Urban Stormwater Management Plan

Volume 1

FINAL DRAFT FOR PUBLIC DISPLAY

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PROJECT 12-004– BSC URBAN STORMWATER MANAGEMENT STRATEGIC PLAN

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EXECUTIVE SUMMARY

This Urban Stormwater Management Plan (USMP) has been prepared to improve the sustainability and amenity value of the Ballina Shire urban stormwater management systems. This Plan builds on Council's 2002 Urban Stormwater Management Strategy and focuses on providing an effective framework for stormwater management and providing a clear implementation path to address priority issues. This Plan seeks to review and improve Council's management and planning processes to ensure that stormwater systems are designed, constructed and maintained to best practice standards and in locations that will maximise their environmental, social and economic benefits to the community.

This USMP brings together the available information to identify the urban stormwater management issues and formulate management actions. Volume 1 of the USMP (this document) provides an Implementation Plan for the priority management actions and Volume 2 provides the background information.

Key Urban Stormwater Management Issues

A range of issues were identified through a review of existing documentation and stakeholder input. Many of these issues are being addressed through existing Council actions, however, improved management systems are required to ensure efficient resolution of existing problems and avoidance of future issues. The stormwater management issues are generally:

- Related to the efficiency and/or effectiveness of existing administration and management;
- Significant localised stormwater management issues which are expensive to address or require resolution of other issues before they can be addressed; or
- Minor in nature, but occur throughout the Shire and will require a coordinated approach to achieve the best outcome for stakeholders.

In addition to this, the impacts of climate change will add to the complexity of the current issues.

USMP Objectives

The community and stakeholder values, objectives identified in the 2002 Urban Stormwater Management Strategy (USMS) and Water Sensitive Urban Design (WSUD) principles have been reviewed to establish the management objectives for this USMP.

The overall aim of urban stormwater management in Ballina Shire is:

To provide sustainable and effective urban stormwater systems and assets that protect the natural, social and economic values of the Richmond River and its tributaries and the Ballina coastline.

The urban stormwater management objectives required to contribute to this aim are:

1. Stormwater systems are effective in removing stormwater from urban areas;
2. Stormwater assets limit impacts on receiving environments to acceptable levels;
3. Stormwater assets are integrated into the planned landscape, e.g. provide habitat and natural systems in appropriate places and increase surrounding land values by providing aesthetic and natural appeal; and
4. Management of stormwater systems is efficient and cost effective through the whole asset life cycle.

It is intended that these objectives apply to the full cycle of stormwater management activities including land use planning, development controls, stormwater asset and system design, construction, operation and maintenance. Achievement of these objectives will require Council commitment, resources and funding and community awareness.

Urban Water Management

Council's existing Urban Water Management Strategy provides strategic direction for the provision of water supply, wastewater and stormwater services but currently focuses on recycled water initiatives. Best practice in urban stormwater management is achieved through a Council-wide Water Sensitive Urban Design (WSUD) approach that covers all aspects of the water cycle at all phases of land use and infrastructure planning. With an integrated water management approach, the linkages between the related water, wastewater and stormwater aspects of urban development are strengthened and duplication in planning and decision-making is avoided. The total water cycle approach also requires increased emphasis on the ecosystem health aspects of urban development. For urban stormwater management, this includes runoff water quality, erosion and sedimentation control and hydrological impacts. Increased consideration of these issues at the land use planning and development stages would provide better outcomes for future asset management and ecosystem health.

Implementation of an integrated urban water management framework is consistent with Council's strategic direction and policies and is directly linked to other strategic priorities such as risk management, planning for climate change, floodplain management as well as the Coastal Zone Management Plan (CZMP) for the Richmond River estuary (refer Figure 1).

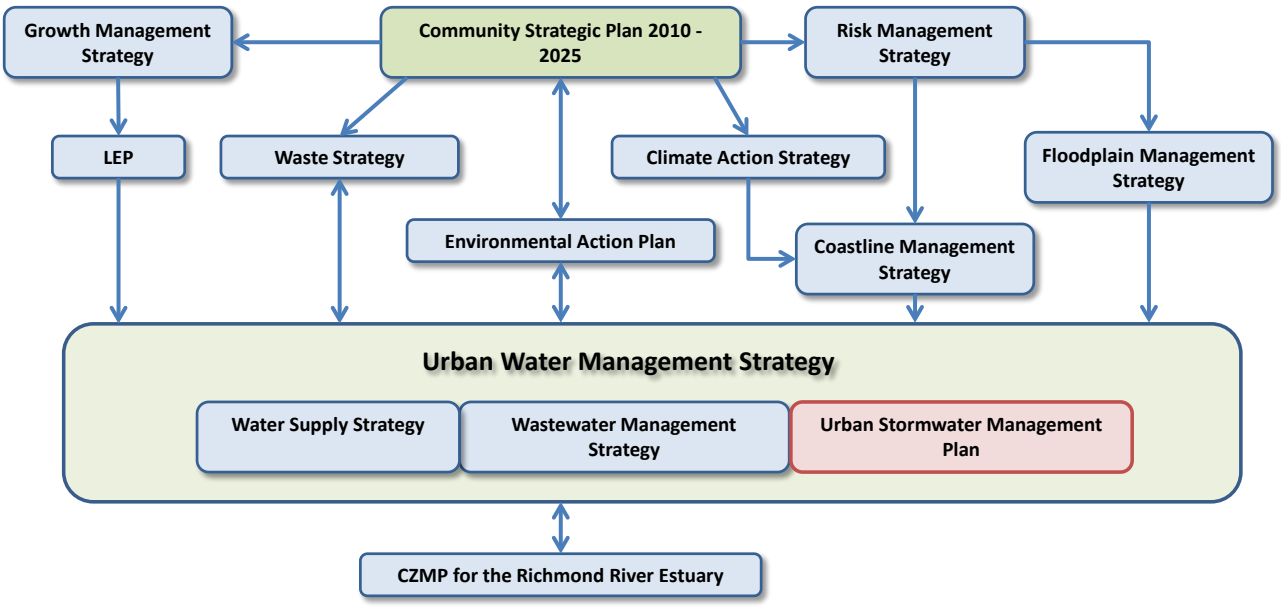

Figure 1: Urban Water Management Framework and Council's overall strategic planning

The urban stormwater management components of the Urban Water Management Strategy should be enhanced through improved administration and governance and increased emphasis on WSUD. This requires:

- Improved Council administration and management of stormwater functions;
- Increased funding to implement stormwater management initiatives;
- Improved direction and guidance for Council staff and developers regarding stormwater management considerations for:
    - land use planning,
    - development services,

- asset management (design, construction, asset transfer, maintenance and rectification/ renewal),
- climate change adaptation, and
- protection of ecosystem health (protected vegetation, habitat and waterway impacts).

- Increased community education and understanding of urban stormwater functions and impacts;
- Rectification of existing site-specific issues on a sub-catchment priority basis; and
- Implementation of a monitoring, evaluation and reporting program.

The proposed framework for the Urban Stormwater Management Plan, as shown in Figure 2, reflects the documentation required to support the urban development process from planning through to asset maintenance. Much of the required documentation exists through Council's current guidelines and can be supplemented by best-practice approaches provided by other government agencies such as Water by Design (south-east Queensland Healthy Waterways Partnership).

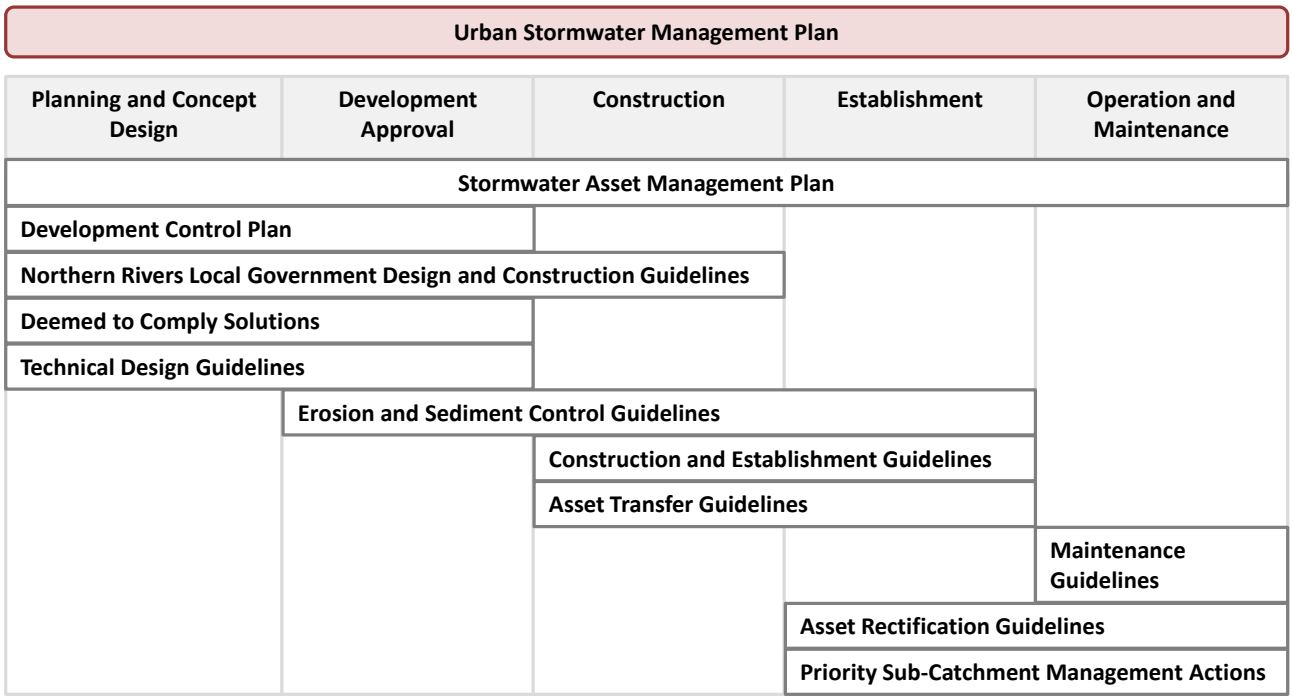

Figure 2: Proposed Urban Stormwater Management Document Framework

Administrative Requirements

Successful implementation of the proposed WSUD framework requires internal Council management responsibilities that foster consideration of the whole water cycle for the full asset lifecycle. A multidisciplinary skillset is required to understand natural waterways and stormwater assets - across engineering, catchment management, hydrology and drainage design, geomorphology, soils, ecology, vegetation as well as operational know-how in construction, on-ground works and bush regeneration. Achieving this balance efficiently requires a shift in Council's organisational culture and practice. Past experience has shown that stormwater issues will remain unresolved as the relevant line managers are hampered by the competing demands of their roles. To resolve this, whilst ensuring that Council's other critical functions are not impeded, it is recommended that a new Council position (WSUD Manager) is created with responsibility for implementation of the WSUD framework.

The WSUD management position is considered to be a key step that will improve the coordination and delivery of urban stormwater services. The position would involve hands-on delivery of administrative and

documentation tasks and would also assist in the identification of external funding for related environmental and engineering works.

Asset Management

Stormwater asset management planning is required to support the USMP through actions that are consistent with Council's Asset Management Strategy including:

- Review and updating the Stormwater Asset Management Plan;
- Collection of data including asset condition;
- Development of a renewal strategy;
- Development of guidelines or adaption of existing guidelines for:
    - Maintenance;
    - Asset Rectification; and
- Training of Council staff and developers in the use of the new guidelines.

Improved understanding and development of asset management procedures are expected to resolve many of the issues related to poor asset function. The preparation and implementation of asset management documentation would be a key task for the WSUD Manager, in consultation with other related Council functional areas.

Planning and Development Controls

There is a need for clear, quantitative planning and design objectives that provide performance standards for developments to meet via WSUD practices. This will require:

- Review and updating DCP13 (Stormwater Management);
- Development of guidelines or adaption of existing guidelines for:
    - WSUD;
    - Deemed to comply solutions;
    - Technical design;
    - Erosion and sediment control;
    - Construction and establishment;
    - Asset transfer; and
- Training of Council staff and developers in the use of the new guidelines.

It is envisaged that the WSUD Manager would also be responsible for preparation and implementation of this documentation.

Climate Change Adaptation

While Council's draft Flood Risk Management Policy Statement 11 aims to control development on flood-prone land by requiring the filling of flood liable allotments prior to constructing buildings, it does not specifically address public infrastructure such as roads and stormwater drainage. This strategy will therefore need to be supplemented with further investigation into the required improvement and flood mitigation of public infrastructure. It is recommended that a Stormwater Master Plan is developed to guide future stormwater asset renewals on low-lying land in Ballina into the future and ensure that efficient upward

migration of stormwater infrastructure and/or implementation of alternative stormwater management in these areas is achieved.

Protection of Sensitive Receiving Environments

The urban areas contains a range of sensitive receiving environments including those areas protected in national parks or reserves or gazetted under relevant legislation. Both current and future urban stormwater planning and management should consider the on-going protection of these environments. Key tasks are:

- Development of procedures to maintain currency of mapping and documentation of sensitive receiving environments;
- Development of guidelines for protection of sensitive receiving environments through planning, development controls and asset management procedures;
- Development of a policy on the application of compensatory measures; and
- Training to Council staff and developers in the use of the new guidelines.

The preparation and implementation of this documentation would be a key task for the WSUD Manager, in consultation with other related Council functional areas.

Education

Community education and capacity building is essential to the success of the proposed management framework. This applies to:

- Residents and businesses with regard to stormwater function and pollution control;
- Council staff in relation to the introduction of new procedures for land use planning, development controls and asset maintenance; and
- Developers and builders regarding the new development requirements.

Existing community education programs should be expanded to support the implementation of the USMP. Training of Council staff in WSUD approaches and the new guidelines developed from the USMP is also required.

Priority Catchment Actions

The USMP aims to facilitate a focus on the priority stormwater management areas (sub-catchments). The priority site-specific management actions relate to:

- Protection of high-value waterways; and
- Retrofit/upgrade of existing assets in areas of high risk.

The priority stormwater catchment actions are discussed in the following sections.

Reduction of Risk Associated with Localised Flooding

The risk of flooding associated with inadequate stormwater drainage is a recurring issue in the Shire's urban areas. This risk is increased with inadequate maintenance of drains and will increase with climate change, particularly sea level rise.

Management of stormwater in low-lying flat land is not easy and deserves specific attention. There are numerous existing examples of stormwater related inundation of low-lying urban land within the Shire. Meeting the expectations of stakeholders in terms of level of service and environmental performance, whilst continuing to allow cost-effective development of land in low-lying areas, is a key challenge for Council.

The required management actions as discussed above are:

- Planning and development controls; and
- Development of a climate change adaptation strategy for the management of stormwater infrastructure.

Localised flooding at some high profile sites will also be addressed through the priority catchment actions including:

- Chickiba Wetlands (discussed below); and
- Alstonville Creek (Tanamera Drain, discussed below).

There are many other examples of poor site drainage which require rectification on a priority basis. It is recommended that a targeted program of asset renewal is developed based on condition assessments and asset management planning utilising Council's updated asset management systems.

Alstonville Creek (Tanamera Drain)

Tanamera Drain (part of Alstonville Creek) has been identified as a high priority site for rectification due to the potential risk of flooding of adjacent properties. A concept plan was prepared in 2003 for rehabilitating a section of the Alstonville Creek stormwater catchment reserve from Apex Park through to and including the Tanamera stormwater reserve. The plan includes paths and cycle ways, recreation facilities, interpretive signage, revegetation works, creek restoration and stormwater facilitation. The capital cost was estimated as $1.36m (indexed to 2012$). Council has not been able to fund the plan.

Council has negotiated an agreement with the downstream land owners to incrementally implement the concept plan, however an affordable staged implementation plan has not yet been developed. The concept plan needs to be reviewed to assess the costs and implications of the current situation and develop a cost-effective staged approach which addresses the key risks.

Cape Byron Marine Park

A previous study has identified that erosion and sediment from stormwater discharges have the potential to adversely affect the reef habitat within the Moat/Bream Hole Sanctuary Zone and the Seven Mile Beach Habitat Protection Zone of the Cape Byron Marine Park (Seven Mile Beach at Lennox Head). Feedback from stakeholders (DPI-Fisheries, Marine Park Authority and fishing groups) suggests that urban stormwater runoff from drains that discharge onto Seven Mile Beach is a key pollutant and sediment source. However, the concerns are based on observations documented in the 2003 study and definitive data on the risks are not available.

It is recommended that Council engage with DPI-Fisheries (Marine Park Authority) to determine the risk associated with urban stormwater runoff on the Marine Park and develop a remediation strategy.

Pacific Pines Water Quality Control Pond

Periodic algal blooms occur in the Pacific Pines water quality control pond and there is concern (DPI-Fisheries and EcoFishers) that additional development will exacerbate the impacts on the downstream SEPP 14 area (Coastal Wetlands).

The impact on the downstream wetlands has not been quantified. It is recommended that Council engage with DPI-Fisheries and the developer to investigate the impact of the water quality control pond (currently and with future development) and determine any required remediation measures. Future development controls should include any required remediation measures such as treatment measures within the catchment.

Potential Impacts on Oyster Lease Areas

There are a range of issues affecting the oyster aquaculture industry in the Richmond River estuary which are related to water quality. None of the issues relating to aquaculture management are unique to the Richmond River estuary and are currently being addressed to various degrees by industry regulation, licensing and research programs. The Coastal Zone Management Plan (CZMP) for the Richmond River Estuary recommended that DPI-Fisheries and Ballina Shire Council (BSC) identify and manage contamination sources in the estuary to minimise oyster harvest closures. This recommendation is supported in the USMP.

