Asset Management Plan

Drainage

Policy Number: POL12/61
Adopted: 20/09/2011
Amended: 15/04/2014
Minute Number: MIN11.923, MIN14.266
File: 30281E
Produced By: Assets and Works Group
Review Date: 01/12/2016

For more information contact the Assets and Works Group

*Administrative Centre, Bridge Road, Nowra • **Telephone (02) 4429 3111** • Fax (02) 4422 1816 • PO Box 42 Nowra 2541*
*Southern District Office – Deering Street, Ulladulla • **Telephone (02) 4429 8999** • Fax (02) 4429 8939 • PO Box 737 Ulladulla*

council@shoalhaven.nsw.gov.au • www.shoalhaven.nsw.gov.au

CONTENTS

1. EXECUTIVE SUMMARY 1

1.1. The Purpose of the Plan 1
1.2. Asset Description 2
1.3. Levels of Service 3
1.4. Future Demand 3
1.5. Lifecycle Management Plan 3
1.6. Financial Summary 3
1.7. Asset Management Practices 4
1.8. Monitoring and Improvement Programme 5

2. INTRODUCTION 5

2.1. Background 5
2.2. Goals and Objectives of Asset Ownership 6
2.3. Plan Framework 7
2.4. Core and Advanced AM 8

3. LEVELS OF SERVICE 9

3.1. Customer Research and Expectations 9
3.2. Strategic and Corporate Goals 9
3.3. Legislative Requirements 10
3.4. Current Level of Service 11
3.5. Desired Level of Service 11

4. FUTURE DEMANDS 12

4.1. Demand Drivers 12
4.2. Demand Forecasts 12
4.3. Demand Impacts on Assets 13
4.4. Demand Management Plan 13
4.5. Asset Programmes to Meet Demand 13

5. LIFECYCLE MANAGEMENT PLAN 14

5.1. Background Data 14
5.2. Infrastructure Risk Management Plan 18
5.3. Routine Operations and Maintenance Plan 19
5.4. Renewal / Replacement Plan 22
5.5. Creation / Acquisition / Augmentation Plan 23
5.6. Disposal Plan 24

6. FINANCIAL SUMMARY 24

6.1. Financial Statements and Projections 24
6.2. Funding Strategy 26

6.3. Valuation Forecasts 26
6.4. Key Assumptions Made in Financial Forecasts 27
6.5. Forecast Reliability and Confidence....27
7. PLAN IMPROVEMENT AND MONITORING 28
7.1. Status of AM Practices....28
7.2. Improvement Programme 28
7.3. Monitoring and Review Procedures 29
7.4. Performance Measures....29
8. REFERENCES 31
9. APPENDICES....31
9.1 Glossary 31
10. REVIEW....42
ATTACHMENT 1 – STORMWATER QUALITY STRUCTURES....43
ATTACHMENT 2 – RATING METHOD FOR CAPITAL PROGRAM....45
ATTACHMENT 3 – DRAINAGE PRIORITY LIST 46
ATTACHMENT 4 – CATCHMENT BASED STORMWATER REVIEWS AND REVISED URBAN STORMWATER QUALITY MANAGEMENT ACTIONS....51
ATTACHMENT 5 – PRIORITY LIST 59

1. EXECUTIVE SUMMARY

Stormwater Drainage is an essential service to both mitigate against property damage during storm events and to minimise the impact of development on the environment.

Drainage assets include about 407km of underground systems and surface open channels as well as 15,600 pits or headwalls. The total budget for drainage services in 2012/13 is approximately $3.4 Million.

Funding levels and the current overall condition of the network are considered satisfactory. However, funding of about $160,000 per annum for renewal is predicted to be required commencing in about three (3) years time. This amount will significantly increase in about 35 years. More accurate asset condition data is required to confirm renewal funding requirements.

The additional funding now available from the *Stormwater Management Service Charge* provides an adequate level of funding and with it the opportunity to reduce the backlog in new drainage works and to consider additional funding to undertake projects to improve stormwater quality.

Due to the relatively low level of claims and customer requests compared to some other asset classes, the current risk management approach of relying on customer reporting is reasonable.

Strategies to improve drainage work have been taken into consideration as detailed in the improvement programme. These strategies are designed to provide long terms drainage issues solution in most Shoalhaven areas.

1.1. The Purpose of the Plan

The purpose of an Asset Management Plan (AMP) is to manage assets, based on data research and investigation, to determine how assets are to be managed in a sustainable and effective method.

AMPs are used to demonstrate how Council's assets are managed based on past and present information to create sustainable and reliable future planning. AMPs will provide the guidance for decisions of renewal, replacement or demolition of an asset.
AMPs are also designed to ensure that assets acquired support and meet the strategic and annual objectives of the organisation and that the cost of providing the service to the community does not outweigh the benefits.

AMPs are fundamental to achieving key elements of asset management, the foundation of the Plan includes as follows:

- Defining levels of service – specifies the services and levels of service to be provided by Council for each asset type
- Condition assessment – specifies the technical tools used to assess the condition of each asset

- Life cycle management – how Council will manage its existing and future assets to provide the required services
- Financial summary – what funds are required to provide the required services
- Asset management practices – how the organisation will manage its assets and the tools it will use to accomplish this
- Monitoring – how the Plan will be monitored to ensure it is meeting Council's objectives
- Asset management improvement plan

Council is committed to ensuring that the facilities are maintained to a high standard and in a manner that ensures available resources are effectively applied. It is recognized that it is neither reasonable nor practical to target zero defects. However it is a valid objective to have a reasonable level of defects with none affecting customer health and safety or the structural integrity of the facility.

The ideal outcome is that the annual capital works and maintenance programs needed to allocate sufficient resources to ensure these objectives are obtained.

1.2. Asset Description

This Asset Management Plan refers to all sub-surface and surface constructed drainage assets that are the responsibility of Shoalhaven City Council. The assets can be installed within private property (generally within a drainage easement); within road reserves and public reserves or Council's operational land. The Plan does not include kerb and gutter; longitudinal drainage along State Roads; or inter-allotment drainage. The Plan also does not include flood mitigation drainage that is subject of a separate Asset Management Plan.

The types of drainage assets include:

- Underground drainage
    - Pipes
    - Pits
    - Minor box culverts (less than 6 meter road length)
- Surface drainage
    - Open channels – lined & unlined
    - Headwalls (including erosion protection at outlets)
    - Swale & table drains
    - Berms & bunding
    - Detention/Retention ponds
- Stormwater Quality Devices (including fencing and other associated devices)
    - Litter baskets
    - Gross pollutant traps
    - Wetlands
    - Sedimentation ponds

1.3. Levels of Service

Understanding Levels of Service (LoS) determines what type of assets will be provided; how often they will be maintained, and when assets will be rehabilitated or replaced. The current level of service is balancing budget and expenditure to be as sustainable and efficient as possible.

1.4. Future Demand

The NSW Office of Environment and Heritage (OEH) has advised that the sea level is expected to rise by 40 cm above the 1990 level by 2050 and 90 cm by 2100. It is also expected that there will be changes to the pattern of storm events with high intensity events being at greater frequency.
These factors will impact on the effectiveness of the existing drainage systems and additional upgrade projects will be identified. When identified, projects will be included in the Drainage Capital Strategy (DCS).

Most projects included in the DCS have been identified following storm events and are generally localised flooding, affecting a minimal number of properties.

Flood studies such as Broughton Creek Flood Study now comprise detailed two dimensional modelling of urban stormwater systems. The Flood Study models 1:5 year and 1:10 year recurrence interval storm events and provide useful information to identify enhancement needs.

In addition to flood studies, Council staffs are now undertaking investigations on a broader catchment basis, both for stormwater capacity and quality, and additional projects will be identified and included in the DCS as identified.

It is not expected that new development will require Council to undertake drainage works other than existing Section 94 projects. New release areas are expected to provide all required drainage infrastructure.

1.5. Lifecycle Management Plan

Management of drainages relates particularly to the creation, maintenance and renewal stages of asset life. After construction phase, it moves into what is known as the “Maintain” phase. Maintenance activities are required to minimise continued deterioration of an asset. As the asset components move towards the end of its life, activities are undertaken to restore the asset to a condition close to that of the original. This is referred to as the “Renewal” phase.

The importance of the time for intervention for renewal is paramount. If renewal activities are not undertaken in a timely manner, the condition of the asset will deteriorate rapidly to failure, and the cost of reconstruction may be many times that of renewal activities.

1.6. Financial Summary

The long term expected expenditure including maintenance, capital and renewal work for the next ten (10) years comes to an average of $2,513,692 per annum. The long term expected

budget is estimated to reach an average of $2,610,031 per annum. These figures show that future budget will be able to cover the next ten (10) year expenditure.

1.7. Asset Management Practices

An ideal Asset Management Practice should be reflective of strong governance and accountability; more sustainable decisions, enhanced customer service, effective risk management; and improved financial efficiency.

This section identifies the strategies, practices and guidelines supporting Asset Management at Shoalhaven City Council. These activities provide the tools and functions required to support the management, maintenance, renewal, creation and disposal of assets. It includes system planning and monitoring; system record management; and asset management planning and policy.

1.7.1. Accounting/ Financial Systems

Financial transactions are recorded in Council's corporate SunSystems Financial Software and are viewable through the Financial Information System (FIS). Finance staffs are responsible for operating the finance system especially the general ledger and budget accounts receivable. A systems Accountant assists in providing technical support for the systems operation and maintenance.

Continued analysis of the Financial Model, capital expenditure, asset renewal, maintenance and operations requirements, and the interrelationships between service levels and expenditure is expected to be part of the asset management improvement programme. The Local Government Act 1993 requires that Council prepare and maintain all accounting records, accounts and financial statements in accordance with all relevant Australian Accounting Standards. The following accounting standards and guidelines must be complied with:

- AASB 116 Property, Plant & Equipment – prescribes requirements for recognition and depreciation of property, plant and equipment assets
- AASB 136 Impairment of Assets – aims to ensure that assets are carried at amounts that are not in excess of their recoverable amounts
- AASB 1021 Depreciation of Non-Current Assets – specifies how depreciation is to be calculated
- AAS 1001 Accounting Policies – specifies the policies that Council is to have for recognition of assets and depreciation
- AASB 1041 Accounting for the reduction of Non-Current Assets – specifies the frequency and basis of calculating depreciation and revaluation basis used for assets
- AAS 1015 Accounting for acquisition of assets – method of allocating the value to new assets on acquisition
- AAS 27 Financial reporting by Local Government
- AAS 1010 Recoverable Amounts of Non-Current Asset – specifies requirement to test the reasonableness of valuations

The objective of the above Accounting Policies is to provide guidance around identifying, classifying, valuing, recording and disposing of non-current physical assets. This will provide for greater understanding and accuracy of Council's capital requirements and depreciation

expenses in the context of financial sustainability and intergenerational equity as well as ensuring that Council is meeting its statutory reporting obligations.

1.7.2. Asset Management Systems

Physical Asset data is recorded in Council's Conquest Asset Register. Customer enquiries are managed via Council's MERIT system, with document management undertaken using the TRIM system.

Responsibilities for administering asset management systems generally sit with the Infrastructure Systems and Support team. Data entry on a job by job basis is handled via several staff across Council, with significant data entry by Council's City Works and Infrastructure Divisions.

1.8. Monitoring and Improvement Programme

Asset Management Plans (AMP) are dynamic documents, reflecting and responding to changes over time and in accordance with the Improvement Programme available. Monitoring of an AMP is required to ensure compliance with the proposed improvement program milestone and to ensure compliance with adopted standards and procedures for condition and performance.

Ideally, full review of an AMP should be undertaken every three to five years to document progress and set out proposals for the next ten to fifteen years.

2. INTRODUCTION

2.1. Background

This Asset Management Plan (AMP) is to assist Council to meet its goals and objectives in a way that best serves the community. It provides a framework for future management of drainages within the Council area based on current and historical information.

Council has approximately thirty (30) Asset Management Plans which is divided based on each asset types. An area, such as a sporting complex may consist of a few asset types. Therefore, each AMP interrelates with one another.

AMPs are positioned within Council's organisation chart to link with corporate and operational objectives as shown below:

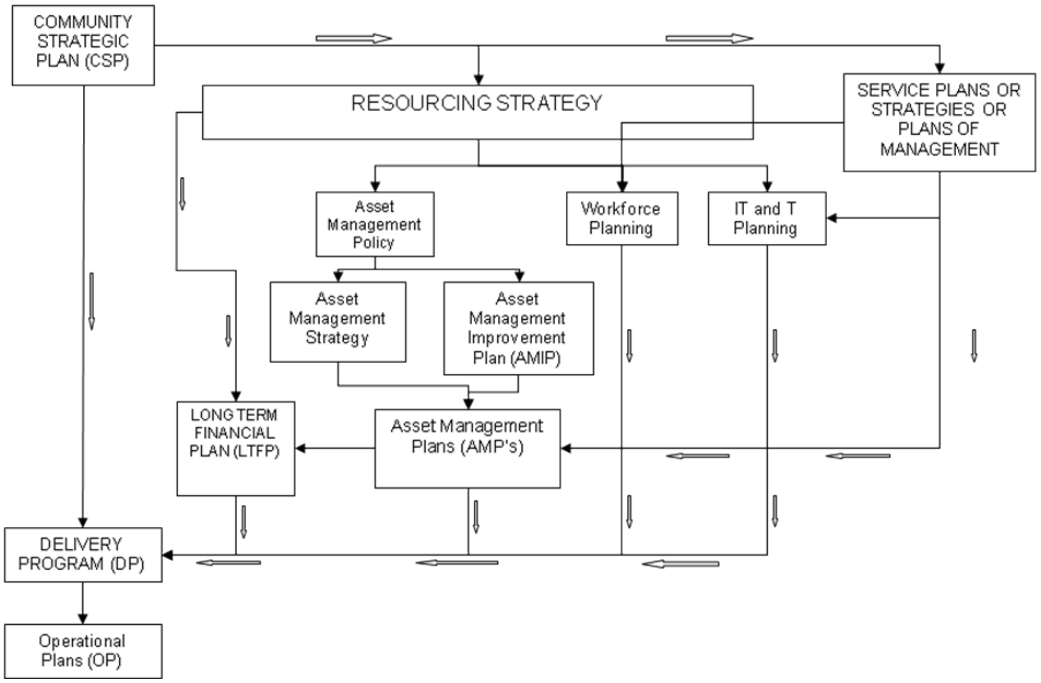

Diagram 1: SCC Organisational Operational Chart

2.2. Goals and Objectives of Asset Ownership

Council exists to provide services to its community. Some of these services are provided by infrastructure assets. Council acquired infrastructure assets by 'purchase', by contract, construction by our staff and by donation of assets constructed by developers and others to meet increased levels of service.

Our goal in managing infrastructure assets is to meet the defined level of service (as amended from time to time) in the most cost effective manner for present and future consumers. The key elements of infrastructure asset management are:

- Providing a defined Level of Service (LoS) and monitoring performance,
- Managing the impact of growth through demand management and infrastructure investment,
- Taking a lifecycle approach to developing cost-effective management strategies for the long-term that meet the defined Level of Service (LoS),
- Identifying, assessing and appropriately controlling risks, and
- Having a Long Term Financial Plan (LTFP) which identifies required, affordable expenditure and how it will be financed.

Council's assets has been acquired by purchase, contract, construction by council staff and donation of assets constructed by developers and others to meet increased level of service. Council is committed to providing safe and efficient facilities, within realistic financial constraints, with the main objectives being as outlined in the strategy, specifically to:

- Improve safety
- Maintain drainages at a reasonable "level of service (LoS)"
- Plan for future development
- Develop strategies for the rationalisation of various drainages due to
- Plan for major work to facilities

Council is also committed to ensuring that the facilities provided are maintained to a standard which suits the purpose and in a manner. By ensuring available resources are effectively applied. It is recognized that it is neither reasonable nor practical to target zero defects. However it is an objective to have an acceptable level of defects and none that affect customer health and safety or facilities' structural integrity. This is achieved through preventative maintenance.
The desirable situation is that the annual capital works and maintenance programs need to allocate sufficient resources to ensure these objectives are obtained.

Council's Vision

> We will work together in the Shoalhaven to foster a safe and attractive community for people to live, work, stay and play; where sustainable growth, development and environmental protection are managed to provide a unique and relaxed lifestyle.

(adopted by Council, 21 May 2013)

Council's Mission

> To enhance Shoalhaven's strong communities, natural, rural and built environments and appropriate economic activities through strategic leadership, effective management, community engagement and innovative use of resources.

(adopted by Council, 21 May 2013)

2.3. Plan Framework

The key elements that effects this AMP are:

Asset Management Policy

> The policy is used as a base of principles and requirements to create an AMP that is in accordance with the organisation's strategic plan. (2011, International Infrastructure Management Manual)

Asset Management Strategy

> A strategy for asset management covering development and implementation of plans and programs for asset creation, operation, maintenance, rehabilitation/replacement, disposal and performance monitoring to ensure desired level of service and other operational objectives are achieved at optimum cost.

