CATCHMENT, STORMWATER AND RIVER MANAGEMENT STRATEGY : FINAL DRAFT

[Approved by Council : 22/07/02]

City of Cape Town
DEVELOPMENT SERVICE

Transport, Roads & Stormwater Directorate

CATCHMENT, STORMWATER AND RIVER MANAGEMENT

STRATEGY 2002 - 2007

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Foreword

Cape Town, a fast growing city, faces the challenge of promoting economic and social development against the backdrop of a rapidly burgeoning population. The Council of the City of Cape Town is committed to making Cape Town a world-class city in which the quality of life of every citizen steadily improves. Catchment, Stormwater and River Management forms an important component of the package of services provided by the city, necessary to achieve this goal.

Good management of both the natural and man-made components of the drainage system adds value to our urban environment and protects us from floods and health risks related to poor water quality. This document details a proactive strategy to achieve these objectives.

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Document Overview and Purpose

There is a growing movement at local, regional and national level to ensure improved and integrated management of urban drainage systems in a manner, which balances competing and often divergent needs of the community, such as:

- Flood protection.
- Ecological enhancement and protection of aquatic systems.
- Cultural, recreational and economic opportunities.

National legislation such as the Constitution, National Water Act, Environmental Conservation Act and the Municipal Systems Act have also imposed further more stringent statutory requirements on Council to address these needs in an equitable manner. In addition, Council during December 2000 set various 'term of office' developmental goals and now seeks to ensure the various service strategies contribute effectively to their achievement.

In an effort to rise to these challenges, this strategy provides a comprehensive framework to guide management of stormwater systems for the sustained benefit of the city's residents, business concerns and visitors alike.

The document provides some basic insight into the issues and challenges facing the service and details a multi-faceted strategy to achieve community needs and expectations.

Executive Summary

A paradigm shift in approach to stormwater and river management has developed over the past few years, based on the philosophy of integrated catchment management. This document provides basic insight into the issues and challenges facing the catchment, stormwater and river management service and details a multi-faceted strategy to achieve community needs and expectations.

The following are the major drivers requiring formulation of a strategy for the service:

- Population growth and the concomitant adverse impacts of development on natural drainage systems (ie. increased runoff and pollution)
- Heightened community expectations for good drainage, flood protection and ecologically healthy rivers.
- Increased pressure on available open land within the city and the need to protect urban river corridors, wetlands and other drainage routes.
- The water scarce nature of the region and the increasing need for integrated urban water resource management.

Whilst the traditional role of stormwater management remains undiminished, namely to minimise the impacts of flooding, more emphasis is now placed on the following:

- An integrated and co-ordinated catchment based planning approach founded on good understanding of local needs and values. Decisions now incorporate water quantity, water quality and socio-economic considerations in support of broader city objectives. It is further recognised that there is strong interrelationship between human health, the environment and development.
- Protection of urban water resources; including rivers, wetlands, vleis, subsurface and coastal waters from the potentially harmful impacts of development through the reduction of pollutant loads as near to source as possible.
- Development of innovative infrastructure solutions that are cost effective, sustainable in terms of future maintenance requirements, environmentally sensitive and maximise social and amenity value.
- Involvement of communities and other stakeholders in the management of river systems through catchment forums. This includes efforts to promote other beneficial uses of stormwater and river systems through educational programmes and capacity building initiatives.

The desired outcomes of the service are as follows:

- Effective stormwater drainage
- Managed flood risks (for residential, industrial and commercial properties)
- Improved water quality (surface, ground and coastal waters)
- Ecologically healthy rivers, vleis and wetlands
- Multi-functional, sustainable use of river corridors and stormwater drainage facilities

This strategy aims to build upon past successes and entrench a proactive and integrated approach to stormwater and river management within the metropolitan area. Whilst the majority of actions in terms of the strategy are the responsibility of the Catchment, Stormwater and River Management Branch, commitment and support from various other service delivery units and key stakeholders is also required. Successful implementation can only be achieved within a co-operative political and corporate management climate.

Flowing from an in depth evaluation of current management practice, development trends and best practice, six strategic focus areas have been identified as indicated in the tabulation below. Holistic planning and management represents the nucleus of the strategy.

Strategic Focus Areas	**Supporting Programmes**
Holistic Planning and Management	1. Catchment, Stormwater and River Planning 2. Integrated Urban Water Management
System Development, Upgrading and Maintenance	1. Stormwater Management Guidelines and Design Criteria for New Developments 2. Risk Based Approach to Upgrading and Maintenance 3. Infrastructure Management System 4. Environmentally Sensitive River Maintenance
Public Safety and Environmental Protection	1. Flood Disaster Mitigation 2. Water Pollution Abatement
Information Management	1. Information Systems 2. Data Bureau Services
Regulatory	1. Control of Development near Watercourses 2. By-Laws 3. Tariff Funding Options
Relationship Management	1. Management Integration Mechanisms 2. Customer Care 3. Staff Development 4. General Education Initiatives 5. Partnership Development

Responsibility for development of this strategy and underlying policy or approach is that of the Transport, Roads and Stormwater portfolio committee with the concurrence of Council. A pragmatic and flexible approach to implementation of the strategy is however required, as it's success hinges on access to resources and the support of the underlying philosophy and approach by a wide range of business units.

Review of progress in implementing the strategy will be undertaken annually. These reviews would include an assessment of the progress in implementing the various priority programmes as well as the critical evaluation of success or otherwise in achieving the desired strategic impacts and outcomes.

Actual reporting on various key performance indicators will be achieved through Council's annual Sate of the Environment Report prepared in terms of the Integrated Metropolitan Environmental Policy. Annual reports prepared specifically for the service will also be utilised for this purpose.

1. Situational Analysis

1.1 Geographic and Socio-Economic Context

The Cape Metropolitan Area, which measures approximately 2500km^2 in extent, is surrounded by the Atlantic Ocean to the west and south, with the most prominent landmass being the Cape Peninsula, linked to the mainland by the sandy Cape Flats. The Hottentots Holland and Helderberg mountain ranges enclose the area to the east. Being a Mediterranean climate, the area experiences mild but wet winters and dry summers. Annual average precipitation varies between 550mm pa on the Cape Flats to in excess of 1700mm pa over the surrounding mountainous areas. These variable geographic conditions and rainfall gradients contribute towards many diverse and unique natural habitats.