North Lakes

Council and community concerns regarding water quality, maintenance and amenity has triggered the preparation of a Water Quality Management Plan (WQMP) for North Lakes to guide the future management of the system, assist in informing local residents on the purpose and function of the lakes, their potential impact on its operation and assist to inform future planning decisions. There has been limited implementation of the proposed actions, due largely to insufficient funding, but also due to the complex nature of the issues, stakeholder acceptance and access/ownership arrangements.

While the management plan identified issues relating to functioning of the lakes, water quality data were not available at the time of development of the plan. Successful management of the North Lakes issue will rely on confirmation of the efficacy of the management actions proposed in the 2008 WQMP. It is recommended that investigations into the biological and chemical functioning of the lakes is undertaken in order to fully visualise the outcomes of the proposed management actions and confirm the approach to be taken before significant investment. A review of the actions proposed in the WQMP may be required depending on the outcomes of this study.

Chickiba Wetlands

Council has been developing a wetland implementation action plan for the restoration of Chickiba wetlands. The proposed actions would restore the health of the wetlands, improve drainage of the sports fields, reduce risk of localised flooding and improve the function of the asset protection zones bordering the wetlands. Implementation of the actions including ongoing monitoring is dependent on funding.

Monitoring, Evaluation and Reporting

The USMP includes actions to review the progress of the USMP through monitoring of key performance indicators (KPIs) as well as a (minimum) ten-year review of the plan.

A catchment-wide monitoring program (EcoHealth monitoring - an action of the Richmond River CZMP) is also supported by the USMP.

Implementation Program

The management strategies have been compiled into a ten-year implementation program as shown in the following table.

The major funding requirements are:

- Creation of the new permanent position of WSUD Manager;
- External consultancies (as required) to assist the WSUD Manager; and
- Priority sub-catchment urban stormwater rectification actions (on-ground works).

Internal staff support across all Council functions will also be required to assist the WSUD Manager.

Indicative budgets are included in the Implementation Program. The USMP aims to address all identified issues through holistic management actions, increased effort or through site-specific management actions. A prioritisation process has been undertaken to identify the key risks and allocate appropriate management actions. The USMP aims to direct funding to the stormwater management areas with the highest overall risk within the short-term. The actions listed here are additional to the existing Council stormwater asset maintenance and renewal programs.

Table 1: USMP Implementation Program

	Action		Responsibility	Support	Management Areas	Potential Funding	Ten Year Cost ($k)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Management Actions	1	Facilitate Integrated Urban Stormwater Management within Council (employ new WSUD Manager)	Civil Services Group Manager	Strategic Services Group, Regulatory Services Group	Shire-wide	General Fund, Stormwater Management Service Charge	1,500	150	150	150	150	150	150	150	150	150	150
	2	Identify stormwater management funding sources	WSUD Manager	Strategic Services Group, Regulatory Services Group	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	3	Review and develop stormwater asset management procedures	WSUD Manager	Open Spaces and Reserves, Asset Management, Engineering Works	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	4	Review and update development controls and guidelines	WSUD Manager	Development Services, Engineering Works, Open Spaces and Reserves, Environmental and Public Health, Strategic Planning	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	5	Prepare asset maintenance guidelines	WSUD Manager	Asset Management, Engineering Works, Open Spaces and Reserves	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	6	Develop asset renewal program	WSUD Manager	Engineering Works, Asset Management, Open Spaces and Reserves	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	7	Develop a Stormwater Master Plan for Low-Lying Land	WSUD Manager	Engineering Works, Asset Management, Strategic Planning	BA01, BA02, NO01, NO02, WE02	General Fund, external grants, developer charges	350			150	150					50	
	8	Identify requirements for protection of sensitive receiving environments	WSUD Manager	Open Spaces and Reserves, Strategic Planning, Environmental and Public Health	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	9	Develop and Implement a stormwater education and consultation program	Environmental and Public Health	WSUD Manager, Open Spaces and Reserves	Shire-wide	General Fund, external grants	50	5	5	5	5	5	5	5	5	5	5
Priority Catchment Actions	10	Targeted program of asset rectification to reduce risk of flooding	WSUD Manager	Engineering Works, Asset Management, Open Spaces and Reserves	Shire-wide	General Fund, stormwater management service charge	900		*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
	11	Rehabilitation of Alstonville Creek (Tanamera Drain)	WSUD Manager	Open Spaces and Reserves, Engineering Works	AL01	General Fund, external grants	350	50	*100*	*100*	*100*						
	12	Reduction of impacts on Cape Byron Marine Park Sanctuary and Habitat Zones	WSUD Manager	Engineering Works, Open Spaces and Reserves, DPI-Fisheries	LE03	General Fund, external grants	70			20	*50*						
	13	Investigation and rectification of Pacific Pines water quality control pond	WSUD Manager	Development Services, Open Spaces and Reserves, DPI-Fisheries	LE06	General Fund, developer, DPI-Fisheries	10	10									
	14	Investigation of potential impacts on oyster lease areas	WSUD Manager	Environmental Health, DPI-Fisheries, OEH	LE09, NO01, NO02, EA03, BA02, WE01	N/A	0	included in Richmond River CZMP									
	15	Rectification of North Lakes Stormwater Management System	WSUD Manager	Environmental Health, Open Spaces and Reserves, DPI-Fisheries	NO02	General Fund, external grants	240	40	*100*	*100*							
	16	Restoration of Chickiba Wetlands	WSUD Manager	Open Spaces and Reserves	EA01	General Fund, DPI-Fisheries, RRCC, external grants, community groups	80	50	10	10							
Monitoring, Evaluation and Reporting	17	EcoHealth Monitoring Program	Environmental and Public Health	WSUD Manager, NRCMA, DPI-Fisheries	Shire-wide	N/A	0	included in Richmond River CZMP									
	18	Review of USMP progress and monitoring of KPIs	WSUD Manager	Strategic Services Group, Regulatory Services Group	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	19	Ten year review of USMP	WSUD Manager	Strategic Services Group, Regulatory Services Group	Shire-wide	General Fund	50										50
		Totals					3,600	305	465	635	565	255	255	255	255	305	305

Notes: Years shown correspond to end of financial year i.e. 2014 is Year 1 of the Plan (starting 1 July 2013). All figures are 2012 $'000. Costs in *italics* represent a realistic allowance which has been stipulated until the full implementation costs are determined as part of prior actions

CONTENTS

APPENDICES

TABLES

FIGURES

1. INTRODUCTION

1.1 Purpose

This Urban Stormwater Management Plan (USMP) has been prepared to improve the sustainability of the Ballina Shire urban stormwater management systems. The plan builds on Council's 2002 Urban Stormwater Management Strategy and focuses on providing an effective framework for stormwater management and providing a clear implementation path to address priority issues. The focus is on reviewing and improving Council's management and planning processes to ensure that stormwater systems are designed, constructed and maintained to best practice standards and in locations that will maximise their environmental, social and economic benefits to the community. The aim is to deliver the greatest benefit to the community at least cost.

The USMP brings together the available information to identify the urban stormwater management issues and formulate management actions.

1.2 Study Area

Ballina Shire is located on the far north coast of NSW within the Richmond River catchment and encompasses an area of 492km^2. Urban areas account for only 5% of the total Shire area with the majority of land use comprised of rural and environmental zonings (95%). The study area for this plan is the shire's urban areas (as defined by the draft LEP 2012) as shown in Figure 3.

Ballina represents one of the major population centres in the Richmond River Catchment and is the major urban centre within the Ballina Shire. The township is located in the lower reaches of the Richmond River near the river mouth (Figure 3) and includes Ballina Island, East Ballina and West Ballina. Other major urban centres within Ballina Shire include Alstonville, Wollongbar, Lennox Head and Wardell. Over recent years, several urban subdivisions have also proceeded between Lennox Head and East Ballina and north of Ballina at Cumbalum. Further urban development in these areas and other urban centres is expected to occur in the future including the expansion of Cumbalum (Precinct A and B). The outcomes of this USMP should also apply to future (rezoned) urban areas.

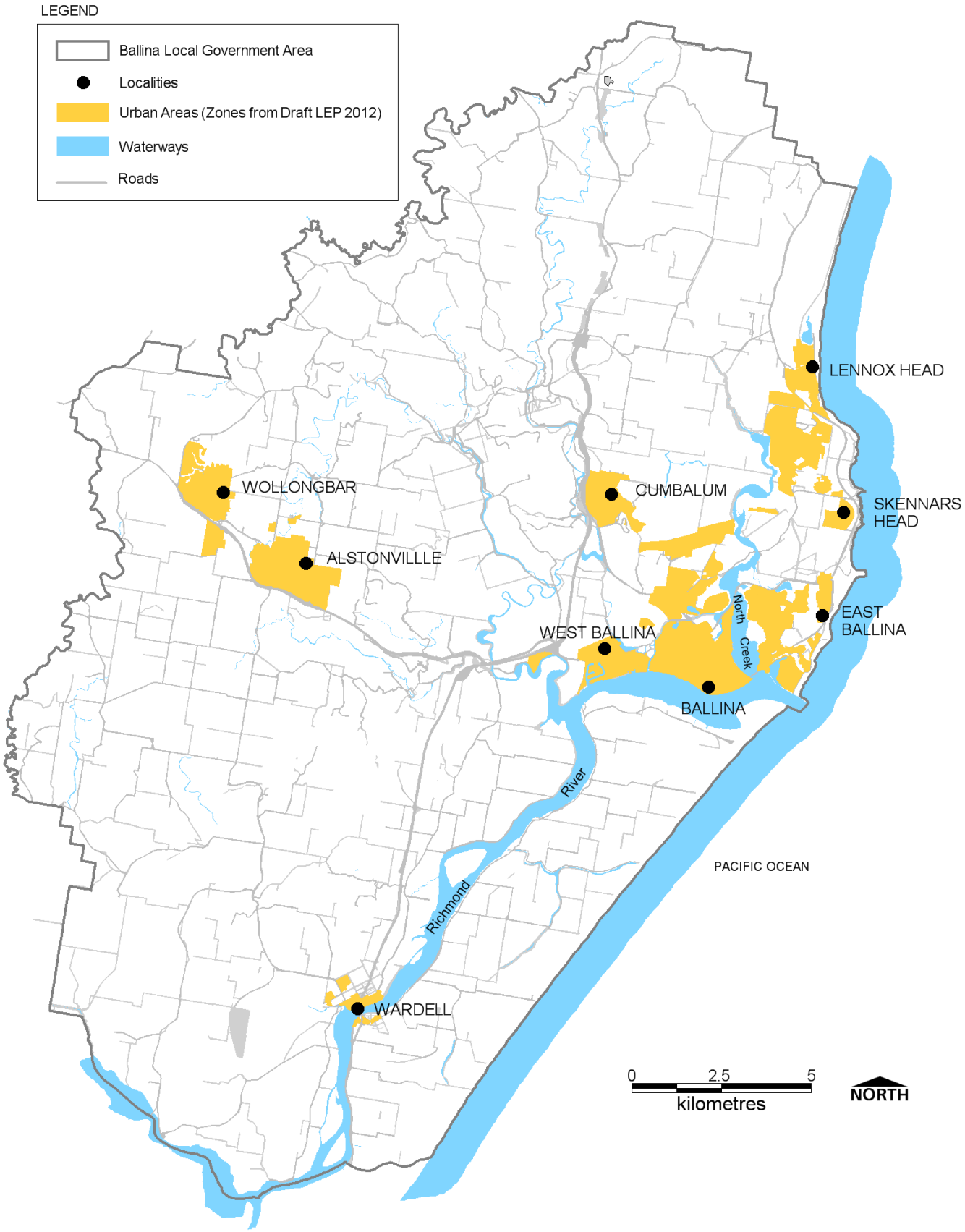

Figure 3: The Study Area: Ballina Shire urban areas (collated urban zonings from Draft LEP 2012)

1.3 Stormwater Systems

Stormwater is water that starts as rainfall and enters stormwater pipes and streams. Stormwater runoff carries pollutants that have accumulated on surfaces such as roads, roofs, car parks and construction sites. Within the Ballina Shire, most stormwater runoff drains to downstream waterways including small creeks and eventually the Richmond River estuary. Stormwater runoff in some small coastal areas, such as Lennox Head and parts of East Ballina drain directly to the ocean.

There is a direct link between urban development and waterway health as urban development changes the natural hydrological cycle. Urban areas contain impervious areas such as roads, roofs, driveways and footpaths which prevent water from infiltrating. This results in less natural on-site detention of stormwater, less evaporation and reduced uptake and transpiration by plants. The impervious areas also convey stormwater more frequently and in greater volumes to receiving waterways.

Stormwater has the potential to cause a range of direct and indirect impacts on human health and safety, the aquatic environment, property and infrastructure. Stormwater runoff can significantly affect water quality by transporting and discharging contaminants such as nutrients, suspended sediments, pathogens, oxygen-demanding substances, hydrocarbons (oils and surfactants), toxicants including pesticides, herbicides and heavy metals, litter and vegetative debris.

Changes to natural ground surfaces and drainage patterns brought about by urban development often leads to increased turbidity, siltation, litter and nutrients flowing into waterways. This can lead to fish kills, algal blooms, sedimentation of waterways and potential public health risks from primary contact or consumption of seafood. The extent and magnitude of urban stormwater pollution is dependent on management practices, population density, rainfall patterns, topography, geology and soils, catchment hydrology, land use, waste disposal practices, air pollution and catchment and floodplain vegetation.

Stormwater systems also modify the natural hydrology by collecting and concentrating flows. This can increase the rate at which erosion occurs, especially where stream gradients are high (faster flow) or there is minimal overland flow of stormwater before it enters natural drainage channels. Localised short-term flooding can also occur within urban areas with intense short duration storms and the influence of high tides in coastal areas.

Ballina Shire Council (BSC) currently provides stormwater reticulation services in Ballina Island, Ballina East, Ballina West, Ballina North, Ballina Heights, Lennox Heads, Lennox Heights, Skennars Heads, Alstonville, Wollongbar and Wardell. The existing urban stormwater reticulation system consists of gravity based pipe networks that transports stormwater runoff from kerb and gutter systems to ocean or river outlets.

1.4 Structure of the Urban Stormwater Management Plan

The USMP brings together the available information to identify the urban stormwater management issues and formulate management actions. The process used to develop the USMP is summarised in Figure 4. Volume 1 of the USMP (this document) provides an Implementation Plan for the priority management actions and Volume 2 provides the background information.

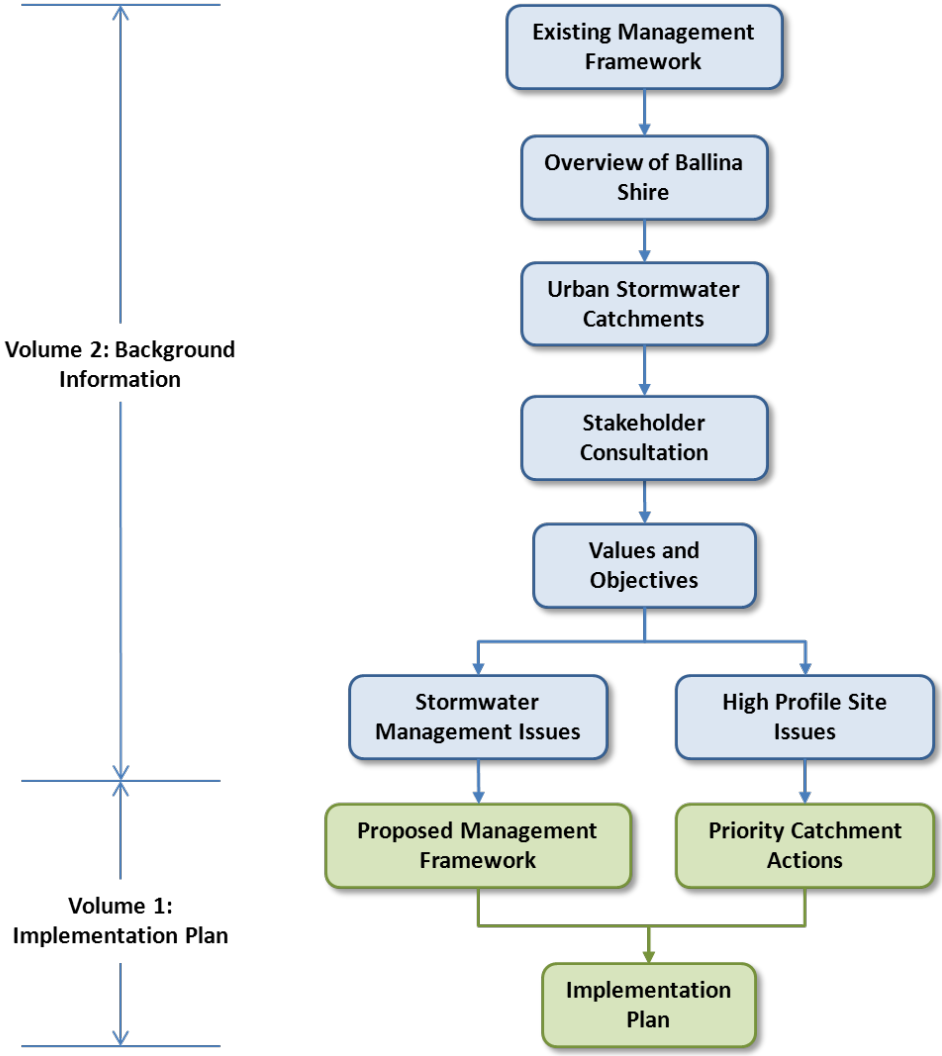

Figure 4: Structure of the USMP

1.5 Stakeholder Consultation

Consultation with stakeholders was undertaken to facilitate collection of site-specific information, local knowledge and identification of stakeholder perceptions and aspirations. This information was used in the identification of issues and tailoring of management strategies. Consultation activities were targeted to Council's residential customers, community groups, state government agencies and Council staff.

