks (including WQ benefits) and subsequent increased uptake within urban areas.

Development within the urban Catchment maintains or improves water quality.

Development in the foreshore area will not impact on natural foreshore processes or affect the significance and amenity of the area.

Key sites include:

- Charlotte Bay
- Pipers Bay Foreshore and subcatchment
- South Forster and Pipers Creek subcatchment
- Big Island

Significant water savings and stormwater flow reductions can accompany the widespread implementation of water tanks. It is estimated that in Forster a 5,000L watertank could see the following stormwater/potable water benefits: 22% reduction in annual average stormwater flows and up to 40% reduction in the areal extent of stormwater treatment infrastructure (WQIP, 2009).

Environmental provisions in the GLC LEP (2014):

- Acid Sulfate Soils (Clause 7.1)
- Earthworks (Clause 7.2)
- Stormwater Management (Clause 7.5)
- Riparian Land and Watercourses (Clause 7.7)
- Wetlands (Clause 7.8)
- Limited Development on Foreshore Area (Clause 7.10)
- Development at Seven Mile Beach, The Lakes Way, Forster (Clause 7.15)
- Development at Carmona Drive, South Forster (Clause 7.19)
- Limited Development on Foreshore Area (Clause 7.10)

WQ6 Reduce the risk of septic waste entering the Wallis Lake Estuary

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: W, C	5, 7, 9, 12	Goal 5, Target 5
CMP: 7, 10		Goal 8, Targets 12, 13

Proposed actions		Responsibility
WQ6.1	<p>Continue to implement the Great Lakes Council Onsite Sewerage Management Strategy:</p> <ul style="list-style-type: none"> All systems are inspected to determine if they are operating satisfactorily Systems identified as high-risk, or those that are operating poorly are inspected more frequently Pump-out records are monitored to ensure systems are not overflowing or being illegally emptied Aerated Wastewater Treatment System(AWTS) reports are monitored to ensure owners are aware of maintenance that is required Approval and ongoing monitoring of AWTS contractors to ensure qualified technicians are carrying out quality services Water monitoring programs to ensure pollution is not occurring from failing systems Implement Council's Onsite Sewage Management Development Assessment Framework 	GLC
WQ6.2	Maintain toilet and pump-out facilities on islands in Wallis Lake, adapt to peak usage times and assess need for additional pump out sites	GLC
WQ6.3	Pursue 1:100 year flood level as benchmark for siting new onsite effluent system disposal areas	GLC GTCC
WQ6.4	Ensure all houseboats on Wallis Lake waterways contain greywater holding tanks and negotiate the phase out of houseboats (commercial and private) without greywater holding tanks	RMS
WQ6.5	Continue to educate and engage with boat owners to monitor the effectiveness and efficiency of holding tanks, and minimise potential sewage dumping from vessels utilising or mooring in Wallis Lake	RMS GLC

Inadequate sewage treatment and disposal can pose a significant threat to public and environmental health. Within the Wallis Lake Catchment, MidCoast Water manages the reticulated sewage system which supplies the majority of the population.

Rural and some small village areas however generally rely on individual on-site sewage management systems

(OSMS) for wastewater treatment and disposal. If these systems are inappropriately sited, or incorrectly managed and maintained, OSMSs can pose a significant risk of effluent entering nearby waterways or seeping into ground water (GLC, 2012b). Aquaculture in particular can be severely affected by such events as the harmful bacteria and virus present in untreated effluent can accumulate in filter feeding organisms such as oysters (GLC, 2009).

Anticipated outcomes

The risks to the WQ of Wallis Lake and its Estuaries presented by existing and proposed on-site sewage management systems is managed within an acceptable level.

Owners of OSMSs and potential developers are aware of their responsibilities with respect to siting of OSMSs and their subsequent operation and maintenance.

Action notes

Council's on-site sewerage management program was developed under the guidance of NSW Health and the Department of Local Government, and reflects the directions and goals of the *Environment & Health Protection Guidelines: On-site Sewage Management for Single Households* and *AS/NZ 1547:2000 (On-site domestic-wastewater management)*.

At time of writing the GLC On-site Sewage Management Strategy is currently under review.

The Development Assessment Framework utilises a risk-based approach to set out Council's levels of investigation, acceptable solutions (deemed to satisfy) and minimum standards for sewage management in unsewered areas.

Effluent does not enter Wallis Lake from toilets located on Islands.

Island toilets have limited capacity, and as such maintenance strategy reflects increased demand for pump-out during peak usage times (eg. summer and Easter school holidays).

OSMSs are located above major flood levels, thereby reducing risk of intrusion to Wallis Lake during flood events.

Current requirement is that new tanks and electrical components are located above the 1:100 year flood level, while the effluent disposal area is allowed at the 1:20 year flood level.

No untreated dumping from vessels occurs within Catchment.

At time of writing, all commercial boats within Wallis Lake Estuary are fully compliant.

No dumping occurs from vessels utilising or moored in Wallis Lake and Estuaries.

The discharge of untreated sewage from vessels into navigable waters is prohibited under the *Protection of Environmental Operations Act*.

The discharge of treated sewage from vessels into certain sensitive waters ('no discharge-zones') is prohibited—this includes all inland waterways, intermittently opening lagoons, Aquatic Reserves and Marine Parks; and all waters within 500 metres of aquaculture, bathing, mooring and anchoring areas, persons in the water, beaches and marinas. As a result of these 'no discharge zones', Wallis Lake is effectively a no discharge zone.

WQ 7

Reduce the impacts of gross pollutants entering waterways

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: W, C	3, 5, 7, 9, 12	Goal 5, Target 5
CMP: 10		Goal 8, Targets 12, 13

Proposed actions		Responsibility
WQ7.1	Investigate options for the installation of additional gross pollutant traps (GPTs) on urban waterways and ensure appropriate maintenance of existing GPTs	GLC GTCC
WQ7.2	Run regular clean-ups (involving volunteers, where possible) of waterways and Lake including: <ul style="list-style-type: none"> Great Lakes Underwater Group (GLUG) annual clean-up of the breakwaters Record and publicise litter collection data in national marine debris database 	GLC GTCC LLS
WQ7.3	Investigate the effectiveness of targeted Catchment litter management in key subcatchments	GLC
WQ7.4	Ensure adequate receptacles are provided for waste, and that they're emptied and maintained	GLC GTCC
WQ7.5	Engage the general community regarding both the sources of litter and the impacts it has on waterways, native flora and fauna	GLC GTCC LLS
WQ7.6	Engage commercial and recreational fishers regarding the impacts of fishing debris on the Estuarine and Lake environment	GLC DPI (Fisheries) Fishing Co-op

Litter is a major problem in Australia and it poses a number of important environmental, social and aesthetic problems:

- Danger to marine life through entanglement or ingestion
- Danger to native animals by polluting their food and water
- Choked waterways and blocked drains cause floods
- Danger of cause health risks (eg. broken glass, syringes, fishing tackle, animal faeces)
- Excessive litter—if people see litter around, they may be more likely to litter (SCEW, 2008)

Litter can move from where it's deposited in the catchment (such as urban areas, public parks and picnic areas) into estuaries via wind and stormwater: 80% of litter removed from the marine environment originates from land. The vast majority of this litter (70%) is non-biodegradable plastics.

Marine debris and gross pollutants entering the Estuary from recreational boats and commercial activities are also a problem in the Catchment.

Anticipated outcomes

Total gross-pollutants entering Wallis Lake from urban areas are reduced.

Reduce the amount of gross-pollutants in Lake and waterways, particularly bulky items.

A 'catchment approach' to managing gross-pollutants at their source is investigated and potentially trialled, rather than collecting them where they enter the Lake system, thereby reducing gross-pollutants entering Wallis Lake.

Total gross-pollutants entering Wallis Lake from urban areas are reduced.

Volunteers, schools and key user groups will be targeted, educated, and empowered to make change in their daily consumer activity, stewardship of local beaches and foreshores and pride in their contribution to this global environmental issue.

Commercial and recreational fishers are aware of the impacts of their activities on Wallis Lake and take steps to minimise these impacts.

Action notes

Successful engagement of the local community and fostering local stewardship of our waterways is essential to ensuring long term reductions in gross-pollutants entering Wallis Lake (and subsequently coastal areas).