The basic key elements of the AMP consist of:

- Level of Service (LoS) – specifying the services and levels of service to be provided by Council
- Future demand – how this will impact on future service delivery and how this is to be met
- Life cycle management – how Council will manage its existing and future assets to provide the required services
- Financial summary – what funds are required services
- Plan Improvement and Monitoring – how the plan will be monitored to ensure it is meeting Council's objectives

A road map for preparing an asset management plan is shown below:

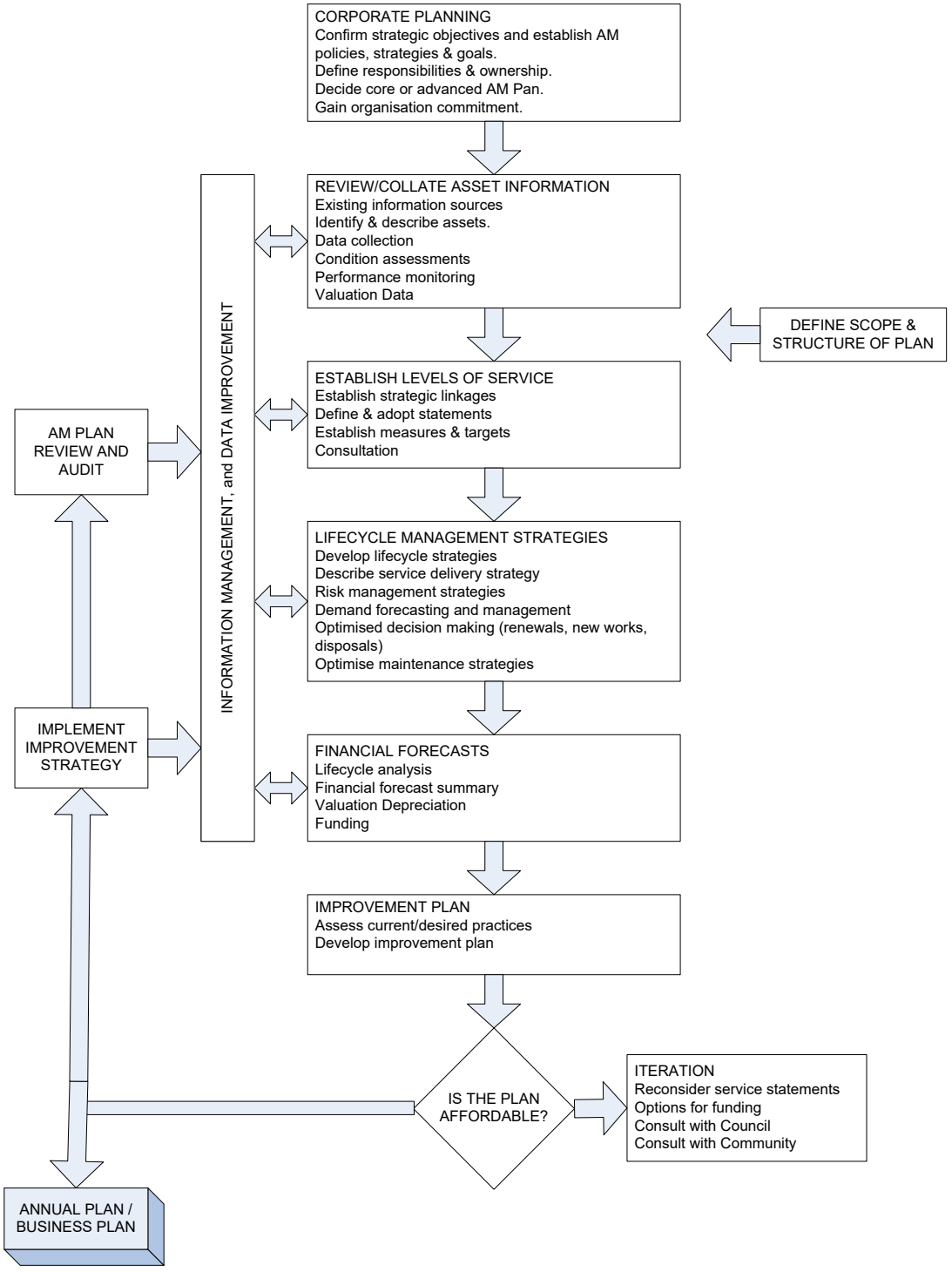

Diagram 2: Road Map for preparing an Asset Management Plan
Source: IPWEA, 2006, IIMM, Fig 1.5.1, p 1.11.

2.4. Core and Advanced AM

Asset Management Plan is a continuous document that will require ongoing evaluation. Currently, the level of this AMP is at the Minimum level which contains basic information on assets and financial forecasts.

3. LEVELS OF SERVICE

Council is currently managing drainage assets which include about 407km of underground systems and surface open channels as well as 15,600 pits or headwalls.

3.1. Customer Research and Expectations

Community consultation with regard to works within private property is undertaken for both maintenance and capital works.

The Capital Works Program is publically advertised annually as part of the annual Delivery Program and Operational Plan process.

This Asset Management Plan will be advertised for public exhibition before adoption. However, it is not intended to consult with the community, in the short term, about ‘’levels’ of service for Drainage assets.

3.2. Strategic and Corporate Goals

The AMP provides clear guidelines for the effective management of the assets owned and managed by Council. Local Authorities exist principally to supply core services that meet the needs of their communities.

Council’s goal in managing assets is to meet the required level of service in a sustainable manner for present and future stakeholders. The key elements to strategic goals of asset management are:

- Demonstrating responsible stewardship;
- Taking a life cycle approach to asset ownership;
- Defining the infrastructure assets physically and financially;
- Providing a defined Level of Service and monitoring the performance against service levels and service expectations;
- Understanding and meeting the demands of growth through demand management and infrastructure investment;
- Managing risks associated with asset failure; and
- Support long term financial planning.

Council objective is to ensure financial strategies underpin Council’s asset management policies and strategic. Its goal is to have long term vision for sustainability. In order to do so, the action that can be done is to prepare and review the Council’s short and medium term financial plans for Risk Management; Plant & Equipment, Information Technology, Section 94; Asset Management Plans and case reverses.

Acting as a leader in the delivery of social, financial, environmental, and operational objectives, Council needs to ensure good governance and administrative support for the Council and organization.

Council’s other goals are to plan, manage and fund Council’s public assets to meet the community expectations and defined levels of services. Furthermore, the safety of the community is paramount and is acknowledged and supported through proactive policies, programs and strategies.

3.3. Legislative Requirements

Table 1: List of Legislation Requirements

Legislation	Requirement
National Asset Management Framework Legislation 2010	Focuses on long term financial sustainability and provides a mandate to have a long term strategy, financial statements and annual reporting mechanisms.
DLG Integrated Planning NSW	Key requirement is to integrated community plans with operational and delivery plans
Local Government Act 1993	Sets out role, purpose, responsibilities and powers of local governments including the preparation of a long term financial plan supported by asset management plans for sustainable service delivery
Work Health and Safety Act 2011	Aims to secure the health, safety and welfare of people at work. It lays down general requirements which must be met at places of work in New South Wales. The provisions of the Act cover every place of work in New South Wales. The Act covers self employed people as well as employees, employers, students, contractors and other visitors.
Occupational Health and Safety Regulation 2001	Regulations on the control and management or risk in the work place
The Protection of the Environment Operations Act 1997 (POEO Act)	Is the key piece of environment protection legislation administered by Department of the Environment and Climate Change (DECC). The POEO Act enables the Government to set out explicit protection of the environment policies (PEPs) and adopt more innovative approaches to reducing pollution.
Disability Discrimination Act	Sets out responsibilities of Council and staff in dealing with access and use of public infrastructure
Australian Accounting Standards	Sets out the financial reporting standards relating to infrastructure assets. Standards of particular relevane to Infrastructure Assets include:
	AASB116 Property, Plant & Equipment - prescribes requirement for recognition and depreciation of property, plant and equipment assets
	AASB136 Impairment of Assets - aims to ensure that assets are carried at amounts that are not in excess of their recoverable amounts
	AASB1021 Depreciation of Non-Current Assets - specifies how depreciation is to be calculated
	AAS1001 Accounting Policies - specifies the policies that Council is to have for recognition of assets and depreciation
	AASB1041 Accounting for the reduction of Non-Current Assets - specifies the frequency and basis of calculation depreciation and revaluation basis used for assets
	AAS1015 Accounting for acquistion of assets - method of allocating the value to new assets on acquistion
Crown Lands Act 1989	Defined principles for the use and management of Crown land which may be under Trust to Council, they may prescribe:
	Lease & licences of Crown Lands (Part 4, Division 3 & 4); and
	Plans of Management for Crown Lands (Part 5, Division 6)
AS 3600-2001 Concrete Structures	Proposes a set of standard for achieving a design life of 40-60 years for concrete structures.

3.4. Current Level of Service

The current levels of service are:

- Stormwater quality devices
  - Cleared as required on cyclic basis; generally every 2 months
- Repairs
  - Undertaken as required;
  - Make safe within 3 days
- Clearing pits & other drains
  - Within 5 working days of identification
- Capital projects
  - As determined by the *Drainage Capital Strategy* with Renewal Projects within 1 year of identification

The preferred internal service provider, Works & Services, under the Roads Service Agreement, will generally undertake all maintenance activities in accordance with both the Risk Management Procedures and this Asset Management Plan.

The provision of new works will generally be undertaken in accordance with the adopted Capital Works Program by both Works & Services and external contract.

3.5. Desired Level of Service

The main framework of desired Level of Service is stated as follows:

- Service attributes : Aspects or characteristic of a service including accessibility, cost, efficiency, quality, quantity, reliability, responsiveness and safety levels of Service : What Council intends to deliver that is based on the community's point of view
- Community performance measure : How the community receives or reacts to the service
- Technical Performance Measure : What Council does to deliver the service, which includes operation and maintenance

(International Infrastructure Management Manual, 2011)

Council aims to provide an effective drainage system that is designed to capture stormwater to protect property and to not affect the safety of traffic and pedestrians. This can be achieved as follows:

- Inspecting road drainage pits in accordance with the '*Defect and Risk Management Inspection Procedure*'
- Inspecting drainage systems as required when hazards are reported by the public
- Clearing existing drains & pits as required
- Repairing existing drains & pits as required
- Ensuring all new drainage meets the design requirements of Council's Development Control Plan 100 (DCP100) and industry 'best practice guidelines', where possible.
- Investigating catchments for the need to upgrade existing drainage or provide additional drainage
- Including works identified in Flood Risk Management Plans in the prioritised Drainage Capital Strategy (DCS) and
- Providing/upgrading drainage systems via the annual capital program in accordance with the DCS

It is an additional aim to minimise the impact of stormwater on the quality of the receiving watercourse(s). This can be achieved as follows:

- Undertaking works identified in natural resource management plans including the Stormwater Management Plan, Estuary Management Plans and Coastal Zone Management Plan
- Clearing/Servicing stormwater quality structures as required and as shown in Attachment 1
- Investigating catchments for the need to provide stormwater quality structures and
- Providing/upgrading stormwater quality structures via the annual capital program in accordance with the prioritised strategy

4. FUTURE DEMANDS

In 1996 the population in Shoalhaven was 76,726. In 2011 showed the population was 98,542. It is projected that in 2016 the population would be 104,079 and in 2021is 111,401 (http://www.id.com.au/forecast/shoalhaven). This forecast and population statistics shows the percentage of population has been increasing 6.4% every five (5) years. Therefore it is more than likely that demand for most type of facilities will increase as well.

4.1. Demand Drivers

Any enhancements of the existing facilities would need to be justified in relation to upgrading existing facilities providing an increase in the "level of service" rather than a maintenance activity prolonging the useful life of drainages.

Population growth alone is not the sole driver for drainages. Factors affecting demand for drainages include population growth and density; changes in demographics; seasonal factors; social and economic factors; environmental awareness and technological changes.

4.2. Demand Forecasts

Strategies for ensuring that assets are well utilised include:

- Effective demand forecasting before creating new assets, to ensure asset capacity and demand requirements are matched
- Maximising the asset utilisation by providing other assets to meet the demand or operational asset solutions to improve overall asset capacity and hydraulic performance
- Management of customer demand, to reduce demand for over-utilised assets or vice versa

(International Infrastructure Management Manual, 2011)

Demand for new and enhanced services will be managed through a combination of managing existing assets, upgrading existing assets and providing new assets to meet demand and demand management. Demand management practice including non-asset solutions, insuring against risks and managing failures.

4.3. Demand Impacts on Assets

Demands are usually impacted by a number of components which includes:

- Population or demographic changes
- Changes in community's expectation
- Changes in usage pattern
- Seasonal variation
- Cyclical variations
- Random variations which cannot be attributed to specific causes

Effective asset utilisation seeks to provide the maximum return on funds invested in assets. Over-utilisation can cause failure to achieve levels of service due to asset 'capacity failure'. Under-utilisation of an asset is also a 'capacity failure' and represents a lack of demand for the service the asset provides causing a less than cost effective level of utilisation. (International Infrastructure Management Manual, 2011)

4.4. Demand Management Plan

The planning for infrastructure due to demand is a constant process of review and assessment of existing infrastructure and its ability to cope with increasing demand, versus the need to augment with new infrastructure.

Demand on infrastructure is created through increased utilisation generated from a growing population and changing patterns of behaviour, ranging from social demographics to transport options and solutions. Often this increasing demand will stem from urban or residential growth increasing the utilisation of a range of community infrastructure.

Council develops strategies for demand management on single or groups of affected assets and continues to manage the relationship between existing and new asset requirements in the context of asset management. This demand management also includes asset rationalisation as discussed in this plan.

4.5. Asset Programmes to Meet Demand

The Section 94 Contribution plan effective from 2010 for Community Facilities identifies the current proposed projects and provides a detailed estimate of costs for implementation and construction, reference to the relevant sections of the Plan presents the estimate breakdown.

Table 2: Section 94 References

Project Reference Number	Project Description	Estimated Project Cost	Estimated Council Contribution	Estimated Dev Contribution	Percentage balance collected to November 2012	Actual Dev Contribution Received
01DRAI0004	Hillcrest Avenue Drainage	$1,273,210	$448,170	$825,040	5%	$38,352
01DRAI2002	South Nowra Industrial Estate GPT and Artificial Wetlands	$902,990	$476,779	$426,211	40%	$151,233
01DRAI2003	Illaroo Road Drainage	$225,841	$192,868	$32,973	367%	$109,881
03DRAI2001	St Georges Basin Village Centre Drainage	$1,258,673	$338,835	$919,838	6%	$52,143
05DRAI2002	Camden & Deering Streets interallotment drainage	$32,424	$7,133	$25,291	0%	$0
05DRAI2005	New Street drainage pipline	$36,633	$14,323	$22,309	16%	-$30,354
05DRAI2009	Boree Street drainage	$161,778	$153,366	$8,412	1067%	$89,755
05DRAI2010	Kingsley Avenue drainage	$937,904	$791,028	$146,876	37%	$17,645
05DRAI2012	St Vincent Street drainage	$253,486	$222,814	$30,672	22%	-$120

Council has prepared a list of programme that identifies drainage issues requested by the community. Please refer to Attachment 3 for further detailed information.

5. LIFECYCLE MANAGEMENT PLAN

5.1. Background Data

The inspection to identify urban drainage assets was completed in early 2010 and took several years to undertake with one staff member being available. Further work is required to fully identify all rural drainage assets. However, there is a high confidence level in the extent of urban drainage assets identified. Asset data is currently stored in the GIS Arcmap and all identified drainage assets can be viewed graphically on this map based system. Planning is underway to transfer asset data to the corporate asset register (Conquest) but the link to enable map based viewing of assets will be maintained.

The survey to identify drainage assets required considerable resourcing and was completed over about a 10 year period. The additional resources were not available to undertake

condition inspections of the drainage assets. However, an 'age' has been assigned to all drainage assets based on the subdivision release date and this information is considered reasonable for initial condition data and funding modelling.
An identified future task is to undertake condition inspections (likely starting with the older assets) to further refine condition assumptions and expected asset 'useful life'.