The metropolitan area is charactarised by unparalleled beauty and cultural diversity with well-developed infrastructure being home to some 3.1 million residents. This figure is expected to grow to 4 million by the year 2015 representing an annual growth rate of 2.6%. Approximately 30% of the city's residents currently live below the poverty datum line, many within informal settlements or "backyards" within formal residential areas. The current formal housing backlog totals 230 000 units and is increasing on an annual basis. These factors have resulted in the establishment of large informal settlements, many of which are located in poorly drained or flood prone areas. A diverse economy comprising predominantly manufacturing and service industries (incl. tourism) has ensured sustained and rapid development in the area over the last few years.

1.2 Historic Approach to Stormwater Management

Cape Town's unique rivers, wetlands, vleis and estuaries, form important 'green corridors' between the mountains and coastline as well as providing habitats for a rich diversity of terrestrial and aquatic life. The major river systems and associated catchment areas within the metropolitan area are illustrated in Figure 1.

In the past, these natural features have been viewed as convenient drains to convey urban waste and storm runoff. Many rivers were canalised while some wetland areas in-filled and drained to allow for urban development, dramatically altering runoff patterns. In retrospect, this approach has inadvertently also precipitated a decline in water quality with concomitant adverse effects for human health and welfare (viz. pollution of recreational waters) as well as the ecological integrity of the city's rivers and vleis. In addition, potential community interaction with rivers and wetlands has been seriously compromised.

1.3 Environmental Drivers

The following are the major drivers requiring formulation of a strategy for the service:

- Population growth and the concomitant adverse impacts of development on natural drainage systems (ie. increased runoff and pollution)
- Heightened community expectations for good drainage, flood protection and ecologically healthy rivers.
- Increased pressure on available open land within the city and the need to protect urban river corridors, wetlands and other drainage routes.

- The water scarce nature of the region and the increasing need for integrated urban water resource management.

1.4 Customer Needs

Residents and visitors to the city have reasonable expectations for the following outcomes from the service:

- Good drainage
- Management of flood risks to houses industrial and commercial properties.
- Improved water quality in the city's rivers, vleis, wetlands and receiving coastal waters.
- Protection and enhancement of urban river corridors and wetlands as important natural features within the urban landscape.
- Multi-functional, sustainable use of river corridors and drainage systems

1.5 Contemporary Catchment, Stormwater and River Management Practice in Cape Town

A paradigm shift in approach to stormwater and river management has developed over the past few years, based on the philosophy of integrated catchment management. Catchment management is defined as simultaneously a philosophy, a process and an implementation strategy to achieve a balance between utilisation and protection of environmental resources within a particular catchment area.

Whilst the traditional role of stormwater management remains undiminished, namely to minimise the impacts of flooding, more emphasis is now placed on the following:

- An integrated and co-ordinated catchment based planning approach founded on good understanding of local needs and values. Decisions now incorporate water quantity, water quality and socio-economic considerations in support of broader city objectives. It is further recognised that there is strong interrelationship between human health, the environment and development.
- Protection of urban water resources; including rivers, wetlands, vleis, subsurface and coastal waters from the potentially harmful impacts of development through the reduction of pollutant loads as near to source as possible.
- Development of innovative infrastructure solutions that are cost effective, sustainable in terms of future maintenance requirements, environmentally sensitive and maximise social and amenity value.
- Involvement of communities and other stakeholders in the management of river systems through catchment forums. This includes efforts to promote other beneficial uses of stormwater and river systems through educational programmes and capacity building initiatives.