Gross-pollutants entering the Wallis Lake system can subsequently enter marine environments.

'Injury and fatality to marine life caused by ingestion of, or entanglement in, harmful marine debris' has been listed as a key threatening process under the Environment Protection and Biodiversity Conservation Act 1999 (Cth).

DPI (Fisheries) undertakes an advisory and compliance role in this regard.

Minimising the impact of abandoned and lost hoop-nets and crab traps on turtles and other wildlife is also of concern in this action.

WQ 7

Reduce the impacts of gross pollutants entering waterways

Proposed actions		Responsibility
WQ7.7	Continue to initiate and support campaigns to reduce reliance on plastic bags and other single-use plastics in the community	GLC GTCC
WQ7.8	Develop programs targeting engagement of visitors (and those local tourism businesses) to the region during peak times to reduce their concentrated impact on waterways	GLC DPI (Fisheries) LLS

Anticipated outcomes

Community and business are aware of the impacts of their daily lifestyle choices on Wallis Lake and take steps to minimise these impacts.

Visitors to the region are aware of the impacts of their recreational activities on Wallis Lake and take steps to minimise these impacts.

Action notes

'Tangler' bins are provided at various locations around the Lake for recreational fishers to deposit their tangled fishing lines.

During peak holiday periods (particularly summer and Easter holidays) the Great Lakes experiences a significant growth in population from tourism and a subsequent increase in gross-pollutants entering waterways.

Many of these visitors are attracted to this region because of the iconic blue waters of Wallis Lake, and as such its WQ. Behavioural change in these visitors (many of whom are returning visitors) is essential to ensure long term reductions in gross-pollutants entering Wallis Lake and adjacent coastal areas.

Scope for this action to be delivered through visitor information centres.

DPI (Fisheries) holds fishing clinics during holiday periods to educate children/teens (8-14yrs) on appropriate fishing activities.

ECOSYSTEM HEALTH MANAGEMENT ACTIONS

The land resources of the Wallis Lake Catchment underpin the Catchment's health. Maintaining the quality of these land resources is therefore crucial to the maintenance of the services that these ecosystems provide (GLC, 2003). The loss or over-exploitation of these services eventually results in decreased system 'resilience' which can lead to further and accelerating environmental decline.

The Wallis Lake Estuary and Catchment supports a variety of unique landscapes and vegetation communities as well as a diversity of plants and animals. The Catchment has 51 different vegetation communities, ranging from lowland wetland ecosystems to dry sclerophyll forests. Of these vegetation communities, 32 are classified as being of high conservation value. Because of this diversity of its habitats, the Catchment is home to an abundance of flora and fauna, including a number of migratory species (GLC, 2003).

Human impacts are however placing increased pressure on the variety of species present and the integrity of habitats within the region. The loss of habitat, altered ecosystem structure, declining habitat quality and loss of connectivity of ecosystems are all threats to the health of these ecosystems. Unless these threats are managed appropriately, the extent of biodiversity currently present in the region will decrease.

As highlighted in Chapter 3, while these ecosystems may now rely on our intervention and protection, we in turn rely on the services that they provide to support our social and economic systems.

The objectives and accompanying action plans below address key threats to the quality of ecosystem health in the Catchment including maintenance and protection of native vegetation (including riparian and estuarine communities), threatened species, environmental flows and connectivity as well as reducing the impacts of invasive species.



EH 1

Protect and improve biodiversity, particularly threatened species, populations and ecological communities

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: E, C	2, 3, 8	Goal 6, Target 9
CMP: 1		Goal 8, Target 15

Proposed actions		Responsibility
EH1.1	Develop and implement an over-arching Biodiversity Strategy for the Great Lakes LGA. Monitor and report on the implementation of the strategy and coordinate reviews and updates	GLC
EH1.2	Prioritise the development and implementation of specific threatened biodiversity action plans within the Great Lakes LGA, based on an assessment of risk	GLC, GTCC, OEH
EH1.3	Prioritise the protection and improvement of areas deemed as locally significant vegetation or high priority habitat for important biodiversity	GLC, GTCC, LLS, OEH
EH1.4	Implement the NSW Threatened Species Priorities Action Statements (PAS) and published recovery plans for threatened species (including federally threatened species), populations and ecological communities in the Wallis Lake Catchment. Monitor the outcomes of such activities	OEH, GLC, GTCC, DoE, LLS
EH1.5	Continue to promote and provide support to local volunteer environmental groups	GLC, GTCC, LLS, OEH

The Wallis Lake Catchment is a region of high biological diversity and importance. The Estuary itself is listed as a Nationally Important Wetland; contains the largest area of estuarine seagrass in the state and the second largest representation of saltmarsh in the state (after Port Stephens); while almost 50 threatened fauna species (GLC, 2010) and 8 endangered ecological communities occur within the Catchment.

To manage this rich biological diversity, developing a strategic approach to conservation of biodiversity is a central focus of this objective. This can be achieved using the different available levers of state and federal strategies, plans and priorities in cooperation with local land use planning provisions to develop a comprehensive plan to conserve biodiversity across the Catchment and the LGA as a whole, with a particular focus on threatened species, populations and ecological communities.

Anticipated outcomes

Biodiversity in the Wallis Lake Catchment is maintained or improved. Species do not become extinct in the wild and the conservation status and the number of proactively conserved populations of threatened and important biodiversity (including species, populations and ecological communities) is increased. Further, that biodiversity is managed in a landscape context.

Threatened biodiversity is understood and managed in a manner that reverses declines, protects from local extinctions, and enhances conservation status, resilience and abundance/representation in both an individual as well as a landscape context.

High priority habitat for important biodiversity is recognised, mapped, described and managed such that biodiversity in the Wallis Lake Catchment is maintained and ultimately improved.

Threatened biodiversity is prevented from becoming extinct in the wild and is recovered to a position of viability in the Wallis Lake Catchment. Key threats are identified and managed and there is effective and coordinated action to protect and recover populations and habitat.

There are effective, coordinated volunteer groups conducting supervised and prioritised restoration and conservation actions in important habitats across the Wallis Lake Catchment such that biodiversity is maintained or improved and threatened biodiversity is protected and recovered.

Action notes

Incorporate a Local Biodiversity Offset Strategy as an appendix to this broader strategy.

Action plans should discuss the species local distribution, habitat, status and key pressures and include implementation measures to assist conservation and recovery. Action plans need to be adaptive and evolving.

(Eg. Forster Squirrel Glider Action Plan)

To be achieved through planning controls, strategic acquisitions, decision-making and other available means.

Volunteer groups include, but are not limited to Landcare, Dunecare, Coastcare, Bushcare, Great Lakes Underwater Group and Dad's Army. Prioritise the efforts of such groups to deliver biodiversity outcomes of substance.

EH 1

Protect and restore biodiversity, particularly threatened species, populations and ecological communities

Proposed actions		Responsibility
EH1.6	Continue to educate and inform the community regarding the importance of biodiversity, including protecting and restoring habitat for threatened species, populations and communities. Engage with the community on the benefits of natural areas	GLC, GTCC, LLS, OEH
EH1.7	Adopt and implement a model NRM clause for terrestrial biodiversity in the Great Lakes Local Environmental Plan (LEP)	GLC
EH1.8	Pursue collaborations with researchers to design and deliver threatened and important biodiversity research and management programs such as the Forster Local Squirrel Glider Study (Niche Environment and Heritage, 2013). Implement the priority recommendations arising from threatened species investigations and research	GLC, OEH, academic/research institutions
EH1.9	Collate and update a map of all public and private conservation lands in the Catchment Ensure permanently protected land (including covenanted lands, development offsets and important habitats identified by the NSW Land and Environment Court) is zoned for Environmental Protection through amendments to Great Lakes LEP 2014	GLC DP&E

Objective notes

- Further detail on significant Communities, Populations and Species of the Wallis Lake Catchment, as well as key threatening processes is included in the Wallis Lake Wetlands Strategy (2010)

Anticipated outcomes

There is a greater awareness of biodiversity issues in the local community, leading to behavioural change and acceptance of the need for effective biodiversity conservation and enhancement programs.