The drainage assets consist of:

Pipes & Channels

Pipe Size	Total Length (m)	Replacement Unit Cost (m)	Total Replacement Cost
150 (mainly private interallotment)	2,730	$136	$NA
225	1,924	$179	$344,353
300	8,940	$246	$2,199,351
375	161,002	$332	$53,452,532
450	70,495	$425	$29,960,524
525	28,002	$500	$14,001,066
600	20,183	$579	$11,685,724
675	6,751	$700	$4,725,474
750	8,132	$849	$6,904,427
825	3,423	$1,000	$3,423,142
900	12,602	$1,154	$14,542,983
1050	4,122	$1,300	$5,358,721
1200	1,880	$1,579	$2,968,741
1350	454	$1,750	$795,113
Pipe Size	**Total Length (m)**	**Replacement Unit Cost (m)**	**Total Replacement Cost**
1500	439	$1,900	$834,573
1650	17	$2,100	$35,700
1800	471	$2,500	$1,176,500
Unknown pipe size (assume 375)	696	$332	$230,972
Lined Open Channel	437	$800	$349,250
Unlined Open Channel	71,110	$30	$2,133,300
Box 2-3m	79	$3,000	$236,340
Box 1.5-2m	60	$1,100	$66,110
Box 1-1.5m	232	$800	$185,600
Box 0.7-1m	83	$650	$53,950
Box 0-0.7m	458	$575	$263,523
	Total Length :	**404.72**	**Km**
	Estimated Total Replacement Cost:		**$155,927,967**

Drainage Pits

Pit Type	Number	Unit Cost	Replacement Cost
Headwalls			
Headwalls - <=450	1,068	$305	$325,740
Headwalls - >450<=600	305	$600	$183,000
Headwalls - >600<=900	242	$1,050	$254,100
Headwalls - >900<=1800	77	$2,500	$192,500
Headwalls - >1800	29	$3,500	$101,500
Headwalls - other	134	$305	$40,870
	1,855		**$1,097,710**
Kerb Inlet Pit with Grate			
Kerb Inlet Pit with Grate - 1000lintel	533	$1,545	$823,485
Kerb Inlet Pit with Grate - 1800lintel	137	$1,545	$211,665
Kerb Inlet Pit with Grate - 2400lintel	593	$1,620	$960,660
Kerb Inlet Pit with Grate - 3000lintel	133	$1,760	$234,080
Kerb Inlet Pit with Grate - 3600lintel	39	$1,760	$68,640
	1,435		**$2,298,530**
Kerb Inlet Pit no Grate			
Kerb Inlet Pit no Grate - 1000lintel	2,997	$1,295	$3,881,115
Kerb Inlet Pit no Grate - 1800lintel	619	$1,295	$801,605
Kerb Inlet Pit no Grate - 2400lintel	2,886	$1,370	$3,953,820
Kerb Inlet Pit no Grate - 3000lintel	632	$1,510	$954,320
Kerb Inlet Pit no Grate - 3600lintel	49	$1,510	$73,990
Kerb Inlet Pit no Grate - 4000lintel	188	$1,510	$283,880
Pit Type	**Number**	**Unit Cost**	**Replacement Cost**
Kerb Inlet Pit no Grate - 5000lintel	11	$2,000	$22,000
Kerb Inlet Pit no Grate - 6000lintel	3	$2,200	$6,600
	7,385		**$9,977,330**
Note: Assume that future standard lintel sizes are 1800, 2400, 3600, 4800			
Grated Pits			
Grated Pits - 600X600	7	$1,200	$8,400
Grated Pits - 750X750	434	$1,200	$520,800
Grated Pits - 900X900	10	$1,200	$12,000
Grated Pits - 1200X1200	111	$1,625	$180,375
Grated Pits - 1500X1500	6	$1,625	$9,750
Grated Pits - 1800X900	3	$1,925	$5,775
Grated Pits - 3000X1200	3	$3,000	$9,000
	574		**$746,100**
Junction Pit			
Junction Pit - 600X600	300	$1,090	$327,000
Junction Pit - 750X750	10	$1,090	$10,900
Junction Pit - 900X900	1,181	$1,090	$1,287,290
Junction Pit - 1200X1200	99	$1,440	$142,560
Junction Pit - 1500X1500	18	$1,440	$25,920

Pit Type	Number	Unit Cost	Replacement Cost
Junction Pit - 1800X1500	7	$2,250	$15,750
Junction Pit - >1800	9	$3,400	$30,600
	1,324		**$1,513,020**
Letterbox Pit			
Letterbox Pit - 750X750	202	$1,090	$220,180
Letterbox Pit - 900X900	1,931	$1,090	$2,104,790
Letterbox Pit - 1200X1200	559	$1,440	$804,960
Letterbox Pit - 1500X1200	69	$1,440	$99,360
Letterbox Pit - 1800X1500	31	$2,250	$69,750
Letterbox Pit - 2100X1500	12	$2,250	$27,000
Letterbox Pit - 3300X1500	17	$3,400	$57,800
	2,821		**$3,383,840**
Other Pits			
Value as 900X900 junction pit	**119**	**$1,090**	**$129,710**
Total Pits & Replacement Value	**15,513**		**$19,146,240**

Table 3. Asset description

There are also 65 stormwater quality structures and these are shown at Attachment 1 including the cleaning/treatment frequency. Additional structures arise from development and council's own works and the budget for operating/clearing the structures needs to be reviewed annually to ensure appropriate levels of service are maintained.

As an indication of the condition of the drainage network, the following chart shows the future renewal funding need over the next 100 years. The chart highlights that the majority of drainage assets have been installed since 1970 and that the current overall condition is reasonable.

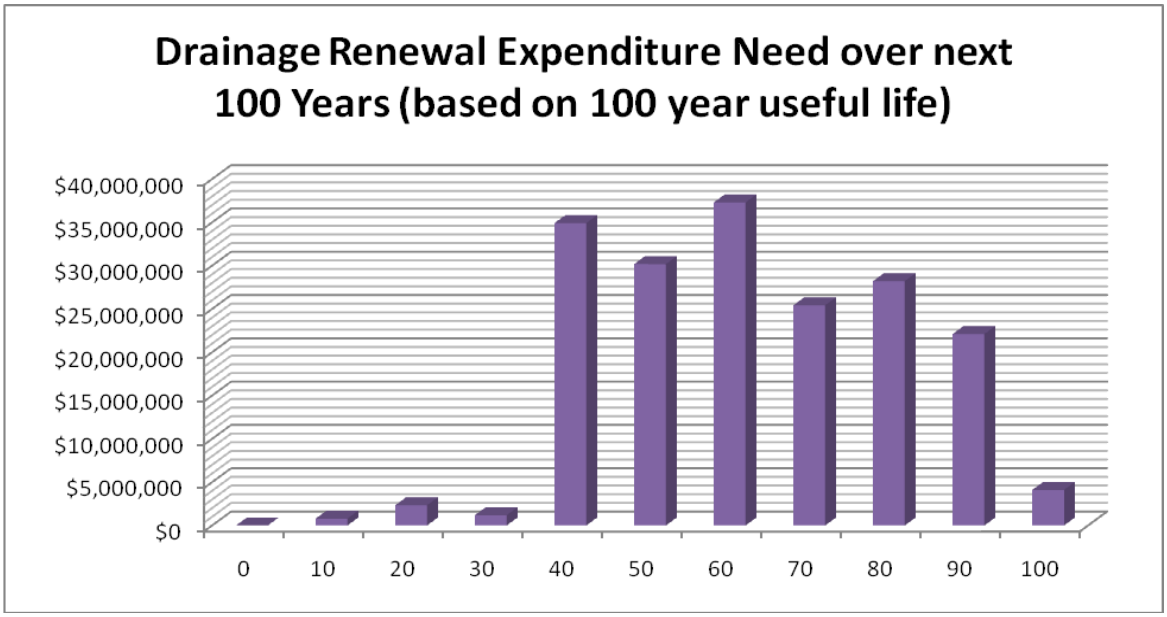

Chart 1. Drainage Renewal Expenditure

5.2. Infrastructure Risk Management Plan

Council's current '*Defect and Risk Management Inspection Procedure*' includes for Risk Management Inspections for Drainage to be undertaken at the same time as Risk Management Inspections for the adjacent road.

This entails an inspection frequency of:

- Arterial Roads – monthly
- Collector Roads – 6 monthly and
- Local Roads – 12 monthly.

With current available resources the drainage risk inspection can only consist of noting of any blocked or damaged pits or blocked open drains that are visible in a 'drive-by' inspection. Resources are not available to check pipes for blockages or inspect systems within properties. There is a high reliance on customer reporting of any hazards or blockages.

The '*Defect and Risk Management Inspection Procedure*' also includes for Drainage to be inspected for Defects and Condition on a 10 yearly cycle. This has yet to be undertaken and is an identified task as resources permit.

A review of Claims on Council due to property damages arising from storm events shows:

- 2005 – 4 claims; 1 accepted
- 2006 – 3 claims; 2 accepted
- 2007 – 8 claims; 4 accepted
- 2008 – 8 claims; 5 accepted
- 2009 – no claims
- 2010 – 4 claims; 1 accepted
- 2011 – 13 claims; 3 accepted
- Total claim amount for the 7 years - $59,452

Accordingly, it is considered that the current level of risk management is satisfactory especially when considering the high cost for additional inspections.

It is noted that Statewide (Mutual) have issued *Guidance Note 3 – Detention Basins* and this recommends design standards of basins and swale drains to minimise risks to public safety. These standards are being applied to new works but there are some existing locations that do not comply with the new standards. Resources to audit all existing locations for compliance is required and upgrade projects identified and added to the DCS.

The Works and Services Section maintains a list of 'high local flood risk' locations which need to be regularly inspected and cleaned. These locations are usually pits and 'sags' in the road and if blocked may flood adjoining properties.

There are two main risks that Council is facing as follows:

- **Strategic Risk** – Risk managed through Council's annual Risk Management Plan due to the potential affect a failure in this area can have on Council's operations
- **Operational Risk** – Risks that relate to the day-to-day operations of Council. Operational risk arises from inadequate internal controls, inadequate or no documentation, poor planning and implementation, or inadequate supervision.

Any hazards identified will be prioritised and undertaken as either "Urgent Maintenance" or listed and undertaken as "Programmed Maintenance" in accordance with the timeframes adopted by Council for the defect priority.

This risk management section of the asset management plan concentrates on identification of practical risks at the asset level. An assessment of the risks associated with the service delivery of building assets has identified some critical risks to Council. The risk assessment process:

- Identifies credible risks;
- The likelihood of the risk event occurring;
- The consequences should the event occur;
- Develops a risk rating; and
- Evaluates the risk and develops a risk treatment plan for non-acceptable risks.

5.3. Routine Operations and Maintenance Plan

Council currently undertakes the following operating/maintenance drainage activities:

- Clearing drainage structures (pipes, pits, channels)
    - Works are usually identified by customer reporting although blocked pit entries can also be identified by cyclic road inspections
    - Blockages can occur due to sticks, leaves, sediment, or foreign objects
    - It is estimated that about 4,000 pits or about 34% of the total number are cleared annually
    - The 2010/11 budget is $390,000 and this is considered satisfactory.

- Clearing roadside table drains (earth gutter lines)
    - Works are usually identified by customer reporting although blocked table drains can also be identified by cyclic road inspections
    - About 100Km per annum is cleared
    - The 2010/11 budget is $145,000 and is considered satisfactory for reactive maintenance but $200,000 would be required to maintain drains in 'good' condition. A further $300,000 per year would be required to effectively drain roads to protect the long term integrity of road pavements.

- Repairing drainage structures (pits, pipes, channels)
    - Works are usually identified by customer reporting although damaged pits can also be identified by cyclic road inspections
    - Damage is generally caused by vehicles and the location is 'made safe' pending repairs
    - The 2010/11 budget is $80,000 and is considered satisfactory.

- Clearing/servicing of stormwater quality structures/devices
    - The frequency of servicing is specified (refer Attachment 1) and is based on estimated need and adjusted as required. Additional servicing may be required following storm events.
    - The activity includes removal of gross pollutants, sediments and mowing. Mowing and wetland maintenance are generally funded under Parks Maintenance.
    - The 2010/11 budget is $52,000 and is considered satisfactory.

- Erosion protection to open drains
    - Erosion of unlined open drains occurs regularly and can be corrected by sandbagging, vegetating or other methods.
    - If erosion is significant and there is danger to property then the works can be listed for urgent capital funding.
    - The 2010/11 budget is $20,000 and is considered reasonable but an allocation of $50,000 would be satisfactory

- Other maintenance activities
    - Includes but not limited to minor new works and sealing of pit entries
    - The 2010/11 budget is $120,000 and is considered satisfactory

The clearing/sweeping of Kerb & Gutter is funded under ‘Road Maintenance’ but also impacts on Drainage by the removal of sediments from the system. The Asset Management Plan for Kerb & Gutter includes an action to review the frequency and extent of K & G sweeping outside of shopping precincts. The intent was to review if the extent of sweeping could be reduced and to redirect resources to K & G repairs.

However, it is more appropriate to also include in the review the benefits to stormwater quality arising from siltation collection from the K & G. The review should include a trial detailing the quantity collected by sweeping and a comparison of cost benefits over (expensive) sediment traps.

5.3.1. Operations and Maintenance Plan

Maintenance includes proactive, reactive and cyclic maintenance work activities. Reactive maintenance is unplanned repair work carried out in response to service requests and management / supervisory directions. Community and customers directly affected by the asset generally make these requests. To provide the highest level of service, Council’s objective in relation to maintenance requests is to inspect and prioritize the work requests as quickly as possible.

General maintenance strategies have been developed to have an annual asset inspection to identify any defects which have developed since the time of the previous inspection. A reasonable base condition of the facilities has been established and documents in the Asset Audit Reports for each of the drainages.

When the defect is identified, it is recorded in the conquest database with a condition assessment and priority for action. The data in the data base forms the basis of the annual programmed maintenance program. Any defects which show up and considered a risk or hazard are rectified from the maintenance budget.

5.3.2. Operations and Maintenance Strategies

Environmental Issues

It is to be noted that Council is required to identify any impacts on the environment arising from maintenance/operating activities. In particular processes have been developed for the clearing of open drains where there is likelihood of disturbing endangered flora & fauna (e.g. the Green & Golden Bellfrog). For example, the processes included for Culburra Beach to restrict the clearing of open drains to winter months on a programmed cycle and setting higher mowing heights.

The importance of an appropriately maintained drainage system is critical in terms of minimising negative environmental impacts such as water quality; erosion / scoring, stream health, biodiversity etc.

Further it is also recognised that an appropriate drainage asset management and sustainable regime is interdependent on healthy natural drainage assets. For example, wetlands provide water cleansing functions and storm flow detention / retention effects that greatly reduce flooding and peak discharge storm effects.

It is therefore critical that appropriate support for natural area management and ‘soft engineering’ occur to minimise costly and less effective hard engineering solutions such as grass pollutant traps, wherever possible.

Council Policies

Council adopted in 1983 the Policy (POL08/275) - “Drainage Easements – Maintenance of Open Drains”. The Policy was last ratified by Council in 2009. The Policy states that property owners are responsible for the normal maintenance of an open drain within an easement on their property but that Council will clear the drain if it becomes blocked by matter washed into it from upstream of the property.

That is, Council will take action to ensure free water flow but not to ensure aesthetics such as mowing or weed removal.

5.3.3. Summary of Future Costs

A total budget of $992,000 2011/12 is considered satisfactory to cover clearing drainage structures, clearing roadside table drains, repairing drainage structures, clearing/servicing of stormwater quality structures/devices, erosion protection to open drains and other maintenance acitivities.

5.4. Renewal / Replacement Plan

5.4.1. Renewal Plan

There are no identified renewal needs. However, about 2% (in $ value) of pipes are greater than 75 years of age. This equates to an average annual renewal budget of about $130,000 over the next 25 years. However, it is expected that expenditure will be Nil for 5 years and then about $160,000 per annum for the next 20 years may be required. As additional condition data becomes available these funding predictions can be revised and this AMP reviewed.

Significant annual funding is expected to be required commencing after this in about 2045.

5.4.2. Renewal Strategies

Council Policies
Council reaffirmed in 2005 the Policy (POL05/51) – "Drainage Easements – Piping in Old Subdivisions". The Policy allowed property owners to bring forward in Council's Works Program, the piping of an old drainage easement by contributing 50% of the cost of works.

Upgrade of existing systems & piping of open drains
In August, 1999 Council considered a rating method for assessing the priority of identified capital works. Although not formally adopted by Council, the rating method was used till 2007 and the priority list was referred to Council annually. The rating method was updated by staff in about 2007 but was not referred to Council.

The current rating method is shown at Attachment 2 and the proposed priority list of the *Drainage Capital Strategy (DCS)* is shown at Attachment 3. It is to be noted that the projects included in the list have been identified by customer requests. As further catchment analyses are undertaken it is expected that staff will identify further projects. It is to be noted that the DCS is reviewed annually and that new projects are identified each year. Accordingly, generally only one year of the 3 year Delivery Program shows specific projects.

5.4.3. Summary of Future Costs

The total value of projects on the list is $7 Million and (unless significant numbers of additional projects are identified) the current identified projects will be completed within 6 years.

The extent of funding for capital works has increased in recent years following the introduction of the 'Stormwater Management Service Charge' and funding is now about $1.4 to $1.5 Million per annum. This extent of funding has accelerated the rectification of localised drainage issues and the consideration of increasing funding to operating/maintenance and stormwater quality projects is recommended.

5.5. Creation / Acquisition / Augmentation Plan

5.5.1. Selection Criteria

A review of the *Stormwater Management Plan* commenced in 2002. The purpose of the review was to prioritise actions according to the sensitivity of receiving waters and then identify, within those urban areas, the sub-catchments with the greatest potential to negatively impact on stormwater quality and define actions to mitigate the impacts.