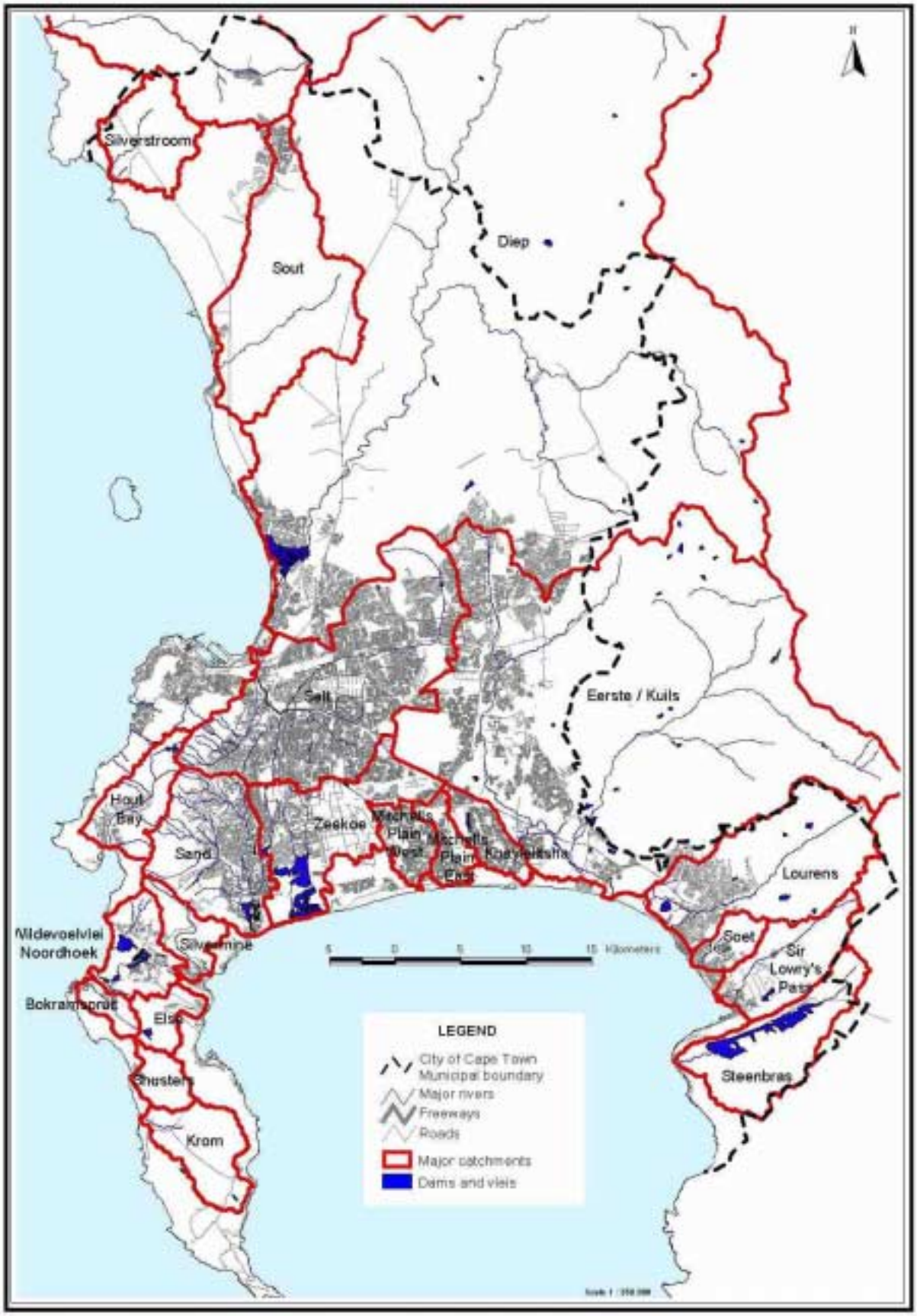

Figure 1: Drainage Catchments of Cape Town

2. Institutional Overview

2.1 Mandate

In terms of the Constitution of the Republic of South Africa (Act 108 of 1996), municipalities have the executive authority and the right to administer stormwater management systems in built-up areas. Receiving water bodies such as rivers, wetlands, vleis and groundwater reservoirs within the metropolitan area of Cape Town are deemed included, insofar as hydrological functioning is concerned.

2.2 Local Government Reforms

The past decade has seen sweeping structural changes at national, provincial and local government levels. During 1996, various smaller municipalities within the metropolitan area were amalgamated into a two-tear system of municipal governance comprising six Metropolitan Local Councils and the Cape Metropolitan Council.

The metropolitan council was responsible for ensuring integrated management of urban drainage systems and providing the required strategic framework for the provision, operation and maintenance of stormwater systems by the local councils. The second and final phase of local government restructuring commenced in December 2000, with the formation of the City of Cape Town by amalgamation of the seven administrations mentioned above in terms of the Municipal Structures Act (No.117 of 1998).

A process of administrative reform in terms of the Municipal Systems Act (No.32 of 2000) is also underway. This act empowers and encourages municipalities to move progressively towards the social and economic upliftment of communities in a financially sound and economically viable manner. In support of the developmental role of local government, strong emphasis is placed on integrated planning, service delivery and performance management as well as the engagement of communities in municipal affairs.

2.3 Core Business Definition

The catchment, stormwater and river management service currently provided within the municipal area, involves the management of urban catchments in respect of their hydrological functioning for drainage, flood control, ecological and social needs and as an important urban water resource. It includes the management of stormwater reticulation systems, open watercourses, wetlands, groundwater, vleis and river estuaries.

2.4 Functional Areas

The main functions of the Catchment, Stormwater and River Management service are as follows:

- Strategy, policy and guideline development
- Planning and development control
- Monitoring of rainfall, river flow and water quality
- Relationship management and education
- System upgrading and development
- Infrastructure maintenance (reticulation, watercourse maintenance, etc)

2.5 Service Delivery Mechanisms

Responsibility for delivery of the service is vested in the Transport, Roads and Stormwater Directorate. The relationship to other services and directorates is depicted in **Figure 2** below.

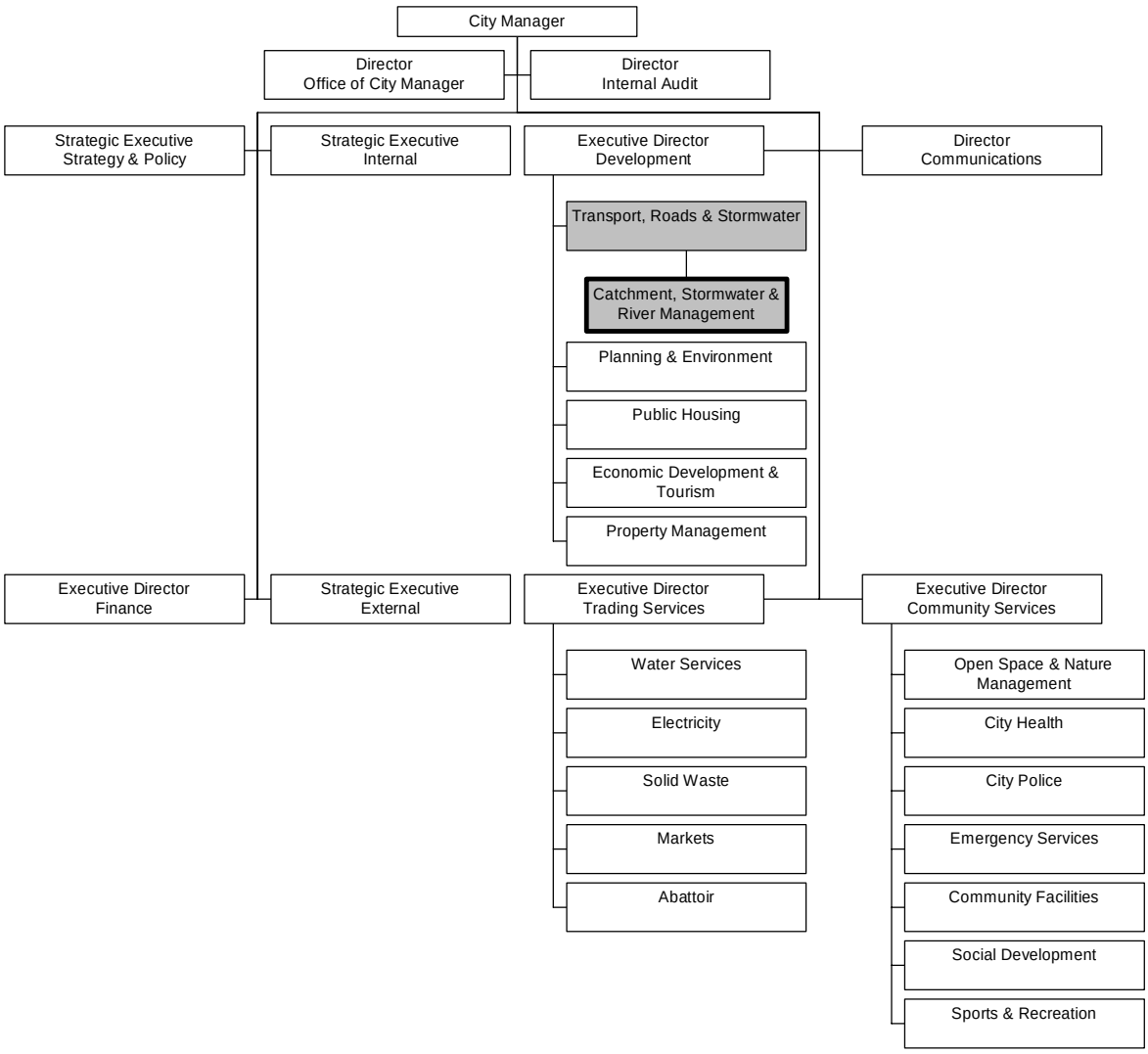

Figure 2: City of Cape Town Organisational Structure

Note: The diagram reflects reporting lines only, and does not imply relative seniority of the executive management team of the City

The drainage system comprises a complex mix of constructed infrastructure (underground pipes and culverts, lined and unlined canals, etc) and "natural" features (rivers, vleis, wetlands, etc) with diverse functions (stormwater drainage, recreation, nature conservation, wastewater effluent conveyance, water supply, etc).