Consultation activities undertaken to date have included:

- Development of a project webpage detailing the project, its progress and outcomes;
- Preparation of a media release;
- Advertisements in the Council notices pages of local newspapers;
- A workshop with Council staff;
- Consultation with external stakeholders including state government agencies, fishing and aquaculture groups, community groups; and
- An online community survey.

Volume 2 of the USMP provides additional information on the consultation activities.

The Draft USMP will be placed on public exhibition in August 2012 to provide the community with the opportunity to review what is proposed for the management of urban stormwater, the means and implications of the proposed strategies and to provide feedback on the management plan.

2. URBAN STORMWATER MANAGEMENT OBJECTIVES

The management objectives have been developed from Council's adopted strategic direction (Community Strategic Plan 2010-2025) and stakeholder feedback.

2.1 Water Sensitive Urban Design

Water Sensitive Urban Design (WSUD) is an internationally recognised concept that offers an alternative to traditional development practices. WSUD is a holistic approach to the planning and design of urban development that aims to minimise negative impacts on the natural water cycle and protect the health of aquatic ecosystems (Healthy Waterways Partnership, 2006). WSUD considers ways in which urban infrastructure and the built form can be integrated with a site's natural features. In addition, WSUD seeks to optimise the use of water as a resource.

The key principles of WSUD are to:

- Protect existing natural features and ecological processes;
- Maintain the natural hydrologic behaviour of catchments;
- Protect water quality of surface and ground waters;
- Minimise demand on the reticulated water supply system;
- Minimise sewage discharges to the natural environment; and
- Integrate water into the landscape to enhance visual, social, cultural and ecological values.

2.2 USMP Objectives

The community and stakeholder values, objectives identified in the 2002 Urban Stormwater Management Strategy (USMS) and Water Sensitive Urban Design (WSUD) principles have been reviewed to establish the management objectives for this USMP.

The overall aim of urban stormwater management in Ballina Shire is:

To provide sustainable and effective urban stormwater systems and assets that protect the natural, social and economic values of the Richmond River and its tributaries and the Ballina coastline.

The urban stormwater management objectives required to contribute to the protection of water quality are:

1. Stormwater systems are effective in removing stormwater from urban areas;
2. Stormwater assets limit impacts on receiving environments to acceptable levels;
    - Stormwater systems are effective in removing gross pollutants, nutrients, sediment, chemicals, bacteria, etc. prior to discharge to waterways; and
    - Aesthetic impacts are minimised (through asset design, pollutant and erosion control);
    - Stormwater systems do not contribute to public health and safety issues; and
    - Discharge quantities are controlled to prevent local flooding or erosion.
3. Stormwater assets are integrated into the planned landscape e.g. provide habitat and natural systems in appropriate places and increase surrounding land values by providing aesthetic and natural appeal; and
4. Management of stormwater systems is efficient and cost effective through the whole asset life cycle.

It is intended that these objectives apply to the full cycle of stormwater management activities including land use planning, development controls, stormwater asset and system design, construction, operation and maintenance. To achieve these objectives, the following management principles apply:

- Council Commitment – Appropriate policy development to ensure the success of the USMP. The urban stormwater management objectives will be integrated into all relevant Council groups/functional areas;
- Resources and Funding – An appropriate level of funding and resources (Council and external contributions) is required to ensure successful implementation of the USMP; and
- Community Awareness – Council programs and actions will aim to increase public awareness and education on the impacts of stormwater pollution and the implementation of improved stormwater management practices.

3. IMPLEMENTATION REQUIREMENTS

3.1 Stormwater Management Areas

For the purposes of this USMP, the study area was divided into urban stormwater management areas based on urban stormwater catchments. The management areas served to break the large study area down into smaller units in order to visualise the location of stormwater assets in relation to receiving environments at a suitable scale and identify any problem areas. Figure 5 provides an overview of all stormwater management areas within Ballina Shire. The stormwater management areas are described in detail in Section 3 of Volume 2 (Background Information) and key features have been mapped for each area. .

While a management area approach is desirable for the implementation of site-specific actions in the USMP, many of the identified issues are relevant to the whole Shire and need to be managed on a Shire-wide basis. In this USMP, the location of recommended management actions have been indicated as either occurring Shire-wide or within specific stormwater management areas where this information is known.

3.2 Management Issues

Management issues were identified from the available background data, site assessments and stakeholder consultation activities. Many of these issues had been previously identified by Council and in some cases are being addressed through existing Council actions. The issues are generally:

- Related to the efficiency and/or effectiveness of existing administration and management;
- Significant localised stormwater management issues which are expensive to address or require resolution of other issues before they can be addressed; or
- Minor in nature, but occur throughout the Shire and will require a coordinated approach to achieve the best outcome for stakeholders.

The impacts of climate change will add to the complexity of the current issues.

The management issues are discussed in detail in Sections 8 and 9 of Volume 2.

3.3 Management Actions

The Implementation Program (Section 7) includes a list of actions or steps which have been developed to provide the desired outcomes of the USMP. Actions consist of a combination of administrative tasks, development of guidelines, studies, investigations and on-ground works. Some of the site-specific actions require some research or assessment prior to implementation of on-ground works. This is to ensure the appropriate effort, funding and geographical focus of on-ground works is undertaken. In addition, due to the complexity of the current administrative arrangements, partnerships between the responsible Council groups, government agencies, landholders and community groups are required to be developed to achieve the required outcomes.

Management strategies and actions have been developed for a ten-year period. The USMP and the progress of the management actions should be reviewed to ensure the actions remain relevant and the objectives of the plan are being achieved (refer Section 6).

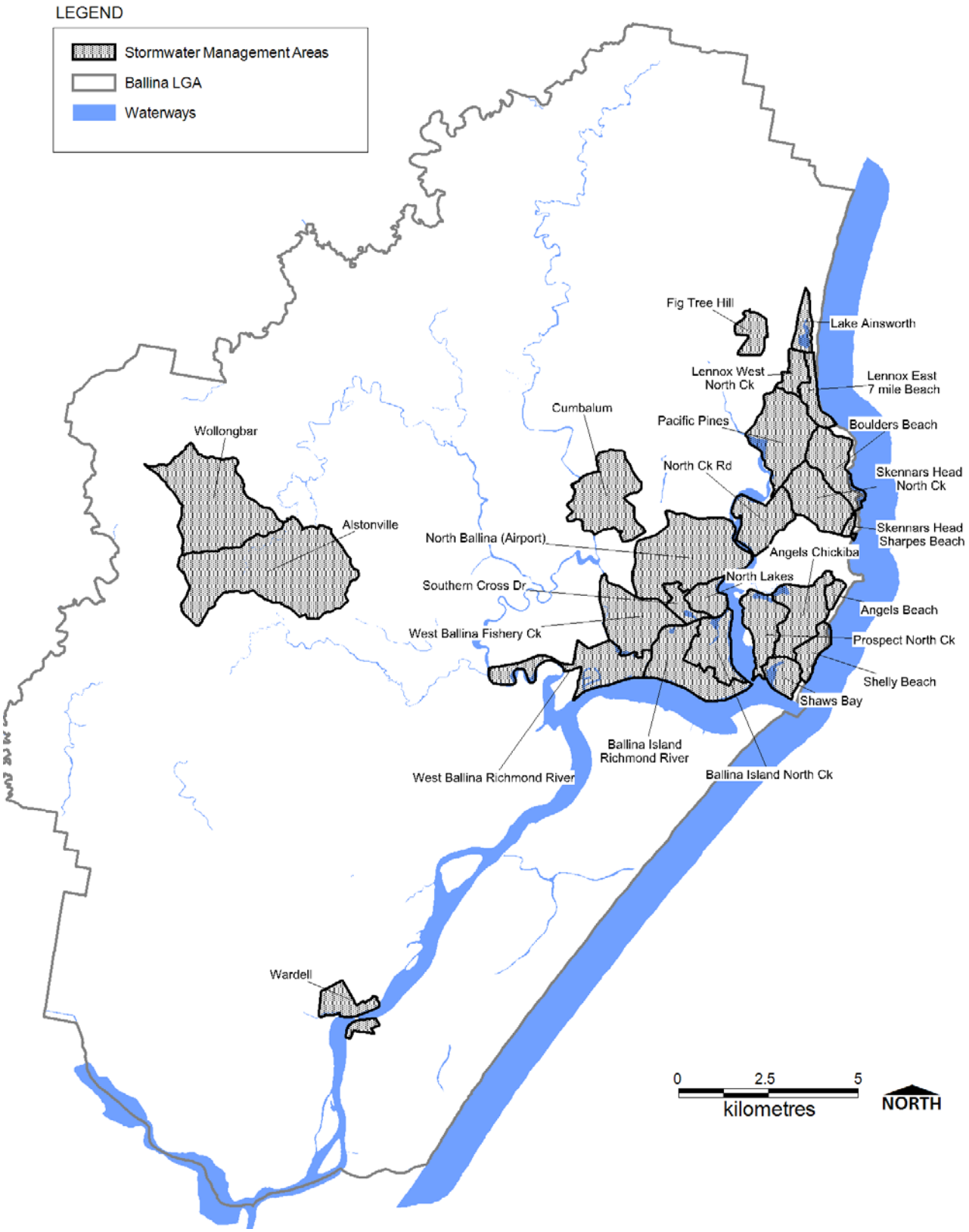

Figure 5: Stormwater Management Areas

3.4 Responsibilities

Responsibilities for implementation of the management actions have been assigned to the relevant Council position or function area. In addition, support from various government and local non-government organisations and groups, including industry bodies, private landholders and community groups, will be essential in the implementation of the plan.

3.5 Timeframe

Based on the management issues and the priority site-specific issues identified in Volume 2, timeframes for management actions have been developed. Implementation is expected to commence from the start of the 2013/14 financial year (i.e. July 2013). High priority actions have been programmed to start either immediately or within the short term (next 3 years). Further details of recommended timeframes is provided within each specific action in Sections 4, 5 and 6, and tabled in the Implementation Program (Section 7).

3.6 Costs and Funding

Cost estimates provided in the action descriptions are preliminary only and based on the best available information. Where a study/review is required to determine the appropriate level of expenditure, the cost of the future works has been broadly estimated to provide an allowance for these works. These budget elements need to be confirmed or updated by the results of the review.

Significant increases in funding will be required to implement the full cost of the USMP. The funding sources are expected to include Council's General Fund, the stormwater service management charge, developer contributions and external grants. Collaboration with universities may also provide opportunities for research projects.

The potential funding sources have been identified for each strategy. It is important to note that many grants and funding sources are only available up to a limited budget and as such, the available grants are changing from year to year. It will be necessary to keep abreast of current funding availability throughout the implementation of the USMP.

A summary of potentially relevant and available grant schemes is given in Appendix 1. In most cases it is expected that in-kind contributions will be provided from Council or other agencies.

3.7 Community Involvement

On-going community involvement will be required to ensure successful implementation of the USMP. This will include:

- Ongoing consultation with interested and committed community groups;
- A high degree of engagement and collaboration with landholders;
- On-ground participation in management actions, particularly local community groups such as EnviTE, Coastcare and fishing groups; and
- Education programs.

Achievement of the management plan objectives is reliant on community understanding and effective involvement in the implementation process.

3.8 Measures of Success

The management objectives defined in Section 2 are aspirational in that they are high-level goals that may not be achievable within the life of this plan. However they remain as long-term desires held by Council and the community. Continuous improvement towards these objectives across the full range of issues should be seen as the first measure of success.

The substantial implementation of measures to address the root cause of urban stormwater issues, as well as conclusive documentation of the effectiveness of such measures is required. Success of the USMP will be gauged by:

- Stakeholder acceptance;
- Incorporation of the USMP actions into Council business planning;
- Securing sufficient funds to implement the actions;
- Implementation of actions in an efficient and timely manner;
- Uptake of actions by stakeholders and others; and
- Positive stakeholder feedback on improvements.

Key Performance Indicators (KPIs) have been identified where appropriate for each management action.

4. MANAGEMENT FRAMEWORK

4.1 Urban Water Management

Council's future planning needs to present a holistic approach to water cycle management including:

- Water supply;
- Sewerage;
- Urban stormwater;
- Catchment management; and
- Floodplain management.

In all the above aspects of the water cycle, planning for population growth and climate change are key considerations.

Historically, separate elements of the Ballina Shire water cycle have been managed by different parts of Council, other State Government authorities (e.g. Office of Environment and Heritage and Office of Water) and Richmond River County Council (floodplain assets). This has created a narrow focus on discrete parts of the water cycle.

WSUD aims to consider the whole water cycle when planning and implementing urban development as well as the community's needs and aspirations. While Council urban stormwater management is geographically limited to the urban areas of the Shire, the outcomes are intrinsically linked to the health of the Shire's waterways. Similarly, a holistic consideration of waterway health must consider other, often dominating, influences such as catchment management and point source pollution (such as treated sewage discharges). In addition urban development within the Shire must consider floodplain management and the implications of climate change and sea level rise.

The drivers for implementation of a total water cycle approach for Ballina Shire include population growth, environmental impacts, community values, climate change and the increased consideration of stormwater and wastewater as a resource. This approach recognises that all elements of the water cycle are interdependent and all aspects of land use and infrastructure planning should be integrated with the water cycle considerations.

In July 2003, Council adopted the Urban Water Management Strategy (UWMS), which provided a 'blueprint' for the management of water supplies, wastewater and stormwater in Ballina Shire. The strategy commits Council to actions that will result in progressive improvements in line with best practice in these areas. Although stormwater is referred to in the UWMS in broad terms, it has not been integrated into the broader water cycle management hierarchy, partly due to the segregation of stormwater from other water cycle elements within Council's management structure. Urban stormwater management actions in the UWMS are limited to the initiatives in the 2002 USMS which was not actively implemented, mainly due to lack of awareness of the strategy and its requirements, lack of identification and coordination of responsibilities and lack of funding.

Best practice in urban stormwater management is achieved through a Council-wide WSUD approach that covers all aspects of the water cycle at all phases of land use and infrastructure planning. With an integrated approach, the linkages between the related water, wastewater and stormwater aspects of urban development are strengthened and duplication in planning and decision-making is avoided. The total water cycle approach also requires increased emphasis on the ecosystem health aspects of urban development. For urban stormwater management, this includes runoff water quality, erosion and sedimentation control and

hydrological impacts. Increased consideration of these issues at the land use planning and development stages would provide better outcomes for future asset management and ecosystem health.

The urban stormwater management components of the UWMS should be enhanced through improved administration and governance and increased emphasis on WSUD. This is consistent with Council's strategic direction and policies and is directly linked to other strategic priorities such as risk management, planning for climate change, floodplain management as well as the CZMP for the Richmond River estuary (refer Figure 6).

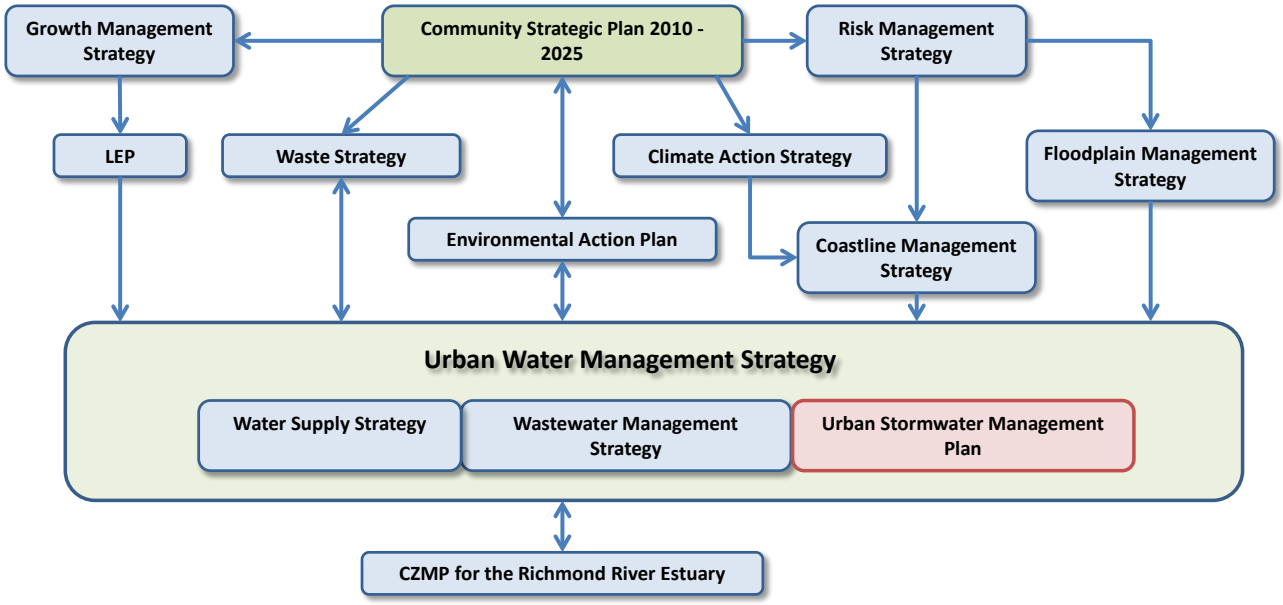

Figure 6: Urban Water Management Framework and Council's overall strategic planning

4.2 Improved Urban Stormwater Management

The proposed urban stormwater management framework has been developed to address the identified administrative, planning and asset management issues. This requires:

- Improved Council administration and management of stormwater functions (refer Section 4.3);
- Increased funding to implement management initiatives (refer Section 4.4);
- Improved direction and guidance for Council staff and developers regarding stormwater management considerations for:
    - land use planning (refer Section 4.5),
    - development services (refer Section 4.5),
    - asset management (design, construction, asset transfer, maintenance and rectification/renewal, refer Section 4.5),
    - climate change adaptation (refer Section 4.7), and
    - protection of ecosystem health (protected vegetation, habitat, waterway impacts, refer Section 4.10).
- Increased community education and understanding of urban stormwater functions and impacts (refer Section 4.11);
- Rectification of existing site-specific issues on a sub-catchment priority basis (refer Section 5); and

- Implementation of a monitoring, evaluation and reporting program (refer Section 6).