Biodiversity in the Wallis Lake Catchment (and wider Great Lakes LGA) is maintained and improved through strategic and targeted planning controls embedded within the LEP. Biodiversity issues are demonstrably considered and managed within the regulation of land use.

Effective, applied research is conducted by independent bodies to address knowledge gaps about the protection and recovery of biodiversity, including threatened species. Priority actions arising from research is implemented to ensure that biodiversity is maintained and ultimately improved upon and important populations and habitat are managed and restored.

Relevant authorities have mapped and can readily identify all permanently protected public and private lands in the Wallis Lake Catchment. At the first available opportunity, all such lands are zoned in the applicable LEP for the highest level of Environmental Protection. By doing so, the area of land conserved and managed by provisions of the zoning system and the LEP is increased and there is greater awareness of the spatial locations of protected land for applied conservation management (connectivity, reserve establishment, etc.).

Action notes

Education to include specific information regarding local species and communities so people know what needs protecting in the area. Also the impacts of various pressures such as litter and habitat loss.

Also need to provide information regarding statutory controls and responsibilities.

It is particularly important that all development offsets be conserved and managed in the zoning system. All Conservation Property Vegetation Plans (PVPs), Biobanking sites, Registered Property Agreements, Voluntary Conservation Agreements, sites protected by conditions of a consent as well as relevant public lands are spatially identified and zoned for protection.

EH 2

Maintain and improve areas of locally significant native vegetation as well as linkages between key habitat nodes

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: E, C CMP: 8	1, 2, 3, 4, 5, 8, 11, 12	Goal 6, Target 7, 8

Proposed actions		Responsibility
EH2.1	Implement the Tops to Lakes Initiative, monitor and report on outcomes and review and update, as necessary	GLC, GTCC, LLS
EH2.2	Ensure that native vegetation clearing on private land (including private native forestry) complies with statutory controls and regulations	OEH, LLS
EH2.3	Continue to monitor and report regularly on native vegetation cover, fragmentation, public reservation and environmental zoning of catchments across the Great Lakes LGA <ul style="list-style-type: none"> Develop a Great Lakes Catchment Landscape Report Card to assist in reporting the results of monitoring to the Great Lakes community 	GLC
EH2.4	Continue to promote and support biodiversity and habitat conservation on private land	GLC, GTCC, LLS

Wallis Lake Catchment has high vegetation biodiversity with 51 vegetation communities, ranging from lowland wetland ecosystems to dry sclerophyll forests. Because of the diversity of its habitats the Catchment is home to an abundance of flora and fauna, including a number of migratory species.

The loss of habitat, altered ecosystem structure, declining habitat and loss of connectivity of ecosystems have the potential to reduce Catchment biodiversity

(GLC, 2003), as well as have direct and immediate impacts on land uses through processes such as erosion and loss of water quality.

A key focus of these management actions is the implementation of the Tops to Lakes Initiative that aims to achieve the conservation and re-establishment of landscape-scale biodiversity, and habitat resilience and connectivity across the Great Lakes (GLC, 2012a).

Anticipated outcomes

The natural habitats of the Wallis Lake Catchment are protected, restored and connected in a manner that provides for biodiversity conservation and sustainable production/development. Important ecosystem services functions of the natural landscapes are recognised, protected and, where required, reinstated.

Unlawful and inappropriate clearing of native vegetation is avoided. Where native vegetation has been cleared unlawfully, swift and effective regulation, compliance and remediation actions are identified and implemented. Regulation of the clearing of native vegetation recognises the 'maintain or improve' principle and is under-pinned by a common understanding of the importance of native vegetation for biodiversity and other ecosystem services values.

A reliable system of up-to-date landscape information is collated and published to inform knowledge of trends and enhance effective and priority-based decision-making and management interventions.

Through the production of regular Great Lakes Catchment Landscape Report Cards or equivalent, the landscape grades of the seven subcatchments of the Wallis Lake Catchment are maintained or improved. Priority actions associated with restoration, protection and revegetation are implemented and monitored.

Effective biodiversity conservation relies not only on a comprehensive, adequate and representative reserve system, but also on relevant and effective private land conservation, within production and development landscapes. The relevant authorities shall continue to provide extension and support services for private land conservation in a manner that complements the public conservation reserve system. To achieve such, all relevant mechanisms shall be utilised including conservation covenants, non-government organisations, conservation zoning and voluntary mechanisms.

Action notes

Through programs such as Land for Wildlife, Conservation Agreements, and Property Vegetation Plans.

EH 2

Maintain and improve areas of locally significant native vegetation as well as linkages between key habitat nodes

Proposed actions		Responsibility
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EH2.5	Develop and implement a Great Lakes Vegetation Strategy, monitor and report on outcomes. Review and update, as necessary	GLC
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EH2.6	Progress the development of a Great Lakes vegetation classification scheme and fine-scale, accurate vegetation community mapping. Review and update as necessary	GLC, GTCC, OEH
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Objective notes

- Fostering mutually beneficial partnerships with landowners is a crucial aspect of successful protection of significant vegetation, and especially for the formation of unbroken regional, sub-regional and local wildlife corridors

Anticipated outcomes

Vegetation in the Wallis Lake Catchment is maintained or improved. The conservation status of vegetation communities is improved and functional and self-sustaining native vegetation is managed in a landscape context. Also, fragmentation of vegetation shall be reduced and the condition of native vegetation shall be enhanced. Vegetation that is considered to be regionally significant or threatened shall be protected and enhanced.

Action notes

Council shall work progressively on the compilation of a suitably fine-scale and accurate vegetation community description and a map for the LGA (and Wallis Lake Catchment). The vegetation community shall be progressively enhanced and updated, as new information is available. The outputs of the vegetation mapping program shall be used to inform management, including the identification of conservation and restoration priorities.

Accurate vegetation community description and mapping is very important for ecological decision-making.

EH 3

Maintain, and improve where necessary, environmental flows and reduce the impact of barriers to fish passage

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: F	2, 3, 5, 7, 8, 9, 12	Goal 5, Target 4
CMP: 3		Goal 6, Target 7 Goal 8, Target 14

Proposed actions		Responsibility
EH3.1	Install and maintain effective fishways at Dyers Crossing and other crossings according to DPI (Fisheries) identified priorities and opportunities	DPI (Fisheries), LLS, GLC, GTCC
EH3.2	Ensure compliance with the Lower North Coast unregulated and alluvial water sources Water Sharing Plan	NoW, Landholders
EH3.3	Include water quality, water sharing legislation and environmental flow information in rural landholder extension and education programs	NoW, GLC, GTCC, DPI (Ag), LLS
EH3.4	Target invasive species which block natural flows in waterways where consistent with agency priorities	MNCWCC, GLC, NPWS

Maintaining appropriate water flows is critical to maintaining fish and invertebrate populations, aquatic plants, riparian vegetation, channel morphology and water quality. Connectivity with flood plains of the aquatic environment is important for fish moving upstream or downstream for feeding, breeding and spawning. As in the terrestrial environment, maintaining diversity of habitats within streams and riparian zones is important for biodiversity. This includes maintaining diversity of the water flow regime (GLC 2003).

All freshwater fish need to move freely between the various areas of their habitat, although the scale of movement probably varies from species to species.

Barriers to fish movement include weirs, causeways and culverts which block passage and increase flow velocity. Physical barriers such as weirs and causeways present major restrictions to fish movement which can cause local extinctions or greatly reduce fish abundance and diversity (GLC 2003).

The intent of these management actions is to ensure that natural flows and volumes of water resources within the Catchment are sustainably managed for ecosystem services, riverine and catchment health, and production values, while ensuring that native fish populations and movements, as well as the ecosystem that they are a part of, are restored.

Anticipated outcomes

Structures that impede the natural movement of fish are progressively remediated or managed by the removal of such barriers or the establishment of effective fishways on a priority basis.

Native fish populations and movements, and the ecosystems they are a part of in the Wallis Lake Catchment, are restored.

Natural flows and volumes of water resources are sustainably managed for ecosystem services, riverine and catchment health and production values.

Enhanced knowledge of water flows and volumes, and the sustainable management and protection of such, leads to better management of water resources, improved flows and water quality in riverine and groundwater systems as well as reduced risk associated with unlawful or damaging water extraction.