In extent, it comprises approximately:

- 1500 km of rivers, streams and canals
- 5000 km of underground pipes and culverts
- 300 stormwater detention ponds
- 300 Ha of wetlands

- 50 Ha of estuarine areas

This requires a concerted multi-sectoral approach to management dependent on the co-operation of various service delivery units within Council to achieve desired outcomes. Examples of service delivery units with an interest and / or impact in management of the drainage system are depicted in the tabulations below.

Service Delivery Unit	**Interest / Impact**
Roads	Roadways form part of the drainage system.
Water Services	Discharge of wastewater effluents into river systems. Also possible future abstraction of water from rivers and aquifers to augment water supply to the metropolitan area.
Waste Management	Effective street sweeping and area cleansing reduces pollution of watercourses, the marine environment and reduces flood risk.
Planning and Environment	Responsible for urban planning and environmental auditing.
Open Space, Nature and Coastal Management	Management of amenity and nature conservation aspects of riverine corridors, wetlands, vleis and beaches.
Health	Human health implications of poor water quality.
Housing	Responsible for informal settlements
Disaster Management	Management of flood disasters and pollution incidents

In addition, the following external stakeholders also have an interest and / or impact on the service:

Organisation	**Interest / Impact**
Department of Water Affairs and Forestry (DWAF)	Management and control of water resources in terms of National Water Act (Regulatory function)
Provincial Administration of the Western Cape (PAWC)	Control of activities that may have a detrimental effect on the environment in terms of Environmental Conservation Act (Regulatory function)
Academic and Research Institutions	Related research and education
Non Governmental Organisations and Catchment Forums	Advise and monitor activities of service

3. Strategy Context

3.1 City Vision and Priorities

The City of Cape Town aims to achieve a safe, well-run, open, smart city that is populated by informed people in order to make Cape Town the best city in which to live, work, invest and visit in South Africa. Priorities include crime, HIV/AIDS, free lifeline services and tourism.

The service supports the vision of the City through helping to provide a safe and clean city that is attractive to investors and visitors, by building partnerships, encouraging citizens to

take responsibility for the upkeep of the City and its environment, and in efficiently delivering an affordable service.

In addition, the service actively supports all Council's Pledges as indicated below.

Safe City	-	Provides stormwater drainage and prevents flooding
Caring City	-	Caring for the needs of all customers
Healthy City	-	Promotes healthy rivers and wetlands
Opportunity City	-	Promotes optimal use of natural resources
Well Run City	-	Includes best management practices
Access to Housing	-	Provides basic framework for drainage of catchment areas
Close to People	-	Encourages participation through catchment forums

3.2 Relationship to Other Sectoral Strategies

This strategy conforms to applicable legislative objectives and is anticipated to form an important sectoral component of both the Integrated Development Plan (IDP) prepared in terms of the Municipal Systems Act and the Integrated Metropolitan Environmental Policy (IMEP). The latter policy forms the foundation for an environmental management strategy for the City of Cape Town and integrates the built, cultural and socio-economic factors into a single environmental policy framework. In both cases, performance management and reporting form an integral component.

The relationship of the Catchment, Stormwater and River Management Strategy to other sectoral plans, strategies and the Integrated Development Plan is graphically illustrated by Figure 3:

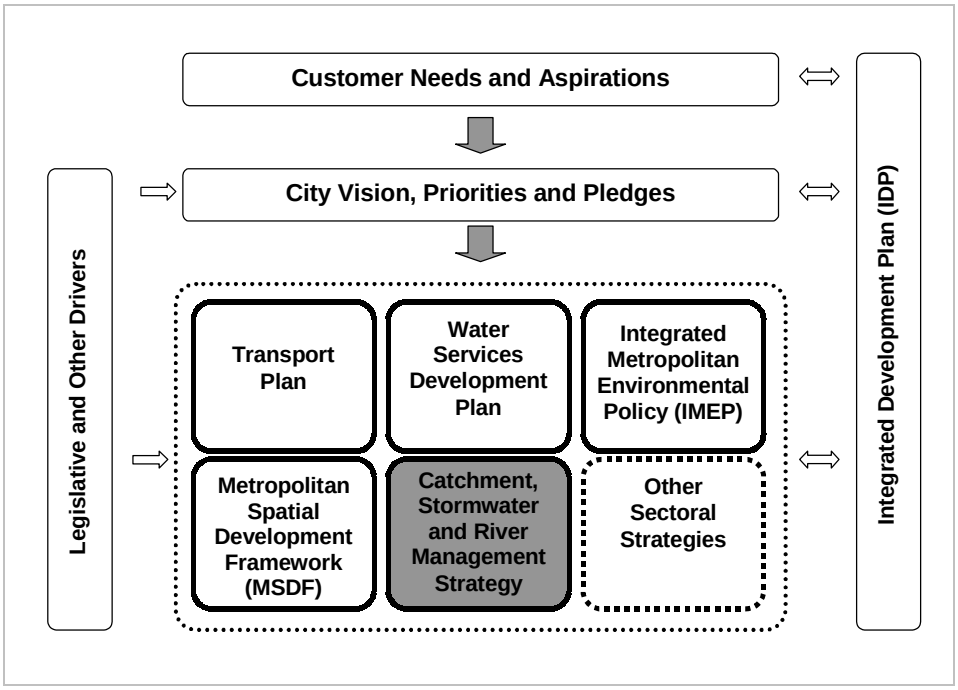

Figure 3: Relationship of the Catchment, Stormwater and River Management Strategy to other Sectoral Strategies

4. Goals and Outcomes

4.1 Service Vision and Mission

The vision and mission of the catchment, stormwater and river management service are as follows:

Vision - Effective stormwater drainage with safe and healthy rivers, wetlands, vleis and coastal bathing areas

Mission - Minimise flooding of property and improve the water quality and health of our rivers, wetlands, vleis and coastal bathing areas through integrated catchment management for the benefit of the people of Cape Town.