Detailed information is shown at Attachment 4; however, in summary -

The review identified the sensitivity of receiving waters as (most sensitive to least sensitive):

- St Georges Basin
- Burrill Lake
- Lake Wollumboola
- Swan Lake
- Ulladulla Harbour
- Lake Tabourie
- Shoalhaven River
- Lake Conjola
- Narrawallee and
- Jervis Bay, Currarong, Kangaroo Valley

Available resources were directed to projects identified in the St Georges Basin catchment. The projects were generally targeted to stopping sediments at the source by sealing or grassing unsealed road verges.

A hydraulic model was developed for each catchment to provide the necessary information to effectively target water quality measures.

The prioritised list of identified projects is shown at Attachment 5.

5.5.2. Capital Investment Strategies

Council's *Subdivision Code (DCP100)* details stormwater drainage design requirements and the relevant pages are shown at Attachment 5. Further details are included in Council's *Engineering Design Specifications (based on Aus-Spec).*

Some of the main criteria are –

- Major flows are to be designed to include a 1:100 year overland flow path
- Minor flows are to be designed for a minimum pipe/culvert size to cater for 1: 5 year event
- Minimum pipe size to be 375mm dia & minimum box culvert size of 600mm by 300mm
- Design calculations to be generally in accordance with *Australian Rainfall and Runoff (ARR)1987*
- The flow from new development to be no larger than from the pre-developed site
- New pits in kerb to be grate and lintel
    - It is to be noted that this standard is under review as risk issues are rising from lintels placed in roll-top kerb.

Consideration should be given to the advice from The NSW Office of Environment and Heritage (OCH) that there will be changes to the pattern of storm events with high intensity events being at greater frequency. As pipes are expected to provide 100 years of service it is likely that any new pipes designed to a 1:5 year storm event will not be of sufficient size in the near future.

Consideration should be given to increasing the design standard to 1:10 year event. However, it is noted that *Engineers Australia* have commenced a four (4) year project to revise *ARR* and the revised *ARR* will provide revised data sets for stormwater design calculations.

A draft policy for *Water Sensitive Urban Design (WSUD)* and DCP 122 – Draft Proposed Stormwater Controls are currently under preparation for inclusion in the draft Citywide Development Control Plan. Accordingly, it is expected that there will be future changes to council's design standards.

5.5.3. Summary of Future Costs

The 2012/13 budget for implementing actions is $61,800 and this level of funding has been available for several years. However, the *Stormwater Management Service Charge* can be utilised for stormwater quality projects including education and it is recommended that additional funding be directed to the implementation of Stormwater Management Plan projects.

5.6. Disposal Plan

Every drainage asset that has been constructed throughout the Shoalhaven is holding a significant role to prevent flooding. There is no disposal plan for this asset, however, when a drainage reaches its life expectancy, it shall be renewed/replaced. When this occurs, the waste materials are to be recycled instead of being disposed.

6. FINANCIAL SUMMARY

6.1. Financial Statements and Projections

As detailed previously in this Plan, it is considered that the funding levels for maintenance/operating are reasonable but below desirable levels by about $85,000/annum. Additionally, the level of funding for capital projects is satisfactory, at the current level of knowledge on asset condition and catchment analyses.

The budgets for Drainage for the current and past six years are shown in Table 1.
(Note: the budgets do not include funds for clearing of Kerb & Gutter which is funded under Road Maintenance)

Table 4. Maintenance Budget 2006 - 2012

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Maintenance							
Repair Structure	$100,000	$120,000	$130,000	$120,000	$80,000	$80,000	$80,000
Clear Structure	$170,000	$190,000	$230,000	$190,000	$390,000	$430,000	$430,000
Clear Road Table Drains	$96,000	$120,000	$180,000	$120,000	$145,000	$140,000	$170,000
Clear Stormwater quality device	$45,000	$45,000	$45,000	$45,000	$52,000	$52,000	$54,000
Erosion protection to open drains	$30,000	$50,000	$60,000	$50,000	$20,000	$20,000	$20,000
Drainage other	$61,000	$35,000	$85,000	$85,000	$120,000	$88,000	$88,000
Total Maintenance	$502,000	$560,000	$730,000	$610,000	$807,000	$810,000	$842,000
Capital	$892,600	$951,000	$1,645,350	$2,238,961	$1,420,000	$2,603,357	$1,725,784
Grand Total	**$1,298,600**	**$1,391,000**	**$2,195,350**	**$2,728,961**	**$2,227,000**	**$4,223,357**	**$3,409,784**

Council determined to introduce a ‘Stormwater Management Service Charge’ of $5 per residential assessment and $2.50 per strata assessment in 2006/07 pursuant to Section 501 of the Local Government Act (1993). The ‘Service Charge’ has increased from the initial $5 to $25 in 2009/10 and has generated estimated income of $1,000,000 in 2009/10 that has funded additional drainage capital works. The ongoing annual capital funding for Drainage is expected to be about $1.4 to $1.5 Million, increasing at 0.5% per year.

Table 5 shows the long term expected expenditures on maintenance, capital (now) and renewals.

	Maintenance Budget	Capital Works Budget	Renewal Budget	Total
2013/14	$868,000	$1,732,784	$0	$2,600,784
2014/15	$893,000	$1,740,784	$0	$2,633,784
2015/16	$920,000	$1,747,784	$0	$2,667,784
2016/17	$947,000	$1,754,784	$160,000	$2,861,784
2017/18	$975,000	$1,761,784	$160,000	$2,896,784
2108/19	$1,004,000	$1,769,784	$180,000	$2,953,784
2019/20	$1,034,000	$1,776,784	$180,000	$2,990,784
2020/21	$1,065,000	$1,784,784	$200,000	$3,049,784
2021/22	$1,096,000	$1,791,784	$200,000	$3,087,784
2022/23	$1,129,000	$1,798,784	$200,000	$3,127,784
2023/24	$1,162,000	$1,806,784	$200,000	$3,168,784

Table 5. Estimated 10 Year Drainage Expenditure

The 'Service Charge' can be spent on both capital and maintenance relating to new/additional stormwater management services such as –

- Planning, construction and maintenance of pipes, channels & basins
- Planning, construction and maintenance of stormwater treatment measures (e.g. pollutant traps & wetlands)
- Planning, construction and maintenance of stormwater harvesting & reuse
- Community and industry stormwater pollution education campaigns
- Inspection of commercial and industrial premises for stormwater pollution prevention and
- Temporary project staff to implement the additional projects.

6.2. Funding Strategy

Considering the increase in number of population each year, there will be an increase on demands for drainage work and infrastructure. For this reason funding required should be increased each year, as constructing drainages must remain in the level of the Australian Standard which is costly.

6.3. Valuation Forecasts

According to Australian Accounting Standard (AASB) 116, asset classes only need to be revalued if there have been material change otherwise it is every five (5) years. The due date of revaluation to each asset class is shown below:

Table 6: Fair Valuation – Infrastructure, property, plan and equipment

Asset Class	Due
Water & Sewer	30-Jun-12
Property, plant and equipment, operational land, buildings	30-Jun-13
Roads, bridges, footpaths, drainage, bulk earth works	30-Jun-15
Community land, other assets, land improvement	30-Jun-16

6.4. Key Assumptions Made in Financial Forecasts

Key assumption made in presenting the information in this AMP and in preparing forecast of required operating and capital expenditure and asset values, depreciation expenses and carrying amount estimates are detailed below. They are presented to enable readers to gain an understanding of the levels of confidence in the data behind the financial forecast.

Key assumption:

- Average useful lives and average remaining lives of the asset classes are based on current local knowledge and experience, historical trends and accepted industry practice. These need to be reviewed and the accuracy improved, based on regular re-assessment of asset deterioration.
- Reviews of the effective useful lives of assets and population / demographic changes have the potential for greatest variance in future cost predictions.
- Changes in development needs associated with the rate and location of growth and changes in the desired level of service and service standards from those identified in the Asset Management Plan, will both impact on future funding.

Accuracy of future financial forecasts may be improved in future revisions of the Plan by the following actions:

- Implementation of a Job Costing system to incorporate continuously current unit rate data.
- More refined condition rating data with more history for reference.
- Greater degree of componentisation in the rating process.
- Development of better degradation models through national research and development programs.
- Development of better financial models through collaborative processes.
- Implementation of an asset information system.

Specific annual maintenance and renewal cost trends are detailed for each asset category in the relevant Sections.

6.5. Forecast Reliability and Confidence

Network condition has been assumed to be a direct relationship to the age of the subdivision release. It is acknowledged that this is not a high level of accuracy and it will be necessary to gradually undertake condition inspections to verify overall network condition.

It has been assumed that drainage assets have a 100 year useful life before replacement is required. It is noted the 'useful life' for drainage is generally assumed as at between 80 to 100 years. It is also to be noted that replacement of pipes may occur after 100 years of age; however, currently for analysis purposes it is assumed that pipes will be replaced at 100 years.

As improved condition data becomes available the 'useful life' used by Council will be reviewed. The oldest identified asset age within the network is currently 85 years and only about 2% of the network is over 80 years.

It is also to be noted that drainage assets have not been identified for most of the rural road network including all road cross pipes and culverts. This data will be collected as resources permit and the data included in subsequent AMP reviews.

7. PLAN IMPROVEMENT AND MONITORING

This section of the asset management plan outlines any asset management practices and improvements that have arisen during the process of documenting this first plan and can be incorporated into the organisation's methodology for further enhancement to the asset management practice as the second tier asset management plan is undertaken.

7.1. Status of AM Practices

It is desirable to have an Asset Management Practice that indicates sound governance and accountability; more sustainable decisions, enhanced customer service, effective risk management; and improved financial efficiency.

7.2. Improvement Programme

There is an increasing need to align stormwater quantity projects with stormwater quality projects. Accordingly, it is recommended that regular liaison meetings be established between natural resource & floodplain staff and road & drainage management staff. The meetings to review the annual capital programs and coordinate drainage catchment analyses.

The following tasks are recommended to improve the level of service provided under drainage services:

- Progressively undertake catchment analysis for both quantity and quality and add identified projects to the *Drainage Capital Strategy.*
- Progressively undertake drainage asset condition surveys and review renewal funding forecasts
- Linking the Asset Register (Conquest) to Strategic Planning Systems (Maloney Modelling Tool), Works Management Systems (MMS), Asset Costing Systems (Knowledge Base), Customer Request Systems (Merit), Plans & Records Management (Drawing Catalog), Electronic Data Management System (EDMS/TRIM), Financial Information System (SUN/FIS) and Spatial Mapping Systems (ESRI/GIS)
- Investigate benefits to water quality from undertaking additional kerb & gutter sweeping and construction
- Undertake a review to determine the benefits of increasing the design standard for minor systems from a 1:5 year recurrence interval to 1:10 year.

- Commencing in 2013/14 consider allocating about $200,000 of the funding from the *Stormwater Management Service Charge* to identified Stormwater Management Plan (water quality) projects.
- Establish an internal 'Stormwater Management Team' to -
    - Review capital strategies
    - Recommend draft annual works program and
    - Coordinate catchment analyses (both quality & quantity).
- Engage a stormwater design engineer for a fixed term of 5 years (funded by the *Stormwater Management Service Charge)* to –
    - Carry out catchment modelling for both quantity & quality and update the *Drainage Capital Strategy (Quantity) & Stormwater Management Plan (Quality)*
    - Develop projects for stormwater harvesting
    - Review performance of existing stormwater quality structures and recommend changes
    - Investigate benefits of increased street sweeping
    - Undertake stormwater education projects (internal & external)
    - Audit existing discharge points at watercourses and coastal locations and recommend improvement works
    - Review Estuary & Coastal Zone Management Plans for recommended stormwater actions and develop projects for inclusion in capital programs.
    - Audit existing detention basins and swale drains and recommend actions to bring structures into compliance with Guidance *Note 3 – Detention Basins* issued by Statewide (Mutual).

7.3. Monitoring and Review Procedures

Regular monitoring and review of this asset management plan is essential in order to ensure the document is able to continue to provide strategic guidance in the sustainable management of Council's open space and recreational assets. This is the second version of the AMP and it will be reviewed and further developed over the next few years with further detailed information for an advanced AMP.

7.4. Performance Measures

Council's Resourcing Strategy contains a Long Term Financial Plan forecast. Table 2 in 4.1 details the long term financial forecast, for at least the next ten (10) years, for the provision, maintenance and renewal of drainage assets.

The following measures can be used as a guide to monitor performance of Drainage Services –

- Annual number of community action requests
- Number and value of public liability claims
- Asset condition (once information is available)
- Water quality monitoring at major stormwater outlets (once program has been established)

The *Community Strategic Plan 2010* lists in its core 'Objectives' –

- A City that protects, values and cares for the Shoalhaven Environment
- Community infrastructure and services that are environmentally responsible and sustainable

More specifically the *Community Strategic Plan 2010 lists the following strategies which are directly or indirectly influenced by Drainage assets.*

Strategy 1.1.4	Maintain and improve road, cycling and pedestrian networks and associated infrastructure
Strategy 2.1.1	Ensure that ecological and biological environments of the Shoalhaven are protected and valued through careful management
Strategy 2.2.1	Develop and implement land use and related strategies for future growth of the City, based on the principles of connectivity, ecological sustainability, flexibility and accessibility
Strategy 2.3.1	Responsibly manage community exposure to natural hazards and resulting risks
Strategy 2.4.2	Create urban environments that meet community needs while ensuring the qualities and ecological integrity of the natural environment are protected
Strategy 2.4.3	Investigate and establish sustainable and responsible stormwater management measures
Strategy 4.5.1	Manage Council's finances and resources in accordance with the Resourcing Strategy

Council's Delivery Program (2010 – 2013) contains activities for the provision and maintenance of drainage assets and related programs. These are –

Activity 1.1.4.5	Develop strategies and programs for roads, stormwater drainage, car parking, kerb and gutter and bridges
Activity 1.1.4.1	Carry out Cyclic Inspections of Roads and Town Centres in accordance with the schedule of roads and Risk Management Procedure
Activity 1.1.4.17	Complete the annual Capital Works Program t be undertaken by in-house field based resources to improve the road network and associated infrastructure
Activity 1.1.4.19	Complete the annual Capital Works Program to be undertaken by in-house field based resources to repair / rehabilitate the road network and associated infrastructure
Activity 1.1.4.22	Maintain road assets in accordance with the Risk Management Procedures
Activity 2.1.1.11	Review, develop and implement Estuary Management Plans
Activity 2.2.1.3	Ensure that DCPs and policies address the managed growth of the city's towns and villages
Activity 2.3.1.5	Implement floodplain program
Activity 2.4.2.7	Develop an Integrated Environmental Management Strategy to protect the environment and define the parameters for sustainable growth
Activity 2.4.3.2	Ensure DCPs and policies address water sensitive urban design and stormwater management

Activity 2.4.3.3	Undertake strategic stormwater catchment analysis to inform teh Stormwater Management Plan review
Activity 2.4.3.4	Ensure compliance of Greenfield subdivisions with Council policies on Water Activity Sensitive Urban Design
Activity 4.5.1.8	Develop stormwater infrastructure asset management plan

8. REFERENCES

IPWEA, 2006, 'International Infrastructure Management Manual', Institute of Public Works Engineering Australia, Sydney, www.ipwea.org.au/IIMM

IPWEA, 2008, 'NAMS.PLUS Asset Management', Institute of Public Works Engineering Australia, Sydney, www.ipwea.org.au/namsplus

IPWEA, 2009, 'Australian Infrastructure Financial Management Guidelines', Institute of Public Works Engineering Australia, Sydney, www.ipwea.org.au/AIFMG.

IPWEA, 2011, 'International Infrastructure Management Manual', Institute of Public Works Engineering Australia, Sydney, www.ipwea.org.au/IIMM

Shoalhaven City Council, 2010, Community Strategic Plan 2020

http://www.id.com.au/forecast/shoalhaven

9. APPENDICES

9.1 Glossary

Age
The current date less year when asset was constructed

AMP
Asset Management Plan

Annual service cost (ASC)
1) Reporting actual cost
The annual (accrual) cost of providing a service including operations, maintenance, depreciation, finance/opportunity and disposal costs less revenue.
2) For investment analysis and budgeting
An estimate of the cost that would be tendered, per annum, if tenders were called for the supply of a service to a performance specification for a fixed term. The Annual Service Cost includes operations, maintenance, depreciation, finance/ opportunity and disposal costs, less revenue.

Asset condition assessment
The process of continuous or periodic inspection, assessment, measurement and interpretation of the resultant data to indicate the condition of a specific asset so as to determine the need for some preventative or remedial action.

Asset management

A systematic process to guide the planning, acquisition, operation and maintenance, renewal and disposal of asset based on the combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost effective manner.

Asset

A resource controlled by an entity as a result of past events and from which future economic benefits are expected to flow to the entity. Infrastructure assets are a sub-class of property, plant and equipment which are non-current assets with a life greater than 12 months and enable services to be provided.

Asset category

Sub-group of assets within a class hierarchy for financial reporting and management purposes.

Asset class

A group of assets having a similar nature or function in the operations of an entity, and which, for purposes of disclosure, is shown as a single item without supplementary disclosure.