Priority infestations of terrestrial, riparian and aquatic weeds that block natural flows in waterways are reduced. Where feasible, such outbreaks shall be eradicated. Information is collated on the spatial location of infestations of weeds that disrupt natural water flows.

Action notes

A spatial and descriptive database of fish barriers is to be maintained and updated.

Appropriate research and monitoring opportunities are to be conducted to greater understand the ecological impacts of fish barriers and the best practice management responses to enhancing fish movement processes in rivers and streams of the Wallis Lake Catchment.

Planning controls pertaining to maintenance of pre-disturbance environmental flows is incorporated into Great Lakes Development Control Plan, Water Sensitive Design Section.

Species include willows, invasive reed species, coral trees, camphor laurel, and aquatic weeds such as salvinia, parrots feather, and alligator weed.

EH4

Reduce the presence and impact of invasive species on terrestrial and aquatic environments

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: E, C CMP: 6	1, 3, 4, 8, 12	Goal 6, Target 9

Proposed actions	Responsibility
EH4.1 Continue to work with local landholders to strategically control and reduce weed impacts on farming land and the natural environment	MNCWCC, GLC, LLS, GTCC
EH4.2 Continue to educate businesses and the community regarding the impacts of invasive plant and animal species and their role in control and surveillance	MNCWCC, GLC, NPWS, LLS, GTCC
EH4.3 Implement the NSW Biosecurity Strategy 2013-2021 and the relevant outcomes of the NSW Strategic Review of Weed Management (2013-14). Continue to implement the DPI Fisheries Bio-security Program, reviewing and updating as necessary	LLS, GLC, GTCC, MNCWCC, DPI (Fisheries), Crown Lands, Fishing Co-op
EH4.4 Work collaboratively with multiple landholders and agencies to establish a prioritised and cross-tenure approach to monitoring and managing terrestrial vertebrate pests within the Catchment (and across the Great Lakes LGA) consistent with state and regional management plans and priorities	MNCWCC, GLC, NPWS, LLS, GTCC, OEH, DPI (Ag), Forestry, Crown Lands, local landholders

Invasive plant species are a significant concern in NSW, with over 170 weed species listed as noxious, 53 species listed as invasive native scrub and several hundred recognised as a threat to biodiversity, with an estimated cost to NSW of \$1.2billion of lost productivity each year alone (NRC, 2013a).

Environmental weeds can cause loss of biodiversity by invading natural ecosystems and altering habitat, out-competing and displacing native species, choking up wetlands and waterways, and altering fire regimes (GLC, 2003). Invasive vertebrate pests such as wild dogs, feral pigs, rabbits, foxes, feral goats and feral cats also cause significant economic, environmental and social impacts within the Catchment and across Australia.

The following actions incorporate a collaborative, cross-tenure and prioritised approach to managing invasive pest threats to the Wallis Lake Catchment. Implementation of these identified actions is dependent on a well-designed decision process aligning actions with stakeholder agency (and landholder) priorities and available funding opportunities. For instance, NPWS has an existing (5-year) Regional Pest Management Strategy (2012-17) in place. As a major landholder within the Catchment, collaborative activities to manage pests and weeds within the Catchment should take into account and incorporate these existing priorities in order to leverage support and resources.

Anticipated outcomes

Through strategic, multi-tenure and coordinated programs, there is no net increase – and ultimately – a net reduction in the distribution and biomass of priority agricultural and environmental weeds in the Wallis Lake Catchment; such that production losses and biodiversity impacts/ecosystem services reductions, due to weeds, are minimised and avoided. Further, no new outbreaks of threatening or problematic weeds occur, as a consequence of surveillance and immediate coordinated action.

There is increased knowledge and awareness within the community as to the impacts of weeds and feral pests, the identification of such and the measures associated with surveillance, control and management. This results in increased participation in tenure-blind, coordinated and strategic programs.

Agency and community actions relating to biosecurity is strategic, coordinated, proactive and based on best management practice. This results in the efficient identification, suppression and monitoring of new outbreaks of threatening weeds and pests and the minimisation of risks associated with importation or spread of threatening pests and weeds.

Feral pest animal distribution, abundance and impact are better understood. Control programs are implemented based on priorities, reflecting management of the impact of pest animals on production, the natural environment and other social and economic values. In this manner, feral pest animal impacts are reduced. Isolated occurrences are eradicated and new infestations are identified and managed.

Action notes

- Focus on building landholder knowledge and capacity
- Assist landholders to apply for funding for control works
- Engage with existing groups and programs
- Agencies are to coordinate multi-tenure or tenure-blind surveillance and control programs

Employ diverse methods such as workshops, field days, information packages, articles in local publications, booklets, etc.

Offer awareness and capacity building for weed and feral animal control as an extension to other programs such as sustainable farming, bushcare, sustainable gardening, schools education, etc.

Educate aquarium shops regarding aquatic weed species. Online shops could be targeted at state government level.

Inform stakeholders of current and potential pest species, how they can help reduce the spread of these species, and their reporting responsibilities.

Respond effectively to reported instances of pest species outbreaks.

Feral pest animal management in the Wallis Lake Catchment requires a tenure-blind, strategic and cooperative approach.

Vertebrate Pest Management Strategy to be based on the NSW Invasive Species Plan.

EH4

Reduce the presence and impact of invasive species on terrestrial and aquatic environments

Proposed actions		Responsibility
EH4.5	Work collaboratively with multiple landholders and agencies to establish a prioritised and cross-tenure approach to managing invasive weeds within the Catchment (and across the Great Lakes LGA) consistent with state and regional management plans and priorities	MNCWCC GLC, NPWS, LLS, GTCC, OEH, DPI (Ag), Crown Lands, Forestry, local landholders
EH4.6	Work collaboratively and across tenures to implement the Weeds Action Program and the MNCWCC Regional Weed Management System as it aligns with agency priorities	MNCWCC, GLC, NPWS, LLS, GTCC
EH4.7	Prepare and implement specific control action plans for critical outbreaks of high priority weeds and vertebrate pest animals where required	MNCWCC, GLC, NPWS, LLS, GTCC, Forestry
EH4.8	Implement relevant actions set out in approved Threat Abatement Plans (TAP) across the Catchment where relevant	GLC, NPWS, LLS, GTCC, OEH, DPI, Forestry, multi agencies, local landholders

Objective notes

- It is important to take into account and allow for the differing, and potentially competing, priorities and interests of agencies involved in invasive species control
- Compromise needs to be made by all parties involved, due to the importance of a cooperative and strategic approach. This is of particular importance when it comes to the implementation of the Rapid Response Program
- Cross-agency partnerships on pest species control improve the chance of receiving grant funding

Anticipated outcomes

Priority weed distribution, abundance and impact are better understood. Control programs are implemented based on priorities, reflecting management of the impact of weeds on production, the natural environment and other social and economic values. In this manner, weed impacts are reduced, isolated occurrences are eradicated and new infestations are identified and managed.

Weed management is undertaken by all agencies in a strategic and coordinated fashion. Available funding is directed to specified priorities.

High priority weeds and feral animals are managed strategically across landscapes and across agencies. Specific, explicit and coordinated objectives are established for priority weeds and feral animals to reduce spatial distribution, abundance and negative effects of priority weeds and feral pests.

There is a demonstrable progress to reducing the impact of key threatening processes on natural landscapes and threatened biodiversity. TAP implementation shall be multi-tenure, multi-agency and coordinated.

Action notes

Weed management in the Wallis Lake Catchment requires a tenure-blind, strategic and cooperative approach.

To be based on the MNCWCC Regional Weeds Strategy and the results of the NSW Strategic Review of Weed Management (2013 – 14).