4.2 Outcomes

The following are the desired outcomes of the service:

- Effective stormwater drainage
- Managed flood risks (for residential, industrial and commercial properties as well as transport systems)
- Improved water quality (surface, ground and coastal waters)
- Ecologically healthy rivers, vleis and wetlands
- Multi-functional, sustainable use of river corridors and stormwater drainage facilities

Performance indicators are defined in Section 8.2.

5. Guiding Principles

Underpinning the strategy are the following guiding principles:

- Continuous improvement
- Customer focus
- Holistic planning & management
- Duty of care
- Sustainability
- Management excellence
- Co-operative governance
- Participation and partnership
- Transparency

It is important to note that in addition to the above-mentioned principles, the service is also subject to various principles contained in legislation such as the Municipal Systems Act and Development Facilitation Act.

6. Sphere of Influence

Application of the philosophy of catchment management to urban drainage catchments has been pioneered within the metropolitan area over the past five years to national acclaim. This strategy aims to build upon past successes and entrench a proactive and integrated approach to stormwater and river management within the City administration. Council plays a pivotal role in understanding the cause and effect relationships associated with stormwater and river systems and managing the impacts of development and it's own operational activities such as wastewater treatment works.

Whilst the majority of actions in terms of the strategy are the responsibility of the Catchment, Stormwater and River Management Branch, commitment and support from various other service delivery units and key stakeholders is also required. (Refer to Section 2.5 above). Successful implementation can only be achieved within a co-operative political and corporate management climate.

Further detail on mechanisms to ensure the commitment and co-operation required to achieve the strategic outcomes are detailed in various sections below.

7. Strategic Focus Areas

Flowing from an in depth evaluation of current management practice, development trends and best practice, six strategic focus areas have been identified for the service as depicted in **Figure 4** below. Holistic planning and management represents the nucleus of the strategy.

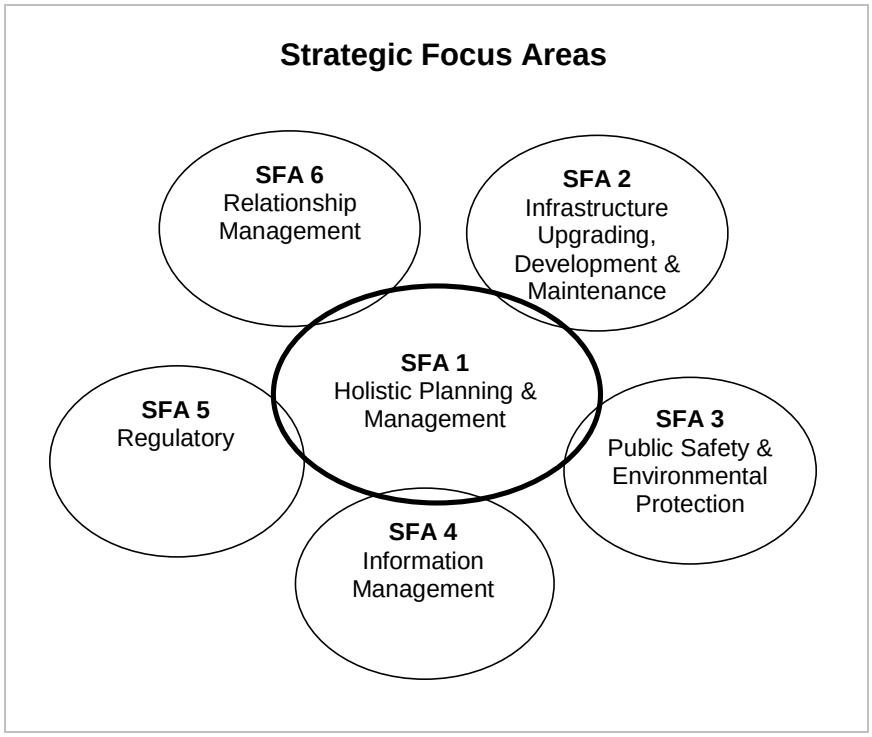

Figure 4: Inter-relationship of the Six Strategic Focus Areas

Various priority programmes within each focus area have been formulated to confirm and where necessary re-focus service delivery effort with anticipated minimal impact on current resources.

7.1 Focus Area 1 - Holistic Planning and Management

An integrated and holistic planning approach to stormwater and river management forms the core of the strategy. The numerous interdependencies that exist with other services such as Water & Sanitation, Transportation & Roads, Open Space and Nature Management, Housing and Amenities are also recognised.

By adoption of a systems approach, both the constructed and natural components of the stormwater system will be managed as an indivisible, mutually dependent whole. All planning will strive to balance competing societal needs and expectations with environmental requirements in an effort to ensure true sustainability. It is also recognised that large parts of the stormwater system have high intrinsic environmental value that must be protected or enhanced.

Participation of communities and civil society in the planning and management of rivers systems through catchment forums is strongly advocated.

7.1.1 Catchment, Stormwater and River Planning

Planning programmes are divided into the following categories (or levels):

Plan Category (Level)	Purpose
Catchment and River Management Plan (CRMP)	Sets overall management objectives and recommends key management actions with respect to runoff quantity, quality and other associated environmental and social issues.
Stormwater Management Master Plan (SMMP)	Identifies bulk infrastructure required within developing areas where applicable.
Local Stormwater Management Plan (LSMP)	Details how stormwater is to be managed within proposed or existing developments focussing on localised issues.

Catchment and River Management Plans will incorporate specific elements and/or inform related strategies, including but not limited to:

- Water Services Development Plan
- Metropolitan Spatial development Framework
- Metropolitan Open Space Systems
- Integrated Metropolitan Environmental Management Framework
- Coastal Management Framework

They will be prepared by the catchment, stormwater and river management service with the assistance and participation of key internal and external stakeholders (Water Services, Open Space and Nature Management, Community Organisations, etc) on a ‘rolling programme’. Plans for the eleven major drainage catchments within the metropolitan are scheduled for completion by July 2007. It is anticipated that each plan will be formally adopted by Council as a policy document.

In some cases, development pressures may require the formulation of Stormwater Management Master Plans in advance of a Catchment and River Management Plan.

Local stormwater management plans will primarily be prepared for new developments or the upgrading of existing infrastructure within the framework of CRMP's and SMMP's as required.