Asset condition assessment

The process of continuous or periodic inspection, assessment, measurement and interpretation of the resultant data to indicate the condition of a specific asset so as to determine the need for some preventative or remedial action.

Asset Register

A record of asset information including condition, construction, financial, historical, inventory and technical details

Asset renewal funding ratio

The ratio of the net present value of asset renewal funding accommodated over a 10 year period in a long term financial plan relative to the net present value of projected capital renewal expenditures identified in an asset management plan for the same period [AIFMG Financial Sustainability Indicator No 8].

Average annual asset consumption (AAAC)*

The amount of an organisation's asset base consumed during a reporting period (generally a year). This may be calculated by dividing the depreciable amount by the useful life (or total future economic benefits/service potential) and totalled for each and every asset OR by dividing the carrying amount (depreciated replacement cost) by the remaining useful life (or remaining future economic benefits/service potential) and totalled for each and every asset in an asset category or class.

Borrowings

A borrowing or loan is a contractual obligation of the borrowing entity to deliver cash or another financial asset to the lending entity over a specified period of time or at a specified point in time, to cover both the initial capital provided and the cost of the interest incurred for providing this capital. A borrowing or loan provides the means for the borrowing entity to finance outlays (typically physical assets) when it has insufficient funds of its own to do so, and for the lending entity to make a financial return, normally in the form of interest revenue, on the funding provided**.**

Capital expansion expenditure
Expenditure that extends an existing asset, at the same standard as is currently enjoyed by residents, to a new group of users. It
is discretional expenditure, which increases future operating, and maintenance costs, because it increases council's asset base,
but may be associated with additional revenue from the new user group, eg. extending a drainage or road network, the provision
of an oval or park in a new suburb for new residents.

Capital expenditure
Relatively large (material) expenditure, which has benefits, expected to last for more than 12 months. Capital expenditure
includes renewal, expansion and upgrade. Where capital projects involve a combination of renewal, expansion and/or upgrade
expenditures, the total project cost needs to be allocated accordingly.

Capital expenditure - expansion
Expenditure that extends the capacity of an existing asset to provide benefits, at the same standard as is currently enjoyed by existing beneficiaries, to a new group of users. It is discretionary expenditure, which increases future operations and maintenance costs, because it increases the organisation's asset base, but may be associated with additional revenue from the new user group, eg. extending a drainage or road network, the provision of an oval or park in a new suburb for new residents.

Capital expenditure - new
Expenditure which creates a new asset providing a new service/output that did not exist beforehand. As it increases service potential it may impact revenue and will increase future operations and maintenance expenditure.

Capital expenditure - renewal
Expenditure on an existing asset or on replacing an existing asset, which returns the service capability of the asset up to that which it had originally. It is periodically required expenditure, relatively large (material) in value compared with the value of the components or sub-components of the asset being renewed. As it reinstates existing service potential, it generally has no impact on revenue, but may reduce future operations and maintenance expenditure if completed at the optimum time, eg. resurfacing or resheeting a material part of a road network, replacing a material section of a drainage network with pipes of the same capacity, resurfacing an oval.

Capital expenditure - upgrade
Expenditure, which enhances an existing asset to provide a higher level of service or expenditure that will increase the life of the asset beyond that which it had originally. Upgrade expenditure is discretionary and often does not result in additional revenue unless direct user charges apply. It will increase operations and maintenance expenditure in the future because of the increase in the organisation's asset base, eg. widening the sealed area of an existing road, replacing drainage pipes with pipes of a greater capacity, enlarging a grandstand at a sporting facility.

Capital funding
Funding to pay for capital expenditure.

Capital grants
Monies received generally tied to the specific projects for which they are granted, which are often upgrade and/or expansion or
new investment proposals.

Capital investment expenditure
See capital expenditure definition

Capitalisation threshold
The value of expenditure on non-current assets above which the expenditure is recognised as capital expenditure and below which the expenditure is charged as an expense in the year of acquisition.

Carrying amount
The amount at which an asset is recognised after deducting any accumulated depreciation / amortisation and accumulated impairment losses thereon.

Capital new expenditure
Expenditure which creates a new asset providing a new service to the community that did not exist beforehand. As it increases
service potential it may impact revenue and will increase future operating and maintenance expenditure.

Capital renewal expenditure
Expenditure on an existing asset, which returns the service potential or the life of the asset up to that which it had originally. It is
periodically required expenditure, relatively large (material) in value compared with the value of the components or subcomponents
of the asset being renewed. As it reinstates existing service potential, it has no impact on revenue, but may reduce
future operating and maintenance expenditure if completed at the optimum time, eg. resurfacing or resheeting a material part of
a road network, replacing a material section of a drainage network with pipes of the same capacity, resurfacing an oval. Where
capital projects involve a combination of renewal, expansion and/or upgrade expenditures, the total project cost needs to be
allocated accordingly.

Capital upgrade expenditure
Expenditure, which enhances an existing asset to provide a higher level of service or expenditure that will increase the life of the
asset beyond that which it had originally. Upgrade expenditure is discretional and often does not result in additional revenue
unless direct user charges apply. It will increase operating and maintenance expenditure in the future because of the increase in
the council's asset base, eg. widening the sealed area of an existing road, replacing drainage pipes with pipes of a greater
capacity, enlarging a grandstand at a sporting facility. Where capital projects involve a combination of renewal, expansion and/or
upgrade expenditures, the total project cost needs to be allocated accordingly.

Capital Works
The creation of new assets or an increase in the capacity of existing assets beyond their original design capacity or service potential

Carrying amount
The amount at which an asset is recognised after deducting any accumulated depreciation / amortisation and accumulated impairment losses thereon.

Component
An individual part of an asset which contributes to the composition of the whole and can be separated from or attached to an asset or a system.

Conquest
An asset management software package that includes Council's Asset Register and Asset Maintenance System

Core asset management
Asset management which relies primarily on the use of an asset register, maintenance management systems, job resource management, inventory control, condition assessment, simple risk assessment and defined levels of service, in order to establish alternative treatment options and long-term cashflow predictions. Priorities are usually established on the basis of financial return gained by carrying out the work (rather than detailed risk analysis and optimised decision- making).

Cost of an asset
The amount of cash or cash equivalents paid or the fair value of the consideration given to acquire an asset at the time of its acquisition or construction, plus any costs necessary to place the asset into service. This includes one-off design and project management costs.

Council
Shoalhaven City Council

Critical assets
Assets for which the financial, business or service level consequences of failure are sufficiently severe to justify proactive inspection and rehabilitation. Critical assets have a lower threshold for action than noncritical assets.

Current replacement cost (CRC)
The cost the entity would incur to acquire the asset on the reporting date. The cost is measured by reference to the lowest cost at which the gross future economic benefits could be obtained in the normal course of business or the minimum it would cost, to replace the existing asset with a technologically modern equivalent new asset (not a second hand one) with the same economic benefits (gross service potential) allowing for any differences in the quantity and quality of output and in operating costs.

Current replacement cost "As New" (CRC)
The current cost of replacing the original service potential of an existing asset, with a similar modern equivalent asset, i.e. the total cost of replacing an existing asset with an as NEW or similar asset expressed in current dollar values.

Depreciable amount
The cost of an asset, or other amount substituted for its cost, less its residual value.

Depreciated replacement cost (DRC)
The current replacement cost (CRC) of an asset less, where applicable, accumulated depreciation calculated on the basis of such cost to reflect the already consumed or expired future economic benefits of the asset

Depreciation / amortisation
The wearing out, consumption or other loss of value of an asset whether arising from use, passing of time or obsolescence through technological and market changes. It is accounted by the allocation of the cost (or revalued amount) of the asset less its residual value over its useful life.

Disposal
Activities necessary to dispose of decommissioned assets

DLG
NSW Division of Local Government, Department of Premier and Cabinet

Expenditure
The spending of money on goods and services. Expenditure includes recurrent and capital.

Facility
A complex comprising many assets which represent a single management unit for financial, operational, maintenance and other purposes

Fair value
The amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties, in an arms length transaction.

Financing gap
A financing gap exists whenever an entity has insufficient capacity to finance asset renewal and other expenditure necessary to be able to appropriately maintain the range and level of services its existing asset stock was originally designed and intended to deliver. The service capability of the existing asset stock should be determined assuming no additional operating revenue, productivity improvements, or net financial liabilities above levels currently planned or projected. A current financing gap means service levels have already or are currently falling. A projected financing gap if not addressed will result in a future diminution of existing service levels**.**

GIS
Geographical Information System, mapping and spatial location technology systems which show location and relationship to key geographical datum points

Heritage asset
An asset with historic, artistic, scientific, technological, geographical or environmental qualities that is held and maintained principally for its contribution to knowledge and culture and this purpose is central to the objectives of the entity holding it.

Impairment Loss
The amount by which the carrying amount of an asset exceeds its recoverable amount.

Infrastructure assets
Physical assets of the entity or of another entity that contribute to meeting the public's need for access to major economic and social facilities and services, eg. roads, drainage, footpaths and cycleways. These are typically large, interconnected networks or portfolios of composite assets. The components of these assets may be separately maintained, renewed or replaced individually so that the required level and standard of service from the network of assets is continuously sustained. Generally the components and hence the assets have long lives. They are fixed in place and are often have no market value.

Investment property
Property held to earn rentals or for capital appreciation or both, rather than for:
(a) use in the production or supply of goods or services or for administrative purposes; or
(b) sale in the ordinary course of business (AASB 140.5)

Level of service
The defined service quality for a particular service against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental, acceptability and cost).

Life Cycle Cost *
1. **Total LCC** The total cost of an asset throughout its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal costs.
2. **Average LCC** The life cycle cost (LCC) is average cost to provide the service over the longest asset life cycle. It comprises average operations, maintenance expenditure plus asset consumption expense, represented by depreciation expense projected over 10 years. The Life Cycle Cost does not indicate the funds required to provide the service in a particular year.

Life Cycle Expenditure
The Life Cycle Expenditure (LCE) is the actual or planned annual maintenance and capital renewal expenditure incurred in providing the service in a particular year. Life Cycle Expenditure may be compared to Life Cycle Expenditure to give an initial indicator of life cycle sustainability.

Loans / borrowings
Loans result in funds being received which are then repaid over a period of time with interest (an additional cost). Their primary benefit is in 'spreading the burden' of capital expenditure over time. Although loans enable works to be completed sooner, they are only ultimately cost effective where the capital works funded (generally renewals) result in operating and maintenance cost savings, which are greater than the cost of the loan (interest and charges).

Maintenance
All actions necessary for retaining an asset as near as practicable to an appropriate service condition, including regular ongoing day-to-day work necessary to keep assets operating, eg road patching but excluding rehabilitation or renewal. It is operating expenditure required to ensure that the asset reaches its expected useful life.

- **Planned maintenance**
  Repair work that is identified and managed through a maintenance management system (MMS). MMS activities include inspection, assessing the condition against failure/breakdown criteria/experience, prioritising scheduling, actioning the work and reporting what was done to develop a maintenance history and improve maintenance and service delivery performance.
- **Reactive maintenance**
  Unplanned repair work that is carried out in response to service requests and management/ supervisory directions.
- **Specific maintenance**
  Maintenance work to repair components or replace sub-components that needs to be identified as a specific maintenance item in the maintenance budget.
- **Unplanned maintenance**
  Corrective work required in the short-term to restore an asset to working condition so it can continue to deliver the required service or to maintain its level of security and integrity.

Maintenance and renewal sustainability index
Ratio of estimated budget to projected expenditure for maintenance and renewal of assets over a defined time (eg 5, 10 and 15 years).

Maintenance expenditure
Recurrent expenditure, which is periodically or regularly required as part of the anticipated schedule of works required to ensure that the asset achieves its useful life and provides the required level of service. It is expenditure, which was anticipated in determining the asset's useful life.

Materiality
An item is material is its omission or misstatement could influence the economic decisions of users taken on the basis of the financial report. Materiality depends on the size and nature of the omission or misstatement judged in the surrounding circumstances.

Modern equivalent asset
Assets that replicate what is in existence with the most cost-effective asset performing the same level of service. It is the most cost efficient, currently available asset which will provide the same stream of services as the existing asset is capable of producing. It allows for technology changes and, improvements and efficiencies in production and installation techniques

Net present value (NPV)
The value to the organisation of the cash flows associated with an asset, liability, activity or event calculated using a discount rate to reflect the time value of money. It is the net amount of discounted total cash inflows after deducting the value of the discounted total cash outflows arising from eg the continued use and subsequent disposal of the asset after deducting the value of the discounted total cash outflows.

New Works
New work expenditure is Capital Works expenditure, i.e. money spent on new works (development costs) and upgrades to an existing asset or on creating a new asset

Non-revenue generating investments
Investments for the provision of goods and services to sustain or improve services to the community that are not expected to generate any savings or revenue to the Council, eg. parks and playgrounds, footpaths, roads and bridges, libraries, etc.

Operations
Regular activities to provide services such as public health, safety and amenity, eg street sweeping, grass mowing and street lighting.

Operating expenditure
Recurrent expenditure, which is continuously required excluding maintenance and depreciation, eg power, fuel, staff, plant equipment, on-costs and overheads.

Operational Plan
Generally comprise detailed implementation plans and information with a 1-3 year outlook (short-term). The plans detail structure, authority, responsibilities, defined levels of service and emergency responses

Rate of annual asset consumption *
The ratio of annual asset consumption relative to the depreciable amount of the assets. It measures the amount of the consumable parts of assets that are consumed in a period (depreciation) expressed as a percentage of the depreciable amount.

Rate of annual asset renewal *
The ratio of asset renewal and replacement expenditure relative to depreciable amount for a period. It measures whether assets are being replaced at the rate they are wearing out with capital renewal expenditure expressed as a percentage of depreciable amount (capital renewal expenditure/DA).

Rate of annual asset upgrade/new *
A measure of the rate at which assets are being upgraded and expanded per annum with capital upgrade/new expenditure expressed as a percentage of depreciable amount (capital upgrade/expansion expenditure/DA).

Reactive maintenance
Unplanned repair work that carried out in response to service requests and management/supervisory directions.

Recoverable amount
The higher of an asset's fair value, less costs to sell and its value in use.

Recurrent expenditure
Relatively small (immaterial) expenditure or that which has benefits expected to last less than 12 months. Recurrent expenditure includes operating and maintenance expenditure.

Recurrent funding
Funding to pay for recurrent expenditure.

Rehabilitation
See capital renewal expenditure definition above.

Remaining Useful life
Remaining useful life is determined for each individual asset from the condition rating. It is the time that the asset provides future economic benefit, from acquisition to expected replacement, renewal in full or replacement / disposal

Renewal
Works or actions to upgrade, refurbish or replace components of an asset to restore it to near new and required functional condition, extending its current remaining life

Residual value
The net amount which an entity expects to obtain for an asset at the end of its useful life after deducting the expected costs of disposal.

Revenue generating investments
Investments for the provision of goods and services to sustain or improve services to the community that are expected to generate some savings or revenue to offset operating costs, eg public halls and theatres, childcare centres, sporting and recreation facilities, tourist information centres, etc.

Risk management
The application of a formal process to the range of possible values relating to key factors associated with a risk in order to determine the resultant ranges of outcomes and their probability of occurrence.

Section or segment
A self-contained part or piece of an infrastructure asset.

Service
A benefit gained from utilising or accessing an asset and the associated work done by Council staff or others associated with the Council

Service expectation
The description of Level of Service available to users of an asset and any associated services, as described in consultation for developing and reviewing the Community Strategic Plan

Specific Maintenance
Replacement of higher value components/sub-components of assets that is undertaken on a regular cycle including repainting, replacement of air conditioning equipment, etc. This work generally falls below the capital/ maintenance threshold and needs to be identified in a specific maintenance budget allocation.

Strategic Longer-Term Plan
A plan covering the term of office of councillors (4 years minimum) reflecting the needs of the community for the foreseeable future. It brings together the detailed requirements in the Council's longer-term plans such as the asset management plan and the long-term financial plan. The plan is prepared in consultation with the community and details where the Council is at that point in time, where it wants to go, how it is going to get there, mechanisms for monitoring the achievement of the outcomes and how the plan will be resourced.

Stakeholder
A person; group; company or government department representing an interest in an asset; project or service utilising an asset

Sub-component
Smaller individual parts that make up a component part.

Useful life
Either:
(a) the period over which an asset is expected to be available for use by an entity, or
(b) the number of production or similar units expected to be obtained from the asset by the entity.
It is estimated or expected time between placing the asset into service and removing it from service, or the estimated period of
time over which the future economic benefits embodied in a depreciable asset, are expected to be consumed by the council. It is
the same as the economic life.

Value in Use
The present value of estimated future cash flows expected to arise from the continuing use of an asset and from its disposal at
the end of its useful life. It is deemed to be depreciated replacement cost (DRC) for those assets whose future economic
benefits are not primarily dependent on the asset's ability to generate new cash flows, where if deprived of the asset its future
economic benefits would be replaced.

10. REVIEW

All Asset Management Plans are reviewed on a four yearly cycle and all reviews are undertaken within 12 months of the election of a new Council. The capital program will be reviewed annually in conjunction with the preparation of the draft Delivery Program and Operational Plan.