Current TAPs include:

- Rabbits (Commonwealth EPBC Act)
- Unmanaged goats (Commonwealth EPBC Act)
- Red fox (Commonwealth EPBC Act)
- Feral cats (Commonwealth EPBC Act)
- Feral pigs (Commonwealth EPBC Act)
- Cane toads (Commonwealth EPBC Act)
- Bitou bush and boneseed (NSW TSC Act)
- Red fox (*Vulpes vulpes*) (NSW TSC Act)
- Plague minnow (*Gambusia holbrooki*) (NSW TSC Act)

EH5 Maintain and improve riparian vegetation

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: E, M, C	1, 5, 9	Goal 4, Target 1
CMP: 8		Goal 6, Target 7

Proposed actions	Responsibility
EH5.1 Develop and implement mapping processes to monitor the presence and condition of riparian areas across the Wallis Lake Catchment	GLC, LLS, GTCC
EH5.2 Develop and implement a Riparian Vegetation Management Strategy to prioritise interventions and actions. Complete Foreshore Management Plan for Wallis Lake	GLC, GTCC
EH5.3 Conduct riparian vegetation protection, establishment and rehabilitation works according to priority and opportunity, incorporating works on both public and private land	GLC, LLS, GTCC
EH5.4 Phase the removal of stock from riparian zones in identified foreshore Crown Reserves and manage Crown Foreshores for conservation purposes. Zone identified Crown Foreshores for Environmental Protection within the relevant Local Environmental Plans	Crown Lands, GLC, GTCC

Riparian land is any land which adjoins, directly influences or is influenced by a body of water. While riparian land is generally associated with streams, billabongs, wetlands and lakes, it also includes farm dams, drainage lines, the floodplains connected to streams and estuaries, and tidal interchange areas (HCR CMA, 2007).

Destruction of riparian vegetation compromises the water filtering capacity and sediment stabilisation of these areas, thus impacting on water quality. Riparian vegetation can reduce nutrient, thermal, light and bacterial pollution; increase fish stocks by providing suitable aquatic habitat; and help to limit algal growth by decreasing nutrients and light. Healthy riparian

land will also maintain stable stream channel shape by controlling erosion and sedimentation. It is often argued that 'healthy riparian zones mean healthy streams' (Abal, Bunn & Dennison, 2005).

Well maintained riparian land can also increase a property's value through retaining fertile soils and preventing erosion, as well as providing shade, shelter and habitat (HCR CMA, 2007).

In this context, these actions work in concert with WQ3, by targeting land-based pressures on riparian vegetation, while WQ3 primarily targets the impacts of water-based activities on foreshores, impacts which will be exacerbated as riparian vegetation is removed from foreshore areas.

Anticipated outcomes

A standardised method is adopted and implemented to regularly map the spatial extent and condition of riparian zones across the Wallis Lake Catchment. Discussion reports are prepared to guide adaptive management, including the identification of priority intervention sites for riparian vegetation re-establishment and restoration.

There is no net loss in the presence of existing riparian vegetation from a 2013 baseline and ultimately there is demonstrated increase in the area of riparian zones that contain functional native vegetation and thus the condition of riparian vegetation is enhanced and restored. Riparian vegetation interventions are based on priorities and coordinated by way of strategic plans.

There is an overall net positive trend in the area and condition of riparian vegetation and there is no further decline or reduction in the 2013 area and condition of riparian vegetation within the Wallis Lake Catchment.

There is demonstrated progress to the achievement of 100% of foreshore Crown Land in the Wallis Lake Catchment with stock excluded by 2018.

Action notes

Consider land acquisitions of priority riparian zones including the possible use of revolving funds (private/public partnerships, development incentives etc).

Enacted through planning controls, promoted and supported through programs.

This should prioritise the funding and administration of offstream watering projects.

Utilise and promote the full suite of funding opportunities for riparian protection and management including carbon farming and biodiversity initiatives.

Suggested steps to achieve this action are outlined in the WQIP (2009) (Table 3.3.2 p265).

EH5 Maintain and improve riparian vegetation

Proposed actions		Responsibility
EH5.5	<p>Coordinate and deliver education and awareness programs with regards to the importance of riparian areas</p> <ul style="list-style-type: none"> Eg. restore degraded islands in Wallis Lake including Cockatoo, Mather and Long and Miles Islands 	GLC, LLS, GTCC
EH5.6	<p>Actively pursue opportunities to research the ecosystem services functions of riparian zones and the best management practice approach to riparian protection and restoration</p>	GLC, LLS, GTCC, research institutions
Objective notes		
<ul style="list-style-type: none"> Action WQ2.1 (Establish stock exclusion riparian fencing, as well as off-stream watering and shade) is a crucial step toward achieving this objective This objective is an important aspect to achieving objective Action WQ3. Control and mitigate waterway use erosion of the foreshore and riparian zones 		

Anticipated outcomes

There is a greater understanding by the community of the importance of vegetated riparian zones for the protection of water quality, the provision of ecosystem services and the connectivity of the natural landscape, as well as the need for effective protection and restoration of such areas. Further, this enhanced knowledge contributes to net improvements in the area of riparian zones that contain native vegetation and the improvement of the condition of riparian zones, through the exclusion of stock and the management of weeds and other threats.

There is published research addressing knowledge gaps which lead to enhanced local management but which also contributes to enhanced general knowledge.

Action notes

Use all available means and techniques including field days, workshops and case studies. Use successful sites such as the Durness/ Borland Landcare Corridor to demonstrate and promote riparian restoration works.

EH6 Monitor and protect aquatic vegetation including seagrass and sponges

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: E	5, 9	Goal 6, Target 8, 9 Goal 8, Target 13

Proposed actions		Responsibility
EH6.1	Continue with seagrass surveys on a regular basis	GLC, DPI (Fisheries)
EH6.2	Promote the importance of seagrass and other aquatic habitats, and their protection to stakeholders and the general community	GLC, DPI (Fisheries)
EH6.3	Promote appropriate behaviours to minimise impacts on seagrass beds, including promotion of seagrass friendly moorings	RMS, DPI (Fisheries)
EH6.4	Dredge the sand bar encroaching on <i>Posidonia australis</i> beds between Wallis and Tonys Point Islands	GLC, Crown Lands OEH
EH6.5	Identify, and where appropriate, establish and promote locations of powerboat exclusion zones in important and sensitive seagrass beds	RMS
EH6.6	Actively pursue opportunities to collaborate with researchers on seagrass health and distribution trends in Wallis Lake	GLC
EH6.7	Protect sponge communities by preventing the loss of valuable seagrass and macro-algal habitats	GLC

Wallis Lake contains the largest area of estuarine seagrasses in NSW, comprising 35% of the total seagrass in the state. Of the five species recorded in the lake, two are at the limits of their distribution, and one (*Halodule tridentata*) has not been recorded from any other NSW lake or estuary.

Wallis Lake's extensive seagrass meadows support a relatively diverse assemblage of sponges compared to other coastal lakes and lagoons in New South Wales. Furthermore, many of the sponges previously found

in Wallis Lake are likely to be undescribed and new to science (Barnes, 2010). These seagrass meadows are also pivotal to supporting Wallis Lake's extensive recreational and commercial fishing industry.

Key threats to seagrass and sponges, as well as other aquatic vegetation, is deterioration of water quality through increased sediment loading, as well as impacts from human use of the Estuary and encroachment on seagrass beds from sand bars.

Anticipated outcomes

The spatial distribution of seagrass is regularly mapped and trends in distribution are reported and used in adaptive estuary management.

There is demonstrated greater understanding within the community and key stakeholders (boaters and fishers in particular) of aquatic vegetation and habitats, and the importance of their protection. Opportunities for regular education and delivery of key messages are taken where possible. Increased awareness leads to a net reduction in the physical damage of seagrass and other important estuarine communities by Lake users.

A net reduction in the extent of damage done to seagrass beds by boating activities.

There is an increase in the installation and usage of seagrass friendly moorings and a net reduction in moorings of a type that damage seagrass beds and other important estuarine habitats.

The sand bar is dredged as required in an ecologically and hydrologically responsible manner. The *Posidonia australis* beds between Wallis and Tonys Point Islands are kept free of sand encroachment.

There is a net reduction of propeller chop and other power boat related disturbance of important seagrass beds and other estuarine habitats.

Research papers are prepared which lead to better understanding and adaptive management of the broader Estuary.

There is no loss of sponge species in Wallis Lake and the spatial distribution and abundance of sponges in Wallis Lake is maintained and increased.

Action notes

Investigate opportunities to form partnerships with universities, colleges etc. for studying and monitoring.

Remote sensing mapping should be used to monitor the extent of seagrass beds.