7.1.2 Integrated Urban Water Management

In view of the water scarce nature of the region and the interdependencies of the various sectors of water management, the service undertakes to play an active role in achieving the objectives of Integrated Urban Water Resource Management in partnership with Water Services. This is to the mutual benefit of both services, their respective customers and the environment.

Although already operating informally, it is envisaged that a fully representative multi-sectoral co-ordinating team will be established by July 2003. The primary focus will be on strategic issues, including inter-alia:

- Review of the respective services strategy development and implementation initiatives.
- Liaison with regulators
- Management of system relief connection sewers to stormwater management systems
- Management of the impacts of effluent from wastewater treatment works on river systems
- Water resource development

7.2 Focus Area 2 – System Development, Upgrading and Maintenance

The development, upgrading and maintenance of stormwater and river systems to cater for customer needs is fundamental to ensuring sustainable social and economic development in Cape Town. In addition, promotion of innovation, cost effectiveness and 'best practice' will serve to improve the overall competitiveness of the City.

7.2.1 Stormwater Management Guidelines and Design Criteria for New Developments

Guidelines and design criteria are critical to ensure development and extension of the stormwater system on a rational and coherent basis with similar standards being applied across the metropolitan area. They will provide guidance on development layout, available stormwater management technologies, minimum construction standards and environmentally sensitive construction practices.

Currently in preparation, they are scheduled for adoption as policy during 2002.

7.2.2 Risk Based Approach to Upgrading and Maintenance

In view of severe pressure on available financial resources within the city administration, there are distinct advantages to adopt decision criteria based on considered risks to life and property when contemplating system upgrading or maintenance. Evaluation techniques have been developed by a national research institution, which with some modification could enable comparison and prioritisation of projects or quantification of potential liability on the part of Council.

Implementation of this approach by 2005 is contemplated, subject to the availability and development of the required modeling tools.

7.2.3 Infrastructure Management System

Management of the infrastructure under the control of the service currently occurs on a fragmented ad-hoc basis, driven primarily by perceived priority of individual operational managers, the current parameter based budgeting process and customer complaints and requests. This approach is obviously flawed and cannot be expected to deliver optimum effectiveness.

Development of a customised system, interfacing with the corporate enterprise resource planning system (ERP), will facilitate the following:

- Management of both the natural and man made components of the stormwater system in terms of defined performance standards and outcomes
- Optimised utilisation and application of scarce resources
- Effective communication and flow of management information
- Implementation of a life cycle costing approach to infrastructure development
- Management of planning processes

It is the intention of the service to investigate and commission the development of such system by 2007 in phases.

7.2.4 Environmentally Sensitive River Maintenance

The rivers, wetlands and vleis within the metropolitan area form important components of the natural environment and are particularly susceptible maintenance technique. activities can disturb or irreversibly impact on these aquatic ecosystems through inter alia; release of fine sediments through dredging, stripping of bank vegetation and unintentional straightening of channels.

This programme aims to review and adapt current river maintenance activities to achieve reduced impacts, whilst ensuring compliance with provisions of relevant legislation. The guidelines will be completed by June 2002.

7.3 Focus Area 3 – Public Safety and Environmental Protection

The service accepts that it has a duty of care to ensure public health and safety as well as to minimise and mitigate where possible environmental degradation.

7.3.1 Flood Disaster Mitigation

In spite of City having a well developed conventional drainage system, many communities located within river floodplains or other trapped drainage areas (as is the case within many informal settlements) are vulnerable to the ravages of extreme flood events. The recently promulgated Disaster Management Act requires a proactive approach to all disasters including, flooding, with particular emphasis on prevention and mitigation. This philosophy reduces both social and financial post disaster recovery costs.

The service aims to provide technical and specialist advice to Disaster Management, including but not limited to:

- Identification and delineation of floodprone areas (including within informal settlements) to assist with response and evacuation planning.
- Extension of the real-time radio telemetry based flood warning system, currently operating in the Lourens River catchment to include the Kuils/Eerste and Diep/Rietvlei catchments (Refer **Figure 1** above for catchment locations).

- Assistance with public education and awareness campaigns
- Updating the corporate disaster management plan as required.

In an effort to promote flood readiness, and in pursuance of the requirements of the National Water Act, the service has commenced dissemination of information regarding the location of floodprone areas by means of the Internet.

7.3.2 Water Pollution Abatement

Wide-ranging concerns exist regarding deteriorating water quality in river systems and the concomitant impacts on coastal bathing water quality as well as the increased prevalence of toxic algal blooms in some water bodies.

Whilst water quality management forms an integral component of each catchment and river management plan, a generic metropolitan wide approach with defined protocols is required. Specific issues to be addressed under this programme by June 2003 include:

- Agreements with regulators such as Department of Water Affairs and Forestry on the city's water quality management functions
- Service level agreements with other business units such as Water Services
- Development of management tools, techniques and approaches
- Formulation of protocols for dealing with pollution incidents

The Coastal Water Quality Committee established in 1990, which is representative of the main functions within Council with an interest or impact on water quality will continue to play an advisory and audit function in this regard.

Further to the above, a specific programme to address the water quality impacts of poorly serviced dense settlements will also be undertaken. Protocols have been developed by the Department of Water Affairs and Forestry based on experiences in various pilot programmes.

7.4 Focus Area 4 – Information Management

The diverse nature and complexity of the stormwater and river systems requires a rigorous, systematic, integrated but flexible approach to computer based information systems. Management effectiveness founded inter-alia on access to good information, and the programmes described below aim to provide the necessary framework.

7.4.1 Information Systems

Considerable progress has already been made towards the electronic management of spatial information. In this regard the rivers and associated catchments as well as approximately 75% of the constructed stormwater infrastructure has been mapped in electronic format. The remaining base data capture is scheduled for completion by December 2004.

Rainfall, river flow and water quality monitoring results have been incorporated in a custom developed Monitoring Information System (MONIS) with various analysis tools for data interrogation and manipulation. These systems will be expanded to serve the district offices through the corporate Wide Area Network (WAN) over the next 2 years.

7.4.2 Data Bureau Services

Information collated or generated by the service such as rainfall and water quality monitoring results, floodlines and other GIS information is often of interest to property owners, developers, consultants, other authorities as well as research institutions.

In view of the high costs associated with data gathering, analysis and dissemination, it is proposed that suitable charges be levied for this service. Various cost recovery options will be evaluated with recommendations by January 2004.