Attachment 1 – Stormwater Quality Structures

Gross pollution traps, detention basins, retention basins, or other type flood or pollution control structures

Town	Location	Structure	Maintenance Schedule	Remarks
Basin view	Basin view boat ramp	Precast sediment pits, no trash rack	sediment: remove in 1 in 3 months	
Berry	Cnr Bong Bong Rd/Woodhill Mtn Rd	Sedimentation Pond	Sediment: remove in 1 in 6 months	
Bomaderry	downstream of 7 Magnolia Dr	GPT & Sediment Basin	Litter: check & remove once a month Sediment: remove in 1 in 3 months	
Bomaderry	Sheraton Gardens, Gardenia Cres	Sediment traps and Pond - Parks Maintenance	GPTs: check & remove litter once a month	Ponds: clean in 1 in 5 years
Bomaderry	Nita Pl	Sedimentation Pond	Litter 1 in 2 months	
Burrill Lake	Lakeview Drive	Sediment Trap - Concrete Pit Aluminium Lid	Sediment: remove in 1 in 2 months	
Burrill Lake	McDonald Parade	Sediment Trap - Concrete Pit Aluminium Lid	Sediment: remove in 1 in 2 months	
Burrill Lake	Commonwealth Ave	Earth Dam (temporary structure)	Sediment: After significant rainfall	
Callala Bay	Off Monarch Pl	Sedimentation Pond	Sediment: remove in 1 in 2 months	
Cambewarra	Hockeys Lane	Sedimentation Pond	Sediment: remove in 1 in 2 months	
Cambewarra	Hockeys Ln	Sedimentation Pond	1 in 2 months	
Dolphins Point	Dolphins Pt Development P/Y	GPT & Dam	Litter 1 in 2 months	
East Nowra	Ratcliffe Park	Retention Basin	Sediment: remove in 1 in 2 months	
Huskisson	Currambene St at Wharf	Litter trap at end of pipe - 2 off	Litter: check & remove once in 2 years	
Kings Point	Henry Place	Sediment Trap - Concrete Base Gabion Walls - Open	Sediment: remove in 1 in 2 months	
Lake Tabourie	River Rd	Litter basket	Litter: check & remove monthly	
Lake Tabourie	Mercury Dr	Litter basket	Litter: check & remove monthly	
Manyana	The Bulwark Manyana			
Mollymook	Clifford Close	Sediment Trap - Concrete Base Gabion Walls - Open	Sediment: remove in 1 in 2 months	
Mollymook	Settlers Way	Sediment Trap - Concrete Base Gabion Walls - Open	Sediment: remove in 1 in 2 months	
Mollymook	Mollymook Golf Club Estate	GPT	Litter 1 in 2 months	
Narrawallee	Leo Drive	Sediment Trap - Concrete Base Gabion Walls - Open	Sediment: remove in 1 in 2 months	
Narrawallee	Woodalla Way	Sediment Trap - Concrete & Gabion Channel - Open	Sediment: remove in 1 in 2 months	
North Nowra	Yurunga Drive/Hoskin Street	Sedimentation Pond	Sediment: remove in 1 in 4 months	
North Nowra	Greys Beach	Trash Rack	1 in 6 months	
Nowra	Harry Sawkins	Two Gross Pollution Traps (GPT)x2 & Pond - Parks Maintenance	GPTs: check & remove litter once a month	Ponds: clean in 1 in 5 years
Nowra	Marriot Park	Sediment traps and Pond - Parks Maintenance	Sediment traps near inlets: clean 1 in 2 months	Ponds: clean in 1 in 5 years
Nowra	Nowra Fair	Sediment trap and trash rack	Litter: check & remove once a month Sediment: remove in 1 in 2 months	
Sanctuary Point	MacLeans Point Rd	Concrete Basin with Trash Rack & Sediment trap	Litter: check & remove once a month Sediment: remove in 1 in 3 months	
Sanctuary Point	Paradise Beach Rd	Concrete Basin with Trash Rack & Sediment trap	Litter: check & remove once a month Sediment: remove in 1 in 3 months	
Sanctuary Point	Cammaray Dv	Detention Basin near cnr of Hewitt Ave	Maintain banks	
Sanctuary Point	Loralyn Ave	Gabion Basket Weir	Sediment: remove in 1 in 3 months	
Sanctuary Point	Sanctuary Pt Rd	CDS unit opposite no 16	Litter: check & remove once a month. Sediment: remove 1 in 3 months	
Sanctuary Point	Greville Ave (No162)	Sedimentation Pond		
Sanctuary Point	Golf course	Retention Pond?		
Sanctuary Point	Robinsville Pl	Detention Basin		
Shoalhaven Heads	Shoalhaven Hds Rd NW Corner of Woolstencraft St	Two Ecosol GPT-RSF 100 Pit litter Baskets	Litter and Sediment: check & remove once every 2 months	

Town	Location	Structure	Maintenance Schedule	Remarks
Shoalhaven Heads	Shoalhaven Hds Rd North side just east of Aspinall St W Corner of Woolstencraft St	Ecosol GPT-RSF 100 Pit litter Basket	Litter and Sediment: check & remove once every 2 months	
Shoalhaven Heads	Woolstencraft St	Sedimentation Pond	Litter 1 in 2 months	
St Georges Basin	Anson Street	Concrete Basin with Trash Rack & Sediment trap	Litter: check & remove once a month Sediment: remove in 1 in 3 months	
St Georges Basin	Collett Place	Grated, Concrete Basin with Trash Rack & Sediment trap	Litter: check & remove once a month Sediment: remove in 1 in 3 months	
St Georges Basin	Island Pt Rd / Gumden Ln	Small roadside retention pond	Sediment: remove in 1 in 12 months	
St Georges Basin	Basin Rd	small roadside retention structure	Sediment: remove in 1 in 3 months	
St Georges Basin	Graham Ave	Precast sediment pits, no trash rack	sediment: remove in 1 in 3 months	
St Georges Basin	Loralyn Ave	CDS unit opposite retirement village	Litter: check & remove once a month Sediment: remove in 1 in 3 months	
St Georges Basin	Panorama Dr	CDS unit at SGB soccer fields	Litter: check & remove once a month Sediment: remove in 1 in 3 months	
St Georges Basin	The Wool Road Bypass	Sedimentation Pond	Clean sediment every 6 months	
St Georges Basin	Island Pt Rd at Kingfisher Park	Precast sediment pits, no trash rack	sediment: remove in 1 in 3 months	
Terara	Terara Flood Mitigation	Drain	1 in 3 months	
Ulladulla	Princes Hwy, Cowleys	Pit Litter Basket	Litter: check & remove once in 2 weeks	
Ulladulla	Tetley Place	Earth Dam (temporary structure)	Sediment: remove in 1 in 3 months	
Ulladulla	Warden Street	Earth Dam (temporary structure)	Sediment: remove in 1 in 3 months	
Ulladulla	RVCP Ulladulla Harbour	CDS unit	Litter 1 in 2 months	
Ulladulla	Princes Hwy & Boree St	Litter Basket (baskets no longer working)		
Vincentia	Blenheim Beach	Sediment Trap	Sediment: remove in 1 in 3 months	
Vincentia	Church St	Litter trap at end of pipe	Litter: check & remove once in 4 weeks	
Worrigee	Old Southern Rd	ponds CHECK		
Worrigee	Worrigee Rd	Two earth basins embankment weirs and low flow box culverts	No cleaning required apart from mowing	3 cuts per year

Attachment 2 – Rating Method for Capital Program

Drainage Strategy – Rating Method for Capital Program

Rating Type	Rating Factor	Rating Code	Scoring
Environment	Watercourse Sensitivity	E1	3=Burrill , Woollumboola, Swan, wetlands 2= Tabourie, Conjola, Shoalhaven R, Ulladulla Harbour 1= Narrawallee, Jervis Bay, Kangaroo Valley, Currarong
	Dist. To Watercourse	E2	3= 0 to 100m 2= 100 to 500 m 1= >500m
	Soil Erodibility	E3	3= High 2= Moderate 1= Low
	Discharge volume	E4	3= >2m3/s 2= 1 to 2 m3/s 1= <1m3/s
Flooding	Frequency	F1	3= more than once per year 2=1 in 2 years to 1 in 5 years 1= less than 1 in 5 years
	No. people affected	F2	3=>10 2=5 to 10 1=1 to 5
	Depth of Flow	F3	3=>0.5m 2= 0.1 to 0.5m 1= <0.1m
	Velocity of Flow	F4	3= > 3m/s 2= 1 to 2 m/s 1= < 1m/s
	What is Flooded?	F5	5= house 4= garage 3=private property 2= reserve/road 1= no flooding
Safety	Traffic	S1	Consider factors such as velocity, depth of flow, traffic volume. Possibility of an accident? 6= very high possibility 3= moderate possibility 1= low possibility
	Adults	S2	Consider slipping over, falling down embankment, drowning, etc 3= high possibility 2= moderate possibility 1= low possibility
	Children	S3	Risk of drowning 3= high possibility 2= moderate possibility 1= low possibility
	Damage to property	S4	3= high possibility 2= moderate possibility 1= low possibility

Rating formula = E1+E2+E3+E4+2*F1+2*F2+2*F3+2*F4+2*F5+S1+S2+S3+S4

Attachment 3 – Drainage Priority List

	AS AT:	16/11/2012		ENVIRONMENT				FLOODING					SAFETY						
PRIORITY	VILLAGE	STREET	Details	Sensitivity	Dist.to Watercourse	Soil Erodibility	Discharge Volume	Frequency	No.of people affected	Depth	Velocity	What is Flooded?	Traffic	Adult Pedestrians	Children	Damage to Property	PRIORITY SCORE	Estimate	Capital Works Year
1	Basin View	Watersedge Ave (Stage 2)	Flooding of downstream properties, continous water ponding along shoulders and needs urgent attention. Street need full kerb and guttering with associated drainage. Mr Kielly's property was flooded during the rain event, resulting in excessive amounts of gravel from the road being deposited in his garage and rompus room. Mr Kielly would like an engineer to assess the drainage in the street, currently there are no drainage pits just table drains, which are not effective. Mr Kielly would like to be advise of inspection. Need to look into catchment including Elanora Pde (No. 50 flooded).	3	3	2	2	3	3	2	2	5	4	2	2	3	**51**	$350,000	2013/14
2	Sanctuary Point	195 Kerry Street	Dr Jackson recorded some video water entering shops apparently coming across the carpark. Council did work at the carpark couple of years back which needs to be investigated.	3	2	1	2	3	3	2	2	5	5	3	1	3	**50**	$150,000	2013/14
3	St Georges Basin	Panaroma Road Stage 2	Drainage issues of downstream property nearly getting flooded out. Ground water is an issue and needs urgent attention.	3	3	2	2	3	3	2	2	4	3	2	2	3	**48**	$200,000	2013/14
4	Park Row	Orient Point	Water is sheeting across the Jerrinja Aboriginal Land Council land to properties in Park Row and Orient Point Road. Need to investigate water retention or flow diversion.	2	2	1	2	1	3	3	2	5	4	2	2	3	**46**	$150,000	2013/14
5	Vincentia	340 Elizabeth Drive	Stormwater runoff from the street flooding the property resulting with stormwater through the house. Mrs Gruia was advised by neighbours this has occurred before. Mr Gruia would like the drainage near her property assessed and she would like to be kept informed of intended works. Caller was Dominika Gruia Mobile No: 0412881112 (storm 09/01/2011)	2	2	2	3	2	3	2	2	5	2	2	1	2	**44**	$100,000	2013/14
6	Ulladulla	21 Dolphin Street	D12/246626 (May be sorted with Maintenance??)	2	2	2	1	3	2	2	2	3	3	2	3	3	**42**	$200,000	2013/14
7	St Georges Basin	10 Island Point Road	D11/15055	3	2	2	2	2	2	2	2	4	3	2	1	2	**41**	$60,000	2013/14
8	Erowal Bay	61 Naval Pde	See D12/111026	3	2	2	2	3	2	2	2	3	2	2	1	2	**40**	$100,000	2013/14
9	Culburra Beach	The Triangle	Further drainage improvements required in this area, house almost got flooded in major storm event. D12/205775. Further @ 1A Mowbray Road, due to heavy storms on 20/02/2010, garage has flooded from the road. Requries drainage and KG	2	2	1	2	2	2	2	2	4	3	2	1	3	**40**	$250,000	2013/14
10	Lake Conjola	3 Karingal Place	D12/62722 & D12/135619	2	2	1	2	3	3	2	1	3	2	2	2	3	**40**	$100,000	2013/14
11	Sanctuary Point	6 Gibson Crescent	MERIT no.: 233849	3	1	2	1	3	3	2	1	2	5	2	3	1	**40**	$120,000	2013/14
12	Erowal Bay	169 Naval Pde	D12/87148	3	3	1	2	2	2	2	2	3	2	2	2	2	**39**	$150,000	2013/14
13	Culburra Beach	27 Greenbank Grove	Flooding issues, David Webb has info	3	2	2	2	1	2	2	2	4	3	2	1	2	**39**	$100,000	2013/14
14	Sanctuary Pt	38 Edmund St	Drain reserve adj 44 Edmund Street & 151 Sanctuary Pt Road. Inspected 7/4/03. Possibly place road crossing in Sanct Pt. Rd. 900Dia. No. 38 is also experiencing problems. This will release water and prevent dammingand therefore flodding of properties upstream. Need to do calcs on volume of water. (Existing System Edmund St = 3x750, Sanct Pt Rd= 2x900.) MERIT no's 246510, 245397, 222098	3	1	1	3	3	2	2	1	3	2	2	2	3	**39**	$100,000	2013/14
15	Sanctuary Point	134 Park Drive	Homes in the vincinty have been flooded due to 19 Feb 2012 storms (calculated 1 in 5 ARI - Vincentia Gauge)	3	1	1	2	2	2	2	2	5	2	1	1	2	**39**	$100,000	2013/14

	AS AT:	16/11/2012		ENVIRONMENT				FLOODING					SAFETY						
PRIORITY	VILLAGE	STREET	Details	Sensitivity	Dist.to Watercourse	Soil Erodibility	Discharge Volume	Frequency	No.of people affected	Depth	Velocity	What is Flooded?	Traffic	Adult Pedestrians	Children	Damage to Property	PRIORITY SCORE	Estimate	Capital Works Year
16	Woollamia	770 Woollamia Road	Open drain along this section either needs piping or re-constructing the swale and pipes under driveways, no. 770 and 770a driveways causing water to backup the line and cause nuisance flooding. Also the area is lacking drainage and needs full investigation to determine works.	1	2	2	2	3	3	2	1	2	5	2	2	1	**39**	$200,000	2013/14
17	Vincentia	Elizabeth Dr (Stage 2)	The open stormwater easement running through # 303 requires clearing/digging out as it is overgrown & water pools at the back of the property. Please inspect. Area has been inspected and drainage is clear, there are some deep points in easement holding water. This area needs to be considered for pipe works to solve drainage issue. Must priortise for 2012/2013 CWP. See D11/63659 re Lambs Cres which can be tackled with this project.	1	2	2	2	1	1	2	3	4	4	2	2	2	**39**	$200,000	2013/14
18	Sussex Inlet	Ellmoos Ave	Intersection of River Rd/Gordon Street/Ellmmos Sussex Inlet needing drainage upgrade, requests have been recieved from local residents	3	2	1	1	3	3	2	1	2	4	3	1	1	**38**	$80,000	2013/14
19	Sanctuary Point	52 Sanctuary Point Road	Pipe easement to drain water from the bend, awaiting easement from Bunnerong Estate	3	2	2	2	3	3	1	2	2	3	2	1	1	**38**	$60,000	2014/15
20	Huskisson	24 Owen St	Property was flooded (09/01/2011), KG could not cope with flow. Need to do a catchment analysis to determine if more drainage infrastructure is required.	3	3	2	2	3	1	2	2	2	1	2	3	2	**38**	$50,000	2014/15
21	Wrights Beach	Fisher and Deakin St's	Reports of drainage not coping with volume of water (storm 09/01/2011)	3	3	2	2	3	1	2	2	2	1	2	3	2	**38**	$50,000	2014/15
22	Sanctuary Point	258 The Park Drive	Complaints regarding stormwater encroahing into property. Seems that flow coming from the golf course is also effecting these properties. Channel leading of the golf course needs to be diverted towards Larmer Ave Cuvlert, maybe building a bund or diversion channel.	3	3	1	2	3	2	2	1	3	1	1	2	3	**38**	$100,000	2014/15
23	Milton	26 Thomas Street	See D12/177661	2	1	2	2	3	2	1	2	3	3	2	2	2	**38**	$100,000	2014/15
24	Culburra Beach	Lake Circuit	Open drain compliant D12/228202	2	3	2	2	2	3	2	2	2	1	2	2	2	**38**	$80,000	2014/15
25	Sanctuary Point	135 Macleans Pt Road	MERIT no.: 276983	3	2	1	2	2	1	2	2	4	4	1	1	2	**38**	$80,000	2014/15
26	Falls Creek	Dowling Street	Upgrade causeway by utilising culvert located near the site	1	1	1	3	3	3	3	2	2	3	1	1	1	**38**	$60,000	2014/15
27	Sanctuary Point	10 Albion Street	D12/65488 - review drainage system	3	1	2	2	2	2	2	2	3	3	1	1	2	**37**	$90,000	2014/15
28	Sanctuary Point	51-53 Frederick St	Please see D12/39319	3	1	1	2	2	2	2	2	4	2	1	1	2	**37**	$80,000	2014/15
29	Vincentia	11 Argle Street	Claims of flooding, need to investigate further to confirm. Please see D11/40610	1	2	1	2	3	1	2	2	4	3	1	1	2	**37**	$40,000	2014/15
30	Currarong	Webber Ave	Open drain needs to realigned for better hydraulic efficiency (near tennis courts)	1	2	2	2	3	2	1	3	2	1	2	3	2	**37**	$120,000	2014/15
31	Sanctuary Point	210 Loralyn	Resident reporting issues with the stormwater drain running between # 208 & # 210 Loralyn Avenue. Apparently the drain has been 'dug out & dug out' over the years. K&G has also been installed in the street. Now, with a larger volume of water running through this drain the outlet in the reserve, is being undermined. Soil is being washed away from his property & trees roots are being exposed. Please inspect. MERIT 188266	3	3	2	2	1	2	2	2	2	3	2	2	1	**36**	$80,000	2014/15
32	St Georges Basin	268 Wool Rd	See D12/55514	3	1	1	2	2	2	2	2	3	2	1	2	2	**36**	$80,000	2015/16
33	Basin View	136 Tallayan Pt Road	Table drain not coping with volume of water, need to investigate	3	1	2	2	3	1	2	2	2	1	2	3	2	**36**	$30,000	2015/16
34	Berrara	31 Berrara Road	Complaints regarding stormwater encroahing into property. Required solution is KG and associated drainage works	3	2	1	2	1	3	2	2	2	3	2	1	1	**35**	$50,000	2015/16