To be achieved through diverse means such as signage, maps, and information added to any boating media. Through boat hire sheds, bait sellers, boat ramps etc. Promote seagrass importance for fish populations. Focus on holiday periods. Education should be part of licensing process.

REF for dredging works has been completed, awaiting funding (currently low priority works). Crown lands to review REF and consider approval.

(See Appendix B, Draft Wallis Lake Dredging Program)

Also refer action CW3.1: Allocate, promote and monitor management areas, speed restriction zones, powerboat and jet ski -free zones in Wallis Lake and tributaries.

In particular the large beds of *Lamprothamnion* in the southern portion of Wallis Lake should be protected in accordance with the recommendations of: Sponges and Ascidians of the Southern Basin of Wallis Lake, New South Wales (Barnes, 2010).

EH7 Maintain and improve wetlands in the Catchment

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: E, C	1, 4, 8	Goal 4, Target 3
CMP: 2		Goal 5, Targets 4 Goal 6, Targets 7, 8 Goal 8, Targets 15, 14

Proposed actions		Responsibility
EH7.1	Map the occurrence and condition of wetlands. Identify priorities for management and action	GLC, LLS
EH7.2	Implement the Wallis Lake Wetlands Strategy, monitor and report on the implementation of this Strategy and review and update as necessary	GLC

Healthy wetlands are dynamic living entities which provide services such as nurseries for recreational and commercial fisheries; opportunities for tourism; support for sustainable timber production; grazing and apiculture; as well as a cultural focus for many regional communities, including Aboriginal communities (DECCW, 2010).

All wetlands are integral to landscape processes such as nutrient cycling, detention and slow release of flood water, and trapping of sediments. Wetlands also form a vital component of regional and national biodiversity by providing habitat for a wide range of animals and plants (DECCW, 2010).

Pressures on wetlands in the Wallis Lake Catchment include altered hydrological regimes, infilling due to sedimentation, declining water quality due to elevated nutrient loads, weed invasion, land reclamation and physical disturbance due to grazing (GLC, 2003). Furthermore, wetland habitats are likely to be seriously impacted by global sea level rise associated with anthropogenic climate change. In recognition of these issues, in 2011 Great Lakes Council adopted the Wallis Lakes Wetland Strategy.

Anticipated outcomes

Spatially accurate wetland maps are prepared and utilised in NRM decision making. A standardised method for the rapid assessment of wetland condition is devised and adopted.

There is demonstrated achievement with regard to the stated vision, guiding principles and actions of the Wallis Lake Wetland Strategy, such that there is net improvement in wetland distribution, condition, conservation status and public ownership over time. In particular:

- There is a net increase in the area of wetlands of the Wallis Lake Catchment zoned for environmental protection in the LEP
- Wetlands in the Wallis Lake Catchment are not lost or diminished, but if such loss is unavoidable, then offsets are used such that wetland habitat and function is maintained or improved
- Wetland function is generally enhanced and the area of wetlands managed for enhanced function is increased over time
- There is a net increase in the area of wetland in the Wallis Lake Catchment that is, publicly or privately, permanently conserved
- Wetlands on Crown Land and Council land are effectively managed
- The floodplains and catchments of wetlands are better managed and wetlands are protected by way of established buffers and linkages
- Development is effectively regulated and controlled to avoid impacts on wetlands and to restore and enhance wetland function and conservation
- Research is conducted on local wetlands, their functions and their restoration management
- The community is educated about the importance of wetlands

Action notes

Prioritisation to be based on biodiversity, water quality improvement, ecosystem function values.

The key elements of the Wallis Lake Wetland Strategy that are relevant to this Plan include:

- Private land conservation of wetlands
- Strategic and prioritised acquisition and public reservation
- Investigate Ramsar listing of Wallis Lake
- Monitor wetland health and function

EH 7

Maintain and improve wetlands in the Catchment

Proposed actions		Responsibility
EH7.3	Adopt and implement a model NRM clause for wetlands in the Great Lakes Local Environmental Plan (LEP)	GLC
EH7.4	Continue to rehabilitate purchased wetlands and investigate and pursue further strategic purchases of wetlands	GLC
EH7.5	Continue to educate and engage the community regarding general and local wetland values and issues	GLC, GTCC, NPWS, LLS
EH7.6	Focus on wetland protection, restoration and management on private lands	GLC, LLS
EH7.7	Protect natural wetlands from grazing pressures	GLC, GTCC, LLS
EH7.8	Pursue collaborations with researchers to design and deliver wetland condition assessment and reporting	GLC

Anticipated outcomes**Action notes**

Wetland NRM clause adopted and enforced such that wetlands are better protected, restored and managed over time.

Local wetland map layer to be created in order to enable implementation of the new LEP.

There is a net addition of wetlands in GLC and OEH tenure over time. Further, that acquired wetland condition and function is enhanced over time by management interventions and restoration activities, such as drain-infilling, weed and feral animal control, access management and revegetation.

There is greater awareness and appreciation in the local community about the critical roles of wetlands in ecosystem services provisions, leading to behavioural changes and acceptance of the need for wetland protection and restoration programs.

Employ diverse methods such as workshops, field days, information package for home-owners, articles in local publications, booklets etc.

Incorporate with other programs such as sustainable farming, bushcare, sustainable gardening, schools education etc.

The net area of privately conserved wetlands is increased over time and the general condition of privately held wetlands is enhanced.

Despite the best endeavours of relevant agencies in conservation and acquisition programs, proper wetland protection and restoration programs will rely on commitments of private landholders to the protection and conservation management of wetlands on their landholdings.

(Also refer to action EH2.6)

Programs for private land conservation include Land for Wildlife, Conservation Agreements, and Property Vegetation Plans.

The area of natural wetlands that is protected is increased and their natural abilities to filter nutrients and sediments are maintained or improved, through strategic stock exclusion of wetland habitats.

Suggested steps to achieve this action are outlined in the WQIP (2009) (Table 3.3.2 p268).

Effective, applied and published research is undertaken which contributes to enhanced wetland conservation and restoration programs within the Catchment.

EH 8

Address the threats to local ecosystems arising from climate change and associated sea level rise

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
none	3, 9	Goal 6, Target 9 Goal 8, Target 15

Proposed actions		Responsibility
EH8.1	Continue to investigate threats posed to different landscapes and ecosystems by climate change and sea level rise, as well as mitigation and adaptation options for all land managers	GLC, LLS, NPWS, OEH, GTCC
EH8.2	Prioritise the adaptive management of areas and ecosystems most at threat from climate change and sea level rise	OEH, LLS, GLC, GTCC, Crown Lands
EH8.3	Continue to monitor the condition and extent of saltmarsh around Wallis Lake	GLC, DPI (Fisheries)
EH8.4	Investigate opportunities to purchase or otherwise protect suitable areas to act as buffer zones to allow for ecosystem migration based on modelled predicted sea level rise impacts on Wallis Lake and Estuaries	GLC, OEH
EH8.5	Implement appropriate management actions from: Condition Assessment and Management Considerations for Saltmarsh in Wallis Lake (Umwelt, 2012) and any subsequent reports	GLC, OEH

Climate change is emerging as a serious threat to native species and ecosystems and is expected to be an ongoing challenge to the effective conservation of these assets. Rising temperatures and sea levels and climate-induced changes in fire regimes, water quality and ocean chemistry (such as acidification) will have a wide-ranging impact on biodiversity in NSW. Climate change is also expected to intensify existing threats to biodiversity, such as habitat loss, weeds and pest animals, and drought (DECCW, 2010a).

Saltmarsh is a habitat in decline in NSW and its limited distribution has led to its classification as an Endangered Ecological Community. As a habitat representing the meeting of land and water, it is susceptible to rising sea levels, as well as a variety of other pressures such as urban and tourism development and economic uses of coastal resources for agriculture (Umwelt, 2012). With this in mind, actions within this Plan aim to proactively manage saltmarsh habitats within the estuary with a view to achieving a no net loss of saltmarsh areas within the Wallis Lake Estuary.

Anticipated outcomes

Various management reports are produced that investigate at-risk ecological communities and landscapes from sea level rise and anthropogenic-related climate change. The outcomes of these management reports lead to the adoption of actions that boost resilience and increase protection of at-risk landscapes and communities.