The proposed framework for the USMP, as shown in Figure 7, reflects the documentation required to support the urban development process from planning through to asset maintenance. Much of the required documentation exists through Council's current guidelines and can be supplemented by best-practice approaches provided by other government agencies such as Water by Design (south-east Queensland Healthy Waterways Partnership).

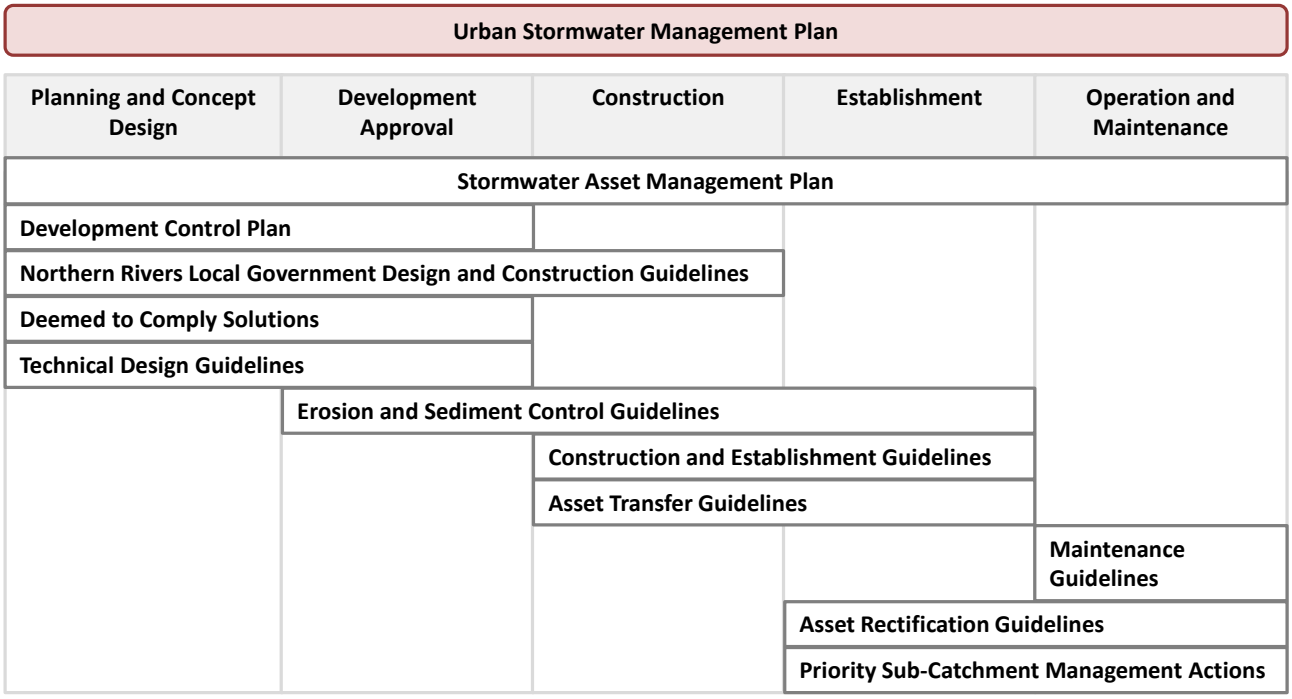

Figure 7: Proposed Urban Stormwater Management Framework

4.3 Administrative Requirements

Stormwater management responsibilities within Council have evolved in an *ad hoc* manner and are currently spread across the functional areas of Council. This is mainly due to the diverse nature of stormwater and the lack of recognition of the importance of stormwater systems and the implications for floodplain management and natural resource protection. Within Council, the responsibilities for stormwater management are unclear and stormwater considerations are not well addressed by the existing functional responsibilities.

With increasing urbanisation and community understanding of the water quality and hydrological impacts of stormwater systems, increasing emphasis is being placed on the consideration of stormwater assets and their function. As with other public infrastructure, consideration of the full asset lifecycle and the related implications translates to improved outcomes at each stage of the asset lifecycle. This requires an integrated approach to management activities with clear responsibilities for implementation.

Council's policy making is starting to recognise the importance of stormwater considerations at the land use planning stage, although Council can be constrained by State Government approval processes. For example, the Cumbalum rezoning proposal has aimed to address stormwater design considerations at the early planning stages. Recent structure planning is more integrated and has refined urban development policies to consider the suitability and capability of the land for urban development. However, engineering input is required at the land use planning stages to inform decision-making regarding land capability and infrastructure requirements. Full consideration of the long-term consequences of Council policy and decisions is required to ensure the full life cycle of stormwater management assets is managed appropriately. Enhanced Council policy and direction would provide better outcomes for urban stormwater management within the Shire, even when Council is not the main decision-maker.

Successful implementation of the WSUD framework requires internal Council management responsibilities that foster consideration of all aspects of the water cycle for the full asset lifecycle. A multidisciplinary skillset is required to understand natural waterways and stormwater assets - across engineering, catchment management, hydrology and drainage design, geomorphology, soils, ecology, vegetation as well as operational know-how in construction, on-ground works and bush regeneration. This may require a shift in organisational culture and practice.

It is recommended that a new Council position is created with responsibility for implementation of the WSUD framework. It is acknowledged that this position is a significant cost component of the USMP, however, this is considered to be a key step that will improve the coordination and delivery of urban stormwater services. The position would involve hands-on delivery of administrative and documentation tasks, assist in the identification of external funding for related environmental and engineering works and relieve the burden on existing managers. If this position is not filled, the USMP tasks will need to be allocated to existing staff members under the existing administrative arrangements. This is not expected to achieve the desired outcomes as the existing administrative model has been linked to a number of key urban stormwater management issues. History has shown that other functions and responsibilities are more likely to be prioritised and therefore Council's performance in stormwater management is not likely to improve dramatically without this new management role.

While a key requirement of this role is to bring together the related functions and responsibilities of Council, the existing arrangements and actions being undertaken by Council (such as review of DCP13 and development of the asset register) should continue in the interim.

Action 1: Facilitate Integrated Urban Stormwater Management with Council

Issue	Lack of integration of Council stormwater management responsibilities
USMP Objectives	• Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Provide appropriate resources to implement the USMP
Responsibility	Civil Services Group Manager
Support	Strategic Services Group, Regulatory Services Group
Cost Estimate (10 year)	$1,500,000 ($150,000 p.a. including salary and on-costs)
Potential Funding	General Fund, Stormwater Management Service Charge
Timing	On-going (year 1 – 10)
Management Zones	Shire-wide

DESCRIPTION OF TASKS:

It is recommended that a new Council position is created with responsibility for implementation of the WSUD framework. The priority tasks for this position are the implementation of this USMP and integration with Council's other WSUD strategic priorities. Within Council's current management structure, this new position could be integrated into the Civil Services Group with direct links to the activities of the Strategic and Community Services and Regulatory Services Groups.

The new WSUD Manager would have responsibility for:

- Development and ongoing review of a funding strategy (refer Section 4.4)
- Development of WSUD, urban stormwater management guidelines and asset management systems (refer Sections 4.5 and 4.5);
- Preparation of development control guidelines (in consultation with the Development Services staff, refer Section 4.5);
- Consultation with Council staff, developers, the community and consultants (refer Section 4.11);
- Delivery of training to Council staff, developers and consultants (refer Sections 4.5 and 4.11);
- Implementation of priority catchment actions (refer Section 5);
- Ongoing coordination of WSUD considerations with other Council functions; and
- Periodic review of this USMP, guidelines and development controls (refer Section 6).

KPIs

- Position filled by July 2013

4.4 Funding

The major funding and resourcing requirements are:

- Creation of the new permanent position of WSUD Manager (Action 1);
- Internal staff positions (as required) to assist the WSUD Manager;
- External consultancies (as required) to assist the WSUD Manager; and
- Priority sub-catchment urban stormwater rectification actions (Section 5).

Potential funding sources are discussed below.

4.4.1 Council General Fund

Historically, Council and external funding allocated to stormwater management has been inadequate, due to the lack of recognition of the importance of stormwater systems in the protection of natural resources, public safety and infrastructure.

It is recommended that Council increase the share of internal funding for stormwater management activities in recognition of the need for action and in accordance with Council's strategic priorities.

4.4.2 External Grants

Reliance on *ad hoc* grant funding has been unsuccessful in resolving many existing issues or preventing ongoing problems. In 2011/12 and 2010/11, grants were not identified due to the lack of Council staff available to prepare applications and the lack of relevant funding programs. While lobbying State and Federal governments to increase funding and providing sufficient human resources to access the available grants is essential for successful implementation of the USMP, this source of funding should only be considered as a supplement to internal Council funding sources. Grants are usually provided on the basis of funding matched by Council. The currently available external grant programs are discussed In Appendix 1.

4.4.3 Charges and Contributions

Stormwater Management Service Charge

Council should raise the maximum allowable stormwater charge from existing urban residential and non-residential properties. Currently the maximum charge ($25 p.a.) is levied for residential properties with an equivalent charge for non-residential properties. In accordance with the Stormwater Management Service Charge Guidelines (DLG, 2006), urban business land can be charged up to $25 per $350m^2$ of land area or part thereof. This acknowledges the often greater area of impervious surfaces on urban business land as compared to urban residential land. The current charging arrangement for business properties (flat rate of $25 for businesses and $12.50 for business strata units) is considered to be an interim arrangement and the guidelines expect that Councils will charge business properties on the basis of actual land area after the first year of implementation. This is to ensure equitable charging between residential and business properties.

It is recommended that Council review data on business property land area to determine if higher charges would be appropriate.

Application of the funds from the stormwater management service charge should be determined on a priority basis utilising the asset management practices discussed in Section 4.5.

Works on Private Land

Council should also continue to charge the appropriate fee for service for works on private land. This may require improved definition and delineation of Council versus landholder responsibilities, for example, related to inter-allotment drainage.

Additional mechanisms to enable or enhance landholder responsibilities for management and maintenance of stormwater assets may also be required to reduce the burden on Council funds and resources including:

- Encouraging appropriate maintenance of private assets through provision of information and compliance checks;
- Establishment of a maintenance agreement as a planning obligation or as a condition attached to a planning approval;
- Including maintenance requirements in property covenants;
- Creation of easements for inspection and maintenance access; or
- Mandatory reporting requirements against an agreed maintenance plan.

Other financial instruments such as bonds, contributions and Voluntary Planning Agreements (VPAs) may be appropriate for new developments with handover of significant assets and the associated ongoing maintenance burden. While Council has attempted to apply the above mechanisms to certain developments in the past, the inclusion of the key requirements in policies and guidelines would strengthen their application and success.

Section 94 Contributions

The introduction of Section 94 contributions for stormwater works would ensure the full cost of developments is recovered at the development approval stage. The three general principles to be satisfied in validly requiring section 94 contributions are:

- The contribution must be for, or relate to, a planning purpose;
- The contribution must fairly and reasonable relate to the subject development; and
- The contribution must be such that a reasonable planning authority, duly appreciating its statutory duties, could have properly imposed the contribution.

Council may require a contribution by way of the payment of monies and/or either or both of the following methods:

- The dedication of land, free of cost to Council; or
- The carrying out of works approved by and free of cost to Council, where such contribution is for the carrying out of public works and/or provision of public facilities which are reasonably required by the particular development.

Internal drainage in subdivisions and other developments is normally accepted as part of the works associated with the development. This work will generally be wholly provided by the developer, and no section 94 contribution will be required. However recovery of trunk drainage costs may include:

- Studies;
- Acquisition of land;
- Construction of drainage facilities;
- Pipelines;

- Culverts;
- Pollution control measures;
- Formation of detention and retention basins;
- All ancillary works; and
- Topdressing and grassing.

In determining a reasonable trunk drainage contribution, the necessary land reservation and construction costs need to be identified. Ecological mechanisms which help drainage, such as appropriate planting and measures to reduce potential downstream impacts, may also be incorporated when assessing the contribution. The application of Section 94 contributions would need to be assessed to determine which components are applicable to future development.

In 2010, the NSW Government introduced reforms to increase housing development including a limit on the amount of development contributions ($20,000 per residential lot for established areas and $30,000 per lot for green field areas). BSC's existing level of developer contributions (for roads, open space and community infrastructure) has reached the $20,000 cap for established areas. Council should consider including stormwater works in any future review of the contributions plan or if the cap is raised. There is also the potential to raise higher contributions for green field developments such as Cumbalum.

Section 64 Developer Charges

Developer charges are up-front charges that a LWU can levy under section 64 of the Local Government Act 1993 to recover part of the infrastructure costs incurred in servicing new development or additions and changes to existing development. Developer charges provide a source of funding for infrastructure and provide signals to the community regarding the cost of urban development. The NSW Office of Water has issued Developer Charges Guidelines for Water Supply, Sewerage and Stormwater, December 2002 pursuant to section 306 (3)(C) of the Water Management Act 2000. NSW local water utilities are required to prepare a Development Servicing Plan (DSP) and to levy developer charges in accordance with these guidelines. A DSP documents all the relevant information used to calculate the developer charges per lot.

Council has adopted DSPs for water supply and sewerage services. The preparation of a DSP for stormwater services would also facilitate recovery of costs associated with stormwater management for new developments. This would replace the need for section 94 stormwater contributions.

Action 2: Identify stormwater management funding sources

Issue	Inadequate funding to implement stormwater management works
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels • Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Provide appropriate resources to implement the USMP
Responsibility	WSUD Manager
Support	Strategic Services Group, Regulatory Services Group
Cost Estimate (10 year)	To be undertaken by WSUD Manager (costs included in Action 1)
Potential Funding	N/A
Timing	On-going (year 1 – 10)
Management Zones	Shire-wide
DESCRIPTION OF TASKS:	
A sustainable source of funding is required to be identified. The required actions are: • Review the application of the stormwater management service charge for businesses; • Investigate the potential to provide additional mechanisms to improve developer and landholder responsibilities for management and maintenance of stormwater assets; • Investigate the potential to levy additional developer contributions for stormwater works through section 64 developer charges or future section 94 contributions (for existing and green field developments) or ; and • Develop a long term funding program for stormwater asset management (Section 4.5).	
KPIs	o Funding strategy developed by April 2014 and reviewed annually

4.5 Asset Management

A key requirement for urban stormwater management is a comprehensive Asset Management Plan that provides practical and financially responsible means of managing the assets through the creation, acquisition, maintenance, operation, rehabilitation and disposal stages of assets to provide for present and future needs.

The key elements of successful infrastructure asset management are (IPWEA, 2006):

- Taking a lifecycle approach;
- Developing cost-effective management strategies for the long-term;
- Providing a defined level of service and monitoring performance;
- Understanding and meeting the impact of growth through demand management and infrastructure investment;
- Managing risks associated with asset failures;
- Sustainable use of physical resources; and
- Continuous improvement in asset management practices.

Council's Asset Management Strategy (2012b) provides asset management goals and actions and these are discussed below in relation to urban stormwater management:

- Further Development of 'working' Asset Management Plans – The stormwater asset management plan was prepared in 2007 and should be updated to reflect the new asset management tools being implemented by Council such as Authority Asset and Infrastructure Management;
- Update Physical Data – The register of stormwater assets in incomplete. Council is preparing a procedure for distribution of asset information and is developing asset identifiers for all stormwater assets including vegetated assets;
- Obtain Asset Condition Data - The register of stormwater assets does not include condition data. The Asset Management Strategy identifies the need for 5 yearly visual condition surveys for all stormwater assets apart from pollution control devices (1-2 years). The Draft 2012/13 Operational Plan identifies $40,000 budget expenditure for stormwater asset data collection;
- Incorporate GIS location systems for asset base – The Strategy identifies that GIS data would be a very useful user interface in locating specific assets within a large network and ensuring that asset updates are performed on the actual asset being maintained/replaced. In addition, GIS data assists with identification of receiving environments and development of appropriate controls; and
- Ensure all data are maintained and updated.

Action 3: Review and develop stormwater asset management systems

Issue	Asset data is incomplete and there is a need for detailed asset management planning covering the whole life cycle of the assets
USMP Objectives	• Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Provide appropriate asset management documentation to implement the USMP
Responsibility	WSUD Manager
Support	Open Spaces and Reserves, Asset Management, Engineering Works
Cost Estimate (10 year)	To be undertaken by WSUD Manager (costs included in Action 1)
Potential Funding	N/A
Timing	Short-term (year 1 – 3)
Management Zones	Shire-wide
DESCRIPTION OF TASKS:	
The documentation tasks are: • Review and updating the Stormwater Asset Management Plan; • Include development of levels of service (based on design objectives, Section 4.6.1, and maintenance response times); • Include renewal planning, maintenance planning and climate change impacts (Section 4.7); • Complete the asset register including vegetated assets; • Undertake condition assessments and update asset register.	
KPIs	o Asset Management Plan adopted by June 2014 o Condition assessments completed by June 2013

4.6 Planning and Development Controls

There is a need for clear, quantitative design objectives that provide performance standards for developments to meet via WSUD practices. While it is necessary to clearly specify Council's requirements for development controls, selection of assets and system elements should be undertaken by the developer with consideration of current best-practice and site specific considerations (such as groundwater levels, flooding, soil types, receiving environments, etc.). Development controls cannot anticipate or apply to all situations, so there need to be a focus on specifying the required function, performance and asset management considerations.