7.5 Focus Area 5 - Regulatory

The service will continuously develop and enhance the regulatory framework and policies governing management of drainage catchment areas, stormwater and river systems within the context of evolving legislation and best practice.

7.5.1 Control of Development near Watercourses

Currently, different guidelines are being applied across the metropolitan area in assessing and approving developments adjacent to watercourses and wetlands. In addition, the impact of development on riverine ecosystems and the interface areas between developments and drainage corridors have generally received little attention in the past.

Revised draft guidelines are currently being applied on an evaluation basis. They will be upgraded to policy by January 2003, subject to public comment and Council approval. A comprehensive implementation manual to assist in interpretation and application thereof will also be prepared.

7.5.2 By-Laws

The legal framework within which the service can regulate the use of the stormwater and river systems is presently very limited. This results in common issues such as in-filling of floodplain areas or prevention of water pollution being almost impossible to enforce.

Subject to compliance with applicable legislation and corporate policy a uniform suite of by-laws will be completed and promulgated by July 2003.

7.5.3 Tariff Funding Options

The service is presently funded via the general rate on property. Various tariff-based models have been successfully implemented internationally in the face of diminishing fiscal resources. They are mainly based either directly or indirectly on impervious area measurements for individual properties and concomitant impacts on runoff quantity and quality

The service will institute investigations into a stormwater tariff system and report on findings and recommendations by January 2004.

7.6 Focus Area 6 - Relationship Management

Responsiveness to the needs and expectations of customers is one of the cornerstones of the strategy. Promotion of the service philosophy and objectives will be achieved by building capacity and competence within the organisation, facilitating value shifts within social and institutional contexts and developing partnership approaches.

7.6.1 Management Integration Mechanisms

As has been mentioned previously, the service outcomes are influenced by a number of functional areas within the administration. The necessary management integration will be achieved through the establishment of three or four regional multi-disciplinary catchment management teams comprising representatives from at least Transport, Roads & Stormwater, Water Services, Public Housing and Open Space & Nature Management. Each team will be responsible for a grouping of drainage catchments and will perform the following functions:

- Compilation, implementation and monitoring of Catchment and River Management Plans
- Water quality monitoring and recommending corrective action
- Co-ordination of capital and maintenance programmes of the various functions represented.
- Interface with external stakeholders. (eg. through established catchment forums)
- Comment on development applications, which affect the catchment, stormwater and river management service.

The catchment management teams will be constituted and formalised by agreement between the various functional areas to be represented by March 2003. Responsibility for the co-ordination thereof rests with the Catchment, Stormwater and River Management service. Success of the teams will however be largely dependent on the co-operation of each of the various services involved.

7.6.2 Customer Care

The service will participate in corporate initiatives and develop requisite staff competencies. Business processes will be re-engineered and / or refocused to enhance customer satisfaction where appropriate. Measurement of customer satisfaction, not provided through corporate initiatives, will also be undertaken. This could include regular surveys, interviews, workshops and seminars with key stakeholders including councilors.

Catchment forums also play an important role in customer care by facilitating interaction between council and civil society around river management issues. Several of these advisory bodies have already been established.

The various actions in terms of this programme will be undertaken on an on-going basis.

7.6.3 Staff Development

This strategy challenges past management paradigms. As such, it is vital that staff adapt their values and work ethic to achieve true synergy in approach.

Particular areas for managerial and supervisory staff development will include:

- Customer care.
- Systemic thinking.
- Principles of land use planning.
- Basic understanding of hydrological and hydraulic principles.
- Environmental awareness and aquatic ecosystem functioning.
- Project management.
- Application of legislation and legal processes.

The various actions in terms of this programme will be undertaken on an on-going basis.

7.6.4 General Education Initiatives

This programme is intended to promote basic awareness and appreciation of stormwater systems and the functioning and value of rivers, wetlands, vleis and the receiving coastal waters; through:

- Educational materials.
- Printed and electronic media publications.
- Displays, exhibitions and presentations.
- Workshops and Training seminars.

The various actions in terms of this programme will be undertaken on an on-going basis.

7.6.5 Partnership Development

The forging of mutually beneficial partnerships is considered vital in assisting the service to achieve the strategic objectives. They can also realise significant benefits such as reduced service delivery costs and assist in promoting new philosophies and ideas, in addition to beneficially exploiting areas of synergy.

Partnerships will be pursued with individuals, community groupings, non-governmental organisations and institutional stakeholders in the following areas:

- Education and capacity building
- Water related research
- River, vlei and wetland management
- Pollution control and abatement.

The various actions in terms of this programme will be undertaken on an on-going basis.

8. Review, Evaluation and Updating

The stormwater management strategy is expected to re-position, consolidate and develop the service over the medium term to long term. It is however patently obvious that service outcomes will not be directly influenced through mere execution or implementation of the supporting programmes. Other factors such as access to resources and support of the underlying philosophy and approach by a wide range of business units could prove more important. As such, a pragmatic and flexible approach to implementation of the strategy will be required.

8.1 Responsibility

As mentioned in Section 6 above, responsibility for managing the various supporting programmes vests in the Catchment, Stormwater and River Management Branch. This branch will thus be responsible for ensuring the necessary co-ordination with other affected internal and external stakeholders where required.

The current political structure of the Council clearly separates legislative and executive powers with Portfolio Committees inter-alia responsible for the following within their functional areas:

- Development and recommendation of policy
- Monitoring the implementation of Council's IDP, budget, business plans, strategic objectives, policies and programmes
- Development and recommendation of business plans
- Assessing the performance of service delivery (outcomes monitoring).

Responsibility for development of this strategy and underlying policy or approach is that of the Transport, Roads and Stormwater portfolio committee with the concurrence of Council. In terms of the current functions and powers, this committee is logically also responsible for monitoring implementation of the strategy as well as the overall service outcomes. Where required this may also include the necessary co-ordination with other functional portfolio committees.

8.2 Performance Measurement and Updating

Review of progress in implementing the strategy will be undertaken on a annual basis at a special meeting of the responsible portfolio committee attended by representatives of other functional portfolio committees and the administration as may be required. These reviews would include an assessment of the outputs of various priority programmes as indicated in Table 2 as well as the service outcomes as indicated in Table 1 below.