	AS AT:	16/11/2012		ENVIRONMENT				FLOODING					SAFETY						
PRIORITY	VILLAGE	STREET	Details	Sensitivity	Dist.to Watercourse	Soil Erodibility	Discharge Volume	Frequency	No.of people affected	Depth	Velocity	What is Flooded?	Traffic	Adult Pedestrians	Children	Damage to Property	PRIORITY SCORE	Estimate	Capital Works Year
35	Vincentia	Frederick Street	Please see D11/43228, need to investigate the matter	1	1	1	3	2	2	1	3	3	2	1	2	2	**35**	$80,000	2015/16
36	Sanctuary Point	7 Pelican Street	D12/264119	3	1	1	2	2	1	2	2	4	2	1	1	2	**35**	$120,000	2015/16
37	Lake Conjola	3 Karingal Place	D12/135619	2	2	1	1	3	3	2	1	3	1	1	1	2	**35**	$160,000	2015/16
38	Basin View	141 - 157 Basin View Pde	Refer to D12/54709 - water ponding, KG maybe required.	3	2	1	1	1	3	2	1	2	4	3	1	1	**34**	$65,000	2015/16
39	Vincentia	85 Waldegrave	Drainage in vincinity of area not coping with volume of flows, need to invesigate catchment. Flooding of yard (storm 09/01/2011)	1	1	2	2	3	1	2	2	2	1	2	3	2	**34**	$90,000	2015/16
40	Sanctuary Point	12 Mountain Street	Very low lying area, drainage infrastructure required, need to weigh out cost benefit. MERIT 207688	3	2	1	1	3	2	2	1	2	2	1	1	2	**33**	$120,000	2015/16
41	Basin View	141 to 157 Basin View Pde	See D12/54709 and Tim file 7983E for history	3	2	1	2	2	3	1	1	2	3	2	1	1	**33**	$70,000	2015/16
42	Nowra	76 Douglas St	There is an ongoing problem with stormwater flooding from the roads on either side of the property and reserve into Mrs Apperley's property causing considerable damage. Mrs Apperley has photographs of this latest incident if you wish to see them. (storm in 2008)	2	1	2	2	1	1	1	2	3	3	2	2	2	**32**	$65,000	2015/16
43	Sanctuary Pt	1 Fairway Dr	Stormwater drain on cnr Park Drive & Fairway Drive, Sanctuary Pt 'does nothing'. Apparently the water needs to run up hill to go into the drain. Water flooding onto the road. Please inspect. (storm in 2008)	3	1	2	2	2	2	1	2	1	3	2	2	1	**32**	$80,000	2015/16
44	Badgee (Sussex Inlet)	Fairview Cres	Please see D09/221723. Not high priority	3	3	2	2	1	1	2	2	2	1	2	2	1	**32**	$60,000	2015/16
45	Vincentia	38 Waldegrave Crescent	Water is running across their block. There is an easement on the right hand side but no drain to collect the water. Need to investigate no. 85	1	1	1	3	1	1	2	3	3	2	1	1	2	**32**	$50,000	2015/16
46	Sanctuary Point	Karne St	See 36574E - This is more then a driveway issue.	3	1	1	2	2	1	1	2	3	3	1	1	2	**32**	$150,000	2015/16
47	Culburra Beach	Eastwood Ave	Water ponding issues on road, need to design kerb and gutter and associated drainage.	2	2	1	2	3	3	1	1	1	3	1	1	1	**31**	$100,000	2016/17
48	Hyams Beach	11 Baysview Ave	Side of a hill, property below road level which seems to be the main issue. Very limited verge need to investigate further. See D11/23992	1	1	2	3	1	1	1	3	3	2	1	1	2	**31**	$30,000	2016/17
49	Vincentia	29 Excellent Street	Illegal driveway built over drainage easement, no pit/headwall at bottom of easement to recieve water. Council will need to extend a drainage line to this easement. See D12/40301	1	1	1	2	2	1	2	2	3	2	1	1	2	**31**	$65,000	2016/17
50	Fishermans Paradise	Anglers Pde	See Phil Milton design. Need a site visit.	3	3	2	2	1	1	1	3	1	1	1	2	2	**30**	No Estimate	2016/17
51	Callala Bay	Chisolm St	Between Emmett & Sheaffe Sts.File No 1684. See also council meeting 20th Feb 2005 item 224. Not a a high priority unless combined with road funding. Pipe roadside drains.	1	1	2	1	2	2	1	1	3	2	1	1	2	**29**	$100,000	2016/17
52	Shoalhaven Heads	10 Discovery Place	Defected Stormwater Line within the easement. It was apparently replaced previously but has failed, need to consider replacing the pipe.	2	2	1	2	1	1	1	2	1	3	2	2	3	**29**	$100,000	2016/17
53	Currarong	39 Walton Way	Pit has not got enough capacity (grate only), need additional pit. See MERIT no. 188026 for more detail	1	2	1	1	1	1	2	1	3	3	2	1	1	**28**	$25,000	2016/17
54	Orient Point	9 Orient Ave	Sag point, needs drainage assessment to determine solution. Catchment is small (D11/268374)	2	1	1	2	2	1	2	1	3	1	1	1	1	**28**	$80,000	2016/17
55	Lake Conjola	35 Edwin Street	See D12/165214	2	3	1	1	3	1	1	1	2	2	1	1	1	**28**	$100,000	2016/17
56	Orient point	Ormonde Cres	24/2/05 No 9. (Mr Pilz).Water running through property and also into garage (Walsh) in Orama Cres.	2	2	1	1	1	1	1	2	3	1	1	1	2	**27**	$50,000	2016/17
57	Vincentia	25 Anne Street	Stormwater run off coming from the road into Ms Stephens' property. Please inspect. (storm in 2008)	2	1	1	1	1	1	1	1	3	2	2	2	2	**27**	$150,000	2016/17

	AS AT:	16/11/2012		ENVIRONMENT				FLOODING					SAFETY						
PRIORITY	VILLAGE	STREET	Details	Sensitivity	Dist.to Watercourse	Soil Erodibility	Discharge Volume	Frequency	No.of people affected	Depth	Velocity	What is Flooded?	Traffic	Adult Pedestrians	Children	Damage to Property	PRIORITY SCORE	Estimate	Capital Works Year
58	Mollymook	Mollymook Beach	File 7531E D12/31415,where a visitor to the area has expressed their concerns about stormwater discharge onto Mollymook Beach. It is a 900mm dia. which drains Mollymook as far back as Seaview St and discharges at the intersection of Golf Av and Ocean St through the sea wall straight on to the beach with resultant ponding depending on the shape of the beach and beach berm. The water is sometimes discoloured and with traces of litter.To place any permanent material at the outfall ,gabion mattress or concrete, would also constitute a hazard. It may be possible to fit a trash rack at the outfall but that would be an extra task to service it.	1	3	3	2	1	1	1	2	1	1	2	1	1	**26**	$150,000	2016/17
59	Ulladulla	St Vincent St	S94 (05DRAI 2112 - 87.9% SCC)	2	2	1	2	1	2	1	2	1	2	1	1	1	**26**	$40,000	2016/17
60	Sanctuary Pt	Nulla Pl	No.5 nearly flooded Sept 2001. Overflow path in reserve required.	3	1	1	2	1	1	1	1	3	1	1	1	2	**26**	$50,000	2016/17
61	Sanctuary Pt	Sirius Ave	Possible K&G and/or extend pipeline to split catchment in half. Tabledrain cannot cope. Also look at easment through No16 escape route not adequate. Also No95 Sanct Pt Rd has pipe but there is no easement.	3	1	2	2	1	1	1	1	3	1	1	1	1	**26**	$80,000	2016/17
62	Vincentia	Edward St	Flooding of 16 Edward St, insufficent escape path Concept design for future drainage program - Pipe between Beach st and Duncan St. There is already pipe crossings at a number of properties, which appear to to inadequate for a significant event.	1	2	1	1	2	1	1	1	3	1	1	1	2	**26**	$100,000	2017/18
63	Basin View	Reserve Rd	Proposed cul de sac requires outlet. Need to acquire an easement through the school property. No consequences at present. Will become an issue if DA lodged on adjacent land.	3	1	2	1	1	1	1	1	3	1	1	1	1	**25**	$100,000	2017/18
64	Greenwell Point	15 Greenwell Point Rd	Related to Comarong Street Drainage works, Mrs Kimpton is complaining about erosion and sedimentation issues dowstream of the easement (Rossmans and Conserv), drain is not effecting property.	2	3	2	2	1	1	2	1	1	1	1	1	1	**25**	$30,000	2017/18
65	Bomaderry	101 Lyndhurst Drive	D12/96230	2	1	1	2	1	1	1	1	2	3	2	1	1	**25**	$7,000	2017/18
66	Broughton	29 Boundary Road	DW has previously inspected this one. Pipe has been blocked since upgrade of road occurred. Large rock has punched through the pipe during filling over culvert and was never rectified before sealing. Will be major job to dig up and repair (Capital Works). The size of pipe should be checked as well for capacity. MERIT 33695	1	1	2	3	1	1	2	2	1	1	1	1	1	**25**	$100,000	2017/18
67	Old Erowal Bay	The Coronado	Ms Tyrell-#34 - discharge from reserve	2	2	1	1	1	1	1	1	3	1	1	1	1	**24**	$90,000	2017/18
68	Bawley Point	Oriole St	Install a letter box pit at the intersection and piped into the drainage reserve through the Council land between Nos: 3 & 5 Oriole Street	2	2	1	1	2	1	1	1	2	1	1	1	1	**24**	$100,000	2017/18
69	Kings Point	Park Drive	Restore natural channel (bioswale) or extend the existing 3 x 600mm RCP pipes to lake. Sediment basin not working and is obsolete	3	3	1	3	1	1	1	1	1	1	1	1	1	**24**	$150,000	2017/18
70	Sanctuary Pt	Larmer Ave	Pipe open drain adjacent No294 The Park Dr	3	3	1	1	1	1	1	1	1	1	2	2	1	**24**	$40,000	2017/18
71	Woollamia	Seasongood Rd	No 21 Extend pipe system to prevent water crossing priv. Prop. (Mike Brunton).	1	1	2	1	1	1	1	1	3	1	1	1	2	**24**	$80,000	2017/18
72	Sanctuary Pt	Sanctuary Point Road	Drainage corner approach and acquire easement over 52 Sanctuary Point Road (currently in progress) and over Bunnarong Investiments land.	3	2	2	2	1	1	1	1	1	1	1	1	1	**23**	$40,000	2017/18

	AS AT:	16/11/2012		ENVIRONMENT				FLOODING					SAFETY						
PRIORITY	VILLAGE	STREET	Details	Sensitivity	Dist.to Watercourse	Soil Erodibility	Discharge Volume	Frequency	No.of people affected	Depth	Velocity	What is Flooded?	Traffic	Adult Pedestrians	Children	Damage to Property	PRIORITY SCORE	Estimate	Capital Works Year
73	Worrigee	17 Golden Ash Cl	D12/86522	2	1	1	2	1	1	1	2	1	2	1	1	1	**23**	$15,000	2017/18
74	Berry	North St	No.118 - No.126. Frequent bypass through properties. Garage @ No.118 flooded twice in 10 years.	1	1	1	2	1	2	1	1	2	1	1	1	1	**23**	$180,000	2017/18
75	Nowra South	Old Southern Road	House No.179. Pipe remaining part of easement. Must investigate further easement requirements through private property.	1	1	1	1	1	1	1	1	3	1	1	1	1	**22**	$80,000	2017/18
76	Old Erowal Bay	McGowen St	House No. 4 must create drainage easement, construct the remaining part of the existing 375mm pipe to reserve.	3	2	1	1	1	1	1	1	1	1	1	1	2	**22**	$100,000	2017/18
77	Ulladulla	Camden St	Interallotment Drainage S94 (05DRAI 2010 - 22% SCC)	1	1	1	1	1	2	1	1	1	1	1	1	1	**20**	$100,000	2017/18
																	Total	$7,402,000	

Shoalhaven City Council

Catchment Based Stormwater Reviews and

Revised Urban Stormwater Quality Management Actions

Background

Shoalhaven City Council commenced a comprehensive review of the Stormwater Management Plan (SMP) in 2002 via a process advocated by the Southeast NSW and Illawarra Stormwater Extension Officer (SEO) Program hosted by the former EPA.

The SMP audit process commenced in 2003, revealed that 25% of all actions in the original Plan had been completed. It was also clear that many actions, such as education initiatives, while progressed, required repetition to maintain their effectiveness and needed to be kept in the Plan as ongoing actions.

Also apparent upon review was a bias in the remaining actions for end-of-pipe solutions. These end-of-pipe solutions were considered in many places to not be in keeping with characteristics of local soils or the general shift towards source control being fostered by State Government agencies such as the former EPA (now DEC) and the former DLWC (now DNR). To comprehensively review the SMP was identified as a medium term process and one that required sustained effort within the capacity of available resources.

The SMP Review has progressed as follows using the following stepped approach:

1. Estuary (receiving water) Sensitivity analysis;
2. Sub-catchment mapping
3. Hydraulic assessment;
4. Water quality action review and refinement; and
5. Drainage program action review and refinement.

The review process was first applied to St Georges Basin due to its high ranking in the sensitivity analysis supported by numerous community reports

of poor quality stormwater and sediment loads being influent to the basin during wet weather. Results of this initiative have been substantial and demonstrated an ability to identify sources and control them. In St Georges Basin key catchments were identified by their percentage contribution to overall urban runoff volumes and identification of sources. Unsealed road verges were identified as primary sources of erosion and sediment following pilot works funded under the Urban Stormwater Quality Management Plan..

On the basis of the strength of the approach grant funding was applied for and won via the Estuary Management Program to carry out the same review process in other catchments identified as being associated with sensitive receiving waters. These locations are as follows:

- Currarong;
- Narrawallee;
- Lake Conjola (Fishermans Paradise and Manyana included);
- Burrill Lake (Kings Point inclusive);
- Lake Tabourie;
- Millard's Creek (Ulladulla Harbour)

This report provides details of the review for the above-mentioned locations and a review of the SMP actions in relation to those locations.

Council wishes to acknowledge that this strategic review would not have been possible in the abovementioned towns without the financial assistance of the NSW Estuary Management Program.

Objectives

The objectives of Shoalhaven City Council's Stormwater Management Plan Review process are consistent with the objectives as stated within the original Plan. The long- term management objectives, which have been considered to contribute to the focus of the review process, have been included within the review process in determining recommended stormwater management options and actions. These objectives include:

- Ensure that water quality in the catchment meets the appropriate water quality objectives;

- Public health and safety is not to be compromised by the stormwater system;

- Ensure development meets the stormwater management objectives;

- Protect and restore waterways within the catchment; and,

- Protect and restore riparian, estuarine foreshore and bushland ecosystems.

With the focus of the review process being a shift towards source control of sediment and nutrient exportation from the catchment to the receiving water bodies, the objectives of the review include;

- Review existing stormwater management options and actions in light of the strategic information provided through catchment and water quality modelling;

- Recommend improved and newly identified stormwater management actions with the focus of source control measures focusing on the following;

    1. An improvement in the quality of sensitive receiving waters for the identified urban areas within the review process;
    2. A decrease in the nutrients and sediments exported from urban areas; and
    3. Where appropriate, seek the opportunity for innovative and environmentally sensitive stormwater and drainage design.