WSUD design guidelines have been developed by Water by Design (2009) for south-east Queensland Councils. The approach outlined in this suite of documents can be directly applied to Ballina Shire development controls but should also consider:

- State Government and Council policy and regulations;
- Regionally and local significant ecosystems and understanding of site context, particularly riparian and wetland ecosystems associated with waterway corridors;
- Environmental values and waterway objectives for receiving waters within and downstream of the development;
- The existing hydrologic cycle of the site and the region;
- Current and future flooding risk on and downstream of the site;
- Understanding of the site terrain and soils; and
- Council's stormwater management objectives.

As the above considerations can vary across the urban areas of the Shire, the developer should be required to confirm design objectives with Council prior to undertaking detailed site analysis and concept development. Underpinning this is the need for a clear set of development controls and guidelines.

Rezoning applications should be accompanied by stormwater management plans to facilitate consideration of stormwater controls and impacts during the early land use planning stages. The proposed future development of the major land release at Cumbalum provides an opportunity for the introduction of improved development controls as discussed above. The downstream receiving environment includes SEPP14 wetlands, Ballina Nature Reserve and key habitat areas and there is significant community concern regarding the impacts of the development on these areas.

4.6.1 Stormwater design objectives

The USMP management objectives (Section 2.2) can be translated to stormwater management design objectives using the principles of WSUD and following a similar approach adopted by the south-east Queensland Healthy Waterways Partnership and Water by Design. The south-east Queensland design objectives have been adapted for the BSC urban areas in Table 2 with additional objectives that are considered appropriate. Performance targets would need to be specific to local conditions. Table 2 provides guidance on potential design objectives which should be developed further by the WSUD Manager. In specifying guideline levels, reference should be made to the latest best-practice guidelines which may be reviewed from time to time.

Table 2: Recommended Stormwater Design Objectives

Policy	Intent	Objectives and Performance Targets
South-east Queensland design objectives (modified) [1]		
Stormwater quality	To protect receiving water quality by limiting the quantity of discharged stormwater pollutants. Treat stormwater in accordance with best-practice for climate conditions.	Minimum required reductions in pollutant loads compared to untreated runoff from the development (TP, TSS, TN and gross pollutants). The following load reductions (specified for South-East Queensland) are considered appropriate: • 80% reduction in total suspended solids (TSS) • 60% reduction in total phosphorus (TP) • 45% reduction in total nitrogen (TN) • 90% reduction in gross pollutants (GP)
Frequent Flow Management	To minimise the change in frequency of disturbance to aquatic ecosystems by managing the volume and frequency of surface runoff during small rainfall events.	Capture and manage design runoff capture depth (mm/day) from all impervious areas so that frequency of surface runoff is the same as pre-development conditions: • Design runoff capture depth = 10 mm/day if total fraction impervious <40%; • Design runoff capture depth = 15 mm/day if total fraction impervious >= 40%. Runoff capture capacity needs to be replenished within 24 hours of runoff event. Compliance with this objective may be demonstrated by providing a total stormwater capture volume (m^3) calculated as follows: • Capture volume (m^3) = Impervious area (m^2) x target design runoff capture depth (mm/day) x 0.001
Additional local objectives		
Source controls	To manage stormwater quality and peak discharge flow rates within allotments	Above ground rainwater tanks are to be utilised in preference to below ground detention systems (porous pavements and infiltration systems) in flood-prone areas. Tank water should be used as a dual water supply for internal and external uses as appropriate (except where dual water supply is available).
Safety	To ensure public and vehicular safety	Overland flows (flows up to and inclusive of the 100yr ARI) need to be considered for vehicular and person safety. This is demonstrated by a velocity x depth product not greater than 0.4 for persons and 0.6 for vehicles. Should it be determined that the velocity depth product exceeds these amounts then fencing that prevents access is to be erected. Aquaplaning must be considered in the design of local roads.

Policy	Intent	Objectives and Performance Targets
Flood management objective [2]	To maintain the site's mean stormwater volumes, peak flow rates, and runoff event frequency as near as possible to the site's original characteristics.	The major storm (100yr ARI) needs to be sized, contained and conveyed such that it is not prone to scour and does not pose a threat structurally/physically to any person, structure or vehicle. This storm flow is also to be contained within an easement. The minor storm is typically the storm piped underground without surcharge. For a standard residential area this is typically a five (5) year storm and for industrial/commercial a ten (10) year storm. Throughout the Shire, stormwater pipe networks are not solely dedicated to one use (urban, residential, industrial, commercial etc.) and may possess intermingling of flows. The rate of 10 year 20 minute ($^{10}I_{20min}$) is the simplified limiting flow leaving the site with the residual retained on site until such time as it can be discharged. The critical storm needs to be calculated separately. On site detention (OSD) is to be provided for all events up to and including the 10 year ARI. Flows leaving the site for the critical design storm are to be restricted to no greater than the 10 year 20 minute ($^{10}I_{20min}$) storm flows for that catchment. The remainder shall be retarded until such time as it is possible to discharge. Events between 10 and 100 year ARI also need to be retarded so that the discharge for these events is no greater that the pre-development flow. This requires all storms to be calculated and tabulated for each ARI's critical storm for the catchment being investigated.
Sensitive receiving environments [3]	To protect sensitive receiving environments downstream of the development	No degradation of sensitive receiving environments through water quantity, quality or erosion as a result of the development.
Degraded land	To return degraded land to a stable state	Land degraded by soil or water contamination or having the potential to cause downstream pollution (through mobilisation of soil) must be stabilised prior to the development.
Asset management	To ensure appropriate resources are available for management of the whole asset life cycle	Concept designs are to be developed in consultation with Council to ensure the technologies adopted are appropriate for the local conditions and Council expertise. This is to include consideration of the pre-construction, construction and post-construction management requirements.

1. The south-east Queensland design objectives apply to developments greater than 6 lots or 2,500 m^2 and with more than 25% impervious area. A similar approach may be suitable for Ballina Shire.

2. Stormwater quantity performance targets would apply to residential, commercial and industrial developments including rural subdivisions. Rural extensions and modifications require capture and treatment of stormwater such that erosion does not occur.

3. Sensitive receiving environments are discussed further in Section 4.10.

Pre-determined infrastructure solutions that are “deemed-to-comply” with the stormwater management objective may be appropriate to eliminate the need for detailed modelling or duplicated design effort. Guidelines for applicable developments and WSUD technologies need to be developed.

For high risk, large, complex or innovative approaches, numerical modelling of pollutant export and stormwater treatment performance is required to demonstrate performance. The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) is widely adopted for this purpose.

4.6.2 Construction and asset handover

Following the development stage, Council needs to ensure that they receive assets that are functioning properly and this requires:

- Clearly defined minimum construction and handover requirements in policy and approval conditions, including defining the policy for operational works requirements and handover and conditions of approval. This is particularly important with the current division of responsibilities within Council to ensure a coordinated approach is adopted;
- Ensuring satisfaction with construction and establishment by undertaking compliance inspections before accepting assets for the defect liability period and off-maintenance period. This should also apply to Council and State government developments;
- Require the full establishment of critical assets (such as vegetated components of the stormwater system) or provision of an uncompleted works or defects liability bond prior to provision of subdivision certificates;
- Consideration of financial instruments (i.e. bonds and contributions) as security; and
- The use of compliance checklists to ensure appropriate procedures are followed. Examples are provided in Water by Design (2012).

Guidance for Council staff and developers is required in relation to:

- Timing of handover;
- Final compliance requirements;
- Requirement for bonds;
- Practical completion;
- Defects liability requirements;
- Off-maintenance requirements;
- Developer contributions for uncompleted works;
- Transfer to asset database (civil asset, landscape asset or a “new” water sensitive urban design asset, how, who does this, what information is being transferred, what is missing, tools to improve this data capture);
- Transfer to GIS;
- Financial accounting (valuing the asset);
- Linkages with Council balance sheets and budget forecasting; and
- The distinction between the requirements for public assets, private assets and council assets.

Construction and establishment methods for WSUD have been documented by Water by Design as part of the south-east Queensland Health Waterways Partnership. Council could adopt these or similar guidelines

by referring to them in planning documents and development controls or specific development applications. Similarly, Guidelines and options for rectification of specific problems associated with swales, bioretention basins, sediment basins and constructed wetlands are provided in Water by Design (2012c).

4.6.3 Floodplain management

The floodplain risk management study (WBM BMT *et.al*. 2012) found that implementation of planning and development controls provides the best mechanism for adaptive management of flood risk in a changing climate. The adopted philosophy for managing future flood risk is to maintain minimum filling criteria to Ballina Island and surrounding low-lying densely populated areas to the predicted 2050 100 year ARI flood level. This will promote drainage and mitigate regular nuisance flooding beyond 2050. Undeveloped areas, where it is easy to fill to higher levels, will be encouraged to fill to a level based on the predicted 2100 100 year ARI flood level (BMT WBM et al, 2012).

The floodplain risk management study has recommended that future flood risk is managed through planning and development controls, which stipulate minimum floor levels for development. Over time, through redevelopment, this approach will lead to filling of Ballina Island and surrounding low-lying developed areas. This approach is also adaptive, whereby if future climate change science predicts different sea level and rainfall intensity changes, development controls can be updated as required. Council has prepared a draft policy statement for flood risk management to address this.

Action 4: Review and update development controls and guidelines

Issue	Lack of clear development controls and guidelines
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels • Stormwater assets are integrated into the planned landscape e.g. provide habitat and natural systems in appropriate places and increase surrounding land values by providing aesthetic and natural appeal • Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Provide appropriate planning and development controls and guidelines to implement the USMP
Responsibility	WSUD Manager
Support	Development Services, Engineering Works, Open Spaces and Reserves, Environmental and Public Health, Strategic Planning
Cost Estimate (10 year)	To be undertaken by WSUD Manager (costs included in Action 1)
Potential Funding	N/A
Timing	Short-term (year 1 – 3)
Management Zones	Shire-wide
DESCRIPTION OF TASKS:	
The documentation tasks are: • Review and updating DCP13 Stormwater Management; • Development of guidelines or adaption of existing guidelines for: o Water Sensitive Urban Design; o Deemed to comply solutions; o Technical design; o Erosion and sediment control; o Construction and establishment; and o Asset transfer. This action also includes provision of training to Council staff and developers in the use of the new guidelines.	
KPIs	o Documentation adopted by June 2014

4.7 Asset Maintenance

Council's schedule for maintenance is often planned over the short-term with limited budget and is often reactive and directed to areas of complaints. Inadequate maintenance has resulted in ongoing issues such as:

- Assets that fail to manage stormwater quality. This is potentially more serious when the ecological value of downstream waterways is high (e.g. fisheries and aquaculture areas);
- Poor amenity due to weed intrusion and pest/nuisance species;
- Establishment of habitat values requiring more stringent environmental controls;
- Litter and weeds accumulating in open drains which are difficult to remove as the site is always wet;
- Health and safety problems such as mosquitoes, odours and safety risks;
- High cost of rectification to a functional state; and
- Reduced asset value.

Further development of asset maintenance guidelines and extension of the existing Stormwater Quality Improvement Devices (SQIDs) Manual to cover all critical stormwater assets as well as vegetated assets is required. Maintenance requirements should be specified by the developer as part of concept designs and asset handover procedures. Levels of service should be developed ensure maintenance requirements for stormwater assets are understood and carried out to the required standard (refer Section 4.5).

Maintenance guidelines and examples of inspection and maintenance checklists are included in the Water by Design suite of documents.

Action 5: Prepare Asset Maintenance Guidelines

Issue	Lack of clear maintenance guidelines for stormwater assets
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels • Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Develop and implement maintenance guidelines
Responsibility	WSUD Manager
Support	Asset Management, Engineering Works, Open Spaces and Reserves
Cost Estimate (10 year)	To be undertaken by WSUD Manager (costs included in Action 1)
Potential Funding	N/A
Timing	Short-term (year 1 – 3)
Management Zones	Shire-wide
DESCRIPTION OF TASKS:	
This task requires the development of guidelines or adaption of existing guidelines for maintenance of all critical stormwater asset categories. The SQIDs manual should be expanded to include all critical asset types as well as vegetated assets. This action also includes provision of training to Council staff in the use of the new guidelines.	
KPIs	o Guidelines adopted by June 2014

4.8 Asset Renewal and Rectification

Limited rectification of poorly performing or ageing stormwater assets has occurred due to limited funding and renewals planning. A cost-effective renewal program relies on accurate asset condition data and reviewing of functional needs (refer Section 4.5).

A goal of the BSC Asset Management Strategy is to prepare a realistic program of tackling unfunded renewals. The renewal program should also consider stormwater asset design and function and address risks such as flooding (Section 5.2) and sea level rise (Section 4.9).

Asset rectification guidelines are included in the Water by Design suite of documents.

Action 6: Develop Asset Renewal Program

Issue	Lack of renewal planning and significant unfunded asset renewals.
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels • Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Develop and implement a funded renewal program
Responsibility	WSUD Manager
Support	Engineering Works, Asset Management, Open Spaces and Reserves
Cost Estimate (10 year)	To be undertaken by WSUD Manager (costs included in Action 1)
Potential Funding	N/A
Timing	Short-term (year 1 – 3)
Management Zones	Shire-wide
DESCRIPTION OF TASKS:	
This task requires the development of guidelines or adaption of existing guidelines for asset rectification and renewal. A pre-requisite action is the completion of asset condition assessments. A funding source for future capital works is also required to be developed. Capital costs have not been included in this action.	
KPIs	o Renewal program adopted by June 2014

4.9 Climate Change Adaptation

Council's draft Flood Risk Management Policy Statement 11 aims to control development on flood-prone land by requiring the filling of flood liable allotments prior to constructing buildings. While this strategy will encourage filling of private land, it does not specifically address public infrastructure such as roads and stormwater drainage. The strategy will therefore need to be supplemented with further investigation into required improvement and flood mitigation of public infrastructure.

The threat of sea level rise and associated exacerbation of tidal inundation and reduced stormwater drainage efficiency is a primary concern for Ballina Island, parts of West Ballina, North Ballina and the Southern Cross Industrial Estate. Current replacement of ageing stormwater assets is generally on a "like-for-like" basis with no additional allowance for future sea level rise. There is a risk that such infrastructure will become redundant as tailwater and groundwater levels rise to the point that elevation of existing infrastructure is insufficient to provide adequate stormwater management in these areas.

It is recommended that a Stormwater Master Plan is developed to guide future stormwater asset renewals on low-lying land in Ballina into the future and ensure that efficient upward migration of stormwater infrastructure is achieved. The priority areas for the master plan are the highest density development and commercial hub of Ballina Island where stormwater inundation is already an issue. However, the investigations and actions should extend to the other high risk areas including North Ballina, Shaws Bay and West Ballina.

Action 7: Develop a Stormwater Master Plan for Low-Lying Land

Issue	The impacts of climate change will exacerbate flood risks and there is a risk that stormwater infrastructure will become redundant as tailwater and groundwater levels rise to the point that existing infrastructure is insufficient to provide adequate stormwater management
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels • Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Future urban stormwater infrastructure is resilient to the impacts of climate change
Responsibility	WSUD Manager
Support	Engineering Works, Asset Management, Strategic Planning
Cost Estimate (10 year)	$350,000 ($300,000 initial study and 5 year review)
Potential Funding	General Fund, external grants, developer charges
Timing	Medium-term (year 3 – 4)
Management Zones	BA01 Ballina Island North Creek, BA02 Ballina Island Richmond River, NO01 North Ballina Airport, NO02 North Lakes/Ballina Racecourse, WE02 West Ballina Fishery Creek

DESCRIPTION OF TASKS:

The master plan should:

- Determine the desired future configuration of the stormwater system for the low-lying areas of Ballina, with direct reference to the NSW government planning levels for sea level rise, whilst also taking into account the potential for increased storminess (scenarios up to 30% increase in rainfall intensity);
- Consider strategies and products that address the root-cause of stormwater related issues, namely: limiting issues of tidal and flood water propagation into low-lying areas via stormwater networks, utilising on-site detention strategies to limit site runoff to neighbouring properties, using public space for short-term detention of stormwater and ensuring that remaining stormwater runoff is conveyed as efficiently as possible to the desired discharge points;
- Consider the most appropriate strategies for stormwater management given the mix of residential, commercial and industrial land uses and the level of existing and future development in these areas;
- Consider current and future land elevation based on projected filling of low-lying areas;
- Evaluate current stormwater assets and determine what parts of the existing stormwater network can be utilised to maximum effect into the future; and
- Determine strategies by which the transition between the existing stormwater infrastructure and the new, desired future configuration can be made without needing to “lift everything at once”.

KPIs

- Master Plan prepared by June 2017

4.10 Protection of Sensitive Receiving Environments

The BSC study area contains a range of sensitive receiving environments including those areas protected in national parks or reserves or gazetted under relevant legislation. Both current and future urban stormwater planning and management should consider the on-going protection of these environments. These areas include:

- Waterways and waterbodies;
- Beaches;
- Cape Byron Marine Park;
- Designated Aquaculture Areas;
- National Parks and Reserves – Ballina Nature Reserve, Richmond River Nature Reserve, South Ballina/Mobbs Bay;
- NPWS Key Habitats;
- BSC High Conservation Value Vegetation;
- SEPP 26 (Littoral Rainforest);
- SEPP14 (Coastal Wetlands);
- Estuarine Habitats (mangrove, seagrass, saltmarsh);

Sensitive receiving environments within the Ballina Shire are mapped in Figure 8. There is a need for regular and accurate identification and mapping of these sensitive areas as well as development of guidelines for their protection. Development controls should be developed with consideration of the appropriate controls for these receiving environments. Asset management planning and particularly maintenance activities also need to be cognisant of the impact of the activities in these areas as well as the need for protection.