Table 1: Service Outcome / Impact Indicators

	Baseline	**Target**
Management of Flood Risks	No information	Less than 5 multiple property flooding incidents per year (provided rainfall is within 10 yearly maximum severity, not applicable for informal settlements)

	Location	**Public Health** (% Compliance with 80th percentile standard)		**Aquatic System** (Index Value)	
		Baseline	**Target**	**Baseline**	**Target**
Improved Water Quality	Rivers	#	#	#	#
	Vleis	#	#	#	#
	Beaches: False Bay	#	90%	Not applicable	
	Beaches: Atlantic	#	75%		

Under development. Scheduled for completion by August 2002

Where circumstances require, the focus of programmes and overall performance targets may be reviewed by the responsible portfolio committee, or on recommendation of service management. It is however prudent that the overall approach, philosophy and management principles be updated as required every 5 years in keeping with the principle of continuos improvement.

Table 2: Priority Programme Output Indicators

Strategic Focus Areas	Supporting Programmes	Output Indicators
Holistic Planning and Management	1. Catchment, Stormwater and River Planning	▪ Complete and adopt two catchment and river management plans per annum ▪ Complete and adopt catchment & river management plans on a prioritised basis for the 11 major drainage catchments by July 2007 ▪ Complete and adopt stormwater management master plans covering areas totaling at least 1000 ha per annum
	2. Integrated Urban Water Management	▪ Establish fully representative multi-disciplinary co-ordinating team by July 2003 ▪ Convene meetings of co-ordinating team at least twice annually.
System Development, Upgrading and Maintenance	1. Stormwater Management Guidelines and Design Criteria for New Developments	▪ Guidelines complete and adopted as policy by December 2002 ▪ Review, validate and update on a biennial basis
	2. Risk Based Approach to Upgrading and Maintenance	▪ Develop and implement system by July 2005
	3. Infrastructure Management System	▪ Develop and implement system by July 2007
	4. Environmentally Sensitive River Maintenance Guidelines	▪ Guidelines complete by June 2002 ▪ Fully implemented at operational level during 2002/2003 financial year. ▪ Review, validate and update on a biennial basis
Public Safety and Environmental Protection	1. Flood Disaster Mitigation	Under development
	2. Water Pollution Abatement	▪ Define and implement generic protocols for water pollution abatement by June 2003
Information Management	1. Information Systems	▪ Complete network data capture by December 2004
	2. Data Bureau Services	▪ Evaluate cost recovery options with recommendations by January 2004
Regulatory	1. Control of Development near Watercourses	▪ Upgrade draft guidelines to policy by January 2003
	2. By-Laws	▪ Promulgate by July 2003
	3. Tariff Funding Options	▪ Report to Council on findings and recommendations by January 2004
Relationship Management	1. Management Integration Mechanisms	▪ Constitute and formalise multi-disciplinary catchment teams by March 2003 ▪ Convene quarterly meetings
	2. Customer Care	▪ Undertake biennial customer satisfaction surveys
	3. Staff Development	Under development
	4. General Education Initiatives	Under development
	5. Partnership Development	Under development

Any amendments that may be required to the strategy will be documented and reported through the applicable administrative and political structures. Annual reporting on the key indicators as outlined in Table 1 above will be achieved through Council's annual Sate of the Environment Report prepared in terms of the Integrated Metropolitan Environmental Policy. Annual reports prepared specifically for the service will also be utilised for this purpose.

8.3 Business Planning

Whilst this strategy has a strong proactive planning bias, the other core business functions within the service are equally important to it's success. Functional business plans will facilitate translation and interpretation of the strategy by the tactical and operational components of the service. The time horizon for detailed business plans varies between one and three financial years in terms of corporate policy. Where required, the business plans of other service delivery units should be aligned with this strategy and the Catchment, Stormwater and River Management Branch business plans.

Contact Details

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Glossary of Terms

Aquifer: A geological formation which has structures or textures that hold water or permit appreciable water movement through them.

Base Flow: Flow occurring in a water course not attributable to a storm rainfall event, but to groundwater flow where the water table intersects the stream channels of a catchment.

Catchment: (in relation to a watercourse or watercourses or part of a watercourse) means the area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points

Catchment Management: simultaneously a philosophy, a process and an implementation strategy to achieve a balance between utilisation and protection of environmental resources in a particular catchment area

Council: means the municipal council of the City of Cape Town.

Detention facility: A structure which temporarily stores excess stormwater for a length of time. The outlet of the structure is designed to release the stored water into the

downstream watercourse at a rate less than the flow rate into the facility during storm events.

Development: means a man-made change to property, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

Flood or Flood Waters: means a temporary rise in water level including ground water or overflow of water onto land not normally covered by water.

Flood Plain: The flood plain of a river is the valley floor adjacent to the incised channel, which may be inundated during high water.

Interception: Precipitation stored on vegetation as opposed to rain in surface depressions (termed depression storage).

Major drainage system: A stormwater drainage system, which caters for severe, infrequent storm events. Supported by the minor drainage system.

Management Plan: A document including, as appropriate, both written and diagrammatic information describing how a particular area of land is to be used and managed to achieve defined objectives. It may also include description and discussion of various issues, problems, special features and values of the area, the specific management measures which are to apply and the means and timing by which the plan will be implemented.

Minor drainage system: A stormwater drainage system, which caters for frequent storms of a minor nature.

Pollution: means the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful to:

- the welfare, health or safety of human beings
- any aquatic or non-aquatic organisms
- soils and vegetation
- the resource quality
- property

Recurrence interval: Recurrence interval or return period is the average interval between events. The recurrence interval is usually expressed in years and is the reciprocal of the annual probability. That is, the event having an annual probability of occurrence of 2% (0,02) has a recurrence interval of 50 Years. This does not imply that such an event will occur after every 50 years, or even that there will necessarily be one such event in every 50 years. This does not imply that such an event will occur after every 50 years, but rather that over a much longer period (like a 1 000 year period) there will very likely be 20 events of equal or greater magnitude.

Retention Facility: A structure which retains runoff indefinitely should the capacity of the structure be sufficient to contain such runoff. Excess flow into the structure will be discharged via a spillway.

Riparian Habitat: includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas

Runoff: Water which flows over the soil surface.

Stormwater: means water resultant from natural precipitation and/or accumulation and includes rainwater, groundwater and springwater;

Stormwater Management: involves both the quantitative and qualitative management of stormwater and the functions associated with planning, designing, constructing, operating, maintaining and financing stormwater management systems.

Stormwater Management Systems: means both constructed and natural facilities that collect, convey, store, control, treat, use and dispose of stormwater.

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Watercourse: Lake, river, channel or other topographic feature in which water flows regularly or intermittently.

Water Resource: includes a watercourse, surface water, estuary or aquifer (National Water Act)

Wetland: Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.