    The above objectives address key management priorities derived from analysis of all actions contained in current Natural Resource Management Plans held by Council:

    1. Water Cycle Management, which includes drainage, entrance and flood management; and
    2. Biodiversity Conservation, which includes habitat connectivity and vegetation management.

Through the achievement of the outlined objectives, it is envisaged that the receiving waters within the Shoalhaven district will be better protected from potentially negative impacts of poor stormwater quality than possible using the original plan with its end of pipe focus and lack of strategic catchment analyses. This will contribute towards the long-term viability of estuarine, riparian and foreshore areas that receive stormwater from urban areas and formal drainage infrastructure.

Methodology

For the targeted urban catchments, a hydraulic assessment and water quality model has been prepared. This provides the intelligence and necessary data for targeting water quality improvements and recommended stormwater and drainage management options within:

1. Currarong
2. St Georges Basin

3. Manyana (Lake Conjola)
4. Fishermans Paradise (Lake Conjola)
5. Lake Conjola
6. Conjola Park
7. Narrawallee
8. Kings Point (Burrill Lake)
9. Burrill Lake
10. Lake Tabourie

The process has required the following to be undertaken:

- Check Section 94 Plans for existing information and designs;
- Define catchments from topography;
- Define sub-catchments taking into consideration existing drainage structures and roads;
- Calculate the area for each sub-catchment;
- Define outlet point of each sub-catchment;
- Identify network linkage and draw skeleton of node model;
- Calculate cumulative time of concentration down flow paths for 5, 20, & 100 year Average Recurrence Intervals.
- Calculate discharge for each sub-catchment for the above mentioned events;
- Calculate the total average annual nutrient and sediment loading of each sub-catchment; and
- Enter data into GIS format.

The completion of hydraulic information and water quality modelling has allowed a review of the existing water quality actions to be undertaken. This consists of:

- Identify locations where water quality treatment measures would have greatest capture;
- Review existing actions efficiency and effectiveness in light of strategic information;
- Design options using strategic information where appropriate;
- Enter options into Plan and prioritise using existing EPA system (environmental parameters, including, distance to water course, slope, soil erodibility and vegetation cover); and,
- Progress process to next town and repeat.

1. Urban Catchment Analyses

The catchment areas were defined by the physical geography of the varying environments. The determination of sub-catchments has been achieved in the field through an analysis of local drainage networks in association with localised topography and road design. This analysis has allowed for the identification of flow paths into drainage networks and outlet points to be

recognised, thus determining each engineered sub-catchment inclusive of formal and informal drainage infrastructure.

The catchment data obtained within the field was transferred and into GIS format. This has allowed for the overlay of a number of data sets including drainage networks, outlet points, contour lines, sub-catchment boundaries and flow paths within each sub-catchment.

Through processing the catchment data into GIS format, specific catchment details have been determined and are available electronically for manipulation. The following catchment details have been determined as follows, and have been used to form the basis of sub-catchment mapping:

- The area of individual sub-catchments has been calculated automatically through the use of GIS software (ARCGIS 9);
- The length of each sub-catchment is defined as the longest flow path within individual catchments; and
- The slope of each sub-catchment has been calculated through the use of a simple equation, 100/length * fall.

2. Hydraulic Analysis

- Flows were calculated based on Council's DCP100 Engineering Design Specification D5 Stormwater Drainage Design.
- Average Recurrence Intervals. In Residential Zonings, a 5 year ARI has been adopted for minor drainage infrastructure and major flow paths identified and checked for adequacy.
- Flows for 20 year and 100 year ARI have also been calculated to indicate the capacity of major events and the adequacy of drainage infrastructure.
- The Rational Method Q = CIA/360 has been employed in determining the peak flow rate.
- Intensity Frequency Duration (IFD) tables for Sussex Inlet, Milton and Ulladulla has been adopted.
- The Kinematic Wave equation and RARE (ver.2.19) software have been used to determine overland flows.
- Time of Concentration. Has been calculated from the Kinematic wave equation. However a maximum of 20 minutes has been adopted for the existing Residential (2a) as required by DCP100.
- Percentage Impervious. 25% for Rural Residential, 50% Residential (2a), 60% Residential (2c).
- Overland Flow Retardance. (n*). 0.25 for the existing Rural Residential land based on the premise that the large blocks are not all forested but contain a dwelling with surrounding cleared area. Values for Residential (2a) can vary greatly, however, 0.125 has been adopted based on 50% being impervious and it meets with the DCP100 requirement for maximum time of concentration of 20min. For Residential (2c), 0.10 has been adopted based on the fact that 60% of the land will be impervious i.e. [(0.6*0.02) + (0.4*0.2)].

3. Water Quality Modelling

The technique employed for the calculation of the average annual total suspended solids (TSS), total phosphorous (TP) and total nitrogen (TN), has been adopted from Managing Urban Stormwater, Strategic Framework (1996). The technique has been used to undertake an order of magnitude analysis of the sediment and nutrient loads for selected catchments with receiving water bodies. The constant concentration equation is as follows:

L = PC« CA

- L = average annual load (kg)
- P = average annual rainfall (mm)
- C«=annual average volumetric runoff coefficient (dimensionless)
- A = catchment area (km2)
- C = average (log-mean) event mean pollutant concentration (EMC) (mg/L)

The data, which has been used within the constant concentration equation, has been obtained from a number of sources including average annual rainfall data obtained from the Bureau of Meteorology rain gauge stations (Milton Post Office, and Ulladulla). Whilst for the northern catchments, including Currarong and St Georges Basin, relevant rain stations have been utilised including Pt Perpendicular and Booderee National Park. Annual average volumetric runoff coefficients and average (log-mean) event mean pollutant concentrations have been adopted from the Managing Urban Stormwater, Strategic Framework, 1996, with a number of alterations being made based on individual catchment characteristics.

Estuary Sensitivity Analysis and Ranking

Council has undertaken a coarse sensitivity analysis of the receiving water bodies into which urban runoff is discharged to prioritise the urban areas for application of the review process. The criteria applied for the determination and ranking of sensitivity for estuarine waters is as follows:

- Rank receiving water bodies trapping efficiency (high medium low);
- Area of urban development in catchment (%);
- Soil erodibility [slope inclusive] (high medium low); and
- Presence/Absence of Sewer.

The results of the sensitivity analysis are presented in Figure 1. The priority list is only a basic guide and the order may change to some extent according to natural estuarine processes and responses to catchment activities. However, Council is broadly following this approach.

Estuary Sensitivity Analysis: Stormwater Management Plan Review

Catchment	Entrance condition (1,2,3,4)		Sewered (1,0)		Tidal Flushing (1,2,3)		Urban %(1,2,3,4)		Soil Erodibility (1,2,3)		Priority Scoring Total	Priority ranking
Weight		25%		15%		20%		20%		20%	100%	1= Highest
Burrill Lake	ICOL open	2	Y	1	L	3	5%	5	High	3	69	2
Lake Wolumboola	ICOL closed	4	Y	1	M	2	7%	7	Mod	2	69	3
St Georges Basin	ICOL Constricted	3	Y	1	L	3	5%	5	High	3	75	1
Narawallee	Open	1	Y	1	H	1	2%	2	Mod	2	42	9
Jervis Bay	Open	1	Y	1	H	1	2%	2	Mod	2	42	9
Ulladulla Harbour	Open	1		1		1	75%	75	Mod	2	61	5
Shoalhaven River	Open	1	Y	1	M	2	8%	8	Mod	2	50	7
Swan Lake	ICOL closed	4	Y	1	L	3	2%	2	Low	1	67	4
Kangaroo Valley	Open	1		0		1	0.10%	0.1	High	3	33	12
Currarong	Open	1	N	0	M	2	7%	7	Mod	2	35	11
Lake Tabourie	ICOL closed	4	N	0	L	3	2%	2	Mod	2	59	6
Lake Conjola	ICOL open	3	N	0	M	2	1%	1	Mod	2	46	8

* ICOL: Intermittent Closed & Open Lake

Figure 1. *Estuary Sensitivity Analysis*.

References

1. Murray, E. Smith, G. Haese, R. Heggie, D. (2004) *St Georges Basin Nutrient Survey – Results Summary For Shoalhaven City Council*. Geosciences Australia.

2. NSW Department of Public Works and Services. (1998). *Currarong Creek Water Quality Monitoring strategy*. NSW Department of Public Works and Services.

3. NSW Department of Public Works and Services. (1999). *Currarong Sewerage & Effluent Management Strategy Study*. NSW Department of Public Works and Services.

4. NSW Environment Protection Authority. (1996). *Managing Urban Stormwater – Strategic Framework.* Environment Protection Authority.

5. Webb, Mckewon & Associates. (1996). *St Georges Basin Estuary Management Plan.* Webb, Mkewon & Associates Pty, Ltd.

6. Shoalhaven City Council. *(1998) Lake Conjola Estuary Management Plan.* Shoalhaven City Council.

7. Shoalhaven City Council. *(2002) Narrawallee Inlet Natural Resources Management Strategy.* Shoalhaven City Council.

8. Shoalhaven City Council. *(2002) Burrill Lake – Estuary and Catchment Management Plan.* Shoalhaven City Council.

9. WBM Oceans Australia. *(2003) St Georges Basin Foreshore Erosion Study.* WBM Oceans Australia.

10. Willing & Partners. (2002). *City of Shoalhaven Urban Stormwater Management Plan.* Crows Nest NSW.

11. Boyd, R., Dalrymple, R., and Zaitlin, B. A. (1992). *Classification of clastic coastal depositional environments.* Sedimentary Geology. 80:139-150.

Attachment 5 – Priority List

Site Location		Site Characteristics			Environment					Issue	Original SMP Options	Revised Management Options
Location	Street	Drain/ Open Channel/ other	Flow Priority	Existing Maintenance	Sensitivity	Slope	Soil Erodibilty	Veg Cover	Priority Score out of 18			
Old Erowal Bay	Prentice Ave	Open Channel	3	3	3	1	3	3	16	Erosion and Scouring of open channel contributing to downstream sedimentaion	Nil	Bitumen road verge sealing.
Ulladulla	Banister Head Rd, opppisite Anker road	Cliff face	2	3	2	3	3	2	15	Erosion & undercutting of cliff face, informal access tracks	Nil	Redirect flow path into drainage easement with the installation of a grassed swale drain
Wrights Beach	Fisher Rd	Gurunby Ck	2	3	3	2	2	3	15	Clearing of stream bank vegetation has allowed for incresed erosion of the stream bed and banks and also the widening of the stream channel. This has incresed downstream sedimentaion and flow velocity.	Nil	Installation of Environpods
Sanctuary Point	Edmund St	Table Drain	2	3	3	1	2	3	14	Erosion of road verge/table drain	Nil	Bitumen road verge sealing
Ulladulla	Cnr Church & Camden St	Road Verge	2	3	2	1	3	3	14	Erosion of road verge/table drain	Nil	Extend stormwater oulet to natural or artificial bedrock material with dissipation bed at exit point. Reset adjacent pit lid
Ulladulla	Cnr Ian st	Road Verge	2	3	2	1	3	3	14	Erosion of road verge/table drain	Nil	Stabilise bank at scour point. Install velocity dissipators.
Ulladulla	Cnr Vincent & Ian st	Road Verge	2	3	2	1	3	3	14	Erosion of road verge/table drain	Nil	Refer to SCC enginers for site review
Wrights Beach	Fisher Rd	Head Wall	1	3	3	1	3	3	14	Collapsed headwall - erosion of the	Nil	Installation of Environpods
Wrights Beach	Wrights Beach Rd & Cnr Fisher Rd	table drain	2	3	3	1	2	3	14	Insufficient escape path of water into drainage easement. This is causing localised erosion and sedimentaion	Nil	Installation of Environpods
Kings Point	James Cr	Open Drain	2	2	3	2	2	2	13	Erosion of open channel	Installation of Biomat	Geotechnical stabilisation (enviromat)
Sanctuary Point	Allen St (Sth)	Table Drain	1	3	3	1	2	3	13	Erosion of road verge/table drain	Nil	Bitumen road verge sealing
Sanctuary Point	Piper Ave (Sth)	Table Drain	1	3	3	1	2	3	13	Erosion of road verge/table drain	Nil	Bitumen road verge sealing
Sanctuary Point	Walmer Ave	Table Drain	1	3	3	1	2	3	13	Erosion of road verge/table drain	Nil	Bitumen road verge sealing
Ulladulla	Church St	Road Verge	2	2	2	1	3	3	13	Erosion of road verge/table drain	Nil	Outlet protection, energy dissipation and bank stabilisation
Ulladulla	Cassia Cl	Confluence/ outlet	2	3	2		3	3	13	Erosion of stormwater outlet, channel & banks	Nil	Stabilise bank at scour point. Install velocity dissipators.
Ulladulla	Banister Head Rd	table drain	2	2	2	2	2	3	13	Failing matting & bitumen seal contributing to localised erosion & sedimentaion	Nil	With the area having a low volume of traffic the installation of a grassed swale drain with the use of geofabric is reconmended
Old Erowal Bay	Fitzpatrick St	Open Channel	2	2	3	1	3	1	12	Erosion and Scouring of open channel, high sediment loading	Net tech 600	Source control - litter baskets/enviropod
Burrill Lake	Commonwealth	Drain	1	2	1	2	3	2	11	sediment load	Nil	verge sealing and shoulder construction to divert flow to formal network away from overland flow path
Burrill Lake	Commonwealth	Drain	1	2	1	2	3	2	11	erosion along power easement	Nil	flow interception cross slope to reduce scour potential
Wrights Beach	Wrights Beach Rd	table drain	1	2	3	1	2	2	11	Insufficent roadside drainage is causing the failure of the road verge and localised erosion and sedimentaion.	Nil	Installation of Environpods
Ulladulla	Carramar Cr/adjacent to rear lot 27 Carramar Cr	outlet	2	3	2		3		10	Erosion	Nil	Revise for Inclusion
Ulladulla	Sapphire Cl & Leigh Cres	Easement	2	3	2		3		10	Deep scouring from outlet pipe from leigh Cres to sth path at easement footbridge contrbuting to localised erosion & downstream sedimentation	Nil	Monitor
Ulladulla	North st	substructure of road	2	3	2		3		10	Significant scour point beneath piping & substructure of road bridge.	Nil	Stabilise at scour point & install velocity dissipators
Ulladulla	Leigh Cr	Easement	2	3	2		3		10	Deep scouring at esaement footbridge contributing to localised erosion & downstream sedimentaion.	Nil	Stabilise at scour point. Undertake risk assessement of impacts of redundant infrastructure.
Ulladulla	Reserve rear lot 28, 28a North st & lot 23 Wattleale Pl		2	3	2		3		10		Nil	Stabilise at scour point & install velocity dissipators, repair siltation trap on maintenance vehicle access track

Site Location		Site Characteristics			Environment					Issue	Original SMP Options	Revised Management Options
Location	Street	Drain/ Open Channel/ other	Flow Priority	Existing Maintenance	Sensitivity	Slope	Soil Erodibilty	Veg Cover	Priority Score out of 18			
Ulladulla	Budawang Dr	Confluence	2	3	2		3		10	Heavy flood flows - erosion is encroaching southwards	Nil	Bank stabilisation works & water diversion/dissipation
Ulladulla	Rear of UPS at Camden St	outlet	2	3	2		3		10	Deep scoring occuring at stormwater oulet discharging at the creek rear of UPS contributing to localised erosion & downstream sedimentaion	Nil	Bank rehabilitaion & stabilisation work
Ulladulla	Camden st	concrete weir	2	3	2		3		10	Scouring of creekbank as a result of channelled water flow from concrete weir. Redundant infrastructure including concrete & asbestos pipes	Nil	Reshape and formalise failed sections of table drain with growth matting '
Ulladulla	St Vincents st	weir	2	3	2		3		10	Deep scoring occuring at stormwater oulet discharging adjacent to road bridge contributing to localised erosion and downstream sedimentaion.	Nil	**1.** Short term remediation to prevent further impacts upom the creek system **2.** Design of strucutural works to provide long term stabilisation and rehabilitaion of the creek. This will incorporate the installation of a several pool and riffle systems to slow the velocity of the flow and minimise erosional impacts and also the revegetaion of the stream banks
Lake Tabourie	Allen St (Sth)	tabledrain & pipe system	1	2	3	1	1	1	9		Nil	sub-catchment capture potential poor, focus on education, 2 workshope Xmas and Easter and Drain stencilling for all pit inlets.
Currarong	Piscator St		2	2	1	2			7	Litter, Sediment & Nutrients	Nil	Regrade creek banks, line with geofabric, Instalation of rip rap protection to minimise flow velocity, bank stabilisation at scour point.
Currarong	Merimbula St	Drain	2	2	1				5	Litter, Sediment & Nutrients	Nil	Channel stabilisation and rip rap outlet protectionm (filtration, minimise scouring)