For some developments, the desired level of protection may not be achievable, even when a range of appropriate measures have been incorporated. In these cases, compensatory activities may be considered to offset residual and cumulative impacts of stormwater discharge into waterways. Where it is determined that the residual discharge from a development will have a detrimental impact on stormwater objectives, Council may consider a VPA via which stormwater impacts on the waterway are offset by rehabilitation, retrofit or compensation measures at another location. The basis of this concept is that the overall ecological health and resilience of the waterway can be improved as a result of the development, despite the potential worsening of local conditions. A VPA can also be a mechanism via which resources are strategically redirected to contribute to catchment wide water quality initiatives, achieving ecological and economic benefits of scale, rather than smaller, localised stormwater devices.

Guidelines need to be developed specifying:

- The accepted application of compensatory measures;
- The desired hierarchy of potential offset measures e.g. within the same catchment, within a similar habitat or addressing a similar issue in a different location; and
- The mechanisms for provision of the measures e.g. VPAs.

It is also recommended that a register of potential compensatory activities or sites is developed based on prioritised catchment actions or projects.

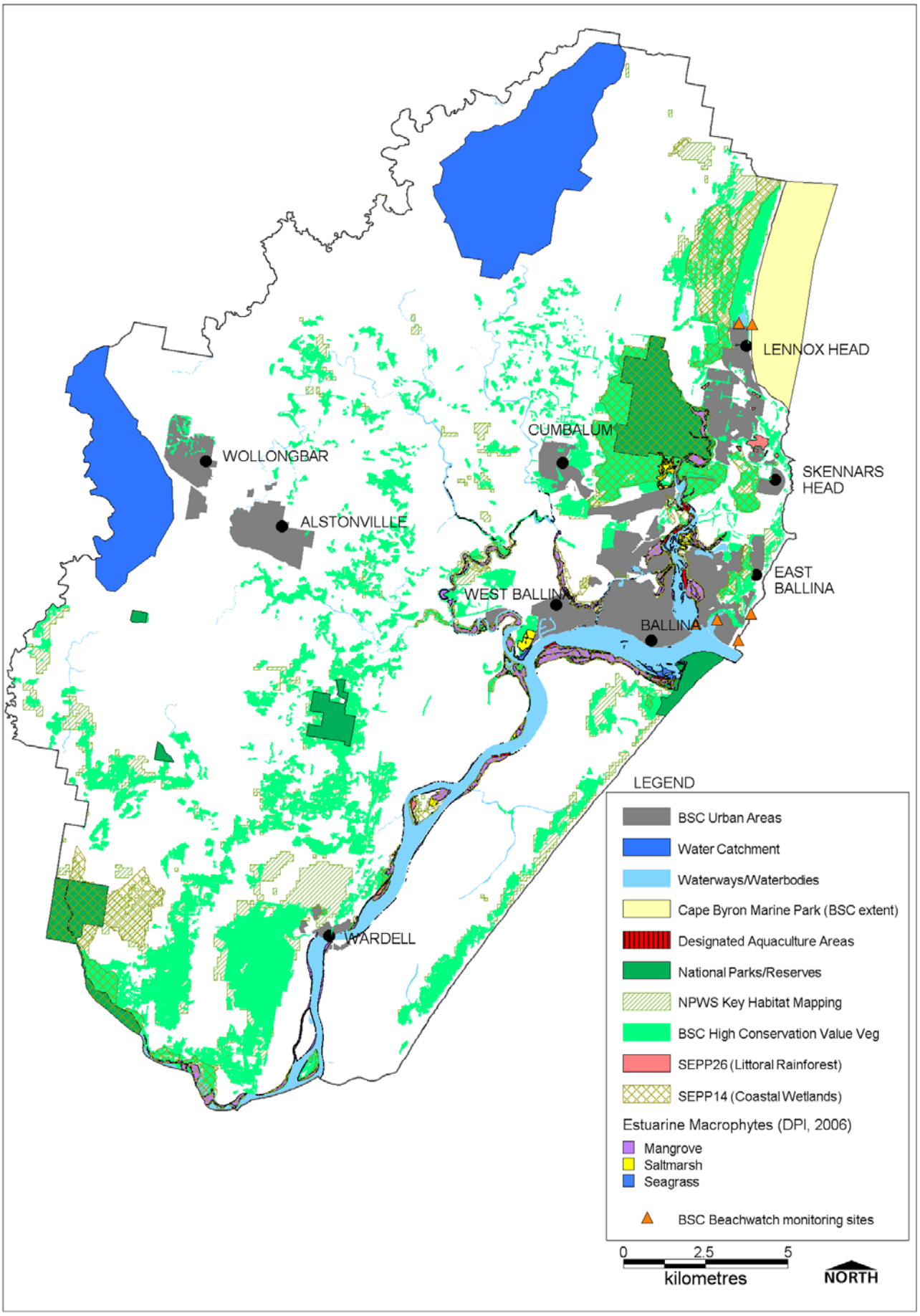

Figure 8: BSC Sensitive Receiving Environments

Action 8: Identify requirements for protection of sensitive receiving environments

Issue	Stormwater systems impact on the hydrology, water quality, ecology and values of the receiving environments.
USMP Objectives	• Stormwater assets limit impacts on receiving environments to acceptable levels
Desired Outcome	Provide appropriate documentation to assist Council staff and the community identify and protect sensitive receiving environments.
Responsibility	WSUD Manager
Support	Open Spaces and Reserves, Strategic Planning, Environmental and Public Health
Cost Estimate (10 year)	To be undertaken by WSUD Manager (costs included in Action 1)
Potential Funding	N/A
Timing	Short-term (year 1 – 3)
Management Zones	Shire-wide
DESCRIPTION OF TASKS:	
The documentation tasks are: • Development of procedures for identification, mapping and documentation of sensitive receiving environments; • Development of guidelines for protection of sensitive receiving environments through planning, development controls and asset management procedures; • Development of guidelines for environmental assessment and approval requirements for maintenance activities; and • Development of a policy and guidelines on the application of compensatory measures. This action also includes provision of training to Council staff and developers in the use of the new guidelines.	
KPIs	o Documentation adopted by June 2013

4.11 Education

Community education and capacity building is essential to the success of the proposed management framework. This applies to:

- Residents and businesses with regard to stormwater function and pollution control;
- Council staff in relation to the introduction of new procedures for land use planning, development controls and asset maintenance; and
- Developers and builders regarding the new development requirements and erosion and sedimentation controls.

The current inadequate administrative and governance arrangements within Council contribute to inaction and misunderstanding regarding management responsibilities. Acceptability of the management actions will increase as the stakeholder understanding of the issues and constraints in stormwater management is increased. Similarly, conflict between Council groups, between Council and developers and between Council and the community can be alleviated with the provision of objective information.

Council currently supports or undertakes education and consultation programs regarding the UWMS, potable water demand management and erosion and sedimentation controls. In addition, signage and drain stencilling has been implemented. It is recommended that Council continue the urban stormwater management education program utilising electronic and print media, school education programs, public signage and fact sheets. A number of fact sheets covering a range of topics have been prepared by other authorities and these may be adapted for Council's purposes.

Action 9: Develop and Implement a stormwater education and consultation program

Issue	There is a lack of understanding of the function of stormwater systems and the impacts of pollution. There is also a lack of understanding between Council staff and developers regarding stormwater asset requirements.
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels • Stormwater assets are integrated into the planned landscape e.g. provide habitat and natural systems in appropriate places and increase surrounding land values by providing aesthetic and natural appeal • Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Improve current understanding of urban stormwater management in the community and among decision makers
Responsibility	Environmental and Public Health
Support	WSUD Manager, Open Spaces and Reserves
Cost Estimate (10 year)	$50,000 ($5,000 per year)
Potential Funding	General Fund, external grants
Timing	Ongoing (year 1 – 10)
Management Zones	Shire-wide

DESCRIPTION OF TASKS:

Future education programs should build on existing Council programs for schools and the community and focus on:

- Erosion and sediment control;
- Stormwater pollution;
- Local flooding;
- Function of stormwater systems; and
- Private maintenance requirements.

Key steps are:

- Design a targeted education program (for community, developers, Councillors and Council staff) considering key management issues, knowledge gaps, available funding and administrative responsibilities;
- Obtain funding;
- Implement the education program;
- Review the success of the program through community and staff surveys; and
- Amend the program as necessary.

KPIs	o Improved understanding of issues demonstrated through implementation of USMP actions.

5. PRIORITY CATCHMENT ACTIONS

5.1 High Priority Stormwater Management Areas

Consistent with the increased focus on the priority stormwater management areas (sub-catchments), the priority site-specific management actions relate to:

- Protection of high-value receiving environments; and
- Retrofit/upgrade of existing assets in areas of high risk.

A summary of the prioritisation of the stormwater management areas (from Section 8 of Volume 2) is given below. This is based on currently available information and should be reviewed on a regular basis. The actions to address these issues are discussed in the following sections. Many of the management actions in this USMP are expected to assist with prevention of similar localised issues in the future.

Table 3: Prioritisation of Stormwater Management Areas and Issues

SMA		Key Issues	Key Risks	Priority	Management Action
AL01	Alstonville	Tanamera drain historical issues and maintenance difficulties	Flooding of adjacent properties	High	Action 11: Rehabilitation of Alstonville Creek (Tanamera Drain)
LE02	Lake Ainsworth	Unresolved master planning inhibits progress of stormwater improvements	Water quality in Lake	High	To be resolved once Master Plan is approved through Crown Reserves planning process
LE03	Lennox East 7 Mile Beach	Protection of Cape Byron Marine Park Sanctuary Zone and Habitat Protection Zone	Fish habitat protection	High	Action 12: Reduction of impacts on Cape Byron Marine Park Sanctuary and Habitat Zones
		Cracked stormwater drains on beach contribute to erosion and reduced amenity	Beach scour	Medium	Action 6: Develop Asset Renewal Program
		Stormwater drainage on floodplain is impeded by low grade and high water table and often fails during heavy rainfall	Localised flooding of roads during heavy rainfall	Low	Action 10: Targeted program of asset rectification to reduce risk of flooding
LE04	Lennox West North Creek	Stormwater drainage on floodplain is impeded by low grade and high water table and often fails during heavy rainfall	Localised flooding during heavy rainfall.	Medium	Action 10: Targeted program of asset rectification to reduce risk of flooding
LE05	Boulders Beach	Increased stormwater flows to Boulder's wetland and beach. Future maintenance of assets in major development area.	Impacts on wetland and beach amenity	Low	Action 5: Prepare Asset Maintenance Guidelines Action 8: Identify requirements for protection of sensitive receiving environments

SMA		Key Issues	Key Risks	Priority	Management Action
LE06	Pacific Pines	Water quality control pond algal blooms and poor water quality. Likely to be exacerbated by future residential development.	Potential water quality impacts on SEPP 14 wetland and mangroves	High	Action 13: Investigation and rectification of Pacific Pines water quality control pond
LE07	Skennars Head North Creek	*Phragmites* blocking open drain adjacent to Headlands Leisure Park exacerbating localised flooding issues. Established bush hen habitat.	Localised flooding. Requirement for environmental approvals prior to maintenance	High	Action 10: Targeted program of asset rectification to reduce risk of flooding Action 8: Identify requirements for protection of sensitive receiving environments
LE09	North Creek Road	Water quality in stormwater pond at Elevation	Potential water quality impacts on downstream oyster lease	Medium	Action 14: Investigation of potential impacts on oyster lease areas
NO01	North Ballina (Airport)	RTA borrow pit poor water quality (not quantified)	Potential water quality impacts on downstream oyster lease	High	Action 8: Identify requirements for protection of sensitive receiving environments Action 14: Investigation of potential impacts on oyster lease areas
		Harvey Norman Centre open drain/infiltration basin does not function as designed. Accumulation of litter and weeds. Lack of access for maintenance.	Potential water quality impacts on downstream oyster lease. Flooding of adjacent properties	High	Action 5: Prepare Asset Maintenance Guidelines
NO02	North Lakes/ Ballina Racecourse	Water quality issues in North Lakes stormwater ponds (algal blooms, odours, fish kills) due to inadequate flushing. Lack of access for maintenance due to land ownership and water logging of swales. Weeds and bank erosion around lakes	Potential water quality impacts on SEPP 14 wetland, mangroves and oyster lease Flooding of adjacent properties	High	Action 15: Rectification of North Lakes Stormwater Management System
NO03	Southern Cross Drive	Stormwater drainage on floodplain is impeded by low grade and high water table and often fails during heavy rainfall	Potential water quality impacts on downstream oyster lease.	Medium	Action 10: Targeted program of asset rectification to reduce risk of flooding Action 14: Investigation of potential impacts on oyster lease areas

SMA		Key Issues	Key Risks	Priority	Management Action
CU01	Cumbalum	Future development of Precinct A and B.	Potential impacts on sensitive receiving environments	High	Action 4: Review and update development controls and guidelines Action 8: Identify requirements for protection of sensitive receiving environments
EA01	Angels Chickiba	Modified hydrological regime due to residential development has impacted on Chickiba wetlands	Impacts on SEPP14 wetland, flooding of adjacent properties, poor drainage of sports fields, weed growth	High	Action 16: Restoration of Chickiba Wetlands
EA02	Angels Beach	Water-borne pollutants (including roadside rubbish and chemical runoff) from urban areas is washed into natural bushland areas via stormwater (either uncontrolled or via drains without pollutant traps)	Transport of weed propagules (seeds, roots, tubers etc.) to key habitat areas. Scouring, erosion, gullying and sedimentation from uncontrolled runoff during heavy rainfall events from urban areas to bushland sites.	Medium	Action 8: Identify requirements for protection of sensitive receiving environments
EA04	Shelly Beach/ Black Head	Cracked stormwater drains on beach contribute to erosion, reduced amenity	Beach scour	Medium	Action 6: Develop Asset Renewal Program
		Lack of drainage from Beachfront Parade and Bayview Drive results in stormwater funnelling through pedestrian underpass and into adjacent bushland causing erosion/ sedimentation	Bushland erosion and sedimentation	Medium	Action 8: Identify requirements for protection of sensitive receiving environments
		“Showcase” stormwater trap at Ballina Lighthouse headland not adequately maintained or functioning effectively.	Beach pollution	Low	Action 5: Prepare Asset Maintenance Guidelines Action 9: Develop and Implement a stormwater education and consultation program
EA05	Shaws Bay	Stormwater drainage on floodplain is impeded by low grade and high water table and often fails during heavy rainfall	Localised flooding during heavy rainfall.	Low	Action 10: Targeted program of asset rectification to reduce risk of flooding

SMA		Key Issues	Key Risks	Priority	Management Action
		Mangroves established in stormwater drains due to tidal intrusion and lack of maintenance.	Localised flooding during heavy rainfall.	Low	Action 5: Prepare Asset Maintenance Guidelines Action 8: Identify requirements for protection of sensitive receiving environments
BA01	Ballina Island North Creek	Stormwater drainage on floodplain is impeded by low grade and high water table and often fails during heavy rainfall	Localised flooding during heavy rainfall/high tides. Impacts on oyster lease	Medium	Action 10: Targeted program of asset rectification to reduce risk of flooding Action 14: Investigation of potential impacts on oyster lease areas
		Ageing assets need repair/replacement	Localised flooding during heavy rainfall/high tides. Impacts on oyster lease	Medium	Action 14: Investigation of potential impacts on oyster lease areas Action 10: Targeted program of asset rectification to reduce risk of flooding
BA02	Ballina Island Richmond River	Stormwater drainage on floodplain is impeded by low grade and high water table and often fails during heavy rainfall	Localised flooding during heavy rainfall/high tides. Impacts on oyster lease	Medium	Action 10: Targeted program of asset rectification to reduce risk of flooding Action 14: Investigation of potential impacts on oyster lease areas
		Ageing assets need repair/replacement	Localised flooding during heavy rainfall/high tides. Impacts on oyster lease	Medium	Action 14: Investigation of potential impacts on oyster lease areas Action 10: Targeted program of asset rectification to reduce risk of flooding
WE01	West Ballina Richmond River	Stormwater drainage on floodplain is impeded by low grade and high water table and often fails during heavy rainfall	Localised flooding during heavy rainfall/high tides. Impacts on oyster lease	Medium	Action 10: Targeted program of asset rectification to reduce risk of flooding Action 14: Investigation of potential impacts on oyster lease areas

SMA		Key Issues	Key Risks	Priority	Management Action
WE02	West Ballina Fishery Creek	Stormwater drainage on floodplain is impeded by low grade and high water table and often fails during heavy rainfall	Localised flooding during heavy rainfall/high tides.	Medium	Action 10: Targeted program of asset rectification to reduce risk of flooding
		Ferngrove Estate: stormwater assets (vegetated swale and basin) overgrown with weeds and difficult to maintain. Grade of stormwater not adequate to achieve required stormwater conveyance.	Localised flooding during heavy rainfall/high tides.	Medium	Action 5: Prepare Asset Maintenance Guidelines
WA01	Wardell	Stormwater drainage on floodplain is impeded by low grade and high water table and often fails during heavy rainfall	Localised flooding during heavy rainfall/high tides.	Medium	Action 10: Targeted program of asset rectification to reduce risk of flooding

5.2 Reduction of Risk Associated with Localised Flooding

The risk of flooding associated with inadequate stormwater drainage is a recurring issue in the Shire's urban areas. This risk is increased with inadequate maintenance of drains and will be exacerbated by climate change, particularly sea level rise.