Risk maps based on modelling and field assessments are prepared and used to inform management planning for the protection, management or offsetting of predicted impacts. Over time, there should be the best endeavours to protect and manage functional areas of at-risk areas and ecosystems.

The regular monitoring of saltmarsh is undertaken to allow for analysis of change over time. This increased knowledge and understanding is used to inform future management strategies.

Potential buffer zones or migration areas are identified and managed in advance of actual sea-level rise related impacts such that the area of at-risk communities, habitats or populations is maintained over time.

There are management interventions adopted to achieve a no net loss over time of saltmarsh areas within the Wallis Lake Estuary.

Action notes

Keep abreast of saltmarsh management being undertaken elsewhere, and the success or otherwise of different techniques.

COMMUNITY WELLBEING MANAGEMENT ACTIONS

Wallis Lake possesses the largest Sydney Rock Oyster industry in NSW, a substantial fishery that supports up to 51 commercial fishers and attracts thousands of recreational users every year as part of a \$315 million tourist industry.

The Estuary and Catchment possesses significant cultural and aesthetic values for its traditional owners and those who currently call the region home, as well as being a driving force behind regular returning visitors to the area. This Plan aims to balance these uses to ensure that the natural resources of the Estuary and Catchment are managed sustainably for now and the ongoing enjoyment of future generations.





CW 1

Manage recreational fishing, commercial fishing and oyster production for economic and ecological sustainability

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: F, C, O, W	2, 3, 5, 7, 9, 12	Goal 8, Target 13
CMP: 10		Goal 10, Target 21

Proposed actions		Responsibility
CW1.1	Ensure commercial fishers continue to comply with the Fishery Management Strategy for the Estuary General Fishery and the Code of Practice is readily available to fishers	DPI (Fisheries) Fishing Co-op
CW1.2	Implement the Environmental Management System for Wallis Lake Estuary – General Fishery, and review/update as opportunity allows	Fishing Co-op DPI (Fisheries)
CW1.3	Promote the DPI (Fisheries) Responsible Fishing Guidelines and the Wallis Lake District recreational fishing guide, and support the application of the National Code of Practice for Recreational & Sport Fishing (2001) to local recreational fishers	DPI (Fisheries)
CW1.4	Investigate options for the monitoring of recreational fishing catch	DPI (Fisheries)
CW1.5	Support a broad communication and education program addressing sustainable management of the Wallis Lake fishery	Fishing Co-op DPI (Fisheries) GLC

Estuary fisheries have a high productivity as well as providing nursery habitat areas for fish caught in fresh, estuarine and marine waters (Turner et al, 2004). Wallis Lake in particular supports a large number of commercial fishers and oyster growers. Key actions to manage these extractive activities relate to industry and government developed: Codes of Practice, Environmental Management Systems and Strategies.

The Lake and waterways also support significant numbers of recreational fishers, particularly during peak holiday periods. The extent and subsequent impact of these activities is difficult to quantify and management of these activities is primarily based around education and compliance.

Anticipated outcomes

All commercial fishing within the Wallis Lake Estuary is undertaken in a sustainable manner to preserve fisheries for the future.

Seafood harvested on behalf of the community is undertaken as sustainably as current technology and techniques allow, and improved as new technology and techniques are developed.

Local recreational fishers are aware of and familiar with the guidelines, and recreational fishing is undertaken in a responsible manner to minimise impact on the environment and other members of the community.

Most appropriate method for monitoring recreational fishing catch in Wallis Lake Estuary determined and implemented.

Information gathered through monitoring used to determine sustainable fishing levels and inform future policy.

A greater understanding amongst professional and recreational fishers, as well as the general community regarding the importance of a healthy aquatic environment and all fishing being undertaken in a sustainable manner.

Action notes

This comprises the majority of the work currently undertaken by DPI (Fisheries) staff in the Wallis Lake area. Primary methodologies relate to an advisory and compliance enforcement role.

Approximately 75% of fishers in the Wallis Lake system belong to the Wallis Lake Fisherman's Co-op (other 25% includes individual fishers, and those from Taree and Newcastle Co-Ops).

EMS originally prepared by the Wallis Lake Estuary general fishers and SeaNet NSW (A project of Ocean Watch Australia).

One-off study undertaken in Wallis Lake in 2000, and a state-wide survey is being undertaken by DPI (Fisheries) in 2013/14.

Important issues to cover in education and communication program include: the link between the management of land based activity, wetland health etc. to fishery health and fish stock recruitment; the importance of mangroves, saltmarsh, seagrass and other natural environments; bag and size limits (and, importantly, the reasons for these); closed seasons; the impacts of various activities such as anchoring and propeller chop; and threatened and protected species. The research done by commercial fishers could also be publicised as well as utilising experienced Wallis Lake fisherman to assist in communication programs.

CW 1

Manage recreational fishing, commercial fishing and oyster production for economic and ecological sustainability

Proposed actions		Responsibility
CW1.6	Implement the National Climate Change Action Plan for Fisheries and Aquaculture and review and update as necessary	DPI (Fisheries) Fishing Co-op Oyster Industry
CW1.7	Continue to support the implementation of the NSW Oyster Industry Sustainable Aquaculture Strategy (OISAS)	Oyster Industry DPI (Fisheries) WLSQAP GLC
CW1.8	Undertake a collaborative effort to audit and manage land-based oyster industry infrastructure to ensure environmental conditions of leases are being met	Crown Lands Oyster Industry DPI (Fisheries)

Anticipated outcomes**Action notes**

Local fishers have strategies in place to adapt to climate change impacts.

Local fishers are aware of the potential impacts of climate change and their role in its mitigation.

Oyster production levels and quality maintained within the Wallis Lakes Estuary.

OISAS last reviewed in 2012 (new version yet to be released). DPI (Fisheries) has compliance and advisory role.

Negative environmental impacts from land-based oyster industry infrastructure is reduced.

Crown Lands management primarily occurs through leasing and licensing compliance.

CW2

Protect the cultural and aesthetic values of Wallis Lake and its Catchment

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: W, F, M, C	12	Goal 9, Targets 16, 19

Proposed actions		Responsibility
CW2.1	Where activities are being proposed or undertaken—identify, monitor and protect sites of known significant Aboriginal and European heritage, and where there is uncertainty about the value of culture and heritage, a precautionary approach is adopted	GLC, GTCC, NPWS, Crown Lands, LLS, FLALC
CW2.2	Incorporate information regarding local Aboriginal cultural history and connection to land in educational material for the community and visitors	GLC, GTCC NPWS, LLS, FLALC
CW2.3	Continue to implement the ongoing strategies of the Indigenous Fisheries Strategy and Implementation Plan	DPI (Fisheries) FLALC
CW2.4	Develop site-specific foreshore management plans for Pacific Palms, Pipers Bay, Little Street foreshore and Tuncurry, and ensure appropriate and sensitive foreshore development through land use planning tools	GLC Crown Lands
CW2.5	Seek funding to develop the Forster Keys/Little St walkway	GLC

Objective notes

- One of the most important aspects of the aesthetic value of the area is the Lake and waterways being in a clean and healthy state. Therefore, all of the activities detailed under the Water Quality theme (as well as the environmental services provided by the Ecosystem Health section) will contribute greatly to addressing this objective

The rich natural resources of Wallis Lake Estuary and Catchment have supported human habitation for thousands of years. In more recent times these resources combined with the aesthetic values of the area such as the crystal clear waters of the Lake and extensive vistas of vegetated foreshores (particularly on the western side) continue to attract new residents and visitors to the area.

Such a long history of habitation in the area has created strong bonds with these cultural and aesthetic values of the Lake and Catchment, and this Plan seeks to balance these values and ensure they are maintained.

Anticipated outcomes

New developments and projects identify and consider potential impacts on Aboriginal and European heritage, as well as the aesthetic values of Wallis Lake and its Catchment, and liaise with relevant stakeholders to pursue appropriate outcomes.

Action notes

Activities must comply with the National Parks and Wildlife Act 1974, which protects Aboriginal objects and Aboriginal places in NSW. It is an offence to do any of the following without an exemption or defence (penalties apply):

- Knowingly harm or desecrate an Aboriginal object (the 'knowing' offence)
- Harm or desecrate an Aboriginal object or Aboriginal place (the 'strict liability' offence)

The Biripi and Worimi are acknowledged as the traditional owners of the Wallis Lake Catchment, and respect and understanding of Aboriginal cultural heritage values is promoted to all people in the Wallis Lake Catchment.