Management of stormwater in low-lying flat land is not easy and deserves specific attention. There are numerous existing examples of stormwater related inundation of low-lying urban land within Ballina Shire. Ideally, urban development is not undertaken in such areas as it is going to be increasingly difficult to meet the expectations of stakeholders in terms of level of service and environmental performance whilst continuing to allow cost-effective development of land in low-lying areas.

The required management actions are:

- Planning and development controls as discussed in Section 4.5; and
- Development of a climate change adaptation strategy for the management of stormwater infrastructure (Section 4.7).

Localised flooding at some high profile sites has also been addressed through the priority catchment actions including:

- Chickiba Wetlands (Section 5.8); and
- Alstonville Creek (Tanamera Drain, Section 5.3).

There are many other examples of poor site drainage which require rectification on a priority basis. It is recommended that a targeted program of asset renewal is developed based on condition assessments and asset management planning utilising Council's asset management systems. This is a key subset of the asset renewal program discussed in Section 4.8.

Action 10: Targeted program of asset rectification to reduce risk of flooding

Issue	Drainage infrastructure is contributing to the risk of localised flooding
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Reduce risk of local flooding to property and infrastructure
Responsibility	WSUD Manager
Support	Engineering Works, Asset Management, Open Spaces and Reserves
Cost Estimate (10 year)	$900,000
Potential Funding	General Fund, stormwater management service charge
Timing	Ongoing
Management Zones	Shire-wide
DESCRIPTION OF TASKS:	
The key tasks are: • Based on the condition assessments, compile a list of urban stormwater assets which are considered to be inadequate regarding conveyance of stormwater flows; • Determine the potential risks of flooding and costs of rectification; • Develop a prioritised works program for rectification of the assets; and • Identification of a funding source. The budget cost estimate for this action is to be confirmed after development of the works program.	
KPIs	o Works program and funding source identified by June 2014.

5.3 Alstonville Creek (Tanamera Drain)

Tanamera Drain (part of Alstonville Creek) has been identified as a high priority site due to the potential risk of flooding of adjacent properties. A concept plan has been prepared for rehabilitating a section of the Alstonville Creek stormwater catchment reserve from Apex Park through to and including the Tanamera stormwater reserve (GeoLINK, 2003). The plan includes paths and cycle ways, recreation facilities, interpretive signage, revegetation works, creek restoration and stormwater facilitation. The capital cost was estimated as $1.36m (indexed to 2012$). Council has not been able to fund the plan.

Council has negotiated an agreement with the downstream land owners to incrementally implement improvement works, however a staged process has not yet been developed. The concept plan needs to be reviewed to assess the costs and implications of the current situation and develop a cost-effective staged approach which addresses the key risks.

Action 11: Rehabilitation of Alstonville Creek (Tanamera Drain)

Issue	Inadequate drainage in Alstonville Creek (Tanamera Drain) is impacting on significant vegetation and increasing the risk of localised flooding.
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels
Desired Outcome	Reduce risk of local flooding to property and infrastructure and improve ecosystem health
Responsibility	WSUD Manager
Support	Open Spaces and Reserves, Engineering Works
Cost Estimate (10 year)	$350,000 plus ($50,000 concept plan plus estimated implementation costs)
Potential Funding	General Fund, external grants
Timing	Short term (Year 1 - 3)
Management Zones	AL01 Alstonville Creek
DESCRIPTION OF TASKS:	
The following actions are required: • Review of the 2003 concept design for rehabilitation of Alstonville Creek (GeoLINK, 2003) with the aim of developing a staged implementation plan for drain improvements; • Identification of a funding source for implementation; and • Ongoing consultation with landholders regarding drain maintenance. The budget cost estimate for this action is to be confirmed after development of the concept plan.	
KPIs	o Development of a staged implementation plan and funding identified by June 2014.

5.4 Cape Byron Marine Park

Previous studies (Smith and James, 2003) have identified that erosion and sediment from stormwater discharges has the potential to adversely affect the reef habitat within the Moat/Bream Hole Sanctuary Zone and the Seven Mile Beach Habitat Protection Zone of the Cape Byron Marine Park (Seven Mile beach at Lennox Head). Feedback from stakeholders (Department of Primary Industries (DPI-Fisheries), Marine Park Authority and fishing groups) suggests that urban stormwater runoff from drains that discharge onto Seven Mile Beach is a key pollutant and sediment source. However, the concerns are based on observations documented in the 2003 studies and definitive data on the risks is not available.

It is recommended that Council engage with Fisheries to determine the risk associated with urban stormwater runoff on the Marine Park and develop a remediation strategy. Considerations include:

- Event-based monitoring of turbidity in the Bream Hole may be undertaken to confirm the contribution of stormwater runoff to sedimentation;
- Sediment traps may be retrofit into the existing pipe and pit system behind the dunes to improve treatment of the runoff;
- Repair of the cracked pipes would reduce erosion of the beach area surrounding the pipes. Energy dissipation at the outlet could be incorporated to minimise erosion potential; and

Regardless of the impact on the Marine Park, the pipes discharging onto the beach are an eyesore. Options for relocation of the discharge to behind the artificial dune with incorporation of appropriate erosion control and infiltration systems should be considered.

Action 12: Reduction of impacts on Cape Byron Marine Park Sanctuary and Habitat Zones

Issue	Stormwater drains discharge into the Cape Byron Marine Park Sanctuary and Habitat Zones
USMP Objectives	• Stormwater assets limit impacts on receiving environments to acceptable levels
Desired Outcome	Establish the risk of urban stormwater impacts on the Marine Park and develop remediation measures.
Responsibility	WSUD Manager
Support	Engineering Works, Open Spaces and Reserves, DPI-Fisheries
Cost Estimate (10 year)	$70,000
Potential Funding	DPI-Fisheries, General Fund
Timing	Short term (Year 1 - 3)
Management Zones	LE03 Lennox East 7 Mile Beach

DESCRIPTION OF TASKS:

It is recommended that Council engage with Fisheries to determine the risk associated with urban stormwater runoff on the Marine Park and develop a remediation strategy. Tasks include:

- Development and implementation of a monitoring program (stormwater runoff and beach erosion);
- Assess the effectiveness of existing drainage infrastructure and treatment measures;
- Develop a rehabilitation strategy including rectification of stormwater pipes and potential addition of sediment traps; and
- Identification of a funding source for implementation.

The budget cost estimate for this action is to be confirmed after development of the rehabilitation strategy.

KPIs

- Development of a rehabilitation strategy including funding by June 2016.

5.5 Pacific Pines Water Quality Control Pond

Periodic algal blooms occur in the Pacific Pines water quality control pond and there is concern (from NSW Fisheries and EcoFishers) that additional development will exacerbate the impacts on the downstream SEPP 14 area and mangroves.

The impact on the downstream wetlands and mangroves has not been quantified. It is recommended that Council engage with NSW Fisheries and the developer to investigate the impact of the water quality control pond (currently and with future development) and determine any required remediation measures. Future development controls could include any required remediation measures such as treatment measures within the catchment.

Action 13: Investigation and rectification of Pacific Pines water quality control pond

Issue	There is concern that the Pacific Pines water quality pond is impacting on downstream sensitive areas.
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels
Desired Outcome	Ensure impacts on downstream sensitive receiving environments are minimised
Responsibility	WSUD Manager
Support	Development Services, Open Spaces and Reserves, DPI-Fisheries
Cost Estimate (10 year)	$10,000
Potential Funding	DPI-Fisheries, General Fund
Timing	Short term (Year 1 - 3)
Management Zones	LE06 Pacific Pines
DESCRIPTION OF TASKS:	
It is recommended that Council engage with Fisheries to determine the risk with urban stormwater runoff from the Pacific Pines development on the downstream SEPP14 wetland and mangroves. Tasks include: • Development and implementation of a monitoring program (stormwater quality in the pond and discharges); • Assess the effectiveness of existing treatment measures for existing and future developments; • Develop a rehabilitation strategy; and • Determine required development controls.	
KPIs	o Development of a rehabilitation strategy and development controls by June 2014.

5.6 Potential Impacts on Oyster Lease Areas

None of the risks to aquaculture are unique to the Richmond River estuary and are currently being addressed to various degrees by industry regulation licensing and research programs. This includes research into QX disease triggers and development of QX disease resistant strains of the Sydney Rock Oyster being undertaken by DPI-Fisheries. The CZMP for the Richmond River Estuary (Hydrosphere Consulting, 2011) identified the linkages between aquaculture management and management of other estuary management issues such as water quality. The CZMP recommended that DPI-Fisheries and BSC identify and manage contamination sources in the estuary to minimise oyster harvest closures. BSC has previously received a grant for oyster lease water quality monitoring as part of the Office of Environment and Heritage (OEH) Estuary Management Program. However, staffing constraints resulted in Council forgoing the grant. OEH has advised Council that changes in priorities for the grant scheme mean that Council would be unlikely to be successful for a grant for this project in future. Council aims to include this project in the EcoHealth monitoring program proposed for the Richmond River.

Action 14: Investigation of potential impacts on oyster lease areas

Issue	There is concern that urban runoff is impacting on downstream oyster lease areas.
USMP Objectives	• Stormwater assets limit impacts on receiving environments to acceptable levels
Desired Outcome	Improve understanding of issues affecting oysters in the Richmond to inform management action to address issues and work towards improving viability of the industry
Responsibility	WSUD Manager
Support	Environmental Health, DPI-Fisheries, OEH
Cost Estimate (10 year)	Included in other programs (Richmond River CZMP)
Potential Funding	N/A
Timing	Short term (Year 1 - 3)
Management Zones	LE09 North Creek Road, NO01 North Ballina (Airport), NO02 North Lakes/Ballina Racecourse, EA03 Prospect North Creek, BA02 Ballina Island Richmond River, WE01 Wet Ballina Richmond River
DESCRIPTION OF TASKS:	
This action will be addressed through the Richmond River CZMP.	
KPIs	o Completion of relevant actions from CZMP

5.7 North Lakes

North Lakes has a history of water quality issues and resident concerns including algal blooms, fish kills, odours and decreased amenity. Implementation of the water quality management plan developed for the site has been hampered by lack of funding. The development has the potential to impact on the adjoining SEPP14 wetland areas, fisheries habitat and oyster lease areas. A 2008 water quality management plan (WQMP) makes recommendations to alleviate issues with waterlogged swales and to ensure appropriate access is established for maintenance and monitoring purposes. There has been limited implementation of the proposed actions, largely due to insufficient funding, but also due to the complex nature of the issues, stakeholder acceptance and access/ownership arrangements.

While the management plan identified issues relating to functioning of the lakes, water quality data were not available at the time of development of the plan. Modelling of the existing system using the computer simulation model MUSIC was undertaken to estimate the pollutant loads entering and leaving the lakes. It found that the swale system and lakes should be effective in reducing the sediment and nutrient loads. However, actual performance of the stormwater system has not been confirmed with monitoring of the lake water quality and downstream receiving environments.

The management plan identified that the stormwater system at North Lakes interacts with North Creek through a reverse flood gate arrangement and discharge weir. The effect of saltwater ingress on the biology and water chemistry of the lakes was not assessed in any detail. Aspects such as the production of monosulfidic black ooze (MBO), accumulation and potential re-suspension of contaminants, entrapment of estuarine fish and general ecological health of the system should be considered further to ensure that implementation of the proposed management actions is as risk free as possible. Ingress of saltwater into the lakes may compromise the success of the proposed vegetation management strategy.

Successful management of the North Lakes issue will rely on confirmation of the efficacy of the management actions proposed in the 2008 WQMP. It is recommended that investigations into the biological and chemical functioning of the lakes is undertaken in order to fully visualise the outcomes of the proposed management actions and confirm the approach to be taken before significant investment. A review of the actions proposed in the WQMP and prioritisation of the works may be required depending on the outcomes of this study. As part of the review, the water quality objectives for the pond should be better defined to enable monitoring of the success of the actions. Ongoing community education and involvement in the review of the plan should include education on the function of the pond and managing the residents' expectations regarding water level and water quality.

Action 15: Rectification of North Lakes Stormwater Management System

Issue	North Lakes has a history of water quality issues and stakeholder concerns including algal blooms, fish kills, odours and decreased amenity
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels
Desired Outcome	Improved amenity and stormwater function and minimised impact on downstream waterways
Responsibility	WSUD Manager
Support	Environmental Health, Open Spaces and Reserves, DPI-Fisheries
Cost Estimate (10 year)	$240,000 ($40,000 study and $200,000 estimated rehabilitation costs)
Potential Funding	DPI-Fisheries, General Fund
Timing	Short term (Year 1 - 3)
Management Zones	NO02 North Lakes/Ballina Racecourse

DESCRIPTION OF TASKS:

Undertake investigations into the water chemistry and biological factors driving ecological function of the North Lake system. This study should be undertaken with the aim of determining the efficacy of the management measures proposed in North Lakes Water Quality Management Plan (2008) and reviewing the best path to successful resolution of the issues at this location. The study should:

- Consider any available water quality data or anecdotal observations since 2008 that may provide additional insight into the ecological functioning of the lake system;
- Investigate the hydrology and water chemistry of the of the system, particularly the strategy of saline flushing of the system, water quality drivers, nutrient cycling, risk of MBO formation, algal blooms and fish kills; and
- Update the status of any management actions that have been undertaken and evaluate whether the remaining actions in the North Lakes WQMP should be amended; and
- Identify funding for the implementation of the rehabilitation strategy.

The budget cost estimate for this action is to be confirmed after development of the rehabilitation strategy.

KPIs

- Develop a rehabilitation strategy and identify funding source by June 2014.

5.8 Chickiba Wetlands

Council has been developing a wetland implementation action plan for the restoration of Chickiba wetlands. The proposed actions would restore the health of the wetlands, improve drainage of the sports fields and improve the function of the asset protection zones bordering the wetlands. Implementation of the actions (including ongoing monitoring of its success) is dependent on continued funding. The estimated cost of the drainage works and installation of the weir is $50,000. Ongoing monitoring of vegetation, water level and pH at a cost of approximately $10,000 p.a. is expected to be required for two years. Minor ongoing monitoring would be required for the medium to long-term. All of the works would be implemented by Ballina Shire Council, or suitably qualified and experienced contractors, project partners and community volunteer organisations.

Action 16: Restoration of Chickiba Wetlands

Issue	Urban development has impacted on the health of Chickiba wetlands and drainage issues in the residential areas and sports field.
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels
Desired Outcome	Improved wetland health and improved drainage of residential development and sports fields.
Responsibility	WSUD Manager
Support	Open Spaces and Reserves
Cost Estimate (10 year)	$50,000 (drainage works and weir installation) and $10,000 p.a. monitoring
Potential Funding	DPI-Fisheries, RRCC, General Fund
Timing	Short term (Year 1 - 3) and ongoing monitoring
Management Zones	EA01 Angels Chickiba
DESCRIPTION OF TASKS:	
Continue to develop and implement the WIAP.	
KPIs	o Completion of drainage works and weir installation by June 2014.

6. MONITORING, EVALUATION AND REPORTING

An effective environmental monitoring and reporting system is regarded as a key component of the USMP. Identification of asset management issues and environmental impacts will ensure Council provides cost-effective actions and directs effort where it is most needed.

Obtaining feedback on the success of management initiatives is also a critical aspect of effective management. Monitoring of asset and receiving environment condition, as well as community opinions should be undertaken to provide a solid information base for future decision making.

Some priority catchment actions (Action 12: Reduction of impacts on Cape Byron Marine Park Sanctuary and Habitat Zones, Action 13: Investigation and rectification of Pacific Pines water quality control pond, Action 14: Investigation of potential impacts on oyster lease areas and Action 15: Rectification of North Lakes Stormwater Management System) require development and implementation of a monitoring/investigative program as part of the development of the rehabilitation strategy. This is to ensure a complete understanding of the technical issues to enable development of cost-effective actions targeted to highest risk areas.

All monitoring should seek to capitalise as much as possible on existing information to provide a baseline from which the success of management actions can be measured and effort can be targeted to appropriate actions. However, as full characterisation of stormwater systems is difficult to achieve, monitoring should be prioritised to address high risk/high priority outcomes. The monitoring program should provide robust scientific data while considering the limited human and financial resources available. Council staff and stakeholders should be involved in the development of the program.

The existing and proposed Council monitoring programs (e.g. as required by the Environment Protection Licences and as recommended in the Richmond River CZMP and Lake Ainsworth Management Plan) should continue. Council should ensure that the proposed Northern Rivers Ecosystem Health (EcoHealth) Monitoring Program recommended in the Richmond River CZMP considers urban stormwater issues in the design stages to provide the opportunity to measure the success of management actions implemented through the USMP on a catchment-wide basis.

The ability to achieve the USMP management objectives will be determined through the success of the management actions. This will require coordinated monitoring as well as on-going review of performance against defined targets. Ongoing reporting of progress of the USMP will be undertaken as part of the Council State of the Environment (SoE) Reporting. A major 10-year review of the USMP is also required.