Aboriginal communities are involved in the stewardship of fisheries' resources and traditional fishing activities are protected and enhanced.

Development in the foreshore area will not impact on natural foreshore processes or affect the significance and amenity of the area.

Appropriate uses of foreshore reserves are identified and promoted.

The Wallis Lake Wetland Strategy covers the management of much of the Wallis Lake foreshore area.

See WQIP (p. 317) for further detail on: Recommendations for the improved management of foreshore and urban riparian areas.

A Forster/Tuncurry Crown Harbour Masterplan has been developed for the area and at time of writing is exhibited for comments from the community. The project includes an MoU between Crown Lands and Great Lakes Council.

Facilitate active community use of foreshore areas and connectivity between key areas of the Forster urban footprint.

Feasibility study has been completed.

This walkway is part of the Forster/Tuncurry Crown Harbour Masterplan.

CW3 Facilitate safe and sustainable waterway usage of the Wallis Lake Estuary

Original objective/s	State-wide target/s addressed	HCR CAP goals addressed
EMP: U, W, C CMP: 10	5, 7, 9, 12	Goal 9, 19

Proposed actions		Responsibility
CW3.1	Allocate, promote and monitor management areas, speed restriction zones, powerboat and jet ski-restricted zones in Wallis Lake and tributaries	RMS
CW3.2	Promote and provide information about the importance of safe and sustainable waterway use	RMS
CW3.3	Continue to implement Recreational Boating Infrastructure Strategy, and review and update as required	GLC RMS
CW3.4	Implement the Wallis Lake Dredging Maintenance Program in consultation with relevant authorities for navigation channels. Support sustainable dredging of oyster leases in 'protocol' area	GLC RMS Crown Lands Oyster Industry
CW3.5	Facilitate appropriate use of islands within the Wallis Lake Estuary and educate the community on the natural and cultural heritage values of the islands	GLC NPWS Crown Lands

Objective Notes

- The Wallamba River Memorandum of Understanding is a key document in continuing to ensure the safe and sustainable use of the Wallis Lake Estuary (see W3.3)

Wallis Lake and its waterways experience a high degree of usage between commercial fishers, oyster growers and recreational users. This Plan provides strategies to proactively manage these uses and mitigate the potential for tension between conflicting users.

Anticipated outcomes

Impacts of vessels on other users of the Estuary, as well as environmental impacts are managed appropriately.

Action notes

Through marker buoys, information displays and maps at boat ramps, boat sheds and bait shops.

Areas allocated to unrestricted powerboat use should likewise be promoted.

Also refer Action EH6.5: Establish and promote locations of powerboat exclusion zones in important and sensitive seagrass beds.

Users of the Estuary are aware of their impacts on other users of the Estuary and the environment, and adapt their behaviour appropriately.

Information to be provided through a variety of avenues, including posters, brochures, booklets and signage at boat ramps, boat sheds and as part of licensing process.

Tours of sensitive and high value areas could improve understanding and compliance.

Facilities and infrastructure meet the needs of Estuary users for safe and sustainable use of their waterway.

The GLC Recreational Boating Infrastructure Strategy initially prioritises high-use sites and seeks to align with other agency infrastructure plans (eg. RMS).

In accordance with best practice and subject to relevant approvals identified navigation channels and oyster lease areas are kept clear, to facilitate safe usage of the Estuary.

Draft Wallis Lakes Navigation Dredging Program included as Appendix B.

Also refer to EH6.4: Dredging the sandbar encroaching on *posidonia australis* beds between Wallis and Tonys Point.

Public appreciation, enjoyment and understanding of the islands within Wallis Lake Estuary is facilitated in the context of environmental protection—including managing the impacts of visitors and residents on accessible sites to avoid degradation of these.

A Draft Plan of Management for the Wallis Lake Nature Reserves (incorporating Wallis Island, Coolongolook, Regatta Island, Mills Island, Yahoo Island, Bandicoot Island, Flat Island and Durands Island Nature Reserves) was developed in 2013.

MONITORING ACTION PLAN

HCR CAP goals addressed

2. Knowledge and research

	Responsibility	Anticipated outcomes
Regular aerial mapping (recommended 5-yearly) to measure longitudinal status of native vegetation (growth or decline)	GLC, LLS, DPI	Changes to ecological communities can be tracked over an extended period of time and managed appropriately
Biodiversity surveys/census of GLC managed reserves	GLC, OEH	Reserves managed for conservation purposes are surveyed to determine the extent and status of key species throughout the Catchment
Continue plot-based monitoring program	GLC	Changes to identified ecological communities are monitored over time to assess status and potential threats
Investigate potential for spectral imaging to identify priority weeds and weed hotspots	GLC, DPI, MNCWCC	Methodologies are developed and implemented to cost-effectively monitor priority weed species across the Catchment
Undertake 10 year mapping of foreshore vegetation, type, density, condition assessment	GLC, LLS	Changes to ecological communities can be tracked over an extended period of time and managed appropriately
Assess groundwater quality discharge to Duck Swamp	GLC, NoW	Groundwater quality discharge to Duck Swamp is determined, and (where required) appropriate strategies are developed
Repeat AusRivas study to investigate changes in upper Catchment over a 10 year period	GLC, LLS, OEH	Changes in upper Catchment since initial study are identified and appropriate management strategies are developed and implemented
Continue to implement an ongoing water quality monitoring program to support management actions and inform the community, such as the annual Waterways and Catchment Report Card	GLC, OEH	Ecological indicators of water quality of key waterways within the Great Lakes LGA (as well as their dependence on rural and urban land uses) are regularly monitored and publicised to the community
Repeat Wallamba River Erosion Survey	GLC	Changes to the Wallamba River profile are monitored over time and subsequently managed appropriately
Periodic audit of GLC Sediment & Erosion EMS implementation and Sediment & Erosion Policy.	GLC	GLC implements best-practice sediment and erosion control during development and road-maintenance projects
Undertake periodic hydro-survey of priority navigation channels to determine maintenance trigger	GLC	Maintenance dredging is undertaken in a timely and efficient manner. Maintenance dredging activities are adapted in line with new information
Investigate incorporation of additional community satisfaction questions relevant to implementation of the E&CMP into the GLC Community Research program	GLC	Community satisfaction with E&CMP implementation is monitored

Link to management objectives	Action notes
EH1, EH3, EH5, EH7	Vegetation mapping in this context is used both as a direct measure of the extent of ecological communities, as well as a surrogate (modelling) for direct surveying of threatened species across the Catchment.
EH1	On ground surveys are undertaken to ground truth the data developed through aerial mapping processes (M1).
EH2, EH4	On ground longitudinal monitoring of permanent plots is undertaken to ground truth the data developed through aerial mapping processes (M1).
EH4	
EH5	The intent is to develop a baseline map of foreshore vegetation that can be used to track long term changes in ground cover.
WQ1	
WQ2, WQ3, WQ4, WQ6	The AusRivas study program was undertaken in 1999 examining key sites in the upper reaches of the Wallis Lake Catchment. This study underpinned the development of the 2003 Wallis Lake Catchment Management Plan.
EH6, WQ2, WQ3, WQ4, WQ5, WQ6	<p>Since 2011 an annual Waterways and Catchment report has been produced to provide information to the community on the health of key waterways throughout the Great Lakes. Each report provides information on ecological indicators including algae (chlorophyll) and clarity (turbidity) as well as subsequent data and case studies based on an annual community relevant theme.</p> <p>Monitoring sites within Wallis Lake relate to both urban (eg. Pipers Bay) and rural (Mid Wallamba Estuary) nutrient and sediment inputs.</p>
EH5, WQ3	This study is based on key sites along the Wallamba River. Since commencement of this study several of the sites experiencing high rates of erosion have been managed through installation of rock fillets and re-establishment of riparian vegetation.
WQ4	
CW3	Further detail on priority navigation channels is included in Wallis Lake Navigation Dredging Program (Appendix B).
CW2, CW3	Great Lakes Council undertakes a regular Community Research program.