Action 17: EcoHealth Monitoring Program

Issue	Current monitoring programs do not provide a consistent approach to identification of the extent or causes of water quality issues.
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels • Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Implementation of a co-ordinated catchment-wide monitoring program to monitor ecosystem health, measure the success of management actions and inform decision-making.
Responsibility	Environmental and Public Health
Support	WSUD Manager, NRCMA, DPI-Fisheries
Cost Estimate (10 year)	Included in other programs (Richmond River CZMP)
Potential Funding	N/A
Timing	Ongoing
Management Zones	Shire-wide
DESCRIPTION OF TASKS:	
This action will be addressed through the Richmond River CZMP.	
KPIs	o Completion of relevant actions from CZMP

Action 18: Review of USMP progress and monitoring of KPIs

Issue	Implementation of the USMP is required to achieve Council's strategic objectives
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels • Stormwater assets are integrated into the planned landscape e.g. provide habitat and natural systems in appropriate places and increase surrounding land values by providing aesthetic and natural appeal • Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Continuous improvement towards the USMP objectives across the full range of issues
Responsibility	WSUD Manager
Support	Strategic Services Group, Regulatory Services Group
Cost Estimate (10 year)	Included in SoE reporting
Potential Funding	N/A
Timing	2016, 2020
Management Zones	Shire-wide
DESCRIPTION OF TASKS:	
Success of the USMP will be indicated by the implementation of substantial measures to address the root cause of management issues. Conclusive documentation of the effectiveness of these measures will be required and should be reported. KPIs have been identified where appropriate for each management action to provide a target for achievement of the major steps in each action. This task requires annual review and reporting of progress towards the KPIs as part of the Council State of the Environment (SoE) Reports.	
KPIs	o Review and reporting undertaken as part of SoE reporting – 2016, 2020

Action 17: Ten year review of USMP

Issue	Implementation of the USMP is required to achieve Council's strategic objectives
USMP Objectives	• Stormwater systems are effective in removing stormwater from urban areas • Stormwater assets limit impacts on receiving environments to acceptable levels • Stormwater assets are integrated into the planned landscape e.g. provide habitat and natural systems in appropriate places and increase surrounding land values by providing aesthetic and natural appeal • Management of stormwater systems is efficient and cost effective through the whole asset life cycle
Desired Outcome	Management strategies remain appropriate for the long term
Responsibility	WSUD Manager
Support	Strategic Services Group, Regulatory Services Group
Cost Estimate (10 year)	$50,000
Potential Funding	N/A
Timing	Long term (year 10)
Management Zones	Shire-wide
DESCRIPTION OF TASKS:	
The USMP and the specified management actions should be reviewed to ensure they are being achieved and are resulting in the desired outcomes. A ten year review (or earlier if warranted by legislative or management changes or improved scientific understanding) of the USMP is required to consider: • Results of the four-yearly KPI reviews (Action 16); • Any barriers identified to the effective implementation of actions or overall success of actions; • Any new or updated scientific knowledge; • Data provided by the EcoHealth monitoring program (Action 15); and • Prevailing community attitudes, government policy, strategic planning and stormwater management issues.	
KPIs	o Review and reporting undertaken by year 10. o Adoption of the amended USMP as required

7. IMPLEMENTATION PROGRAM

The management strategies have been compiled into a ten year implementation program as shown in **Table 4**.

Table 4: USMP Implementation Program

	Action		Responsibility	Support	Management Areas	Potential Funding	Ten Year Cost ($k)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Management Actions	1	Facilitate Integrated Urban Stormwater Management within Council (employ new WSUD Manager)	Civil Services Group Manager	Strategic Services Group, Regulatory Services Group	Shire-wide	General Fund, Stormwater Management Service Charge	1,500	150	150	150	150	150	150	150	150	150	150
	2	Identify stormwater management funding sources	WSUD Manager	Strategic Services Group, Regulatory Services Group	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	3	Review and develop stormwater asset management procedures	WSUD Manager	Open Spaces and Reserves, Asset Management, Engineering Works	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	4	Review and update development controls and guidelines	WSUD Manager	Development Services, Engineering Works, Open Spaces and Reserves, Environmental and Public Health, Strategic Planning	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	5	Prepare asset maintenance guidelines	WSUD Manager	Asset Management, Engineering Works, Open Spaces and Reserves	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	6	Develop asset renewal program	WSUD Manager	Engineering Works, Asset Management, Open Spaces and Reserves	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	7	Develop a Stormwater Master Plan for Low-Lying Land	WSUD Manager	Engineering Works, Asset Management, Strategic Planning	BA01, BA02, NO01, NO02, WE02	General Fund, external grants, developer charges	350			150	150					50	
	8	Identify requirements for protection of sensitive receiving environments	WSUD Manager	Open Spaces and Reserves, Strategic Planning, Environmental and Public Health	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	9	Develop and Implement a stormwater education and consultation program	Environmental and Public Health	WSUD Manager, Open Spaces and Reserves	Shire-wide	General Fund, external grants	50	5	5	5	5	5	5	5	5	5	5
Priority Catchment Actions	10	Targeted program of asset rectification to reduce risk of flooding	WSUD Manager	Engineering Works, Asset Management, Open Spaces and Reserves	Shire-wide	General Fund, stormwater management service charge	900		*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*	*100*
	11	Rehabilitation of Alstonville Creek (Tanamera Drain)	WSUD Manager	Open Spaces and Reserves, Engineering Works	AL01	General Fund, external grants	350	50	*100*	*100*	*100*						
	12	Reduction of impacts on Cape Byron Marine Park Sanctuary and Habitat Zones	WSUD Manager	Engineering Works, Open Spaces and Reserves, DPI-Fisheries	LE03	General Fund, external grants	70			20	*50*						
	13	Investigation and rectification of Pacific Pines water quality control pond	WSUD Manager	Development Services, Open Spaces and Reserves, DPI-Fisheries	LE06	General Fund, developer, DPI-Fisheries	10	10									
	14	Investigation of potential impacts on oyster lease areas	WSUD Manager	Environmental Health, DPI-Fisheries, OEH	LE09, NO01, NO02, EA03, BA02, WE01	N/A	0	included in Richmond River CZMP									
	15	Rectification of North Lakes Stormwater Management System	WSUD Manager	Environmental Health, Open Spaces and Reserves, DPI-Fisheries	NO02	General Fund, external grants	240	40	*100*	*100*							
	16	Restoration of Chickiba Wetlands	WSUD Manager	Open Spaces and Reserves	EA01	General Fund, DPI-Fisheries, RRCC, external grants, community groups	80	50	10	10							
Monitoring, Evaluation and Reporting	17	EcoHealth Monitoring Program	Environmental and Public Health	WSUD Manager, NRCMA, DPI-Fisheries	Shire-wide	N/A	0	included in Richmond River CZMP									
	18	Review of USMP progress and monitoring of KPIs	WSUD Manager	Strategic Services Group, Regulatory Services Group	Shire-wide	N/A	0	To be undertaken by WSUD Manager (costs included in Action 1)									
	19	Ten year review of USMP	WSUD Manager	Strategic Services Group, Regulatory Services Group	Shire-wide	General Fund	50										50
		Totals					3,600	305	465	635	565	255	255	255	255	305	305

Notes: Years shown correspond to the financial year i.e. 2014 is Year 1 of the Plan (starting 1 July 2013). All figures are 2012 $'000. Costs in *italics* represent a realistic allowance which has been stipulated until the full implementation costs are determined as part of prior actions

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Appendix 1: Potential Grant Funding

Agency	Program Name	Description	Criteria/Objectives
State Government			
OEH	Environmental Trust	The NSW Environmental Trust is an independent statutory body established by the NSW government to support exceptional environmental projects that do not receive funds from the usual government sources. The Trust is empowered under the *Environmental Trust Act 1998*, and its main responsibility is to make and supervise the expenditure of grants.	The objectives of the NSW Environmental Trust are: • to encourage and support restoration and rehabilitation projects; • to promote research into environmental problems of any kind; • to promote environmental education in both the public and private sectors; • to fund the acquisition of land for the national parks estate; • to fund the declaration of areas for marine parks and for related purposes; • to promote waste avoidance, resource recovery and waste management (including funding enforcement and regulation and local government programs); • to fund environmental community groups; • to fund the purchase of water entitlements for the purpose of increasing environmental flows for the State's rivers and restoring or rehabilitating major wetlands
DPI (Fisheries and Aquaculture)	Habitat Action Program	Supports the improvement of recreationally important fish populations, engages recreational anglers in fish habitat actions through the Fishers for Fish Habitat project, provides devolved habitat action grants to enhance fisheries in NSW. The Habitat Action Program is funded by the revenue raised by the NSW recreational fishing fee. Habitat Action Grants - Angling clubs, individuals, community groups, local councils and organisations interested in rehabilitating fish habitats in freshwater and saltwater areas throughout NSW can apply for grants.	Habitat rehabilitation projects which may be funded include: • removal or modification of barriers to fish passage • rehabilitation of riparian lands (river banks, wetlands, mangrove forests, saltmarsh) • re-snagging waterways with timber structure • removal of exotic vegetation from waterways • bank stabilisation works • reinstatement of natural flow regimes Habitat Action Grants are available in August each year and require the completion of a habitat-specific Funding Application form. Funding applications must relate to the enhancement of recreational fishing through the improvement of fish habitat. Successful projects are usually funded for one year, however funding may be sought for multi-stage projects that take place over a number of years (e.g. two or three year projects).
DPI	Recreational Fishing Trust	All money raised by the NSW Recreational Fishing Fee is placed into the Recreational Fishing Trusts and spent on improving recreational fishing in NSW. Anyone can apply for funding from the Recreational Fishing Trusts, including fishing clubs and organisations, universities, councils, community groups, individuals.	Priorities for funding from the Trusts Funds include: • recreational fisheries enhancement; • angler education and information; • research on recreational fishing; • recreational fisheries access and facilities; and • recreational fisheries sustainability.

Agency	Program Name	Description	Criteria/Objectives
OEH	Environmental Education Grants	The aim of the Environmental Education program is to support educational projects or programs that develop or widen the community's knowledge of, skills in, and commitment to protecting the environment and promoting sustainable behaviour.	The Objectives of the Environmental Education Program are: • to help attain one or more of the outcomes in the NSW Government's Environmental Education Plan, Learning for Sustainability; • to facilitate changes in behaviour of individuals and groups which affect specific environmental problems; and • to develop and promote education projects which improve the environment.
Federal Government			
Australian Government	Caring for Our Country	Caring for our Country is the Government's natural resource management initiative. It integrates delivery of the Commonwealth's previous natural resource management programs, the Natural Heritage Trust, the National Landcare Program, the Environmental Stewardship Program and the Working on Country Indigenous land and environmental program.	Caring for our Country focuses on achieving strategic results in six national priorities: • the National Reserve System; • biodiversity and natural icons; • coastal environments and critical aquatic habitats; • sustainable farm practices; • natural resource management in northern and remote Australia; and • community skills, knowledge and engagement. The Australian Government calls for investment proposals for projects through annual Caring for our Country business plans. Community Action Grants are the small grants component of the Australian Government's Caring for our Country initiative that aims to help community groups take action to conserve and protect their natural environment. The grants are targeted towards established community-based organisations which have sustainable farming and/or protecting and enhancing the natural environment as their principal objective.

Agency	Program Name	Description	Criteria/Objectives
Australian Research Council (ARC)	ARC Centre of Excellence	The ARC Centres of Excellence scheme aims to enhance and develop Australia's research excellence through highly innovative and collaborative research, as well as build Australia's human capacity in a range of research areas. The objectives of the ARC Centres of Excellence scheme are summarised as: • undertake highly innovative and potentially transformational research; • link existing Australian research strengths and build critical mass with new capacity for interdisciplinary, collaborative approaches; • develop relationships and build new networks with major national and international centres and research programs; • build Australia's human capacity in a range of research areas; • provide high-quality postgraduate and postdoctoral training environments; • offer Australian researchers opportunities to work on large-scale problems over longer periods of time; and • establish Centres of such repute in the wider community.	The National Research Priorities are: • An Environmentally Sustainable Australia; • Promoting and Maintaining Good Health; • Frontier Technologies for Building and Transforming Australian Industries; and • Safeguarding Australia.

Agency	Program Name	Description	Criteria/Objectives
National Water Commission	Raising National Water Standards Program	To guide investment in high priority activities to improve water management and advance national water reform, the Commission developed two investment pathways for the Raising National Water Standards Program: a strategic commissioning pathway and a competitive call pathway. In 2007, a National Groundwater Action Plan was initiated by the Commission under the Raising National Water Standards Program to fund projects to progress the groundwater reforms agreed to under the National Water Initiative. More than 175 Raising National Water Standards projects have been funded under the following themes: • Water accounting; • Emerging water markets; • Water planning and management; • Knowledge and capacity building; • Irrigation and other rural water; • Water-dependent ecosystems; and • Integrated urban water management.	This $250 million program offers support for projects that are improving Australia's national capacity to measure, monitor and manage our water resources. Funds from the Raising National Water Standards Program are directed at activities across three strategic investment areas: • advancing the implementation of the National Water Initiative; • improving integrated water management across Australia; • improving knowledge and understanding of our water resources; • Groundwater; • Northern rivers; • National assessment of water resources; and • Northern Australia water futures assessment.
DSEWPC	Working on Country	In recognising Indigenous people's relationship to and aspirations for country, and that protecting the environment is a shared responsibility, the Australian Government established Working on Country. This program builds on Indigenous knowledge of protecting and managing land and sea country, and provides funding for the employment for Indigenous people to deliver environmental outcomes.	Working on Country aims to: • support Indigenous aspirations in caring for country; • protect, conserve and manage Australia's environment and heritage values contribute to Closing the Gap targets by providing a career pathway and opportunity for Indigenous people to enter into real jobs in the land and sea management sector; and • provide nationally accredited training for Indigenous people in land and sea management, in partnership with industry and others.

Agency	Program Name	Description	Criteria/Objectives
DSEWPC	Maintaining Australia's Biodiversity Hotspots	The Maintaining Australia's Biodiversity Hotspots (MABH) programme is about taking a cost-effective, proactive approach to managing threats in high conservation value areas that are still relatively intact and maintaining their biodiversity values. Managing the threats effectively requires taking a whole of landscape approach, across all tenures, to promote active, on-going conservation management. The MABH programme aims to improve the conservation of biodiversity hotspots on private and leasehold land by enhancing active conservation management and protection of existing terrestrial and freshwater ecosystems as habitat for native plants and animals.	The programme supports two activities in hotspot areas; stewardship payments for on-ground biodiversity improvements and voluntary acquisitions. The stewardship payments offer direct financial support to land-holders to help them protect existing natural habitats with high conservation values. The payments will provide support to those land mangers that have already made a commitment to maintaining the biodiversity values of their properties. Investments will be determined on the basis of a competitive tender process, where the 'best value for money' conservation services to deliver the specified biodiversity outcomes will be purchased. Large properties with outstanding biodiversity values are those most likely to be targeted for voluntary acquisitions. Funding will be provided to registered charitable organisations on condition they manage the properties for conservation in perpetuity and can demonstrate organisational capacity and prior extensive property acquisition and management experience.
Other			
Terrestrial Ecosystem Research Network (TERN)	Australian Centre for Ecological Analysis and Synthesis (ACEAS)	ACEAS is a virtual and physical Facility within the Terrestrial Ecosystem Research Network for both disciplinary and inter-disciplinary integration, synthesis and modelling of ecosystem data to aid in the development of evidenced-based environmental management strategies and policy at regional, state and continental scales.	Up to $50,000 funding to co-ordinate diverse working groups to solve identified problems and get tangible outcomes
Landcare Australia	Junior Landcare grants program	Junior Landcare is about encouraging young people to play an active role in ensuring the safe future of their environment.	Through the Junior Landcare Grants Program, any school or organisation that would like to involve their students in landcare projects, in conjunction with local landcare groups, can apply for grants to assist them with the cost of their projects.

Agency	Program Name	Description	Criteria/Objectives
Norman Wettenhall Foundation Environmental Grants	Small Environmental Grants Scheme	The objectives of the Foundation are: • to support and encourage research, education and recording of all aspects of Australia's natural environment; and • to build capacity in local communities to effect long-term beneficial change in the natural environment. Projects relating to the natural environment that embody the following Principles: • Innovative projects are to be encouraged and preferably act as a model for other developments in the future; • The result should have a long-term effect; • Publication of funded studies is regarded as important and will be supported; • Encouragement of individuals, as well as organisations, is possible provided the project is well planned; and • Dissemination of information which will benefit the natural living environment.	The objectives are to support Australian biodiversity projects that are concerned with one or more of the following: • monitoring and recording data; • community education; • community capacity building (training); and • research and science.

Agency	Program Name	Description	Criteria/Objectives
NRCMA	Caring for Our Coast	This suite of large-scale projects will engage coastal community organisations in the delivery of coastal and marine rehabilitation, restoration and conservation on-ground works and capacity building activities within the Northern Rivers CMA region. The Northern Rivers CMA will devolve funds either directly through community organisations, or else through land managers, land owners and other organisations that actively engage coastal community organisations in the delivery of projects.	Activities that large-scale projects should focus on include one or more of the following as defined in the Caring for our Country Business Plan: • on-ground actions that protect the conservation values of coastal and marine ecosystems and environments; • protection, rehabilitation and enhancement of coastal and marine habitats, waterways and wetlands to stabilise dunes, prevent coastal erosion, establish wildlife corridors and enhance remnant coastal vegetation; • implementation of actions in recovery plans of threatened coastal and marine species and threat abatement plans, such as removing marine debris; • minimising disturbance to and protecting sensitive coastal and marine areas, including working with Indigenous communities to protect Indigenous cultural landscapes and culturally sensitive sites; • implementation of best-practice sustainable near-shore coastal land and resource use (e.g. fishing pressure), including Indigenous traditional use; • reduction of local stressors (e.g. poor water quality) on near-shore coastal ecosystems such as inshore reefs and seagrass meadows; • preventing the decline of water quality in coastal and marine habitats through management of point-source pollution, establishment of buffer zones and off-stream stock watering points; • increasing participation of individuals and communities in coastal and marine conservation projects, including enhancing skills, knowledge and raising community awareness; and • enhancing the skills and knowledge of Indigenous Australians, volunteers and communities in the delivery of on-ground actions in Saltwater Country through the use of traditional ecological knowledge, existing Land and Sea Country Management Plans, local knowledge and the best available science.